ABZECO
Applied Botany, Zoology & Ecological Consulting

Falls to Hotham Alpine Crossing: Environmental Assessment

Prepared for: Parks Victoria

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Report 20083 — Version 1.5 — 11 April 2025

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1.0 FHAC updated PEVA[1]	Author	Louise Rodda (Abzeco) Flora: 2021 and 2022 project area	06/06/2023
1.0 FHAC updated PEVA	Author	David DeAngelis (Abzeco) Fauna: 2021 and 2022 project area	06/06/2023
1.0 FHAC updated PEVA	Author	Alistair Smith (Abzeco) Fauna: 2022 project area	05/06/2023
1.0 FHAC updated PEVA	Author	Neville Rosengren (Environmental Geosurveys P/L) Geomorphology: 2022 additional assessment areas	02/04/2023
1.0 FHAC updated PEVA	Author	Dr John Webb (Environmental Geosurveys P/L) Geomorphology: 2022 additional assessment areas	24/01/2023
1.0 FHAC updated PEVA	GIS mapping	Jamie McMahon (Abzeco & Spatial Niche)	20/02/2023
1.0 FHAC updated PEVA	GIS mapping	Joe Price (Abzeco)	04/06/2023
1.0 FHAC updated PEVA	Author	Dr Matthew Hatton (Abzeco) Flora: study area west of Tawonga Huts 2021 project area	26/03/2021
1.0 FHAC updated PEVA	Author	Julian Martin (Water Technology) Geomorphology 2021 project area	25/02/2021

[1] Falls to Hotham Alpine Crossing (FHAC) updated Preliminary Environmental Values Assessment (PEVA)

Version	Responsibility	Name	Date
1.0 FHAC updated PEVA	Author	Tom Atkin (Water Technology) Geomorphology 2021 project area	25/02/2021
1.0 FHAC updated PEVA	External botanical review: Flora: 2021 and 2022 project areas west of Craigs Hut	Dr Matthew Dell (Southeast botanical consulting)	04/09/2023
1.0 FHAC updated PEVA	External botanical review: Flora: 2021 and 2022 project area across the Bogong High Plains	Doug Frood (Pathways Bushland and Environment)	22/08/2023
1.0 FHAC updated PEVA	External zoological review: 2021 and 2022 project area	Nick Clemann (Arthur Rylah Institute for Environmental Research)	22/09/2023
1.1 FHAC updated PEVA	Updates to address Parks Victoria comments on draft	Louise Rodda (Abzeco)	23/01/2024
1.1 FHAC updated PEVA	Updates to address Parks Victoria comments on draft	David DeAngelis (Abzeco)	23/01/2024
1.1 FHAC updated PEVA	Internal review	Isabella Amouzandeh (Abzeco)	02/02/2024
1.2 FHAC updated PEVA	Cope Hut and Weston Hut assessments	Louise Rodda (Abzeco)	13/05/2024
1.2 FHAC updated PEVA	Cope Hut and Weston Hut assessments	David DeAngelis (Abzeco)	12/05/2024
1.3 Environmental Assessment	Text updates to address Parks Victoria comments and update figures	Louise Rodda (Abzeco)	14/10/2024
1.4 Environmental Assessment	Updates to Cope Hut and Weston Hut Figures	Louise Rodda (Abzeco)	13/01/2025
1.5 Environmental Assessment	Text updates and addition of addendum	Louise Rodda (Abzeco)	11/04/2025

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Acknowledgements

Abzeco would like to thank the following people for their contributions to the project, including providing project information, technical advice and feedback:

- **Luiz Dias Ferreira** — Senior Project Manager – Alpine Infrastructure Capital Projects, Parks Victoria.
- **Christie Hill** – Project Manager, Infrastructure Capital Projects, Parks Victoria.
- **Bruno Benavente —** formerly Strategic Initiatives Coordinator, Park Planning & Policy, Parks Victoria.
- **Bernadette Schmidt** — Program Coordinator—Environmental Impact, Environment and Science, Parks Victoria.
- **Dr Marie Keatley —** Plant Community Ecologist, Science and Management Effectiveness Branch, Parks Victoria.
- **Bruce McGurty —** Analyst Spatial and Information, Cartographer, Information Technology Services, Parks Victoria.
- **Chris Derrick —** District Manager North East, Parks Victoria.
- **Kevin Cosgriff —** Team Leader Mount Beauty, Parks Victoria.
- **Monica Hersburgh** – Area Chief Ranger, Kiewa Murray/North East District, Parks Victoria.
- **Cynthia Tam** – Project Manager – Alpine / Infrastructure Capital Projects, Parks Victoria.
- **Dr Phoebe Burns** — Native Rodent Biologist, Zoos Victoria.
- **Josh Griffiths** — Program Manager, Aquatic and Field Ecology, CESAR/EnviroDNA.
- **Dr Birgita Hansen —** Senior Research Fellow, Federation University.
- **Dr Dean Heinze —** Honorary Visiting Fellow, La Trobe University.
- **Dr Julia Mynott —** Postdoctoral Researcher, Centre for Freshwater Ecosystems, La Trobe University.
- **Dr Tarmo Raadik —** Senior Research Scientist, Applied Aquatic Ecology, Arthur Rylah Institute for Environmental Research.
- **Dr Matt West —** Research Fellow, University of Melbourne.
- **Geoff Williams —** Director, Australian Platypus Conservancy.
- **Dr Ewen Silvester —** (Centre for Freshwater Ecosystems, La Trobe University).

Field team

Name	Title or Role	Assessed area/s	Organisation	Role
Louise Rodda	Senior Botanical/Ecological Consultant	Bogong High Plains, OV1, OV2, Cope Hut, Weston Hut (2020 -2025)	Abzeco	Project Manager, Field Botanist
Dr Matthew Hatton	Senior Botanical/Ecological Consultant	Tawonga Huts to Mount Hotham (2020)	Abzeco	Field Botanist
David De Angelis	Senior Zoological/Ecological Consultant	Entire track alignment in 2020, Bungalow Spur Track (2022), OV3, Cope Hut, Weston Hut (2024)	Abzeco	Field Zoologist, Reporting
Alistair Smith	Field Assistant, Zoology and Geology	Bogong High Plains, Bungalow Spur Track, OV1, OV2, and OV3 (2022)	Abzeco	Field Assistant
Matthew Lee	Field Assistant, Geology	Bungalow Spur Track, OV3 and OV4 (2022)	Abzeco	Field Assistant
Adrian Lamande	Botanical Consultant	Tawonga Huts to Kiewa West Logging Road (2020)	Abzeco	Field Botanist
Doug Frood	Company Director Senior Ecologist and Ecological Vegetation Classes Expert	Bogong High Plains, OV1, OV2 (2020)	Pathways Bushland and Environment	Field Botanist
Dr Matthew Dell	Company Director, Senior Botanist	Kiewa West Logging Road to Mount	Southeast Botanical Consulting	Field Botanist

Name	Title or Role	Assessed area/s	Organisation	Role
		Hotham and Harrietville OV3, OV4 (2020, 2022)		
Dr Catherine Clowes	Senior Botanist	Bungalow Spur Track, OV3, OV4 (2022)	Southeast Botanical Consulting	Field Botanist
Nick Clemann	Senior Zoologist, Threatened Alpine Herpetologist - Program Leader, Threatened Fauna	Track below the dam wall, Fainter Firetrail, short track south of Tawonga Huts, OV1, OV2, OV4 (2020)	Arthur Rylah Institute for Environmental Research	Field Botanist and Zoological Report Review
Dr Zak Atkins	Company Director, Principal Ecologist, Threatened Alpine Herpetologist	Entire track alignment in 2020, track below the dam wall, Fainter Firetrail, short track south of Tawonga Huts, OV1, OV2, OV4 (2020, 2022)	Snowline Ecology	Field Zoologist
Julian Martin	Environmental Engineer/Fluvial Geomorphologist	Entire 2020 alignment	Water Technology	Field Geologist
Tom Atkin	Environmental Engineer/Waterway Management Specialist	Entire 2020 alignment	Water Technology	Field Geologist, Reporting
Neville Rosengren	Company Director, Geomorphologist and Honorary Research Associate	Track below the dam wall, Fainter Firetrail, short track south of Tawonga	Environmental Geosurveys P/L	Principal Field Geomorphologist, Reporting

Name	Title or Role	Assessed area/s	Organisation	Role
		Huts, OV1, OV2 (2022)		
Dr John Webb	Emeritus Professor, Environmental Geoscience La Trobe University	Bungalow Spur Track, OV3 and OV4 (2022)	Subcontracting to Environmental Geosurveys P/L	Principal Field Geomorphologist, Reporting

The locations of fauna species recorded during this assessment that are particularly sensitive to habitat disturbance or at risk from exploitation (e.g. poaching) have been redacted in this report and provided to Parks Victoria separately to safeguard and protect them and their habitats.

Executive summary

Introduction

Parks Victoria (PV) are planning the Falls to Hotham Alpine Crossing (FHAC) project which will entail widening and resurfacing existing tracks, the construction of new sections of track, and construction of huts and camping platforms at four new overnight accommodation nodes between Falls Creek and Mount Hotham. The project scope is detailed in the Falls to Hotham Alpine Crossing Master Plan (FHACMP) which was finalised in 2018.

A preliminary environmental values assessment (PEVA) was undertaken in 2020/2021 to identify the potential impacts to flora, fauna and geomorphological values from the project.

In 2022, the project footprint and concept plans were revised, and the track alignment and overnight node (OV) locations updated. In 2023 two alternative OV options were added to the project plans. Field assessments to assess the new sections of track and new OVs were undertaken in 2022 and 2024. The proposed track below Rocky Valley Dam wall, Fainter Firetrail, the short track south of Tawonga Huts, Bungalow Spur Track, OV1 preferred, OV1 alternate, OV2 preferred, OV2 alternate, OV3 and OV4 were assessed in 2022 and the existing camping areas at Cope Hut and Weston Hut were assessed in 2024.

This FHAC Environmental Values Assessment (EVA) report includes consideration of the areas of existing track assessed in 2020/2021 that have been retained in the current 2022 alignment, additional track sections and revised OV locations included in the alignment in 2022, and the updated 2024 OV locations.

The conservation status of all threatened species recorded in the current assessment area or considered likely to occur there has been updated in line with the current *Flora and Fauna Guarantee Act 1988* (FFG Act) Threatened List, and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) lists of threatened flora and fauna.

Background and context

Understanding and considering existing impacts on natural values in the study area is necessary to assess the potential additional or cumulative effects of the FHAC on flora, fauna, hydrology and geological features.

The Victorian alps support a number of endemic flora and fauna and nationally significant and sensitive geoscience (geoheritage) features that are of restricted occurrence nationally.

Anthropogenic threats in the Victorian alps have impacted natural values in the project area in the past, and several are continuing to do so, which have resulted in some species and vegetation communities becoming threatened, and sites of geological significance and waterways being disturbed and altered.

These impacts include:

- Historic cattle grazing.
- Clearing of vegetation and habitat for the construction and maintenance of recreational facilities and power generation infrastructure including:
    - Vehicle tracks;
    - Walking tracks;
    - Ski resorts and all associated buildings;

  - Ski fields;
  - Ski lifts;
  - Huts;
  - Horse yards;
  - Bridges;
  - Dams;
  - Aqueducts; and
  - Quarries.
- Introduction and spread of weeds.
- Introduction and spread of pest animals.
- Global warming:
  - Increased average temperatures;
  - Reduced snow cover; and
  - Increased frequency, severity and extent of bushfires.

The flora in the Victorian alps is adapted to a short growing season due to limited time periods throughout the year that are above 10^0 C. This limits the capacity and extends the time required for plants (and therefore fauna habitat) to recover from threats and impacts.

Being adapted and restricted to the alpine environment, and in many cases already occurring at the highest elevations on the continent, many endemic flora and fauna species cannot disperse elsewhere to avoid and survive potential threats, making them highly sensitive to impacts.

Project area

The project assessment area includes 64 km of track with a 20 m buffer either side of the central track alignment (40 m belt transect), with the exception of the short track south of Tawonga Huts which has a 10 m buffer on either side. The full extent of each OV and access tracks from the main track to OV2 preferred and OV2 alternate (including a 10 m buffer on either side of the access tracks) are included in the project assessment area. The track buffers were applied to assess natural values adjacent to the existing route so that impacts of any minor changes to the track realignment were accommodated.

Impact area

The current proposed works area assumes track widening to 900 mm with some sections potentially widened to 1.2 m (as outlined in the FHACMP). The area of direct impacts also includes a 1 m construction buffer either side of the track and excludes the existing track section of c. 300 mm. The estimated total extent of the impact area on the track is 16.7 ha.

The total assessed area of all current OVs combined is 21.5 ha and includes connecting tracks (900 mm wide plus a 1 m construction buffer either side) for OV2 preferred and OV2 alternate. The plans for the OVs have not been finalized so the area of impact cannot be calculated at this time.

The final area of impact will be depend on which OV options are selected, final size of the OVs, the final length and width of track, and the length and width of any track realignment.

Natural values and features

Flora

Three hundred and ninety-seven species were recorded within the project assessment area including 329 native species, 66 exotic species and two species with uncertain taxonomic status.

Threatened species

Of the 329 native plant species recorded, 66 are threatened species and include:

- 1 EPBC Act listed species (listed as Vulnerable); and
- 65 FFG Act listed species:
    - 3 listed as Critically Endangered;
    - 51 listed as Endangered; and
    - 11 listed as Vulnerable.

Habitat for 137 threatened plant species (including species recorded during this assessment) was recorded within the project impact area and targeted surveys are recommended to identify the presence, location and population size of 136 of these species. They include:

- 4 EPBC listed species (all listed as Vulnerable); and
- 136 FFG Act listed species:
    - 13 listed as Critically Endangered;
    - 104 listed as Endangered; and
    - 19 listed as Vulnerable.

The abovementioned species include:

- 17 Victorian endemic species;
- 2 possible Victorian endemic species;
- 46 species confined to alpine areas; and
- 15 species confined to the Bogong High Plains/Mount Hotham area.

Long unburnt snow gums were recorded in the project assessment area. They are now uncommon due to the recent extent and increasing frequency of wildfires in the alpine area.

Vegetation communities

Threatened vegetation communities recorded in the project assessment area include:

- 1 EPBC Act listed community - Alpine Sphagnum Bogs and Associated Fens (listed as Critically Endangered); and
- 3 threatened FFG Act listed communities:
    - Alpine Bog Community;
    - Fen (Bog Pool) Community; and
    - Alpine Snowpatch Community.

Twenty Ecological Vegetation Classes (EVCs) were recorded along the track alignment and in the OVs including:

- 3 with a Bioregional Conservation Status (BCS) of Endangered;
- 1 with a BCS of Vulnerable;
- 8 with a BCS of Rare;
- 7 with a BCS of Least Concern; and
- 1 currently with no allocated BCS.

Fauna

Seventy-eight fauna species were recorded within the project assessment area including 73 native species and five introduced species.

Threatened species

Of the 73 native fauna species recorded, 10 are threatened species consisting of:

- 7 EPBC Act listed species:
    - 6 listed as Endangered; and
    - 1 listed as Vulnerable.
- 10 FFG Act listed species, including:
    - 2 listed as Critically Endangered;
    - 5 listed as Endangered; and
    - 3 listed as Vulnerable.

Suitable habitat was identified for an additional 19 threatened fauna species. Targeted surveys are recommended to search for these species as well as seven others already recorded in some parts of the assessment area that are considered likely to occur elsewhere along the alignment. These include:

- 11 EPBC Act listed species:
    - 1 listed as Critically Endangered;
    - 6 listed as Endangered;
    - 4 listed as Vulnerable; and
- 18 FFG Act listed species:
    - 3 listed as Critically Endangered;
    - 8 listed as Endangered;
    - 6 listed as Vulnerable; and
    - 1 Listed as Threatened pending assessment.

The abovementioned species include:

- 1 Victorian endemic species;
- 1 possible Victorian endemic species; and
- 13 species confined to alpine areas.

Six of these species are considered by the authors of this report to be highly prone to habitat vandalism (e.g. rock removal and disturbance) or poaching. Specific location details for them have therefore been redacted from this report and provided to Parks Victoria separately.

Geomorphology

Geoscience significance

Significant geoscience features recorded within the 2022 assessment area include:

- Extensive relict peri-glacial blockstreams and fossil soils along the majority of the Fainter Firetrail;
- Shallow elongate sub-circular depressions singularly and in closely spaced groups of unknown origin that are highly sensitive to disturbance at the eastern end of the short track south of Tawonga Huts;
- Unusually large exposed gneissic boulders at OV1 alternate;
- Relict fossil landforms and rock screes/blockstream deposits created by freeze-thaw wedging of upslope rock during periglacial periods that are sensitive to soil and vegetation disturbance at OV2 preferred; and
- An alluvial fan created by a debris flow slump with an old stream course running through the middle of OV3. There is a remote chance that in the event of an exceptional flood, the stream may revert from its current course in the east back to an old course through the centre of the OV. Although highly unlikely, if a future slump occurred here, it would deposit material across OV3.

Waterways

The track intersects a number of sensitive waterways and waterbodies including ground water discharge seepage/expression points, drainage lines, creeks, streams, and federal and state threatened Alpine Valley Peatlands and Alpine Fens (Bog Pools), which are all highly sensitive to disturbance.

The rivers, streams and creeks throughout the proposed project area may be prone to flooding.

Impacts of the proposed FHAC on environmental values

Natural values have the potential to be impacted by:

- Construction activities;
- Ongoing maintenance activities; and
- Current and increased numbers of visitors such as campers and hikers, and impacts associated with or caused by visitation to the area.

The likely impacts on native vegetation include:

- Vegetation clearing and trampling during the construction of tracks and OV infrastructure;
- Ongoing incremental vegetation loss post-construction caused by trampling from maintenance workers and hikers;
- Spread of weed seeds and propagules (including the nine noxious weeds recorded in the study area) via construction machinery, construction materials (e.g. imported

contaminated track surfacing materials), maintenance vehicles, and on footwear and clothing of construction workers, maintenance workers and hikers;

- Soil impacts including ground disturbance and compaction from vehicles, machinery and foot traffic, leading to an increased risk of erosion, soil loss and increased soil instability impacting plant health and increasing the risk of weed invasion. Many weeds favour disturbed soils, and can outcompete native species; and
- Altered hydrology caused by soil disturbance, soil compaction, soil loss, loss of vegetation, changed drainage and water runoff from track drainage structures and huts, leading to faster flows and reduced soil water retention which impacts vegetation health.

The likely impacts on fauna include:

- Direct mortality and injury from being crushed by machinery, construction workers and hikers;
- Loss and degradation of habitat including shelter, food sources and basking locations through the installation of structures, soil disturbance, altered hydrology, light and noise pollution, and potentially illegal rubbish dumping and rock and log removal by hikers (e.g. to create informal fire pits and rock stacks);
- Habitat fragmentation through vegetation removal for OV construction and track widening and ongoing maintenance resulting in reduced habitat connectivity;
- Potential increased spread of pathogens such as the Amphibian Chytrid Fungus via construction machinery, contaminated track construction materials, maintenance vehicles, and construction workers, maintenance workers and hiker footwear; and
- Elevated rates of predation by invasive and native predators in areas with reduced cover or improved access for predators.

Geomorphology impacts include:

- Damage and destruction of significant geoscience features; and
- Impacts and damage to waterways and water quality.

Legislative implications

Environmental Effects Act 1978 –

An Environmental Effects Statement will be required to address the following referral criteria*:*

- Individual environmental effects referral criteria:
    - Potential removal, destruction or lopping of ≥10 ha of native vegetation consisting of Endangered, Vulnerable or Rare EVCs that is not authorised for removal under an approved forest management plan or fire protection plan;
    - Potential loss a significant proportion of habitat or population (≥1%) of a Victorian threatened species; and
    - Potential effects on water quality, stream flows, water system functioning and the health or biodiversity of aquatic ecosystems over the long term;
- Combined (two or more) environmental effects referral criteria:

  - Potential removal, destruction or lopping of ≥10 ha of native vegetation that is not authorised for removal under an approved forest management plan or fire protection plan;
  - Potential effects on matters listed under FFG Act 1988 including listed ecological communities and endangered or threatened species;
- Potential extensive or major effects on landscape values of regional importance within or adjoining land reserved under the *National Parks Act 1975;* and
- Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term.

Environmental Protection and Biodiversity Conservation Act 1999

- An EPBC referral will be required as there would be significant impacts on a number of Matters of National Environmental Significance including:
  - The Australian Alps National Parks and Reserves, National Heritage Place matter
  - Listed threatened species and communities; and
  - Periglacial values included on the EPBC National Heritage List.

National Light Pollution Guidelines for Wildlife (May 2023)

- If artificial lighting is proposed at some point, then a risk assessment would need to be undertaken in accordance with the Australian Standard AS ISO 31000:2018 *Risk Management – Guidelines* (or updated equivalent). If considerable risk is identified, then an EPBC referral and Environmental Impact Assessment may be required.

National Parks Act 1975 and *1992*

- A referral to the minister is required as works are being undertaken in a National Park; and
- No project development works are permitted in the Bundara-Cobungra Remote and Natural Area.

Flora and Fauna Guarantee Act 1988

- Targeted surveys are required for 136 threatened flora species and 23 threatened fauna species to provide information relevant to the Victorian Environment Minister's consideration of the extent of the impacts of the project on biodiversity; and
- Protected flora permits are required for 117 plant species.

Conservation and Land Protection Act 1994

- Nine noxious weeds were identified that need to be controlled.

Declared water supply catchment

- Approvals are required from the Department of Energy, Environment and Climate Action (DEECA), the relevant Catchment Management Authority and relevant water authority.

Water Act 1989

- A Works on Waterways Permit is required from the North East Catchment Management Authority.

Wildlife Act 1975 and *Wildlife Regulations 2002*

- Wildlife Management Authorisation is required to address impacts on protected wildlife.

Planning and Environment Act 1987

- Avoidance and minimisation must be demonstrated.

Recommendations

Mitigation

The following mitigation measures are recommended:

- Avoid track widening and/or resurfacing works in areas that will impact threatened flora species, threatened fauna habitat or national heritage listed periglacial features; and
- Avoid construction works in OVs that contain threatened flora species, threatened fauna habitat or national heritage listed periglacial features.

Detailed environmental values assessment

A detailed environmental assessment of the works area will be required once the scope has been confirmed including:

- Targeted flora and fauna surveys as recommended in this report to more fully evaluate potential impacts;
- A detailed geoscience assessment of the entire study area to identify all areas of geological significance that may be impacted; and
- Detailed mapping of all waterways and drainage lines likely to be impacted by the project.

1 Introduction

Parks Victoria (PV) is proposing to undertake the Falls to Hotham Alpine Crossing (FHAC) project to resurface and widen existing tracks and construct four new overnight accommodation nodes (OV) between Falls Creek and Mount Hotham.

1.1 Background

The FHAC has been developed in multiple stages over several years. This commenced with the preparation of a master plan for the track alignment and OV locations including concepts for track enhancement works and OV hut and elevated camping platform construction and placement. These plans are detailed in the final Falls to Hotham Alpine Crossing Master Plan (FHACMP) (PV 2018).

Following the completion of the FHACMP, PV commissioned Abzeco in collaboration with Dell Botany (now Southeast Botanical Consulting), Pathways Bushland and Environment, Atkins Ecological Contracting (now Snowline Ecology), and the Arthur Rylah Institute for Environmental Research and Water Technology (ARI) to undertake the Falls to Hotham Alpine Crossing Environmental Values Assessment (FHAC PEVA) in August 2020. The main objective was to assess potential impacts and implications of the proposed project works on natural values and provide recommendations for avoidance and mitigation. The field assessments were undertaken between November 2020 and January 2021. The report was completed in September 2021 (Abzeco 2021) and provides details of the initial track alignment and OV location options.

In response to the findings of the FHAC PEVA, parts of the track alignment and the location and size of the OVs were updated in 2022 (see Appendix 1a-c). Parks Victoria commissioned Abzeco in November 2022 in collaboration with Environmental Geosurveys P/L, Southeast Botanical Consulting, Pathways Bushland and Environment, Snowline Ecology and the Arthur Rylah Institute for Environmental Research to undertake additional field assessments and update the FHAC PEVA report. The field work was undertaken in December 2022.

The updated FHAC PEVA area included the removal of track sections and OVs that were no longer included in the project area and the assessment of additional tracks and new OV locations included in the updated project area. The updates included:

- The removal of proposed new sections of track through uncleared native vegetation assessed in 2020-2021 comprising:
    - Two proposed new track sections west of Tawonga Huts including part of track section 9 and all of track section 10 (see Section 1.4 for details of track sections); and
    - Two proposed new track sections (12A and 12B) at the northern end of the Kiewa West Logging Road;
- The realignment of the track from the top of the Rocky Valley Dam wall (which is a sealed bitumen road with no dedicated pedestrian access) to below the dam wall through exotic vegetation west of a maintenance hut and along an existing vehicle maintenance track east of the maintenance hut;
- The inclusion of additional sections of existing tracks:
    - Fainter Firetrail (as a potential emergency access track);

  - Bungalow Spur Track (as a potential emergency access track); and
  - An existing informal, unnamed, short, walking track south of Tawonga Huts that links the Australian Alps Walking Track and Westons Spur Track (referred to as short track south of Tawonga Huts).
- The relocation and resizing of the proposed OVs which now include six options at four locations:
  - Bogong High Plains (two options):
    - OV1 preferred;
    - OV1 alternate;
  - Tawonga Huts (two options):
    - OV2 preferred (overlapping part of an OV option assessed in 2020/21);
    - North and south link tracks (connects OV2 preferred with Fainter Firetrail);
    - OV2 alternate (overlapping part of an OV location assessed in 2020/21);
    - Link track (connects OV2 alternate with track section 9);
  - West Kiewa Logging Road near Blairs Hut:
    - OV3; and
  - High Knob:
    - OV4 (overlapping part of an OV location assessed in 2020/21).

After a review of the 2022 field assessment results (Abzeco 2023), PV commissioned Abzeco to undertake a flora and fauna assessment of two additional OV location options located within existing camping areas near Cope Hut and Weston Hut (see Appendix 1a-c). These field assessments were undertaken in February 2024.

The 2023 updated FHAC PEVA draft report recommended a geomorphological assessment of LiDAR data be undertaken across the FHAC study area, however LiDAR data was not available at that time (Abzeco 2023). Parks Victoria acquired LiDAR data in late 2023 and commissioned Environmental GeoSurveys Pty Ltd to undertake a desktop review of LiDAR for the current proposed FHAC alignment (Rosengren 2024). The review was completed in February 2024 and is provided as a separate report (Attachment 3c).

The results presented in this FHAC EVA report include the 2020/2021 data for the current project area and the data collected in 2022 and 2024. This includes updates to reflect current taxonomic and FFG threatened species status.

1.2 Project objectives

The project objectives include:

- Identify natural flora, fauna and geomorphological values within the updated 2022/2024 track alignment footprint, OVs, and nearby surrounds that may be impacted by the proposed FHAC redevelopment works in line with the FHACMP (PV 2018);
- Update the conservation status of species recorded in 2020/21 (Abzeco 2021) to align with the new *Flora and Fauna Guarantee Act 1988* (FFG Act) Threatened List[2] and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened species; and
- Provide recommendations for targeted surveys and avoidance and mitigation of impacts on environmental values under the current plan to inform the project referral and assessment process.

1.3 Project description

1.3.1 Proposed track works

The proposed FHAC starts at Falls Creek and follow approximately 64 km (including 12.3 km of emergency access tracks) of largely existing walking and management vehicle tracks between Falls Creek, Mount Hotham and Harrietville.

The FHACMP proposed works includes track widening to 900 mm wide and up to 1200 mm in some sections to enable hikers to walk two abreast. This would require widening and upgrading most of the existing walking tracks. Post 2022 field assessments and draft report submission, PV advised that this is no longer one of the project objectives. The project scope is being updated to reduce track widening to focus on defining the track and improving track condition and sustainability with final widening locations and width yet to be determined. This report is based on the initial FHACMP track widening recommendations which will be updated once the extent of the works areas are finalised.

The proposed track works outlined in the FHACMP include track surfacing with gravel, or other materials and the use of elevated tracks in wet areas and areas with highly sensitive vegetation.

The FHACMP suggests that the use of steps should be limited to steep sections and recommends the use of stone edges, drainage strips and drainage channels to manage surface water runoff.

1.3.2 Proposed overnight nodes construction

The FHACMP proposes the construction of four OVs which would offer different accommodation options and amenities. These may include:

- Elevated camping platforms;

[2]*The Flora and Fauna Guarantee Act 1988* (FFG Act) was amended through the *Flora and Fauna Guarantee Amendment Act 2019* which came into effect on 1 June 2020. The amendments included the establishment of a single comprehensive list of Victoria's threatened species (the FFG Act Threatened List) which replaced the Victorian Advisory lists of threatened species in June 2021. The flora and fauna field assessments for the 2021 FHAC PEVA report were completed in December 2020, before the Victorian Advisory Lists were revoked and the Threatened List completed so threatened species were classified in line with the Victorian Advisory lists at that time.

- Weather-sealed huts;
- Boardwalks;
- Communal shelters for food preparation;
- Communal sealed vault toilet system;
- Water collection and storage areas;
- Solar panels; and
- Information boards.

The proposed OVs would be separate from existing dispersed camping areas and huts.

1.3.3 Scope of the environmental assessment

The work undertaken to update the environmental assessment includes:

- Identification and mapping of significant natural values along the proposed track alignment and within the proposed OV locations including:
    - National and Victorian listed threatened flora and fauna species;
    - Listed ecological communities;
    - Rare or threatened Ecological Vegetation Classes (EVCs); and
    - Habitat for listed fauna species.
- Identification of potential threats and impacts to flora and fauna values from the construction and ongoing management of the proposed FHAC track and OVs;
- Preliminary geomorphology assessments to identify key geomorphic features, values and threats present within the assessment area that are relevant to the track upgrade and associated works (does not include Cope Hut and Weston Hut existing camping area);
- Identification of potential ongoing direct and indirect threats and impacts on environmental values e.g., increased maintenance vehicles and numbers of hikers accessing the proposed FHAC and OVs;
- Recommendations for measures to avoid or mitigate impacts on identified natural values; and
- Identification of legislative and policy implications of the proposed works.

1.4 Study area

1.4.1 Location

The current track alignment and location of the OVs assessed during the 2022 and 2024 field assessments are shown in Appendix 1a and 1b.

1.4.2 Track

The total length of track is 64 km and the majority of the track was assessed in 2020/2021. The track assessment area includes the alignment (which is largely along existing informal tracks) and a 20 m buffer either side (i.e. a 40 m belt transect) along all sections of track, except for the

short track south of Tawonga Huts where a 20 m belt transect (i.e. 10 m buffer either side of the track) was assessed. The track buffer was included to allow for construction impacts and to consider indirect impacts to environmental values bordering the track alignment. The extent of the additional track assessed in 2022 is provided in Table 1.

Table 1. Falls to Hotham Alpine Crossing 2022 assessment area

Location	Track type	Distance (km)	Buffer (m) (either side of the track alignment)	Area (ha)
Bungalow Spur Track	Existing walking track	9	40	36
Fainter Firetrail	Existing 4WD track	3.3	40	13.2
Unnamed (track below Rocky Valley Dam)	New and existing pedestrian track	0.6	40	2.4
Unnamed (Short track south of Tawonga Huts)	New	0.5	20	0.5
OV1 Access Track (part of track section 5) (already assessed in 2020/21 so not reassessed in 2022)	Existing 4WD track	0.7	20	0.7
Totals		**14.1**		**52.8**

1.4.3 Overnight nodes

The OV assessment area in 2022 included the entire area of each OV and the access tracks to OV2 preferred and OV2 alternate. Similar to the main track, the OV2 access tracks assessment area comprised a 20 m belt transect (10 m either side of the tracks) (Table 2, Appendix 1a-c).

The OV assessment areas in 2024 included areas identified in the field by PV staff and Abzeco around existing camping areas and areas immediately adjacent to the assessment area (Table 2, Appendix 1a-c).

Table 2. Overnight nodes areas (ha) assessed in December 2022 and February 2024

Overnight node (2022)	Area (ha)
Cope Hut	
OV1 Preferred	0.8
OV1 Alternate	2.1
Subtotal	**10.1**
Tawonga Huts	
OV2 Preferred	1.4
OV2 Preferred north access track (265 m x 20 m)	0.5
OV2 Preferred south access track (435 m x 20 m)	0.9
Sub total	**2.8**
OV2 Alternate	1.5
OV2 Alternate access track (260 m x 20 m)	0.5
Subtotal	**2**
Blairs Hut	
OV3	**2.2**
High Knob	
OV4	**1.5**
Overnight node (2024)	
Cope Hut (existing camping area)	**1.3**
Weston Hut (existing camping area)	**1.6**
Total	**21.5**

1.4.4 Landscape context

The project area is part of the Alpine National Park with a short section of track located in the Mount Hotham Alpine Resort and includes vegetation contiguous with intact native vegetation within the Alpine National Park (Appendix 1b).

The proposed works area includes vegetation types ranging along an environmental altitudinal gradient of alpine treeless vegetation on the higher peaks to forested areas in the foothills at Harrietville and on the West Kiewa Logging Road.

The topography across the project area is variable (Appendix 1b). It includes gently undulating slopes across the Bogong High Plains ranging from c.1600 m to 1800 m above sea level (ASL). West of the Bogong High Plains, the landscape changes to a mix of steeply intersected gullies and high exposed ridgelines ranging in altitude from c.600 m above sea level (ASL) at the Bungalow Spur Track trail head at Harrietville to c.1900 m ASL at Mount Feathertop.

Numerous waterways intersect the proposed FHAC alignment including small drainage lines across the Bogong High Plains, creeks such as Tawonga Hut Creek, and the Diamantina River along the West Kiewa Logging Road (Appendix 1a and 1b).

The study area is intersected by sealed roads (Bogong High Plains Road and the Great Alpine Road), gravel management vehicle tracks (e.g. Cope Saddle Track) and formal and informal walking tracks (Images 1-7). The Falls Creek Alpine Resort is located at the eastern end, and the Mount Hotham Alpine Resort and Harrietville are situated at the western end of the project area.

1.4.5 Track section divisions and location

The proposed track alignment is divided into 18 sections for assessment, with separate flora and fauna species lists and geomorphological data collected in each track section and at each OV (Appendix 1a).

The track sections were determined based on track type (walking or vehicle) and location associated with changes in vegetation type (montane or alpine), as these divisions have some different threats and impacts, and therefore require different mitigation strategies.

Different areas of the assessment area fall under different jurisdictions which have varying planning requirements. The track sections, OVs and planning jurisdictions are shown in Table 3 and Appendix 1a.

Table 3. Falls to Hotham Alpine Crossing track sections, overnight nodes and planning jurisdictions (see Appendix 1a for maps) (December 2023 and February 2024)

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
1 & 1a	**New section of track** To be constructed from the maintenance hut to western end of dam wall **Existing track** Existing vehicle track from the maintenance hut to start of Heathy Spur Track	Between western end of Rocky Valley Storage Dam and Heathy Spur Track		North East	Alpine Shire • Public Conservation and Resource Zone (PCRZ) • Bushfire Management Overlay (BMO)	Victorian Alps
2	**Existing track** **(Heathy Spur Track)**	Between Rocky Valley Dam and Big River Firetrail	Eastern end within 100 m of the Bogong RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
3	**Existing track** **(Big River Firetrail)**	Between Heathy Spur Track and Marum Point Track/Kelly Track intersection	Northern end within 100 m of the Bogong RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
4	**Existing track** **(Australian Alps Walking Track)**	Between Big River Firetrail and Langford West Aqueduct Road		North East	Alpine Shire • PCRZ • BMO East Gippsland Shire • PCRZ • BMO	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
5	**Existing track** **(Langford West Aqueduct Road)**	Follows the Langford West Aqueduct Road to the Bogong High Plains Road		North East	Alpine Shire • PCRZ • BMO East Gippsland Shire • PCRZ • BMO	Victorian Alps
5	**OV1,** **Cope Hut Track**	Preferred OV location Alternate OV location		North East	East Gippsland Shire • PCRZ • BMO	Victorian Alps
6	**Existing track** **(Australian Alps Walking Track)**	Between the Bogong High Plains Road and a point north of the end of Cope West Aqueduct Road (east of Mount Jim)	South west end of this section is located in the Bundara-Cobungra RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
7	**Existing track** **(Australian Alps Walking Track)**	Between a point north of the end of Cope West Aqueduct Road (east of Mount Jim) and the Fainter Firetrail	South-east end of this section is located within the Bundara-Cobungra RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
8	**Existing track** **(unnamed)**	Between Fainter Firetrail and Tawonga Huts		North East	Alpine Shire • PCRZ • BMO	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
8-9	**OV2, Tawonga Huts, unnamed track**	Preferred OV2 location Alternate OV2 location		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
9	**Existing track** **(unnamed)**	Between Tawonga Huts and alternate OV		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
10a	**Existing track** **(unnamed)**	Connecting track between section 7 and section 11	Within the Bundara-Cobungra RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
11	**Existing track** **(eastern end of Westons Spur Track)**	Between the junction of Pole 333 and Weston Hut.	Eastern part of this section is located within the Bundara-Cobungra RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
12	**Existing track** **(unnamed track, West Kiewa Logging Road and eastern quarter of Diamantina Spur Track)**	Between Weston Hut and Diamantina Spur Track		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
12	**OV3 Blairs Hut, West Kiewa Logging Road**	Preferred OV (new)		North East	Alpine Shire • PCRZ • BMO	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
13	**Existing track** **(western three quarters of Diamantina Spur Track)**	Diamantina Spur Track to the Razorback track		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
13	**OV4, High Knob, Diamantina Spur**	Preferred OV (new)		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
14	**Existing track** **(Razorback track)**	Between the foot and peak of Mount Feathertop		North East	Alpine Shire • PCRZ • BMO	Victorian Alps
15	**Existing track** **(Razorback track)**	Between the foot of Mount Feathertop and the Great Alpine Road		North East	Alpine Shire • PCRZ • BMO Mount Hotham Alpine Resort (UNINC) • Public Park and Recreation Zone (PPRZ) • Transport Zone (TRZ2) • Bushfire Management Overlay— Schedule 1 (BMO1)	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
					• Erosion Management Overlay — Schedule 1(EMO1)	
16	**Existing track** **(unnamed track)**	Between the Razorback track and the water storage dam next to Mount Loch car park		North East CMA and borders the East Gippsland CMA	Mount Hotham Alpine Resort (UNINC) • PPRZ • Comprehensive Development Zone—Schedule 2 (CDZ2) • TRZ2 • BMO1 • EMO1	Victorian Alps
17	**Fainter Firetrail**	Between the intersection of sections 7 and 8 and Pretty Valley Pondage	Borders the Bundara Cobungra RNA	North East	Alpine Shire • PCRZ • BMO	Victorian Alps
18	**Bungalow Spur Track**	From the Razorback to Harrietville		North East	Alpine Shire • PCRZ • BMO	Victorian Alps and Highlands Northern Fall
5	**Cope Hut existing camping area, Cope Hut Track**	Around the existing Cope Hut camping platform area		North East	Alpine Shire • PCRZ • BMO	Victorian Alps

Track section	Track type/overnight node	Location	Remote and Natural Area (RNA)	Catchment Management Authority	Local Government Area (LGA), planning zones and overlays	Bioregion
	Weston Hut existing camping area, Westons Track	At Weston Hut		North East	Alpine Shire • PCRZ • BMO	Victorian Alps

1.4.6 Existing track condition

The existing track varies from around 40 cm wide along pedestrian-only tracks to approximately 3 m wide along maintenance vehicle tracks. Various artificial substrates have been used on the track including rubber matting (Image 1), river pebbles (Image 2), bare earth (Image 3) basalt stepping stones (Images 4-6), gravel (Images 7 and 8) and logs (Image 9). Steel bridge waterway crossings have been installed in some places.

Basalt stepping stones and logs have been used to manage wetter sections of the track across the Bogong High Plains in track sections 2, 4 and 6-8. However, soil surrounding basalt stepping stones has washed away in some locations, possibly making it difficult for walkers to balance on the now elevated stones. Evidence of off-track walking was observed in these locations (Image 6).

Parallel logs arranged along the contours of slopes appear to fail over time, as the logs effectively support one another and easily go askew if one of them begins to fail. The logs are difficult to walk on due to their rounded profile, they can become very slippery, are susceptible to rotting and slumping, and often end up partially submerged in mud (Images 9 and 10). This has resulted in hikers walking off-track adjacent to the parallel logs. This was evident in seepage areas associated with Damp Grassland and Sub-alpine Woodland EVCs in section 12, particularly where the elevation decreases toward Weston Hut.

In some steep and wet areas of track with no artificial substrate, track edges had become degraded by horses and off-track pedestrian traffic. Trampling has led to vegetation damage and loss resulting in bare ground, soil compaction, and erosion forming deep channels, particularly where the track intersects damp areas such as those supporting Alpine Bog Community and Damp Grassland. This was most obvious in track sections 2, 6-9 and 11 (Appendix 1b) (Images 11-16). The sections of track assessed in 2022 included unmade vehicle tracks and bare earth walking tracks (Images 17 and 18).

Image 1. Black matting track surface along a section of existing track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 2. River pebbles track surface along an existing track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 3. Bare earth track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 4. Basalt stepping stones and off track walking (right side of image) through damp grassland across the Bogong High Plain (December 2020), (Image credit: Louise Rodda)

Image 5. Basalt stepping stones crossing a waterway on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 7. Close up of basalt stepping stones crossing a drainage line on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 6. Management vehicle track (crushed rock surface) along Langford Aqueduct (right side of photo) (December 2020), (Image credit: Louise Rodda)

Image 8. Management vehicle track near Cope Saddle Hut (power supply hut) located on Pretty Valley Track (December 2020), (Image credit: Louise Rodda)

Image 9. Parallel logs laid along contour lines used to stabilise part of Westons Spur Track (December 2020), (Image credit: Matthew Hatton)

Image 10. Failed section of log track with pugging and displaced, sunken logs as part of a log crossing along Westons Spur Track (December 2020), (Image credit: Matthew Hatton)

Image 11. Horse pugging on the track and in a pool next to the track on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 12. Trampled vegetation across a drainage line on Heathy Spur Track (December 2020) (Image credit: Louise Rodda)

Image 13. Trampled streamside vegetation across narrow linear Alpine Bog Community on the Australian Alps Walking Trail between Big River Firetrail and Langford Aqueduct (December 2020), (Image credit: Louise Rodda)

Image 14. Trampled vegetation across a drainage line on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Image 15. Off-track parallel walking by hikers widening the trail on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 16. Compacted, widened, track caused by hikers walking off-track to avoid the channelised section on the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 17. Management vehicle track (crushed rock surface) on Fainter Firetrail (December 2022), (Image credit: Louise Rodda)

Image 18. Crushed rock and bare earth walking track on Bungalow Spur Track (December 2022), (Image credit: Alistair Smith)

1.4.7 Access

Access to the FHAC is via various roads, vehicle management tracks and walking tracks intersecting it along its length (Appendix 1a and 1b).

Vehicle access to the track alignment is possible at several points between Falls Creek and Diamantina Spur including the Bogong High Plains Road (bitumen road), the Langford West Aqueduct Road, the Cope West Aqueduct Road via Cope Saddle Track, Fainter Firetrail and the West Kiewa Logging Road (unmade management vehicle only tracks with locked gates) (Appendix 1a and 1b).

There is no vehicle access to the track sections between the West Kiewa Logging Road, the Mount Hotham Resort and Harrietville (Appendix 1b).

Within the Mount Hotham Alpine Resort boundary, the planned track alignment crosses the Great Alpine Road (bitumen) and is accessible by vehicle management tracks.

Overnight node 1 and the proposed OV area at the Cope Hut existing camping area can be accessed by management vehicles and hikers via Cope Hut Track which is vehicle management gravel track with a locked gate that connects with the Bogong High Plains Road at the western end and Langford West Aqueduct Road at the eastern end (Image 7).

Overnight node 2 has management vehicle access via the Fainter Firetrail which has a locked gate at Pretty Valley Dam (Image 17).

Overnight node 3 is accessible via the West Kiewa Logging Road (an unmade road).

Overnight node 4 on Diamantina Spur Track is accessible on foot via the West Kiewa Logging Road to the east, Bungalow Spur Track to the west (Image 18) and the Razorback Track to the south (Image 19) (Appendix 1a and 1b).

The OV at Weston Hut is located on Westons Spur Track which is accessible via the West Kiewa Logging Road to the west and the Australian Alps Walking Track to the east.

Image 19. The Razorback Track (December 2020), (Image credit: Dr Matthew Dell)

1.4.8 Fire history

High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition is an FFG listed potentially threatening process that is impacting the project area. Controlled burns were undertaken in parts of the assessment area in 1972 and 1973 (controlled burns around the Kiewa West Logging Road), 1991 and 2000 (controlled burns around the eastern end of Bungalow Spur Track) and wildfires are now becoming more frequent. Since 1970, wildfires have occurred in various parts of the assessment area in 2003, 2007, 2013 and 2015, which means there has been a fire in the assessment area every 2-6 years, with some locations being burnt more than once in the last 20 years (DEECA 2023a) (RCAAE 2023). For example, parts of Bungalow Spur Track were burnt in 2000 and 2013 and a section of the assessment area between Tawonga Huts and the Razorback was burnt in 2003 and 2007 (DEECA 2023a).

1.4.9 Geology

The underlying geology varies throughout the assessment area. The section from Falls Creek to the central Bogong High Plains sits on Lower Silurian migmatite and gneiss, part of the Omeo Metamorphic Complex (Morand et al. 2005). The track then travels over Holocene fluvial deposits and older Eocene to Oligocene volcanics consisting of extrusive basalts (Mount Jim Volcanic Group), then Lower Devonian intrusive granodiorite to Westons Spur Track (Morand et al. 2004).

On the western edge of the Bogong High Plains, the high plains gneiss, migmatite and granites are faulted against Lower-Middle Ordovician sediments along the Kiewa Thrust Fault (Morand et al. 2004). The Kiewa River West Branch follows the fault and has cut down along the mylonite zone which is up to 1.5 km wide. The West Kiewa Logging Road and beginning of Diamantina Spur Walking Track are located on the fault zone.

The underlying geology of the remainder of the Diamantina Spur track is Lower-Middle Ordovician sandstone and mudstone of the Pinnak Sandstone; this forms part of the Adaminaby Group which consists of marine sandstone, mudstone, siltstone and minor chert (Geoscience 2020).

There are sites of geomorphological significance within the assessment area including the Bogong High Plains South sites of geological or geomorphological national significance (Mount Cope, Mount Jim, Cobungra Gap and Mount Loch), and a site of regional significance; Basalt Hill (AV 2020a).

A detailed description of the geology of the high plains is provided in Attachment 3a-c.

1.4.10 Climate

Climate data were obtained from weather stations closest to the assessment area, located at Mount Hotham and Falls Creek (BOM 2023).

The proposed FHAC traverses the Victorian Alps which experience high precipitation throughout the year. This largely falls as snow during winter, with occasional brief snowfalls at other times of the year. The greatest precipitation occurs from late autumn to early summer. The mean annual rainfall at Falls Creek is 1368 mm, and the mean monthly rainfall ranges from 92 mm to 142 mm. The mean annual rainfall at Mount Hotham is 1489 mm, and the mean monthly rainfall there ranges from 98 to 150 mm.

The Victorian Alps have cool summers and cold winters. The mean monthly temperatures at Falls Creek range from -2.9 to 17.9°C. The mean monthly temperatures at Mount Hotham range from -3.7 to 17°C. The warmest period is in late summer.

Rainfall and temperatures vary across the assessment area, with higher temperatures at lower elevations including the Diamantina River and along the West Kiewa Logging Road.

1.4.11 Management history and past and ongoing environmental impacts

Scientific research into the ecology of Australian alpine lands shows that land surface disturbance is a catalyst for ecological change (Williams et al. 2014).

Past and present management of the Victorian Alps has impacted native flora and vegetation communities, as outlined below. As a result, a number of them are now considered threatened.

Soil erosion and vegetation damage and disturbance in the alpine regions of Victoria caused by cattle grazing is listed as a potentially threatening process under the FFG Act. The assessment area has a history of cattle grazing that began in the early 1800s that damaged alpine vegetation and soils through heavy grazing, soil pugging, soil erosion and the introduction of weeds (DAWE 2021). Impacts also included preferential grazing of many herbs that are now threatened, and damage to habitat for threatened flora and fauna species (DAWE 2021). Grazing was banned in 2005 in response to findings of damaging environmental impacts including impacts on EPBC Matters of National Environmental Significance (see Section 6.2 for further information) however many species have still not fully recovered (AANP 2013, DAWE 2021).

Associated cattlemen's huts (which would have included vegetation removal for construction) remain scattered along the proposed alignment and surrounds including Wallace Hut, Cope Hut, Cope Saddle Hut (SEC Hut), Tawonga Huts, Weston Hut and Blairs Hut.

There are multiple potentially threating processes listed under the FFG Act that have occurred in the past and continue at present within the project area:

- *Habitat fragmentation as a threatening process for fauna in Victoria;*
- *Alteration to the natural flow regimes of rivers and streams;*
- *Degradation of native riparian vegetation along Victorian Rivers and streams;* and
- *Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.*

The Victorian alpine area is also used for recreational activities including downhill and cross-country skiing, bush walking, camping, and more recently mountain bike riding. A number of formal and informal walking tracks and cross-country ski trails connect with the proposed FHAC, and there are existing camping areas within the proposed OVs (Image 20). Off-track walking and camping in non-designated camping areas is currently causing damage to native vegetation and fauna habitats in the assessment area.

Image 20. Existing camping area with elevated camping platform at overnight node 1, Bogong High Plains, near Cope Hut (December 2020), (Image credit: Louise Rodda)

Development in the Mount Hotham and Falls Creek alpine ski resorts and supporting infrastructure at either end of the proposed FHAC includes ski lifts, downhill and cross-country ski runs, work depots, wastewater treatment plants, carparks and accommodation all of which would have involved vegetation clearing. The cross-country ski runs extend into the Alpine National Park and along some sections of the proposed FHAC identified by ski poles (Image 21).

Image 21. Ski poles marking cross country ski runs along the proposed Falls to Hotham Alpine Crossing across the Bogong High Plains (December 2020), (Image credit: Louise Rodda)

There have been major environmental impacts associated with ski resorts and power generation along the proposed FHAC alignment and surrounding areas. This includes the construction of the Kiewa Hydro-Electric Scheme between 1946 and 1961 (Lawrence 2001), which included the construction of Rocky Valley Dam (commenced in 1947 and completed in 1959 (KVHS 2023)) at Falls Creek that resulted in one of the largest areas of EPBC listed Alpine Sphagnum Bogs and Associated Fens Community on the Bogong High Plains being flooded. The dam supplies water to the McKay Creek Power Station. The dam is also used for snowmaking and water-based recreation including boating and swimming. Pretty Valley Pondage was also constructed for hydroelectric power generation under the scheme. Loch Dam at Mount Hotham is another constructed dam completed in 2006 that is used for snowmaking (MHARM 2006).

The Kiewa Hydro-Electric scheme included the construction of aqueducts to collect water from the Bogong High Plains to supply the dams (Lawrence 2001). The Langford East and Langford West aqueducts supply Rocky Valley Dam. The Cope West and Cope East aqueducts supply Pretty Valley Pondage.

Several roads and management tracks intersect the proposed FHAC including the Bogong High Plains Road, the Great Alpine Road, Big River Firetrail between Heathy Spur Track and Marum Point Track, the Fainter Firetrail to Tawonga Huts, Langford West Aqueduct Road along the Langford Aqueduct, Cope Saddle Track, and the West Kiewa Logging Road between Westons Spur Track and Diamantina Spur.

Invasion of native vegetation by 'environmental weeds' is a listed as a potentially threatening process under the FFG Act. Weeds have been introduced and spread into the project area on bike and management vehicle tyres, construction equipment and materials, hikers' shoes and from garden escapes. Exotic species have been planted in the past and are continuing to be planted and grow in the Falls Creek Alpine Resort (as observed by the authors). For example, the highly invasive Orange Hawkweed *Pilosella aurantica* subsp. *aurantica* species was planted as a garden plant in Falls Creek in the early 1990's and rapidly spread into the adjoining Alpine National Park most

likely on hikers' shoes and through wind dispersal of seeds. (Kohout 2015). This species forms a monoculture that replaces native species including threatened species and fauna habitat (PV 2023).

Novel biota and their impact on biodiversity (this list comprises a number of species including Feral Horse (Equus caballus) and Feral Deer) are listed key threatening processes under the EPBC Act. *Degradation and loss of habitats caused by feral Horses (Equus caballus)* and *'Reduction in biodiversity of native vegetation by Sambar Deer Rusa unicolor'* are both listed as potentially threatening processes under the FFG Act.

Feral horses *Equus caballus* (Image 22) and Sambar Deer *Rusa unicolor* are key management issues for environmental values within the Australian alps that are well documented in the literature (Clarke et al. 2000; NPWS 2002; Keith and Pellow 2004; Flora and Fauna Guarantee Scientific Advisory Committee 2004 cited in DPIE 2004; Claridge 2016, Davis et al. 2016, Driscoll et al. 2019, Gates 2023 and Treby and Grover 2023). Recreational horse riding is also impacting natural values in the project area.

The Australian alpine environment has evolved over millions of years with exclusively smaller soft footed animals and is not adapted to cope with large hard hooved herbivores which humans introduced relatively recently. The negative impacts of deer and horses on the natural alpine environment are numerous and include:

- Loss of vegetation structure, plant species diversity and cover, including threatened species, as a result of preferential browsing, preferential grazing, vegetation trampling (e.g. game trails, bedding areas and deer scrapes), tree ringbarking (deer rub trees), vegetation thrashing by deer (during the rut), deer wallows and associated soil disturbance;
- Loss of soil structure caused by compaction of fragile soils and pugging by heavy, hard hooved animals, horse rolling, deer wallowing and deer scrapes. This reduces the ability of soil to absorb and hold water. This in turn impacts access to water and air for plant roots and soil microbes (important for nutrient cycling and soil binding) leading to vegetation decline;
- Increased soil instability caused by loss of vegetation which leads to reduced soil binding by plant roots;
- Increased erosion and waterway sedimentation as a result of increased soil instability;
- Altered stream hydrology and morphology caused by destruction of fringing vegetation, soil structure and stream and waterbody bank integrity caused by trampling, pugging, wallowing and rolling. This can cause increased flows and channelisation leading to increased erosion and sedimentation;
- Decrease in water quality caused by increased sedimentation of waterways resulting from soil disturbance leading to erosion and from water fouling by urine and faeces;
- Increased opportunities for weed invasion due to the loss of native species cover, increased bare ground (cause by activities outlined above) and soil disturbance as well as the spread of weed seeds through horse dung and deer pellets and on horse and deer fur and feet;

- Increased nutrient levels caused by urine and horse dung and deer pellets which may favour weeds over native species (native species are adapted to lower nutrient levels than weed species);
- Destruction, of threatened vegetation communities that are highly sensitive to disturbance from the above-mentioned activities such as the nationally threatened Alpine Sphagnum Bogs and Associated Fens. This community is restricted to the Australian alps, provides an important habitat for endemic and threatened species, and plays an important role in regulating water supply to surrounding catchments, and storing carbon. Deer and horses target these communities because they use them as a ready source of water and places to wallow.
- Increased release of carbon into the atmosphere (a key contributing factor of global warming) resulting from the destruction of alpine Sphagnum bogs. Alpine Sphagnum bogs with horses have been shown to lose carbon to the atmosphere while alpine bogs without horses were found to be removing carbon from the atmosphere;
- Loss of vegetation cover that is vital to some fauna species for shelter, thermoregulation and foraging (e.g. threatened species such as the Alpine Water Skink *Eulamprus kosciuskoi*, Alpine Bog Skink *Pseudemoia cryodroma*, Alpine She-oak Skink *Cyclodomorphus praealtus*, Alpine Tree Frog *Litoria verreauxii alpina* and Broad-toothed Rat *Mastacomys fuscus* (N. Clemann pers. comm.). The removal of vegetation cover and increase in bare ground can particularly reduce protection for fauna from predators and extreme weather.
- Impacts on fauna food sources such as invertebrates that may be affected by habitat loss due to soil disturbance and vegetation destruction causing loss of shelter and organic matter; and
- Potential spread of disease including the Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* (N. Clemann pers. comm.).

Image 22. Horses on the Bogong High Plains within the assessment area between Tawonga Huts and Westons Spur Track (December 2020) (Image credit: Dr Matthew Hatton)

1.4.12 Global warming

The term 'alpine' in Australia is biologically rather than topographically defined and applies to the upland terrain of treeless vegetation above the climatic limits of tree growth, although the altitudinal extent varies with topography and aspect. Global tectonics, geological history and present latitudinal extent results in a limited area of elevated terrain in Australia that experiences climates with winter-only snowfall and few long-lasting snow patches. Because the Australian alpine altitudinal zone is narrow (1,700 – 2,200m) landforms and associated biota have limited

migration zones and are vulnerable to climate warming. Changes in the physical landscape and geomorphic processes will be reflected via soil and hydrological regimes into plant communities and habitat including invertebrates whose diversity is currently unclear.

Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases is a potentially threatening process listed under the FFG Act.

The proposed project area is being impacted by global warming. Australian alpine ecosystems are highly vulnerable to rising temperatures which are increasing by 0.2˚C on average per decade (Harris et al. 2016 in Hoffmann et al. 2019). This has seen snow depth and duration of snow decline since the 1950s. Snow melt is commencing 2.75 days earlier each decade and it is predicted that snow will be confined to the highest peaks by 2100 (Green 2010 and Harris et al. 2016 in Hoffmann et al. 2019).

The Research Centre for Applied Alpine Ecology (RCAAE 2020) online information reports:

- The driest three-year period on record in eastern Australia occurred between 2017 and 2019.
- The warmest year on record for Australia to date is 2019.
- In 2019, the national annual accumulated Forest Fire Danger Index was the highest level since records began being recorded (1950).

There is still much research to be done to determine the full impacts of global warming on alpine flora and fauna. The preliminary results of studies to date in monitoring plots and open topped chambers on the Bogong High Plains reported a decline in grass cover under drought conditions and increase in shrub and forb height and cover and invertebrates under warmer temperatures (Wahren et al. 2013 and Nash 2013 in Hoffmann et al. 2019). Flowering time and seed maturation of some plants was also found to change in warmed plots (Hoffmann et al. 2010 in Hoffmann et al. 2019).

Researchers believe that a warming climate may favour the growth of plants that are adapted to warmer conditions which could displace alpine species that are adapted to surviving in colder conditions (RCAAE 2020).

The response of different plants to increased fire frequency is also likely to drive vegetation change. Shrubs in the treeless alpine vegetation are reported to be more flammable than grasses and respond to fire with increased recruitment due the availability of bare ground (Camac et al. 2017 on Hoffmann et al. 2019). Bare ground is also created by hard hooved animals further assisting shrub recruitment (Hoffmann et al. 2019). Experiments have also shown increased rates of seedling growth of shrubs in warmer temperatures (Camac et al. 2017 in Hoffmann et al. 2019). This in turn is likely to increase fire activity with the increased availability of fuel (Hoffmann et al. 2019).

The vegetation changes such as timing of flowering, seed maturation, and vegetation structure and diversity will impact native fauna habitat including food sources and shelter.

It is documented in the literature that climate change is likely to change moisture levels in the nationally listed, threatened Alpine Sphagnum Bogs and Associated Fen ecological community raising the risk of ecosystem collapse (Regan et al. 2000 in Rowland et al. 2023).

2 Methods

2.1 Desktop review

A desktop review was undertaken to inform and guide the field assessments by identifying the potential locations of threatened species, species habitat, vegetation communities, and geomorphological points of interest and significance. The results are provided in a separate report (Abzeco 2020) and updated here to include the additional areas assessed in 2022 and 2024. This information was used to generate digital maps to assist with identifying likely locations of these significant natural values in the field.

2.1.1 Flora and fauna

A review was undertaken of relevant databases, literature and other resources to search for information on these ecological values, as well as legislation and planning matters applicable to the assessment area and immediate surrounds, including:

- A review of flora and fauna records including native, threatened and introduced species held in the Victorian Biodiversity Atlas (VBA) from within a 2.5 km buffer for flora and a 5 km buffer for fauna, referred to as a data review area (DRA) (DEECA 2022a and DEECA 2024). This information was used to confirm and update the existing desktop analysis of records presented in documentation supplied with the brief and the initial desktop review undertaken by Abzeco in 2020 (Abzeco 2020) and the FHAC PEVA (Abzeco 2021);
- A search of ecological communities and flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) recorded within a 2.5 km DRA (flora) and 5 km DRA (fauna) for the FHAC assessment area (in addition to records in the VBA search), using the online EPBC Protected Matters Search Tool (PMST) (DCCEEW 2023a);
- Ecological Vegetation Class (EVC) mapping/modelling (extant and pre-1750) using the Department of Energy, Environment and Climate Action (DEECA) online tools including NatureKit (DEECA 2023a), the Native Vegetation Regulation Map (NVR) (DEECA 2023b), and associated EVC benchmarks and conservation status (DEECA 2023c);
- A search using VicPlan (Victorian planning schemes online) to identify local government areas and current planning zones and overlays, and provisions that apply to the FHAC assessment area (DEECA 2023d);
- Relevant obligations under legislation, government policies and strategies which need to be considered for the proposed FHAC track upgrade/construction; and
- Review of PVs preliminary GIS data and aerial photography along the indicative FHAC track alignment (GIS data was not available for the OV locations at this stage).
- A review of reports and data sources for the FHAC assessment area provided by PV including:
    - FHACMP (PV 2018);
    - Parks Victoria's visual geographic units and natural values data (unpublished data);

- Greater Alpine National Parks Management Plan (PV 2016);
- Falls to Hotham Alpine Crossing Environmental Risk Assessment Final Report (Biosis 2016);
- National Heritage List citation (National Heritage Places) – Australian Alps National Parks and Reserves (DCCEEW 2023b);
- Falls to Hotham Alpine Crossing, Step A – site options analysis and selection report, (K2LD 2022a);
- Falls to Hotham Alpine Crossing, Step B – concept and design report, (K2LD 2022b); and
- Aerial images provided by PV through the Victorian Department of Transport and Planning Image Web Server (DTP 2023a).

2.1.2 Likelihood of occurrence of threatened species

An assessment of the likelihood of occurrence of threatened species within the assessment area was undertaken in 2023 to update the likelihood of occurrence assessment in the 2020 FHAC PEVA (Abzeco 2020). A likelihood of occurrence assessment of threatened species was undertaken for the Cope Hut and Weston Hut existing camping areas in 2024.

This involved a search of the VBA and PMST report for threatened flora species records within the DRA (the DRA extended from the edge of the track buffer and the edge of the boundary of each OV).

The searches were used to help inform the following:

- Which EPBC and FFG listed species have been recorded within the DRA in the past;
- The number of records for each species within the DRA and how recent they were[3]; and
- Which EPBC listed species are modelled as potentially occurring within the DRA.

This information was used to inform the field assessments by identifying threatened species likely to occur within the study area and their habitat requirements so suitable habitat for those species could be identified and used to inform recommendations for targeted surveys.

Recommendations for targeted surveys were made based on a review of the results of the assessment of the likelihood of occurrence and data collected in the field including:

- Proximity of past records to the project area under the following categories[3]:
  - within the study area;
  - within 200 m; or
  - between 200 m and 2.5 km for flora and 5 km for fauna.
- The number of historical records within 2.5 km for flora and 5 km for fauna of the proposed project impact area and how recent they were;
- The known distribution of the species;

[3] There are a significant number of reptile records recorded by N. Clemann and Z. Atkins that are not in the VBA but have been used to inform the findings and recommendations in this report (N. Clemann pers. comm.).

- The presence of suitable habitat identified within the project assessment area; and
- How detectable the species was at the time of the field assessment.

2.1.3 Nomenclature and taxonomy

The use of common and scientific names for plants follows the VBA (DEECA 2024a) and online version of Flora of Victoria (VicFlora 2023). Fauna names are based on those listed in the VBA or the most recent and widely accepted taxonomic treatment in the published literature.

Where names for flora differ between the VBA and Flora of Victoria, the VBA naming protocol has been adopted as species records are submitted to and managed in this official government database.

Plant and animal names in this report include the common name followed by scientific name (in italics) when first mentioned in the text, and thereafter referred to by common name only.

Where an asterisk (*) precedes a plant or animal name, it signifies non-native taxa (i.e. those species which have been introduced to Australia). A hash (#) is used to denote Australian (including Victorian) native plant or animal species that are not indigenous to the assessment area and may become invasive.

2.1.4 Conservation status

The national conservation status of threatened species was obtained with reference to the EPBC Act lists of threatened flora and fauna. The conservation status of advisory-listed species included in the FHAC PEVA (Abzeco 2021) and recorded in the current (2022 and 2024) project area were updated in line with the FFG Act Threatened List (DEECA 2024a).

2.1.5 Geomorphology

A desktop review was undertaken for the geomorphology component of the project for the initial project area in 2020 and included the following:

- A review of the Victorian Resources Online for Sites of Geological and Geomorphological Significance (AV 2020a);
- A review of previous geomorphic investigations, condition assessments and strategic plans (as relevant); and
- A desktop review of the primary controls on river character and behaviour including geology, hydrology, topography and aerial photography (undertaken by Water Technology in 2020).

In 2022, the desktop review included a desktop study of reports and data sources pertaining to the additional areas to be assessed in 2022 including:

- Falls to Hotham Alpine Crossing: Preliminary Environmental Assessment Report prepared for PV (Abzeco 2021).
- Aerial images provided by PV through the Victorian Department of Transport and Planning Image Web Server (DTP 2023a) and;
- Falls to Hotham Alpine Crossing Preliminary Geotechnical Assessment (Golder 2022).

In 2024, a review of available historic and georeferenced aerial photography, Digital Elevation Models (DEM) (LiDAR)[4] and site photographs was undertaken (Rosengren 2024).

2.2 Field assessments

Spatial data for the location of the revised track alignment and boundaries OVs to be assessed in 2022 was supplied by PV and used to identify the project footprint in the field. The Cope Hut and Weston Hut existing camping area proposed OV areas were mapped on site in direct consultation with PV staff.

The proposed track alignment and OVs were surveyed on-foot. Handheld GPSs were used to record a track log of the alignment as the indicative track alignment in the master plan and spatial data provided by PV did not align precisely with the on-ground track in some sections. The accuracy of the mapping was dependent on GPS accuracy and functionality in different sections of the alignment, which generally varied from 0.3-7 m using a combination of differential and hand-held GPS units.

The track log was used to generate figures for the report. It provides a general overview but may not be accurate enough for design purposes, particularly for the OVs, as their location and extent have not been finalised.

Separate flora species lists, fauna species lists, and geomorphological data were collected in each section of track and in each OV.

A combined list of flora species for each track section and OV was recorded using digital and hardcopy formats.

Opportunistic records of threatened flora and fauna species, the location of track sections, EVCs, long unburnt snow gums[5] and photos and information relating to the project such as, existing vegetation condition, impacts in the study area and track surfaces, were collected throughout the assessment area. This was undertaken using a combination of handheld GPS units. electronic tablets, including some with a differential GPS (Catalyst DA1 digital antenna, Trimble Inc., California, USA), and ArcGIS Collector and Field Maps software (Esri, California, USA) to capture georeferenced photos, location records and notes.

2.2.1 Flora

Flora assessments were undertaken by teams of two botanists from 30 November to 12 December 2020, 1-2 December, 12-16 December, and 19-22 December 2022. The assessment of alternative OVs near existing camping areas at Weston Hut and Cope Hut was undertaken between the 28 February to 1 March 2024. The following data were collected within the assessment area during the surveys:

2.2.1.1 Plant species

Plant species were recorded including:

[4] LiDAR geomorphology desktop assessment report provided separately – see Attachment 3c (Rosengren 2024).

[5] For the purpose of this report 'long unburnt snow gums' refers to all *Eucalyptus pauciflora* species recorded collectively during this project.

- An inventory of plant species, including indigenous and exotic (introduced) species;
- Suitable habitat for threatened plants;
- Records of locations of long unburnt snow gums[6]; and
- Coordinates of threatened species and high threat weeds noted opportunistically in the project area.

2.2.1.2 Listed ecological communities

Vegetation communities listed under the EPBC Act and/or FFG Act or otherwise considered significant were mapped.

Ecological communities were determined based on characteristics such as flora composition, vegetation structure, location in the landscape (e.g. altitude and aspect), soil type and microclimate, as assessed against publicly available listed community descriptions (DEECA 2023c).

2.2.1.3 Ecological Vegetation Class

Vegetation was assigned an EVC following EVC Benchmarks for the Victorian Alps Bioregion (DEECA 2023c), Victorian Wetland Classification Framework (DELWP 2016), Index of Wetland Condition Assessment Procedure (DELWP 2020), Benchmarks for wetland Ecological Vegetation Classes in Victoria August 2022 update (DELWP 2022) and EVC descriptions of Treeless Alpine EVCs (ECAV undated).

EVCs were determined and mapped based on defining characteristics, including floristic species composition, vegetation structure (height and density of cover), lifeforms, and ecological characteristics such as soil depth, geology, altitude, aspect, and position in the landscape (e.g. valleys, steep slopes, and areas with extended snow cover).

Where the majority of the vegetation was highly disturbed beyond the existing walking track i.e. cleared or heavily modified, it was identified and recorded by mapping these areas as EVC 58 'Cleared/Severely Disturbed'. This included for example along vehicle tracks, aqueducts and in formal/informal camping areas with evidence of soil disturbance and weed infestations. This EVC is referenced in the Aquatic Value Identification and Risk Assessment (AVIRA) Manual (DELWP 2015), Victorian wetland classification framework (DELWP 2016).

2.2.2 Fauna

Fauna assessments were undertaken by four zoologists from 23 November to 4 December 2020, and 19-22 December 2022, including the foremost experts on Victorian alpine herpetofauna who have been undertaking monitoring for threatened species in the region over several decades. The additional assessment of alternative OVs near existing camping areas at Weston Hut and Cope Hut was undertaken from 28 February to 1 March 2024.

Targeted surveys were not within the scope of this assessment, although preliminary targeted surveys for some threatened species were undertaken where opportunity permitted (based on

[6] Long unburnt snow gums were mapped during the alternative overnight node field assessments in 2024 (Cope Hut and Weston Hut existing camping areas).

assessments of habitat suitability and pre-existing records). These were informed by state and federal survey guidelines or published literature where available. All other vertebrate and some notable invertebrate species that were opportunistically encountered while undertaking the surveys or walking the alignment in 2020, 2022 and 2024 were also recorded.

Where threatened fauna species were not detected in OVs or on parts of the track alignment assumed as having potential to support them, the likely suitability of the habitat was noted.

2.2.2.1 Broad-toothed Rat

Searches were undertaken for indirect evidence of the Broad-toothed Rat *Mastacomys fuscus mordicus* such as scats, nests and runways (Triggs 1996; Green and Osborne 2012) in areas of suitable habitat, including in damp grassland, woodland and wet heath, particularly along waterways and where there was dense ground vegetation and/or boulders (Walter and Broome 1998; Green and Osborne 2012). Elliott trapping was not possible within the scope of this initial environmental assessment.

2.2.2.2 Sooty Owl and arboreal mammals

The VBA contains one record of the Sooty Owl *Tyto tenebricosa* from 1996 on the planned track alignment in the vicinity of Blairs Hut (DEECA 2024b). Spotlighting and call-playback for this species was therefore undertaken in the area to help inform the risk of potential overnight node construction and track works in the vicinity. Spotlighting in the area also targeted arboreal mammals, with a particular focus on the Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*.

Call-playback targeting the Sooty Owl was undertaken for 2 minutes on dusk before spotlighting began in the vicinity of Blairs Hut, and although not part of the current study area, the nearby Diamantina Horse Yards, in 2020. The survey involved broadcasting the 'falling bomb'-whistle call of the Sooty Owl, followed by 3 minutes of listening for a response, 2 minutes of repeated call-playback, 2 minutes of listening, and 2 minutes of playing the trilling call (Loyn et al. 2011).

Spotlighting was then carried out by two zoologists along a 500 m section of the track alignment at Diamantina Horse Yards on 29 November 2020 (from 2150-2250 hrs), and another 500 m section at Blairs Hut on the following night (from 2055-2150 hrs). This was done using a 30-watt hand-held spotlight (dimmed with a coloured filter to reduce potential impacts on the vision and natural behavior of nocturnal fauna in accordance with animal ethics requirements), and torch with a brightness of up to 2100 lumens. The surveys were undertaken when there was little wind and it was not raining as recommended by Chick et al. (2018).

Spotlighting was also undertaken opportunistically at the rear (west of) Tawonga Huts on 27 November 2020 from 2150-2230 hrs given the taller tree cover there providing potential habitat for nocturnal fauna. The area surveyed followed the edge of the tree line adjacent to a clearing.

2.2.2.3 Latham's Snipe

Latham's Snipe *Gallinago hardwickii* was surveyed for opportunistically by two observers walking along the edges of tributaries and through boggy ground in the assessment area supporting dense grassy or sedgy vegetation, keeping a lookout for any birds that might be flushed. Areas of potential habitat for the species were also noted.

Undertaking targeted surveys for Latham's Snipe, following the EPBC Act survey guidelines (DEE 2017) and methods employed in southern Australia by H. Naarding in 1983 (detailed in Hansen 2018), were not within the scope of the current assessment. Formal targeted surveys will be required in areas of suitable habitat once the track alignment and location of OVs has been refined.

2.2.2.4 Guthega Skink

Guthega Skink *Liopholis guthega* colonies occur in the assessment area (Z. Atkins unpubl. data) and were mapped while undertaking assessments of habitat for this and other threatened reptile species. Rocky areas in relatively open snow gum woodland, heathland, and tussock grasslands, as well as cuttings and track edges in other areas with and without rocks were visually assessed for lizards or their burrows, and habitat suitability for the species along the track alignment was noted. Location co-ordinates were recorded for suspected burrows. Guthega Skinks often, although do not exclusively, construct burrows beneath rocks (Atkins et al. 2015). Burrows have also been found at the base of shrubs some distance from rocks (N. Clemann pers. comm.). As disturbance of surface rocks in areas supporting the species can result in damaging the Guthega Skink habitat, no rocks were lifted during the surveys. However, disturbance of rocks, including those used for shelter by Guthega Skinks, is an increasingly common impact caused by the public (e.g. through rock stacking).

2.2.2.5 Alpine She-oak Skink and Tussock Skink

Observations of active Alpine She-oak Skinks *Cyclodomorphus praealtus* are very infrequent, but the species' habitat preferences in the study area are now well understood by those running the long-term survey, monitoring and conservation management program for this species (N. Clemann and Z. Atkins unpubl. data). The location and extent of suitable habitat for this species along the trail alignment was noted. Observations of Tussock Skink *Pseudemoia pagenstecheri* (High Country) were also recorded during the surveys.

2.2.2.6 Alpine Water Skink and Alpine Bog Skink

As the Alpine Water Skink *Eulamprus kosciuskoi* and Alpine Bog Skink *Pseudemoia cryodroma* both live in and near wet or damp environments, surveys for both were conducted concurrently. Based on the time available to assess each section of the proposed track alignment, surveys were limited to passive observation and hand catching *Pseudemoia* spp. where closer inspection was needed to confirm species identification. When individuals of *P. cryodroma* or skinks sharing morphological characteristics with the closely related Tussock Skink *P. pagenstecheri* were caught (between 24 November and 4 December 2020), approximately 2 mm of the tail tip was collected to enable identification through molecular analysis where required, and to inform a broader project on population genetics being undertaken by N. Clemann and Z. Atkins.

Bogs, fens and wet heaths were surveyed visually in conditions suitable for detecting both species, ensuring the habitat was thoroughly scanned within and on either side of the alignment (from 24 November to 4 December 2020). Suitable areas of habitat were mapped and noted as potentially supporting these species if they were not observed otherwise, as these species are behaviorally cryptic and can be easily overlooked.

Alpine Water Skink and Alpine Bog Skink will traverse areas not typically considered habitat for these species, including areas further away from water (e.g. grassland and heathland between bogs and riparian areas), requiring consideration of potential impacts from the construction which may create potential barriers to movement between areas of core habitat. As threats to these species intensify, dispersal between occupied habitat patches, and capacity for dispersal to other habitats as the climate changes, will be essential for the persistence of these species.

2.2.2.7 Spotted Tree Frog

Surveys for the Spotted Tree Frog *Litoria spenceri* were undertaken in and adjacent to the Diamantina River at Diamantina Horse Yards (near to, although no longer within the current study area), and the West Kiewa River at Blairs Hut. Surveys involved two zoologists listening and searching for frogs and conducting spot counts along the Diamantina River at the Horse Yards, and at the West Kiewa Logging Road bridge crossing the West Kiewa River further downstream. Surveys were undertaken at each of these points for approximately 25 minutes and 10 minutes on the evenings of 29 and 30 November 2020 respectively. A more comprehensive survey was undertaken on the West Kiewa River at Blairs Hut on 30 November, largely in accordance with federal survey guidelines (DEWHA 2010). This involved two zoologists walking in-stream for approximately 350 m (from 2220-2320 hrs) while using head torches to scan the banks, vegetation, emergent rocks and logs for frogs.

Hygiene protocols to reduce the risk of transmitting chytrid fungus followed those outlined in '*Hygiene protocols for the control of diseases in Australian frogs*' (Murray et al. 2011), involving brushing and sterilising potentially contaminated (wet) footwear with 70% ethanol between sites.

The average wind speed, relative humidity and air temperature were measured at approximately 1 m off the ground using a hand-held weather meter (Kestrel 3500, Nielsen-Kellerman, Pennsylvania, USA) at the start of each survey.

2.2.2.8 Mountain Galaxias species complex

Bait trapping for *Galaxias* spp. took place in a single stream that crosses the alignment north of Langford West Aqueduct Road (track section 4), involving setting eight nylon funnels (45 cm × 23 cm × 23 cm, entrance diameter 40 mm) within a 10 m length of the stream. At least 5 cm at the top of each trap was left exposed above the surface in case air-breathing bycatch (e.g. water skinks) was caught. Each trap was baited with a yellow glow stick, marked on GPS, and tied to nearby vegetation with a cord to prevent it from being carried away in case of high flow. The traps were set at approximately 1900 hrs on 25 November and left overnight for collection at 0815 hrs on the following morning.

Dip netting was also undertaken for galaxiids in a headwater tributary of Tawonga Hut Creek and another bog system on the Bogong High Plains on 26 and 27 November respectively. Thirty and 20 minutes were spent dip netting at each site respectively, using a flat-bottomed dip net (bag 35 cm wide × 60 cm deep, mesh size 0.9 mm).

Other tributaries crossing the assessment area were not specifically surveyed for galaxiids, either because they contained a high abundance of trout (with the resulting predation pressure requiring greater survey effort than what was able to be expended to have a reasonable chance of detecting galaxiids), or galaxiids were not observed but still surveyed for opportunistically while dip netting for aquatic invertebrates.

2.2.2.9 Alpine Stonefly and other threatened aquatic invertebrates

Dip netting and kick netting was undertaken to survey for larvae of the Alpine Stonefly *Thaumatoperla alpina*, a second species of stonefly *Riekoperla intermedia*, and the Alpine Darner (dragonfly) *Austroaeschna flavomaculata*. This was done in both survey periods in 2020 and 2022.

Dip netting focused on pools and runs within streams and bogs crossing the track alignment. Approximately 10 m of stream or pond edge was sampled at each of six sites for between 5 and 40 minutes, taking 10-15 sweeps through the water column and aquatic vegetation where it was present. Kick netting took place at the same sites, sampling riffles by periodically kicking or picking up and wiping cobbles in front of a net with a flat-bottomed hoop, with the base of the hoop pressed firmly against the substrate and bag trailing downstream. Ten kick samples were taken from each site over distances between 10 m and 30 m. The same nets were used for both dip and kick sampling (bag 35 cm wide × 60 cm deep, mesh size 0.9 mm). After 1-3 sweeps, the contents of the net were emptied into a plastic tray containing water from the site, and any invertebrates caught were noted before voucher specimens were taken to further identify taxa of interest.

Water samples were also collected for detecting environmental DNA (eDNA) from the Alpine Stonefly during both the original and more recent assessments of the study area. Suitable microhabitats within targeted stream sections (e.g. cobble-bottomed riffles) were targeted for drawing up and passing a total of 150 ml of water through a 60 ml syringe (i.e. three passes of 50 ml) attached to a 0.22 μm filter unit (Sterivex Millipore, EMD Millipore Corporation, Massachusetts, USA). Three filtered samples were taken at each site surveyed. Samples from the initial surveys were transported to the Centre for Freshwater Ecosystems at La Trobe University in Albury, while those from the most recent surveys are being stored frozen pending processing. When results are available they will be provided to PV, however the timing is unknown at this stage.

2.3 Geomorphology

During the initial FHAC PEVA a geomorphic assessment was undertaken over four days by two Waterway Engineers/Fluvial Geomorphologists during December 2020 and January 2021.

As this was a preliminary geomorphological assessment, the inspection focused on priority areas in 2020. The priority areas included the proposed 2020 OVs (now redundant) and landforms that were considered to be most susceptible to change along the initial 2020 track alignment as identified through the desktop analysis. Field surveys were undertaken to assess and record locations of these priority areas and data was collected including field observations and photos of:

- Key features;
- Geomorphic values;
- Stream processes; and
- Threats and risks.

The additional project areas included in the updated 2022 alignment were assessed in December 2022 by two geomorphologists. A detailed geological assessment was undertaken of the updated OVs and additional sections of track to record the following:

- Location and description of geomorphic features;

- Georeferenced photos; and
- Threats and risks to geoscience features.

The information collected in the field and desktop review was used to identify geological values and their significance and determine the potential impacts of the proposed works.

Geomorphological field assessments were not included in the project brief for the 2024 assessment of Cope Hut and Weston Hut existing camping areas.

2.4 General observations

General observations were recorded throughout the assessment area including existing track and OV conditions, and evidence of existing disturbance impacts (e.g. from pest plants and animals, informal camping and off-track hiking).

2.5 Survey limitations

2.5.1 Flora and fauna

The seasonality or migratory/transitory habits of some flora and fauna species was a limiting factor due to the timing of the assessments (i.e. some seasonally active species may not have been readily observable when surveys were undertaken). This was variously due to a lack of fertile material required for the identification of plants, dormancy, fauna migration, hibernation, or variation in seasonal activity. For example, the assessments were undertaken in early summer, and late flowering orchids such as *Prasophyllum* species or dicot herbs such as Bogong Eyebright *Euphrasia eichleri* (EPBC listed as Vulnerable) most likely would not have emerged or been flowering at the time of the surveys. Some grasses did not have fertile material and were difficult to identify to species level without such material. In this instance, grasses were at least identified to genus.

In addition, threatened flora and fauna species may be present in low numbers at certain sites or across the assessment area, so are not always detected during brief surveys.

Targeted flora and fauna surveys were generally beyond the scope of this assessment, although surveys for a small number of fauna threatened species were undertaken where opportunity presented. Some cryptic and/or seasonally active fauna species (e.g. the Alpine She-oak Skink *Cyclodomorphus praealtus*) cannot be presumed absent even after extended survey periods. Where suitable habitat exists within the range of the species, presence should therefore be assumed if any impacts to the species or its habitat are proposed. Where threatened species were not detected in parts of the assessment area but still suspected of occurring there, qualitative determinations of habitat suitability were made.

During the 2022 surveys, unseasonably low temperatures persisted throughout spring and into early summer, resulting in snowfall through part of December including much of the survey period for flora. This is likely to have suppressed the emergence and flowering of some plant species, making them undetectable at the time of the surveys.

The limitations identified here are unlikely to affect the major findings of this assessment in relation to potential impacts from the proposed project on significant flora, vegetation communities, and fauna habitats.

Further targeted surveys for threatened flora and fauna species during the active growing/flowering season for certain plants, or over multiple seasons for some fauna species would be required to determine prescence within the project area.

2.5.2 Geomorphology

Limitations imposed on the descriptions and evaluation include:

- Site investigations were visual only;
- No invasive sampling or testing was undertaken; and
- The resolution of aerial photography provided was insufficient to allow identification of detailed ground features such as outcrop or boulders (Images utilised are from Google Earth and World Imagery (via Blue Marble Graphics)).

The limitations are unlikely to affect the general findings provided for geomorphological features. Detailed field surveys will be required to provide a full assessment and mapping of geoscience and hydrological features throughout the final project development area.

2.6 Project extent

2.6.1 Track

The area of direct impact was calculated based on the track widening to 900 mm as outlined in the FHACMP, plus a 1 m buffer zone either side of the track and excluding the existing track (an average width of 300 mm) provides an estimated impact width of 2.6 m. The resulting area of impact includes:

- The total length of the current revised track alignment (assessed in 2020/21 and 2022): **64.033 km**
- The area that may be impacted: 64.033 km x 2.6 m which is **16.7 ha**.

These calculations do not take into account plans under the FHACMP to widen undetermined lengths of track to 1.2 m so the total area impacted could be >16.7 ha.

The final project footprint is yet to be determined and is expected to be smaller than that proposed in the FHACMP, so the final extent of impact will likely be lower than figures calculated here.

2.6.2 Overnight nodes

The extent (ha) and boundaries of the OVs provided in the project brief were revised by PV during the project as part of the site selection and concept design process which was undertaken simultaneously with the field assessments in December 2022 (Table 4). This included a reduction in the extent of the 2022 OVs initially proposed in 2022. Parks Victoria provided spatial data for the updated OV boundaries in December 2022 (Appendix 1a-c) which was used for this assessment. The areas mapped in the field at Cope Hut and Weston Hut existing camping areas included a 20 m buffer around the core areas identified in the field with PV in February 2024. A detailed design for the nodes has not yet been completed.

The OVs including OV1 and OV2 and their access tracks are largely located in uncleared native vegetation (Appendix 1b and 1c). At OV3, OV4 and Cope Hut and Weston Hut existing camping areas, vegetation is disturbed and trampled from hiker camping use.

It is assumed that pedestrian access will not be restricted within the OVs so the potential impacts on vegetation and fauna habitat have been assessed across the entire mapped area of each OV. The construction width of the OV2 access tracks follows the proposed width of the main tracks which is 900 mm with a 1 m construction buffer each side (2.9 m in total width).

It is assumed that all infrastructure and construction impacts will be contained within the mapped and assessed area of each OV.

The total impact area in each node is summarised in Table 4.

Table 4. Falls to Hotham Alpine Crossing impact extent (ha) assessed in overnight nodes in 2022 and 2024

Overnight nodes assessed in 2022	**Area (ha)**
Cope Hut	
OV1 Preferred	0.8
OV1 Alternate	2.1
Tawonga Huts	
OV2 Preferred	1.4
OV2 Preferred north access track (265 m x 900 mm + 1m buffer either side)	0.1
OV2 Preferred south access track (435 m x 900 mm + 1m buffer either side)	0.1
Sub total	1.6
OV2 Alternate	1.5
OV2 Alternate access track (260 m x 900 mm + 1m buffer either side)	0.1
Subtotal	1.6
Blairs Hut	
OV3	2.2
High Knob	
OV4	1.5
Overnight nodes assessed in 2024	
Cope Hut existing camping area	**1.3**
Westons Hut existing camping area	**1.6**

The extent of the impact area associated with the development of the OVs will depend on which OV options are selected.

3 Findings

3.1 Floristic values

A total of 397 plant species were recorded in the updated project area (combined data from 2020/21, 2022 and 2024), comprising 329 (83%) native species, 66 (16%) exotic species and two (1%) species with an uncertain taxonomic status (that require further work to determine their status) (Appendix 2 to 4).

This included:

- 376 species along the track alignment comprising 316 native species and 60 exotic species (Appendix 3); and
- 185 species in the OVs comprising 149 native species and 36 exotic species (Appendix 4).

Track

The greatest number of native plant species were recorded along Bungalow Spur Track (157 species), followed by Fainter Fire Trail (102 species) then track section 2 (93 species), the number of species recorded along the remaining track sections ranged from 18 to 89 (Appendix 3).

Overnight nodes

The greatest number of native species were recorded in OV2 preferred (includes north and south access tracks) (62 species), followed by OV2 alternate (including access track) (59 species) then OV1 alternate (50 species) and OV1 preferred (50 species) then OV4 (38 species) and OV3 (35 species) (Appendix 4). A total of 37 native species were recorded at Cope Hut existing camping area and Weston Hut existing camping area (Appendix 4).

3.2 Threatened flora species

A total of 66 threatened flora species were recorded in the revised project assessment area (combined data from 2020/21, 2022 and 2024) (Appendix 2, Table 5 and Table 6) including:

- 1 EPBC Act listed species, (Shining Cudweed *Argyrotegium nitidulum* which is EPBC listed as Vulnerable);
- 65 FFG Act listed species, including:
    - 3 Critically Endangered
    - 51 Endangered
    - 11 Vulnerable

The EPBC listed Shining Cudweed was relatively common in localised areas, with multiple plants recorded along four track sections (1-3 and 6) on the Bogong High Plains (Table 5, Images 23-24, Appendix 3).

Image 24. Shining Cudweed *Argyrotegium nitidulum*, Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Image 23. Shining Cudweed *Argyrotegium nitidulum*, Australian Alps Walking Track in the Bundara-Cobungra RNA (December 2020), (Image credit: Louise Rodda)

Track

Sixty five threatened species were recorded along the track (Table 5) including:

- 1 EPBC Act listed (Vulnerable) species; and
- 64 FFG Act listed species, including:
    - 3 listed as Critically Endangered;
    - 50 listed as Endangered; and
    - 11 listed as Vulnerable.

Greater numbers of threatened species were recorded in general along the track alignment across the Bogong High Plains compared to the western sections. Of all the track sections, the highest number of threatened species (33) was recorded along the Fainter Firetrail (on the boundary of the Bundara-Cobungra Remote and Natural Area (RNA)) followed by track section 6 (29 species) and 20 or more species in sections 2, 3, 4, 7, 11 and the short track south of Tawonga Huts (Table 5). Sections 6, 7, 11 and the short track south of Tawonga Huts are all located within the Bundara Cobungra RNA (Appendix 1).

Overnight nodes

Twenty-six threatened species were recorded in the current OVs (Table 6):

- No EPBC listed species;
- 31 FFG Act listed species including:
    - 22 listed as Endangered (plus 3 additional species immediately adjacent to Weston Hut); and
    - 6 listed as Vulnerable.

The highest numbers of threatened flora species were recorded in OV2 alternate (16), followed by OV1 preferred (13), OV2 preferred (12) and OV1 alternate (10) and less than 10 threatened species recorded in OV3, OV4 and in and immediately adjacent to Cope Hut and Weston Hut existing camping areas (Table 6).

Table 5. Listed threatened flora species recorded along the proposed track alignment within the updated 2022 Falls to Hotham Alpine Crossing assessment area (November-December 2020, December 2022)

Legend:

R - recorded in the assessment area

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

V = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

					Track sections																	
No.	**Scientific name**	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1	*Acacia alpina*	Alpine Wattle		e													R		R			
2	*Acacia dallachiana*	Catkin Wattle		v												R						
3	*Aciphylla glacialis*	Snow Aciphyll		e					R	R	R			R	R			R				R
4	*Acrothamnus montanus*	Snow Beard-heath		e	R	R	R	R	R	R	R		R	R					R			
5	*Alchemilla xanthochlora*	Lady's Mantle		e											R							
6	*Argyrotegium mackayi*	Silver Cudweed		e																	R	
7	*Argyrotegium nitidulum*	Shining Cudweed	V		R	R	R			R												
8	*Boronia algida*	Alpine Boronia		v													R		R			
9	*Brachyscome foliosa*	Mountain Daisy		e						R								R			R	
10	*Brachyscome tadgellii*	Tadgell's Daisy		e						R	R				R			R				
11	*Cardamine lilacina* s.s.	Lilac Bitter-cress		e		R	R	R		R	R										R	
12	*Carex canescens*	Short Sedge		e	R	R		R														
13	*Carex jackiana*	Carpet Sedge		e						R												
14	*Celmisia costiniana*	Carpet Snow-daisy		e	R	R	R	R	R					R							R	R
15	*Celmisia latifolia*	Victorian Snow-daisy		e											R							
16	*Celmisia sericophylla*	Silky Snow-daisy		ce					R												R	
17	*Celmisia tomentella*	Silver Snow-daisy		v	R	R	R	R	R	R	R			R				R	R		R	R
18	*Colobanthus affinis*	Alpine Colobanth		e																	R	
19	*Coronidium waddelliae*	Snowy Everlasting		v												R						
20	*Craspedia adenophora*	Sticky Billy-buttons		e			R															R
21	*Craspedia aurantia* var. *aurantia*	Orange Billy-buttons		e	R									R	R			R	R	R	R	
22	*Craspedia aurantia* var. *jamesii*	Green Billy-buttons		e														R			R	
23	*Craspedia crocata*	Crimson Billy-buttons		e																	R	

					Track sections																	
No.	**Scientific name**	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
24	*Craspedia lamicola*	Bog Billy-buttons		e		R	R	R			R										R	
25	*Craspedia maxgrayi* s.s.	Woolly Billy-buttons		ce	R	R	R								R		R					
26	*Epacris celata*	Cryptic Heath		e	R	R	R		R	R	R			R							R	
27	*Epacris glacialis*	Reddish Bog-heath		e										R								
28	*Epilobium curtisiae*	Bald-seeded Willow-herb		e	R					R	R											
29	*Eucalyptus pauciflora* subsp. *hedraia*	Bogong Sally		ce																		R
30	*Euchiton umbricola*	Cliff Cudweed		e												R						
31	*Euphrasia crassiuscula* subsp. *crassiuscula*	Thick Eyebright		v						R					R		R					
32	*Euphrasia crassiuscula* subsp. *eglandulosa*	Thick Eyebright		v														R	R			
33	*Ewartia nubigena*	Silver Ewartia		e							R			R	R			R		R	R	
34	*Grevillea victoriae* subsp. *victoriae*	Royal Grevillea		e	R				R						R	R			R			R
35	*Herpolirion novae-zelandiae*	Sky Lily		e																	R	
36	*Leptorhynchos squamatus* subsp. *alpinus*	Alpine Buttons		e		R	R	R		R					R		R	R	R		R	
37	*Leucochrysum alpinum*	Alpine Sunray		e											R			R				
38	*Luzula acutifolia* subsp. *acutifolia*	Sharp-leaf Woodrush		e											R			R				
39	*Luzula alpestris*	Tussock Woodrush		v						R	R			R							R	
40	*Olearia brevipedunculata*	Rusty Daisy-bush		e	R	R	R	R	R	R	R	R	R		R		R		R		R	
41	*Olearia frostii*	Bogong Daisy-bush		v	R	R	R	R	R					R	R		R		R		R	R
42	*Olearia phlogopappa* subsp. *flavescens*	Dusty Daisy-bush		e		R		R	R					R	R	R					R	
43	*Oreomyrrhis brevipes*	Branched Caraway		e																	R	
44	*Oreomyrrhis pulvinifica*	Cushion Caraway		e						R												
45	*Ozothamnus alpinus*	Alpine Everlasting		e		R	R	R		R									R			R
46	*Pappochroma nitidum*	Sticky Fleabane		v										R				R			R	
47	*Pentachondra pumila*	Carpet Heath		e			R			R	R			R							R	
48	*Phebalium squamulosum* subsp. *alpinum*	Alpine Phebalium		e	R	R	R	R	R	R	R			R	R				R	R	R	
49	*Pimelea axiflora* subsp. *alpina*	Alpine Bootlace Bush		v	R	R	R	R	R	R	R	R				R			R		R	R
50	*Pimelea ligustrina* subsp. *ciliata*	Fringed Rice-flower		e		R		R	R			R			R						R	R
51	*Podolepis laciniata*	High-plain Podolepis		e		R	R		R	R												
52	*Poranthera oreophila*	Mountain Poranthera		e		R	R	R		R												
53	*Psychrophila introloba*	Alpine Marsh-marigold		e						R	R										R	
54	*Ranunculus eichlerianus*	Eichler's Buttercup		e						R	R	R					R				R	R
55	*Ranunculus gunnianus*	Gunn's Alpine Buttercup		e		R				R												
56	*Ranunculus millanii*	Dwarf Buttercup		e		R			R		R			R							R	

					Track sections																	
No.	**Scientific name**	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
57	*Ranunculus muelleri*	Felted Buttercup		e							R			R								
58	*Ranunculus victoriensis*	Victorian Buttercup		e	R	R	R	R	R	R	R			R	R			R			R	R
59	*Rytidosperma alpicola*	Crag Wallaby-grass		v														R				
60	*Rytidosperma nivicola*	Snow Wallaby-grass		e											R							
61	*Scleranthus diander*	Tufted Knawel		e											R			R				
62	*Scleranthus singuliflorus*	Mossy Knawel		e			R	R	R	R	R			R							R	
63	*Senecio pinnatifolius* var. *alpinus*	Snowfield Groundsel		e		R	R	R	R	R	R	R									R	
64	*Stackhousia pulvinaris*	Alpine Stackhousia		e		R	R			R	R			R	R						R	
65	*Trachymene humilis* subsp. *breviscapa*	Alpine Trachymene		e	R	R	R	R	R	R	R			R							R	
	Totals				16	25	23	20	19	29	24	5	2	20	22	6	8	16	13	3	33	12

Table 6. Threatened flora species recorded at proposed overnight nodes within the Falls to Hotham Alpine Crossing assessment area (December 2022)

Legend:

R = recorded in the assessment area

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

V = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

					Overnight nodes (P = preferred, A = alternate) (2022)						2024	2024
No.	**Scientific name**	**Common name**	**EPBC**	**FFG**	**OV1P**	**OV1A**	**OV2P (including two access loop tracks)**	**OV2A (including access track from track section 9)**	**OV3**	**OV4**	**Recorded in and around Cope Hut Existing camping area** IA = immediately adjacent	**Recorded in and around Weston Hut Existing camping area** IA = immediately adjacent
1	*Acacia dallachiana*	Catkin Wattle		v					R			
2	*Alchemilla xanthochlora*	Lady's Mantle		e								IA
3	*Arthropodium* sp. 1 (robust glaucous)	Tall Vanilla-lily		e					R			
4	*Boronia algida*	Alpine Boronia		v						R		
5	*Brachyscome tadgellii*	Tadgell's Daisy		e			R					
6	*Cardamine lilacina* s.s.	Lilac Bitter-cress		e	R		R	R				
7	*Celmisia costiniana*	Carpet Snow-daisy		e	R	R				R	IA	
8	*Celmisia tomentella*	Silver Snow-daisy		v	R		R	R		R	IA	
9	*Craspedia adenophora*	Sticky Billy-buttons		e						R		
10	*Craspedia aurantia* var. *aurantia*	Orange Billy-buttons		e	R			R			IA	
11	*Craspedia aurantia* var. *jamesii*	Green Billy-buttons		e								IA
12	*Craspedia lamicola*	Bog Billy-buttons		e								
13	*Epacris celata*	Cryptic Heath		e				R				
14	*Grevillea victoriae* subsp. *victoriae*	Royal Grevillea		e	R							R
15	*Huperzia australiana*	Fir Clubmoss		e								IA

					Overnight nodes (P = preferred, A = alternate) (2022)						2024	2024
No.	**Scientific name**	**Common name**	**EPBC**	**FFG**	**OV1P**	**OV1A**	**OV2P (including two access loop tracks)**	**OV2A (including access track from track section 9)**	**OV3**	**OV4**	**Recorded in and around Cope Hut Existing camping area** IA = immediately adjacent	**Recorded in and around Weston Hut Existing camping area** IA = immediately adjacent
16	*Leptorhynchos squamatus* subsp. *alpinus*	Alpine Buttons		e		R		R				
17	*Luzula acutifolia* subsp. *acutifolia*	Sharp-leaf Woodrush		e				R				
18	*Luzula alpestris*	Tussock Woodrush		v								
19	*Olearia brevipedunculata*	Rusty Daisy-bush		e	R	R	R	R				
20	*Olearia frostii*	Bogong Daisy-bush		v	R	R	R	R		R	R	
21	*Olearia phlogopappa* subsp. *flavescens*	Dusty Daisy-bush		e			R			R	IA	IA
22	*Phebalium squamulosum* subsp. *alpinum*	Alpine Phebalium		e	R	R	R	R			IA	
23	*Pimelea axiflora* subsp. *alpina*	Alpine Bootlace Bush		v				R				
24	*Pimelea ligustrina* subsp. *ciliata*	Fringed Rice-flower		e	R		R	R				
25	*Poranthera oreophila*	Mountain Poranthera		e	R	R						
26	*Ranunculus eichlerianus*	Eichler's Buttercup		e			R	R				
27	*Ranunculus gunnianus*	Gunn's Alpine Buttercup		e		R						IA
28	*Ranunculus victoriensis*	Victorian Buttercup		e	R	R	R	R		R	IA	IA
29	*Scleranthus singuliflorus*	Mossy Knawel		e	R	R	R	R			R	
30	*Senecio pinnatifolius* var. *alpinus*	Snowfield Groundsel		e			R	R				
31	*Trachymene humilis* subsp. *breviscapa*	Alpine Trachymene		e	R	R		R				
	Totals				13	10	12	16	2	7	8	7

3.2.1 Likelihood of occurrence determinations

In addition to the 66 threatened plant species recorded during the field surveys, the VBA database search and PMST reports identified suitable habitat or records for an additional 97 threatened plants within the 2.5 km DRA (a total 163 species).

The determination of the likelihood of occurrence of the 163 threatened plant species identified 137 plants considered likely to occur within the study area (Attachment 1). The rationale behind the decisions are detailed in Attachment 1. The species include:

- 4 EPBC Act listed vascular species:
    - Shining Cudweed (EPBC Vulnerable);
    - Thick Eyebright *Euphrasia crassiuscula* subsp. *glandulifera* (EPBC Vulnerable, FFG Critically Endangered)
    - Bogong Eyebright (EPBC Vulnerable, FFG Endangered); and
    - Snow Daphne *Kelleria bogonensis* (EPBC Vulnerable, FFG Critically Endangered)
- 136 FFG Act listed vascular species:
    - 13 FFG Critically Endangered species;
    - 104 FFG Endangered species; and
    - 19 FFG Vulnerable species.

A number of these plant species are particularly significant given their limited distribution as they include:

- 17 Victorian endemic species;
- 2 possible Victorian endemic species;
- 46 species confined to alpine areas; and
- 15 species confined to the Bogong High Plains/Mount Hotham area (see Attachment 1).

The majority of these plants are considered likely to occur along the track and around a third are considered likely to occur in the OVs:

Track

- 4 EPBC Act listed species; and
- 135 FFG Act listed species.

Overnight nodes

- 1 EPBC Act listed species (OV1 alternate, OV2 alternate, OV2 preferred); and
- 54 FFG Act listed species (various FFG Act listed species likely at all OVs)

3.2.2 Targeted surveys

To determine the impact of the project on threatened species, targeted surveys would need to be undertaken to identify the presence, location and abundance of 136 of the 137 threatened species identified by the likelihood of occurrence determination (Attachment 1).

One species, Silky Snow-daisy *Celmisia sericophylla* (FFG Act listed Critically Endangered) is very distinctive and detectable. It is confined to waterways in wet open areas on the Bogong High Plains in the assessment area so all populations were able to be mapped during the assessment (Images 25-27) and it is not included in the 136 species recommended for targeted survey.

Image 25. Silky Snow-daisy *Celmisia sericophylla*, Langford Aqueduct (December 2020), (Image credit: Louise Rodda)

Image 26. Silky Snow-daisy on Fainter Firetrail is quite distinctive and readily detectable (December 2022) (Image credit: Louise Rodda)

Image 27. Silky Snow-daisy on Fainter Firetrail is quite distinctive and readily detectable from a distance (December 2022) (Image credit: Louise Rodda)

Three threatened bryophytes and one threatened lichen are likely to occur within the assessment area. It is recommended that bryophytes and lichens are collected opportunistically (including location coordinates and habitat description) from suitable habitat for each species during targeted surveys for vascular species and identified by an experienced bryologist. The nonvascular species identified in the likelihood of occurrence assessment include:

- Shore Feather-moss *Drepanocladus polygamus* (FFG Vulnerable)
- Granite Bristle-moss *Orthotrichum rupestre* (FFG Endangered)
- Black-beard Lichen *Usnea acromelana* (FFG Critically Endangered)
- Bogong Bristle-leaf Moss *Brachydontium intermedium* (FFG Critically Endangered)

When undertaking targeted flora surveys threatened plants may be encountered apart from those recommended to be surveyed for here and they should also be recorded opportunistically. For example, Tall Vanilla-lily *Arthropodium* sp. 1 (robust glaucous) was recorded in OV3 during the FHAC PEVA field assessment in December 2022 but prior to this it was only known from the upper Macalister, Tambo and Snowy River areas (VicFlora 2023). The plant has also been referred to as a robust form of *Arthropodium milleflorum* in the Flora of Australia (Brittan 1987) indicating further studies are necessary to confirm its taxonomy (VicFlora 2023).

3.3 Long unburnt snow gums

Long unburnt snow gums were recorded in the five track sections: 4, 5, 18, OV4 and Cope Hut existing camping area.

Due to the increased frequency of fire, long unburnt snow gums are becoming rarer, over 90% of Victoria's snow gum stands have been burnt at least once since 2003 (RCAAE 2020) and are slow to recover because of their short growing season limited by temperature. Repeated burns which have occurred over the last two decades, negatively impact on the ability of snow gums to resprout and changes their structure from old growth single stem woodlands to denser multi-stemmed stands (Coates et al. 2012).

A study by Fairman et al. (2017) found that after three fires there was >50% mortality of snow gums. Fire intervals of less than 20 years may prevent snow gums reaching their optimal reproductive maturity age and may cause a reduction in snow gum recruitment (Turner 2017). Frequent burning may result in the loss of Sub-alpine Woodland and replacement by scrubby

flammable vegetation (Zylstra 2020) and this may be exacerbated by additional impacts on tree health from construction, maintenance or ongoing use impacts.

The loss of old growth snow gums has multiple implications, including a reduction in the regulation of regular water runoff, decreased soil water retention and decreased snow accumulation (Coates et al. 2012). Trees more than 25 years old have been found to be less flammable than younger trees (Zylstra 2020) so the increased ration of younger trees may be contributing to the flammability of Sub-alpine Woodlands.

Long unburnt snow gums provide habitat for common and threatened understory flora, and foraging, roosting and nesting habitat for common fauna within the study area.

3.4 Introduced plant species

A list of weed species for each section of track and each proposed OV is provided in Appendix 3 and 4 respectively. Nine declared noxious weeds were recorded in the assessment area including four weeds classified as Restricted under the CaLP Act in the North East CMA region:

- Ox-eye Daisy **Leucanthemum vulgare;*
- Weld **Reseda luteola*;
- Grey Sallow **Salix cinerea* subsp. *cinerea;* and
- Rusty Sallow **Salix cinerea* subsp. *oleifolia*.

*Grey Sallow and *Rusty Sallow are also Weeds of National Significance (WONS).

Five weeds classified as Controlled under the CaLP Act in the North East CMA were also recorded in the assessment area including:

- Spear Thistle **Cirsium vulgare*;
- St John's Wort **Hypericum perforatum* subsp. *veronense*;
- Sweet Briar **Rosa rubiginosa*;
- Common Blackberry **Rubus anglocandicans*; and
- Forest Blackberry **Rubus polyanthemos*.

The two Blackberry species are also identified WONS.

Other high threat environmental weeds recorded in the assessment area include Soft Rush **Juncus effusus* subsp. *effusus*, Jointed Rush **Juncus articulatus* subsp. *articulatus*, Slender Rush **Juncus tenuis* and Creeping Buttercup **Ranunculus repens*, which are highly invasive and can spread rapidly and cause significant impacts on natural systems (White et al. 2018). The Advisory list of environmental weeds in Victoria (White et al. 2018) classifies the risk rating of Soft Rush as very high, and the remaining three species as high.

Weeds were largely confined to the track edges, and higher weed covers were largely confined to the edges of management vehicle tracks, Bungalow Spur Track and around existing camping areas (e.g. Tawonga Huts). The most common weed was Sheep Sorrel **Acetosella vulgaris* which was recorded in every section of track and seven out of the eight OV option locations.

Along the track alignment, the highest number of weeds were recorded in track section 1a (32 species) followed by track section 19 (25 species), and more than 10 species were recorded in track sections 2, 5, 11, 12 and 17 (Appendix 3).

In the OV locations, 14 weed species were recorded in the Weston Hut existing camping area and 13 weed species were recorded at OV2 preferred. Less than 10 weed species were recorded in the remaining proposed OV option locations (Appendix 4).

Weeds pose a threat as they compete with native species for nutrients, light and water, reducing native species diversity, and outcompete threatened flora which in turn impacts food sources and shelter for threatened fauna.

3.5 Vegetation communities

3.5.1 EPBC Act listed communities

The desktop review identified two EPBC Act listed communities which may occur in the assessment area (DCCEEW 2023c):

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act listed as Critically Endangered); and,
- Alpine Sphagnum Bogs and Associated Fens (EPBC Act listed as Endangered).

The dominant species and structural characteristics which define the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland community were not recorded within the assessment area, and it is also considered unlikely to occur there as it is mostly found at lower altitudes up to 1200 ASL (Beadle 1981).

Alpine Sphagnum Bogs and Associated Fens ecological community was recorded within the assessment area, and details are provided below.

3.5.1.1 Alpine Sphagnum Bogs and Associated Fens

Alpine Sphagnum Bogs and Associated Fens is listed as an Endangered community under the EPBC Act (DEWHA 2009). This community was recorded in the assessment area on the Bogong High Plains in 33 locations including 28 locations along the track either intersecting the track or adjacent to it (Appendix 1b) and five locations at OV1 and OV2 (Appendix 1c) including:

Track

- One location below Rocky Valley Dam wall (section 1).
- Five locations along Heathy Spur Track (section 2).
- Two locations along Big River Firetrail (section 3).
- Four locations along the Australian Alps Walking Track (between Big River Firetrail and Langford Aqueduct) (section 4).
- Five locations along Langford West Aqueduct Road (section 5).
- One location on Cope Hut Track (section 5).
- Six locations Between Bogong High Plains Road and Tawonga Huts (sections 6-7).
- One location at Tawonga Huts (section 9).
- Three Locations along Fainter Firetrail (section 17).

Overnight nodes

- OV1 alternate.
- OV1 alternate access track.
- OV2 preferred.
- OV2 preferred south access track.
- OV2 alternate.
- OV2 alternate access track.

The Alpine Sphagnum Bogs and Associated Fens community occurs in permanently wet areas along streams, valley edges and valley floors (Claridge 2016). This community forms in and is restricted to areas of low density waterlogged soils, with low nutrients, in cold climates or acidic conditions. These conditions favour slow decomposition and the accumulation of peat which acts as a dense carbon store and plays an important hydrological role of gradually releasing water into surrounding water catchments (Treby and Grover 2023).

It is one of the rarest communities in Australia occupying less than 0.2% of the country (Wahren et al. 2001) and c.4372 ha in Victoria (ARI 2019) which is <0.02% of the state.

This community comprises a unique and distinctive suite of species. Within the assessment area, this community supports threatened flora species such as the Bogong Eyebright, Silky Snow-daisy and Cushion Rush *Juncus antarcticus.*

The community also provides habitat for galaxiid fishes and other threatened fauna such as the Alpine Water Skink, Alpine Bog Skink, Alpine She-oak Skink, Alpine Tree Frog and Alpine Spiny Crayfish.

This community provides important sources of water and food for native animals during dry periods, and performs other important ecological services including sediment trapping, water storage and carbon sequestration (Hope et al. 2009).

Alpine Sphagnum Bogs and Associated Fens is consistent with the Alpine Bog Community and Fen (Bog Pool) community which is listed under the FFG Act (DEECA 2023e). Both the above-mentioned communities are consistent with Alpine Valley Peatland EVC which has a bioregional conservation status of Endangered in Victoria (DEECA 2023c). These community names are used interchangeably throughout the report.

In Victoria, this community has a small geographic distribution and due to past disturbance (including cattle grazing, fire and construction of infrastructure such as the Rocky Valley Dam), it now occurs in small fragmented and isolated locations across the Victorian Alps in alpine, subalpine and montane environments (DEWHA 2009). Alpine Sphagnum Bogs and Associated Fens are two individual communities with different vegetation types but are combined as a listed community due to their high level of interdependence (DEWHA 2009). Multiple Alpine Sphagnum Bogs were recorded in the assessment area, and one fen was recorded.

Typically, *Sphagnum* species dominate (>30% ground cover) this community (DEWHA 2009). This community can also include vegetation with a minor cover of *Sphagnum* spp., and greater cover of shrubs or species such as Spreading Rope Rush on the margins where *Sphagnum* species have been reduced or lost due to disturbance or degradation (DEWHA 2009). Most of the Alpine Sphagnum Bogs in the assessment area fit the latter description. There are no condition thresholds that define Alpine Sphagnum Bogs and Associated Fens (DEWHA 2009).

The Alpine Sphagnum Bogs and Associated Fens in the assessment area were located along permanently wet areas including streams, drainage lines or permanent ground water expression points (soaks). The impeded drainage leads to incomplete decomposition of organic material and the formation of peat (DEWHA 2009). Most were dominated by sedges *(Carex* spp.) and located in flatter valley locations, often referred to as 'valley bogs' (DEWHA 2009). They all occurred above 1600 m ASL both above and below the treeline.

Alpine Sphagnum Bogs and Associated Fens are important ecologically as they store carbon and filter sediments, nutrients and pathogens, maintaining improved water quality. They also have a high water-holding capacity which may assist in regulating water flow in the surrounding environment (DoE 2015) and managing erosion (DEWHA 2009).

This community provides habitat for threatened flora and fauna species, including some endemic species that have a limited distribution confined by climate, geology and hydrology (DoE 2015, DEWHA 2009). The community is also very significant due to pollen and charcoal deposits which provide opportunities for analysis of past climatic conditions, assisting with research on climate change and its potential impacts (DEWHA 2009).

3.5.2 Victorian FFG Act listed communities

Four FFG Act listed communities were identified as likely to occur in the assessment area in the desktop review. During the field assessment, three of these communities were recorded as being present but no evidence of the fourth community was found (Table 7).

Table 7. FFG Act listed vegetation communities recorded in the assessment area or surrounds and determined as being likely to occur there

Communities listed as threatened under the *Flora Fauna Guarantee Act 2019* considered likely to occur in or near the assessment area				
Community	**Status**	**Track section**	**Overnight node**	**Field assessment results**
Alpine Bog Community	Listed	1, 2,3,4,5,7,9, 11 and 17	OV1 alternate OV1 alternate access track OV2 preferred OV2 preferred south access track OV2 alternate OV2 alternate access track	Present
Fen (Bog Pool) Community	Listed	17		Present
Alpine Snowpatch Community	Listed	14 and 15		Present

Communities listed as threatened under the *Flora Fauna Guarantee Act 2019* considered likely to occur in or near the assessment area				
Community	**Status**	**Track section**	**Overnight node**	**Field assessment results**
Caltha introloba Herbland Community	Listed	NA		Not present *Caltha introloba* dominated open herbland was not recorded in the assessment area

3.5.2.1 Alpine Bog Community

The Alpine Bog Community was recorded across the Bogong High Plains and is described as being restricted to permanently wet sites such as ground water expression points and drainage lines with gentle to moderate slopes (Appendix 1b). This community is characterised by *Sphagnum* species which form peat soils ranging from one to several metres deep depending on the substrate. Alpine Bog Communities are now rare and occur in fragmented and isolated alpine, subalpine and montane locations, generally above the climatic tree line and in frost hollows at lower altitudes where tree growth is limited. As stated above, this community is equivalent to the EPBC Act Listed Endangered Alpine Sphagnum Bogs and Associated Fens community.

3.5.2.2 Fen (Bog Pool) Community

The Fen (Bog Pool) Community was recorded at the eastern end of the Fainter Firetrail on the edge of the Pretty Valley Dam (Appendix 1b). The community consists of permanent to semi-permanent pools of standing water dominated by sedges and other amphibious plants. Fen (Bog Pool) Communities occur within Alpine Bog Communities in the wettest areas along watercourses and flat areas on valley floors that are fed by groundwater discharge. All that remains of these rare communities in Victora are fragmented, isolated occurrences in the alps above the tree line or in frost hollows at lower elevations where trees are limited. Their rarity is likely, in part, a reflection of the scarcity of permanent pools in the alpine region. This community is considered interdependent with the FFG Act threatened listed Alpine Bog Community and the EPBC Act Listed Endangered Alpine Sphagnum Bogs and Associated Fens community.

3.5.2.3 Alpine Snowpatch Community

The Alpine Snowpatch Community was recorded near Mount Feathertop (Appendix 1b) and is a rare vegetation type that is restricted to steep, sheltered southerly and easterly slopes above 1600 m ASL, where snow cover is persistent into early summer (diuturnal) and the growing season is reduced. The community is characterised by a sward structure that is less than 10 cm in height and typically dominated by Mountain Sedge, Alpine Wallaby-grass and Ledge Grass, with herbs such as Slender Snow-daisy. The existing track alignment intersects this community.

3.5.3 Ecological Vegetation Classes (EVCs)

An additional seven EVCs were recorded in 2022 bringing the total number of EVCs recorded in the current assessment area to 20 (excluding a 'Cleared/Severely Disturbed' vegetation category which has an assigned EVC number 58 (DELWP 2016)), see Table 8 and Table 9. Two of the additional EVCs were recorded on Fainter Firetrail and the remaining five were recorded along Bungalow Spur Track. One EVC, Montane Riparian Thicket, was located in a section of track that is no longer part of the current alignment so this EVC is not included in the 2022 EVC list.

Descriptions of the EVCs found within the assessment area and representative photos are provided in Table 8 (Images 28-52) and Table 9 (Images 53-67). The mapped locations of the EVCs are provided in Appendix 1b.

The EVCs included in the 2022 track alignment include three EVCs with a bioregional conservation status of Endangered, one with a bioregional conservation status of Vulnerable, eight with a bioregional conservation status of Rare, seven with a bioregional conservation status of Least Concern and one EVC that does not currently have an allocated status (Table 8).

All 20 EVCs were recorded along the track alignment (Table 8) and six EVCs were recorded in the OVs (Table 9).

Multiple EVCs are intersected by the proposed alignment and occur in fine scale mosaic patterns in many areas making it difficult to define one EVC in any given location along the narrow linear assessment area. To manage this, combinations of EVCs were recorded in segments 20 m long or more. For example, if there was Alpine Grassland followed by a small patch of Alpine Grassy Heathland that extended for less than 20 m before changing back to Alpine Grassland then the area was mapped as Alpine Grassland. If there was Alpine Grassland on one side of the track and Sub-alpine Shrubland on other side of the track, then the vegetation was recorded as Alpine Grassland EVC 1001/Alpine Sub-Alpine Shrubland EVC 42.

Sub-alpine Pond Herbland

Sub-alpine Pond Herbland was recorded in track sections 7 and 10a (described below) (Appendix 1b). This EVC has not been mapped across the state and does not have a DEECA benchmark, but it has been allocated the EVC number of 913. The EVC is described in the unpublished report: *Typology for wetlands and related vegetation in Victoria. EVC descriptions: Existing, proposed amendments and new descriptions* (Frood 2003), and included in the Benchmarks for wetland Ecological Vegetation Classes in Victoria August 2022 update (DELWP 2022). Currently, little is known about this EVCs extent and ecology.

The presence of Sub-alpine Pond Herbland in the assessment area is significant as it does not appear to have been recorded on the Bogong High Plains before, and was previously only known from extremely small, localised areas in the Victorian Alps near Mount Wellington and Mount Buffalo.

This EVC is typically located in ponds that occur within sub-alpine wet heath, damp heath and/or damp grasslands between 1470-1560 m ASL. This system sits at a higher elevation within the assessment area. In this location, the EVC occupies small seasonal ponds within alpine vegetation supporting small herbs (D. Frood pers. comm.). Typical species within the ponds include Mat Water-milfoil *Myriophyllum pedunculatum,* Alpine Club-rush *Isolepis crassiuscula, Agrostis* spp. and Dwarf Buttercup *Ranunculus millanii*. Species occurring on the verges include Fen Sedge *Carex gaudichaudiana*, Creeping Raspwort *Gonocapus micranthus* subsp. *micranthus*,

Candle Heath *Richea continentis*, *Juncus* spp., *Poa* spp. Star Plantain *Plantago muelleria*, *Rytidosperma* spp., Alpine Baeckea *Baeckea gunniana* and Short Bent-grass *Deyeuxia brachyathera*.

This community does not have a bioregional conservation classification, however, given its limited distribution and impacts from cattle, deer, horses, and weeds, it should be considered an Endangered EVC (D. Frood pers. comm.).

Table 8. Ecological Vegetation Class (EVC) descriptions and bioregional conservation status (see Appendix 1b for EVC locations in the assessment area) (November/December 2020)

Sources: DEECA EVC Benchmarks (DEECA 2023c), FFG Act descriptions (DEECA 2023e), Treeless Alpine EVC descriptions (ECAV undated) and Bioregional Conservation Status for each BioEVC (DSE undated)

Alpine Grassland EVC 1001

Victorian Alps Bioregional Conservation Status: Rare

This high-altitude alpine tussock grassland occurs above 1500 m ASL in valleys and saddles which are exposed to cold air drainage, frost and snow, and sheltered from high winds, often between heathlands and shrublands (e.g. on the Bogong High Plains and Howitt Plains). In the assessment area, this EVC was scattered across the Bogong High Plains, as well as along parts of the Razorback track and on Mount Feathertop, at the western end of Diamantina Spur Track, and the eastern most end of Bungalow Spur Track. On the Bogong High Plains, Alpine Grassland was characterised by a dense cover of low tussock grasses interspersed with a variety of herbs. The dominant grasses included Soft Snow-grass *Poa hiemata*, and Horny Snow-grass *Poa fawcettiae.* The dominant herbs included *Brachyscome* spp., *Luzula* spp., *Craspedia* spp., *Ranunculus* spp., Alpine Buttons *Leptorhynchos squamatus* subsp. *alpinus*, *Celmisia* spp. and Showy Violet *Viola betonicifolia* subsp. *betonicifolia.* The vegetation was in good condition, with a few scattered weeds confined to areas of disturbance including along the edges of the walking track, maintenance vehicle tracks, and around existing camping areas. The main weeds species were *Sheep Sorrel and Flatweed **Hypochaeris radicata,* as well as Milfoil **Achillea millefolium* toward the southern end of the Razorback track.

Image 28. Alpine Grassland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Alpine Grassy Heathland EVC 1004
Victorian Alps Bioregional Conservation Status: Rare

Typified by a variably open structure of alpine heath species to 1 m tall, interspersed with tussock grasses and forbs. It generally occurs on slopes above 1400 m ASL where tree growth is limited by frost and exposure. This was the most commonly occurring EVC in the assessment area on the Bogong High Plains and was also scattered along sections of Diamantina Spur Track, two sections along Bungalow Spur Track, and Razorback track where it consisted of low closed tussock grassland interspersed with scattered heath species. The dominant grass species were Soft Snow-grass and Horny Snow-grass, with a mix of herbs present including daisies, Billy Buttons, buttercups, Bidgee-widgee *Acaena novae-zelandiae,* Snow-daisies, Alpine Buttons, Australian Caraway *Oreomyrrhis eriopoda* and Fleabane *Pappochroma* spp. Heath species included Alpine Rusty Pods *Hovea montana,* Yellow Kunzea *Kunzea muelleri*, Silky Bossiaea *Bossiaea sericea,* Leafy Bossiaea *Bossiaea foliosa*, Alpine Grevillea *Grevillea australis*, *Ozothamnus* spp., Alpine Phebalium, *Phebalium squamulosum* subsp *alpinum*, and Alpine Mint-bush *Prostanthera cuneata.* This vegetation was in good condition with few weeds, mainly *Sheep Sorrel and *Flatweed along the path, aqueduct, other vehicle tracks and existing camping areas.

Image 29. Alpine Grassy Heathland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Sub-alpine Shrubland EVC 0042

Victorian Alps Bioregional Conservation Status: Rare

This EVC ranges from dense to sparse shrubland above 1200 m ASL in locations that experience extreme conditions including long periods of snow cover, shallow soils, and large areas of exposed rock. This EVC can include scattered mallee-form eucalypts (typically Snow Gum *Eucalyptus pauciflora*), often with a high abundance and diversity of forbs and graminoids. Patches of Sub-alpine Shrubland were scattered throughout the assessment area across the Bogong High Plains and along sections of Diamantina Spur Track, Bungalow Spur Track and Razorback track. Vegetation structure was typically low and closed up to 1 m high, with and without snow gums (e.g. snow gums were present in this EVC along parts of the Langford Aqueduct). Common species in this EVC included *Acrothamnus* spp., Alpine Star-bush *Asterolasia trymalioides*, Silky Bossiaea, Alpine Bottlebrush *Callistemon pityoides*, Yellow Kunzea, Alpine Grevillea, Alpine Orites *Orites lancifolius*, *Ozothamnus* spp. Alpine Phebalium, Alpine Podolobium *Podolobium alpestre*, Alpine Rusty Pods and Alpine Mint-bush. Forbs included daisy bushes, *Veronica* spp., Victorian Buttercup *Ranunculus victoriensis*, *Asperula* spp. and Soft Crane's Bill *Geranium potentilloides*. Along the aqueduct there was a high cover of Royal Grevillea *Grevillia victoriae* in some locations. This vegetation community was in good condition, with few weeds including *Sheep Sorrel and *Flatweed, particularly along the aqueduct.

Image 30. Low (<1m tall) Sub-alpine Shrubland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Sub-alpine Woodland EVC 0043

Victorian Alps Bioregional Conservation Status: Least Concern

Occurs on a wide range of geologies and aspects above 1200 m ASL, in areas of high rainfall and where snow persists over winter. These environs are widespread across the Bogong High Plains and stands of Sub-alpine Woodland were scattered throughout this part of the assessment area. The community was present along the more elevated western section of Diamantina Spur Track, occurred along a large section of the eastern end of Bungalow Spur Track, and in discrete sections along the northern portion of the Razorback track. This vegetation primarily consisted of a canopy of either White Sally *Eucalyptus pauciflora* subsp. *pauciflora* or Alpine Sally *Eucalyptus pauciflora* subsp. *niphophila*, although within the High Knob region of Diamantina Spur Track, some of the canopy appears to be Bogong Sally *Eucalyptus pauciflora* subsp. *hedraia,* which is endemic to the local area. The understorey was variously dominated by a mix of shrubs and grasses and various forbs including Alpine Star-bush, Silky Bossiaea, Alpine Rusty-pods, Tangled Shrub-violet *Melicytus angustifolius* subsp. *divaricatus*, Alpine Orites, Alpine Podolobium, Alpine Mint-bush, *Olearia* spp., *Ozothamnus* spp., Alpine Pepper, *Tasmannia xerophila* subsp. x*erophila,* Alpine Phebalium, Alpine Rusty Pods, *Pimelea* spp., and Alpine Grevillea. Forbs and graminoids included: Bidgee-widgee, woodruffs *Asperula* spp., *Brachyscome* spp., *Celmisia* spp., Billy Buttons, Tasman Flax-lily *Dianella tasmanica*, Soft Cranes's-bill, fleabanes, buttercups, Twin-flower Knawel *Scleranthus biflorus,* Prickly Starwort *Stellaria pungens*, Alpine Buttons, Soft Snow-grass and Ledge-grass *Poa hothamensis* var. *hothamensis.* This vegetation community was in good condition, with few weeds including the ubiquitous *Sheep Sorrel and *Flatweed, as well as scattered Common Mouse-eared Chickweed **Cerastium vulgare*, Self-heal **Prunella vulgaris* and White Clover **Trifolium repens.* The occasional Apple **Malus* spp. and *Rusty Sallow (Willow) were observed primarily in association with camping and hut locations, and one *Sweet Briar was found in close proximity to Weston Hut. Most patches of Sub-alpine Woodland were recently burnt and regenerating well. A few stands of long unburnt woodland were located along Heathy Spur Track (on the boundary of the study area), the Langford West Aqueduct Road, and between Cope Hut and the Bogong High Plains Road. Unburnt sections of woodland are also present midway along Diamantina Spur Track on the boundary of the study area.

Image 31. Sub-alpine Woodland on Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Alpine Damp Grassland EVC 1002

Victorian Alps Bioregional Conservation Status: Rare

Dense tussock grassland typically dominated by Bog Snow-grass, located in high altitude valleys (in and around wet heathland and peatlands) and on plains or plateaus with basalt derived soils above 1600 m ASL. This EVC is subject to seasonal waterlogging. Alpine Damp Grassland occurred in a number of locations across the Bogong High Plains such as Westons Spur track, where it was also present as a mosaic with other vegetation types. Alpine Damp Grassland areas were dominated by Bog Snow-grass, with a variety of forbs and graminoids such as Victorian Buttercup, Australian Caraway *Oreomyrrhis eriopoda*, *Cardamine* spp., Silver Snow-daisy *Celmisia tomentella, Plantago* spp., Southern Woodrush *Luzula modesta, Brachyscome* spp., Alpine Yam-daisy *Microseris lanceolata* and Spreading Rope-rush *Empodisma minus*. This EVC was generally in good condition, except in some spots on the existing track which had bare areas and were channelised where hikers had walked either side of centre. Common weeds included *Sheep Sorrel and *Flatweed, as well as scattered Sweet Vernal-grass **Anthoxanthum odoratum,* Common Mouse-ear Chickweed, White Clover, Dandelion **Taraxacum* spp. and Forget-me-not **Myosotis discolor.*

Image 32. Alpine Damp Grassland in the Bundara-Cobungra Remote and Natural Area north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Alpine Valley Peatland EVC 0288
EPBC Act listed as Endangered (Alpine Sphagnum Bogs and Associated Fens)
Victorian FFG Act listed threatened Alpine Bog Community
Victorian Alps Bioregional Conservation Status: Endangered

Communities comprising mosses, sedges, forbs, and shrubs typically <0.5 m tall. On the Bogong High Plains, this EVC occurs in valleys from 1600 to 1700 m ASL, often in old meander channels with deep humic alluvium. Most of these communities are disturbed or modified due to historic grazing and dam construction. Watchbed Creek is one of the few remaining larger examples on the Bogong High Plains, as much of this community was flooded and is now beneath Rocky Valley Storage Dam. Common species forming part of this EVC in the assessment area include Spreading Rope-rush, Candle Heath, Fen Sedge, Tall Sedge *Carex appressa*, peat mosses *Sphagnum* spp., Alpine Trachymene *Trachymene humilis* subsp. *breviscapa*, Thyme Speedwell *Veronica serpyllifolia*, Southern Woodrush, Silver Snow-daisy, Mountain Woodruff *Asperula gunnii*, Lilac Bitter-cress *Cardamine lilacina*, Victorian Buttercup, Bog Billy-buttons *Craspedia lamicola*, Alpine Baeckea, Ashen Billy-buttons *Craspedia gracilis*, Alpine Club-rush, Bog Snow-grass *Poa costiniana*, Alpine Rusty-pods and Ace of Spades *Epacris gunnii*. This community was disturbed in places where it was intersected by the walking track, for example, at Watchbed Creek where the creek is diverted through a pipe under the track that intersects the peatland. Smaller peatlands occurred adjacent to and were intersected by the walking track along Heathy Spur Track and Australian Alps Walking Track as it descended to the Langford Aqueduct, and between the Bogong High Plains Road and Tawonga Huts. Threats to the smaller peatlands included disturbance by pest animals resulting in exposed soil and trampled vegetation, and invasion by weeds including *Sheep Sorrel, and Brown-top Bent **Agrostis capillaris* var *capillaris*.

Image 33. Alpine Valley Peatland along Watchbed Creek, piped under Big River Firetrail (December 2020), (Image credit: Louise Rodda)

Alpine Fen EVC 171
Victorian FFG Act listed threatened Fen (Bog Pool) community
Interdependent with the Victorian FFG Act listed threatened Alpine Bog Community
Interdependent with EPBC Act listed Endangered community (Alpine Sphagnum Bogs and Associated Fens)
Interdependent with the Victorian Alpine Valley Peatland EVC 0288
Victorian Alps Bioregional Conservation Status: Endangered
Source: (DSE undated):
https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

Permanent to semi-permanent pools of standing water dominated by sedges and other amphibious plants. One remnant Fen (Bog Pool) occurs within the assessment area at the south western edge of Pretty Valley Dam and is intersected by the Fainter Firetrail. It is likely have been part of the Alpine Bog (Alpine Valley Peatland) that was flooded to create Pretty Valley Dam. It is dominated by Tufted Sedge and contains Mat Water-milfoil *Myriophyllum pedunculatum* subsp. *pedunculatum*, Dwarf Buttercup and Mud Pratia *Lobelia surrepens*.

Image 34. Alpine Fen on the south western edge of Pretty Valley Dam (December 2023) (Image Credit: Louise Rodda)

Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic EVC 0211
Victorian Alps Bioregional Conservation Status: Endangered
Alpine Valley Peatland status (see above)

A mosaic of Sub-alpine Wet Heathland and Alpine Valley Peatland (see Alpine Valley Peatland description above). Sub-alpine Wet Heathland is associated with small creeks, drainage lines and ground water expression points (soaks) above 1100 m ASL on organic soils and is closely related to Alpine Heathland. The structure comprises shrubs up to 2 m tall, with a component of sedges and grasses, and some forbs present. This community occurred at Langfords Gap along the Langford Aqueduct and around Tawonga Huts. Common flora species included Spreading Rope Rush, *Sphagnum* spp., Fen Sedge, Candle Heath, Bog Snow-grass, Carpet Sedge *Carex jackiana*, Alpine Marsh-marigold *Psychrophila introloba*, Alpine Everlasting *Xerochrysum subundulatum*, Ashen Billy-buttons, Swamp Heath *Epacris paludosa* and Alpine Baeckea. This vegetation community was being impacted by walking tracks at Tawonga Huts and the vehicle track along the Langford Aqueduct. Impacts included the creation of bare ground and soil compaction from walkers and horses, and invasion by weeds. The main weeds in this community at Tawonga Huts were *Sheep Sorrel and *Flatweed. Additional weeds along the Langford Aqueduct are species listed under the Cleared/Severely Disturbed EVC described below.

Image 35. Sub-alpine Wet-Heathland /Alpine Valley Peatland Mosaic at overnight node 2, Tawonga Huts, track section 9 (December 2020), (Image credit: Louise Rodda)

Sub-alpine Pond Herbland EVC 913

Victorian Alps Bioregional Conservation Status: No status allocated

Small seasonal herbland pond systems within alpine to subalpine vegetation. This community occurs in a mosaic with Sub-alpine Wet Heathland and/or Alpine Damp Grassland. This EVC is very localised in the Victorian Alps and the total area of occurrence is extremely small. Typical vegetation includes small semi-aquatic herbs and sedges, although sometimes plants are absent. In the assessment area, the more common species recorded in this system included Dwarf Buttercup, Mat Water-milfoil *Myriophyllum pedunculatum* subsp. *pedunculatum*, Mud Pratia *Lobelia surrepens*, Alpine Club-rush and Fen Sedge. Species on the pond edges included Bog Snow-grass, Alpine Cotula *Cotula alpina*, Spreading Rope Rush and Bald-seeded Willow-herb *Epilobium curtisiae*. This EVC is located in the Bundara-Cobungra RNA along the track in section 7 north-east of Mount Jim on the Bogong High Plains and was sitting within Alpine Damp Grassland (see Appendix 1b, map 12). The vegetation was in good condition, except for areas of bare ground, pugging and trampling along and either side of the walking track. No weeds were recorded.

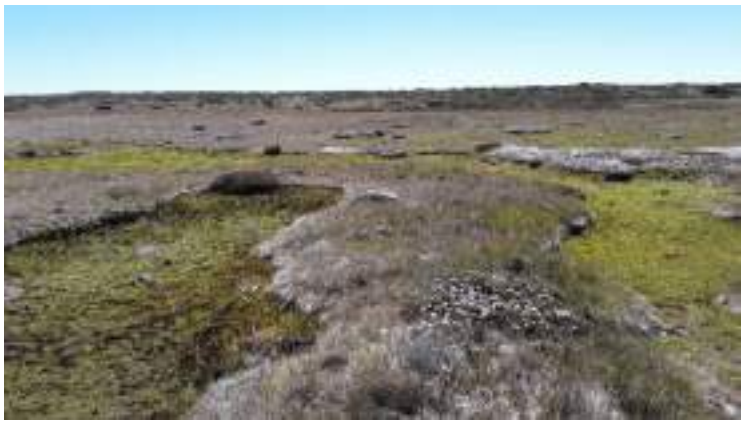


Image 36. Sub-alpine Pond Herbland in the assessment area on the Bogong High Plains in the Bundara-Cobungra Remote and Natural Area, north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Image 37. Sub-alpine Pond Herbland in the assessment area on the Bogong High Plains in the Bundara-Cobungra Remote and Natural Area, north-east of Mount Jim (December 2023), (Image credit: Alistair Smith)

Alpine Rocky Outcrop Heathland EVC 1013

Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated): https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

Alpine Rocky Outcrop Heathland consists of low (<0.5 m) sparse to dense heathland with scattered forbs and grasses on shallow soils of exposed peaks and ridges, typically in eroded areas where rock is at or near the surface. Common species in this EVC in the assessment area included Alpine Grevillea, Alpine Rusty Pods, Alpine Phebalium, Yellow Kunzea, Soft Snow-grass, Horny Snow-grass, Soft Snow-grass, Bristle Grass *Trisetum spicatum* subsp. *australiense*, Leafy Daisy *Brachyscome rigidula*, Mountain Everlasting *Coronidium monticola* and Alpine Podolepis *Podolepis robusta*. This vegetation was in good condition. It is located in the Bundara-Cobungra RNA along the track section north-east of Mount Jim on the Bogong High Plains, as well as the western end of Westons Spur track, and a small section of the proposed new track between Tawonga Hut and Westons Spur track. This EVC also occurred in discrete sections along the Razorback track and as a mosaic with Sub-alpine Woodland midway along the Diamantina Spur Track.

Image 38. Alpine Rocky Outcrop Heathland (on Basalt outcrop) on the Bogong High Plains, in the Bundara-Cobungra Remote and Natural Area, north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Image 39. Alpine Rocky Outcrop Heathland (on Basalt outcrop) on the Bogong High Plains, in the Bundara-Cobungra Remote and Natural Area, north-east of Mount Jim (December 2020), (Image credit: Louise Rodda)

Alpine Dwarf Heathland EVC 0170

Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated): https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

A very low open heathland generally to 0.2 m high. Occurs on exposed ridges and peaks above 1700 m ASL experiencing strong winds, frosts and high temperatures in summer. Located on rocky pavements with minimal soil development. Shrubs are generally wind-pruned. One of the rarest plant communities in the state and subject to damage by horses, cattle (historic grazing) and bushwalkers. The common species in this vegetation community within the assessment area included Ace of Spades, Yellow Kunzea, Alpine Grevillea, Soft Snow-grass, Carpet Heath *Pentachondra pumila*, Silver Ewartia *Ewartia nubigena,* White Purslane *Montia australasica,* Sharp-leaf Woodrush *Luzula acutifolia* subsp. *acutifolia* and Alpine Stackhousia *Stackhousia pulvinaris*. The vegetation was in good condition, with very low weed cover other than scattered *Sheep Sorrel and *Flatweed. This community was located in the Bundara-Cobungra RNA along the track in section 7 north-east of Mount Jim on the Bogong High Plains, at the western end of Westons Spur track where it merges with Alpine Grassland, and along a large section of the proposed track between Tawonga Huts and Westons Spur track where an exposed ridgeline supports a mosaic of Alpine Dwarf Heathland with Alpine Grassland and Rocky Outcrop Heathland. Small areas of Alpine Dwarf Heathland were also present in the Hotham Heights track area south of the Great Alpine Road.

Image 40. Alpine Dwarf Heathland, Australian Alps Walking Track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Image 41. Alpine Dwarf Heathland along the west section of Westons Spur track, Bogong High Plains (December 2020), (Image credit: Louise Rodda)

Alpine Conifer Shrubland EVC 156

Victorian Alps Bioregional Conservation Status: Vulnerable, Source (DSE undated): https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

This community occurs on rocky granite tors or basalt blockstreams that generally offer protection from fire in high mountain areas above 1500 m. It can occur on east or south facing slopes in steep sheltered gullies. This community was located along, (and intersected by) Fainter Firetrail on a basalt blockstream. The vegetation is dominated by Mountain Plum-pine *Podocarpus lawrencei* typically less than 1.5 m high with large thick spreading prostrate stems. Other species that can occur in this community include Fringed Rice-flower *Pimelea ligustrina*, Dusty Daisy-bush *Olearia Phlogopappa,* Royal Grevillea *Grevillea victoriae*, and Alpine Orites and a sparse understory of ground ferns. In wetter sites there may be wetland plants such as Candle Heath and Swamp Heath. There was evidence that the Mountain Plum-pine had been burnt in the last wildfire (charcoal on branches), only a small number of plants survived.

Image 42. Alpine Conifer Shrubland, Fainter Firetrail (December 2023) (Image credit: Alistair Smith)

Snowpatch Grassland EVC 1012
Victorian FFG Act listed (Alpine Snowpatch Community)
Victorian Alps Bioregional Conservation Status: NA (used default Sub-alpine Treeless Vegetation EVC 44): Rare. Source (DSE undated): https://www.environment.vic.gov.au/__data/assets/pdf_file/0012/50511/Bioregional-Conservation-Status-for-each-BioEVC.pdf

Snowpatch Grassland occurs in alpine areas above 1600 m ASL and is restricted to the sheltered slopes on southerly or easterly (lee) aspects where snow cover persists beyond the general thaw into early summer, thereby limiting the growing season. The community is characterised by a sward structure that is less than 10 cm high, typically dominated by Mountain Sedge *Carex hebes,* Alpine Wallaby-grass *Rytidosperma nudiflorum* and Ledge Grass *Poa hothamensis.* Other common components include Slender Snow-daisy, Victorian Snow-daisy, Alpine Woodruff *Asperula pusilla,* Tufted Knawel *Scleranthus diander,* Prickly Starwort *Stellaria pungens* and Showy Violet. Snowpatch Grassland was in good condition, with very low weed cover apart from scattered *Sheep Sorrel and *Flatweed. Within the assessment area this community is entirely restricted to the upper section of Mount Feathertop, more specifically, the southern face (see Appendix 1b, map 16).

Image 43. Snowpatch Grassland, Mount Feathertop (December 2020) (Image credit: Matthew Hatton)

Image 44. Snowpatch Grassland on the south face of Mount Feathertop (December 2020) (Image credit: Matthew Hatton)

Montane Damp Forest EVC 38

Victorian Alps Bioregional Conservation Status: Least Concern

Montane Damp Forest generally occurs on well-developed colluvial soils on a variety of aspects from approximately 700-1500 m ASL. This community is typically characterised by a canopy of Mountain Gum *Eucalyptus dalrympleana* subsp. *dalrympleana* and Alpine Ash *Eucalyptus delegatensis* to ~ 30 m tall, over a dense shrub layer including species such as Silver Wattle *Acacia dealbata,* Mountain Hickory Wattle *Acacia obliquinervia,* Tree Lomatia *Lomatia fraseri,* Dusty Daisy-bush *Olearia phlogopappa* subsp. *flavescens* and Tall Oxylobium *Oxylobium arborescens.* The ground layer includes a variety of herbs, grasses and ferns such as Tasman Flax-lily, Slender Tussock-grass *Poa tenera,* Weeping Grass *Microlaena stipoides* var. *stipoides,* Sword Tussock-grass *Poa ensiformis,* Mother Shield-fern *Polystichum proliferum,* Austral Bracken *Pteridium esculentum* subsp. *esculentum,* Fishbone Waterfern *Blechnum nudum,* Mountain Fireweed *Senecio gunnii* and Common Trigger-plant *Stylidium armeria*. This vegetation type was in good condition, with low weed cover in most areas, although it supported a variety of exotic species, particularly along road edges and near camping areas. Exotic weed species included *Sweet Vernal-grass, *Yorkshire Fog, *St John's Wort, *Apple, *Creeping Buttercup, *Blackberry and *Rusty Sallow. Montane Damp Forest occurs in one long reach from just below Weston Hut to the western end of Diamantina Spur Track below approximately 1500 m ASL and along an extensive stretch in the middle section of Bungalow Spur Track.

Image 45. Montane Damp Forest, Bungalow Spur Track (December 2022) (Image credit: Dr Matthew Dell)

Damp Forest EVC 29

Victorian Alps Bioregional Conservation Status: Least Concern

This community occurs on a variety of geologies on well-developed mainly colluvial soils across a range of elevations and different aspects. Within the study area canopy species typically comprise Mountain Gum mixed with other species such as *Eucalyptus radiata* subsp. *radiata* Narrow-leaf Peppermint. The understorey comprises a tall to medium dense understory of broad leaved moisture-dependent shrubs such as Silver Wattle *Acacia dealbata*, *Olearia argophylla* Musk Daisy-bush, Austral Mulberry *Hedycarya angustifolia*, Blanket Leaf *Bedfordia arborescens*, Blackwood *Acacia melanoxylon*, Mountain Hickory Wattle, Rough Coprosma *Coprosma hirtella*, Prickly Currant-bush and *Pimelea axiflora* subsp. *axiflora* Bootlace Bush. The understory species include Forest Starwort *Stellaria flaccida*, White Elderberry *Sambucus gaudichaudiana* and some species that also occur in drier forest communities. The groundstorey typically includes a variety of forbs, grasses and ferns such as Tasman Flax-lily, *Poa* species, Mother Shield-fern, Ruddy Ground-fern *Hypolepis rugosula*, Fishbone Water-fern and occasional Soft Tree-fern *Dicksonia antarctica.* Scrambler / climbers such as Mountain Clematis *Clematis aristata* are scattered. This community was recorded at lower altitudes along the western end of Bungalow Spur Track on south to south-eastly facing foothills. Weeds within the EVC were mostly limited to track edges and include *Blackberry, *Sweet Vernal-grass and occasional *Rusty Sallow. Image 46 shows a section of track within Damp Forest, however some species typical of drier vegetation types are shown along the more exposed and more regularly disturbed track edges.

Image 46. Damp Forest on Bungalow Spur Track (December 2022), (Image credit: Dr Matthew Dell)

Herb-rich Foothill Forest EVC 23

Victorian Alps Bioregional Conservation Status: Least Concern

Herb-rich Foothill Forest grows on a range of geology types on fertile general well-drained soils. The vegetation consists of a medium to tall open forest or woodland to 25 m occurring on lower slopes and low gradient gullies. The canopy comprises a mix of eucalypt species with *Eucalyptus dives* Broad-leaf Peppermint, Narrow-leaf Peppermint, *Eucalyptus viminalis* subsp. *viminalis* Manna Gum and *Eucalyptus mannifera* subsp. *mannifera* Brittle Gum. The understory includes a mixed open shrub layer of wattles, Cherry Ballart *Exocarpos cupressiformis*, Dusty Daisy-bush, Austral Indigo *Indigofera australis subsp. australis, Cassinia* species and other fire tolerant species. The ground layer comprises a moderate diversity of forbs and graminoids amongst Austral Bracken including Musk Hood-orchid *Caladenia moschata*, *Dianella* species, Kidney-weed *Dichondra repens*, Tall Sundew *Drosera auriculata*, Reflexed Bedstraw *Galium binifolium*, Common Raspwort *Gonocarpus tetragynus*, Purple Coral-pea *Hardenbergia violacea*, Blue Bottle-daisy *Lagenophora stipitata*, Cluster-headed Mat-rush *Lomandra longifolia* subsp. *exilis*, Weeping Grass, Ivy-leaf Violet *Viola hederacea* and Sprawling Bluebell *Wahlenbergia gracilis*, Common Tussock-grass *Poa labillardierei* and Slender Tussock-grass. Weeds are not prevalent in this EVC and are mostly confined to ubiquitous species such as *Flatweed and Common Centaury *Centaurium erythraea*, with some patches of Sweet Vernal-grass. On Bungalow spur track, Herb-rich Foothill Forest is confined to the western-most section of track on the lower slopes. This patch of forest is moderately rich in species, several of which would be revealed with further observations during spring surveys.

Image 47. Herb-rich Foothill Forest on Bungalow Spur Track (December 2020), (Image credit: Dr Matthew Dell)

Grassy Dry Forest EVC 22

Victorian Alps Bioregional Conservation Status: Least Concern

This EVC is found at lower altitudes on slopes with varying gradients and on a range of geologies. Within the study area, it was observed only on a short section of Diamantina Spur Track, which is north to west facing and on a well-drained slope with shallow soils. The canopy is 10–15(20) m tall comprising Broad-leaf Peppermint and minor occurrences of other species. This EVC has an open shrub layer and ground layer dominated by drought-tolerant forbs and grasses. Understorey species include Silvertop Wallaby-grass *Rytidosperma pallidum*, Grey Tussock-grass *Poa sieberiana* var. *sieberiana*, Kangaroo Grass *Themeda triandra*, Clustered Everlasting *Chrysocephalum semipapposum* subsp. *semipapposum*, Hairy Speedwell *Veronica calycina*, Button Everlasting *Coronidium scorpioides*, Gorse Bitter-pea *Daviesia ulicifolia*, Black-anther Flax-lily, Pale Vanilla-lily *Arthropodium milleflorum* s.s., Kidney-weed, Tiger Orchid *Diuris sulphurea*, Twining Glycine *Glycine clandestina*, Purple Coral-pea, Austral Indigo, Mountain Flat-pea *Platylobium montanum* subsp. *montanum*, Blue Bottle-daisy, Prickly Broom-heath *Monotoca scoparia*, Prickly Geebung *Persoonia juniperina*, Beaked Fireweed *Senecio prenanthoides*, Common Triggerplant and Austral Bracken. Weeds are not common in this EVC due to lower nutrient and drier soils.

Image 48. Grassy Dry Forest on Bungalow Spur Track (December 2020), (Image credit: Dr Matthew Dell)

Shrubby Dry Forest EVC 21

Victorian Alps Bioregional Conservation Status: Least Concern

Shrubby Dry Forest occurs on a variety of geologies on ridgelines and other exposed areas such as the upper parts of steep slopes, on shallow soils and generally in higher rainfall areas of the bioregion. The canopy consists of a range of eucalypt species to 25 m tall over a diverse shrub layer and sparse ground layer dominated by grasses. Within the study area, it occurs in the lower elevation half of Diamantina Spur Track. The canopy consisted of Broad-leaf Peppermint and Mountain Gum. The understorey consistently has a moderate cover of medium-height shrubs (1–3 m tall) including Shiny Cassinia *Cassinia longifolia,* Common Cassinia *Cassinia aculeata* subsp. *aculeata,* Rough Coprosma, Prickly Currant-bush, Hop Bitter-pea *Daviesia latifolia,* Pale-fruit Ballart *Exocarpos strictus*, Gorse Bitter-pea, Austral Indigo, Prickly Broom-heath, Dusty Daisy-bush, Mountain Flat-pea, Prickly Bush-pea and Pink-bells *Tetratheca ciliata.* Other ground flora include tussock grasses *Poa* species, bent grasses *Deyeuxia* species, wallaby grasses *Rytidospserma* species and occasional ground ferns such as Common Ground-fern *Calochlaena dubia* and Austral Bracken. Weeds are mostly ubiquitous herbaceous species confined to track edges, however scattered woody weeds such as *Blackberry and Apple **Malus pumila* occur in isolated occurrence amongst more intact vegetation.

Image 49. Shrubby Dry Forest on Bungalow Spur Track (December 2020), (Image credit: Dr Matthew Dell)

Wet Forest EVC 30

Victorian Alps Bioregional Conservation Status: Least Concern

Wet Forest within the study area occupies one section of Diamantina Spur Track where a south-facing creek and steep gully provides shelter from afternoon sun and humid conditions. The gully is subsequently more fire protected than the surrounding landscape and soils on the lower slopes are draining but wet throughout the year. The tree canopy grows to 30 m tall over a dense, tall layer of broad-leaved shrubs. The groundstorey is dominated by ferns including tree ferns. The dominant canopy species is Mountain Gum although other eucalypt species are present. Dominant shrubs include Blanket Leaf, Austral Mulberry, Musk Daisy-bush, Tree Lomatia and Blackwood. Ferns include water ferns *Blechnum* species, Ruddy Ground-fern and Soft Tree-fern. Bryophytes have moderate cover and diversity under the shrub layer. *Forest Blackberry has invaded parts of the gully and represented one of the largest infestations of *Blackberry within the study area. Other weeds are herbaceous and mostly confined to track edges.

Image 50. Wet Forest on Bungalow Spur Track (December 2020), (Image credit: Dr Matthew Dell)

Cleared/Severely Disturbed (allocated EVC number 58) (DELWP 2016)
Victorian Alps Bioregional Conservation Status: No status

Vegetation that has been modified due to disturbance impacts. In the assessment area, this includes vehicle roads and tracks, car parks, camping platforms, camping areas, rock walling, bridging and aqueducts. Impacts include soil compaction, vegetation removal, substrate modification and a high cover of weeds. The more common weed species were *Sheep Sorrel, *Brown-top Bent, *Flatweed, *Dandelion, *White Clover, *Sweet Vernal-grass, Creeping Fescue **Festuca rubra*, Yorkshire Fog **Holcus lanatus*, *Soft Rush (particularly along Langford Aqueduct), Timothy Grass **Phleum pratense*, Squirrel-tail Fescue **Vulpia bromoides*, *Grey Sallow (particularly along Heathy Spur Track), and *Milfoil (associated with roadsides and carparking at the start of the Razorback track).

Image 51. Cope Aqueduct bridge crossing and Cope Saddle Track near Cope Hut (December 2020), (Image credit: Matthew Hatton)

Image 52. Langford West Aqueduct Road and Langford Aqueduct (December 2020), (Image credit: Matthew Hatton)

3.5.3.1 Track alignment — EVCs

A summary of the EVCs recorded in each track section, including their conservation status and corresponding listed communities, is provided in Table 9.

Table 9. List of EVCs and their bioregional conservation status recorded in track sections of the proposed FHAC track alignment

Legend:

R = recorded

EVC = Ecological Vegetation Class

BCS = Victorian Bioregional Conservation Status

EPBC = Listed under the *Environment Protection and Biodiversity Conservation Act 1999*

FFG = Listed under the *Flora and Fauna Guarantee Act 1988*

New EVCs in 2022	EVC	EVC No.	BCS	Listed community	Track sections																
					1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
	Alpine Grassland	1001	R			R	R	R	R	R	R	R	R	R	R		R	R	R	R	R	R
	Alpine Grassy Heathland	1004	R			R	R	R	R	R	R	R		R	R		R		R	R	R	R
	Sub-alpine Shrubland	42	R		R	R	R	R	R				R				R		R		R	R
	Sub-alpine Woodland	43	LC			R		R	R			R	R		R		R		R	R	R	R
	Alpine Valley Peatland	288	E	EPBC FFG	R	R	R	R	R	R	R		R		R						R	
2022	Alpine Conifer Shrubland	156	V																		R	
	Alpine Damp Grassland	1002	R							R	R			R	R							

New EVCs in 2022	EVC	EVC No.	BCS	Listed community	Track sections																
					1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
	Alpine Dwarf Heathland	170	R							R	R									R		
	Alpine Rocky Outcrop Heathland	1013	R								R			R			R		R			
	Alpine Rocky Outcrop Heathland/Alpine Dwarf Heathland Mosaic	1105	R											R	R					R		
2022	Alpine Fen	171	E	FFG																	R	
	Snowpatch Grassland	1012	R	FFG														R	R			
	Sub-alpine Pond Herbland	0913	NS								R			R								
	Sub-alpine Wet Heathland/ Alpine Valley Peatland Mosaic	211	E	EPBC (Alpine Valley Peatland component) FFG					R				R									
2022	Damp Forest	29	LC																			R
2022	Grassy Dry Forest	22	LC																			R

New EVCs in 2022	EVC	EVC No.	BCS	Listed community	Track sections																
					1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
2022	Herb-rich Foothill Forest	23	LC																			R
	Montane Damp Forest	38	LC													R						R
2022	Shrubby Dry Forest	21	LC																			R
2022	Wet Forest	30	LC																			R
	Cleared/ Severely Disturbed	58	NS		R		R	R	R	R		R	R			R				R		

3.5.3.2 Overnight nodes — EVCs

Six EVCs in total (excluding 'Cleared/Severely disturbed EVC) were recorded at the proposed OV locations. A summary and images of EVCs at each proposed OV are provided in Table 10.

Table 10. Ecological Vegetation Classes (EVCs) recorded in the overnight nodes, December 2022 and February 2024

Overnight node	EVC		
OV1 Preferred Cope Hut	Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, and Cleared/Severely disturbed (in part of existing vehicle management track)	 **Image 53. OV1 preferred, Alpine Grassy Heathland, Sub-alpine Woodland (December 2022) (Image: Louise Rodda)**	 **Image 54. OV1 alternate, Cope Hut, Sub-alpine Woodland (with a low heathy understory) (December 2022) (Image: Louise Rodda)**

Overnight node	EVC		
OV1 alternate Cope Hut	Alpine Valley Peatland, Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, and Sub-alpine Shrubland	 **Image 55. OV1 alternate, Cope Hut, Alpine Valley Peatland (December 2022) (Image: Louise Rodda)**	 **Image 56. OV1 alternate, Cope Hut, Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, and Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**

Overnight node	EVC		
OV2 preferred Tawonga Huts	Alpine Valley Peatland, Alpine Grassy Heathland, Sub-alpine Woodland and Sub-alpine Shrubland	 **Image 57. OV2 preferred, Tawonga Huts, Alpine Valley Peatland (December 2022) (Image: Louise Rodda)**	 **Image 58. OV2 preferred, Tawonga Huts, Alpine Grassy Heathland, Sub-alpine Woodland and Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**

Overnight node	EVC		
OV2 preferred linked access tracks Tawonga Huts	Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, Sub-alpine Shrubland and cleared/severely disturbed	 **Image 59. OV2 preferred north linked access track, Alpine Grassy Heathland, Sub-alpine Woodland, Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**	 **Image 60. OV2 preferred south linked access track, Sub-alpine Woodland (December 2022) (Image: Louise Rodda)**

Overnight node	EVC		
OV2 alternate Tawonga Huts	Alpine Valley Peatland, Alpine Grassy Heathland, Sub-alpine Woodland and Sub-alpine Shrubland	 **Image 61. OV2 alternate, Tawonga Huts, Alpine Valley Peatland, Alpine Grassy Heathland, Sub-alpine Woodland and Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**	 **Image 62. OV2 alternate, Tawonga Huts, Alpine Grassy Heathland, Sub-alpine Woodland and Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**

Overnight node	EVC		
OV2 alternate access track Tawonga Huts	Alpine Valley Peatland and Sub-alpine Shrubland	 **Image 63. OV2 alternate access track from track section 9, Alpine Valley Peatland and Sub-alpine Shrubland (December 2022) (Image: Louise Rodda)**	

Overnight node	EVC		
OV3 Blairs Hut	Montane Damp Forest	 **Image 64. OV3, Blairs Hut, Montane Damp Forest (December 2022) (Image: Dr Matthew Dell)**	 **Image 65. OV3, Blairs Hut, Sub-alpine Woodland (December 2022) (Image: John Webb)**

Overnight node	EVC		
OV4 High Knob	Sub-alpine Woodland	 **Image 66. OV4, High Knob, Sub-alpine Woodland (December 2022) (Image: Dr Matthew Dell)**	 **Image 67. OV4, High Knob, Sub-alpine Woodland (December 2022) (Image: John Webb)**

Overnight node	EVC		
Cope Hut existing camping area	Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, and Cleared/ Severely disturbed (in part of existing vehicle management track)	 **Image 68. Cope Hut existing camping area, disturbed Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, southern section (February 2024) (February 2024) (Image: Louise Rodda)**	 **Image 69. Cope Hut existing camping area, disturbed Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, central eastern section (February 2024) (Image: Louise Rodda)**

Overnight node	EVC		
Cope Hut existing camping area	Alpine Grassland, Alpine Grassy Heathland, Sub-alpine Woodland, and Cleared/ Severely disturbed (in part of existing vehicle management track)	 **Image 70. Cope Hut existing camping area, disturbed Alpine Grassland, Alpine Grassy Heathland, central western section (February 2024) (Image: Louise Rodda)**	 **Image 71. Cope Hut existing camping area, disturbed Alpine Grassy Heathland, Sub-alpine Woodland, northern section (February 2024) (Image: Louise Rodda)**

Overnight node	EVC		
Westons Hut existing camping area	Sub-alpine Woodland and Cleared/ Severely disturbed	 **Image 72. Weston Hut existing camping area, cleared, severely disturbed Sub-alpine Woodland, west section (February 2024) (Image: Louise Rodda)**	 **Image 73. Weston Hut existing camping area, cleared, severely disturbed Sub-alpine Woodland, central section (February 2024) (Image: Louise Rodda)**

Overnight node	EVC		
estons Hut existing camping area	Sub-alpine Woodland and Cleared/ Severely disturbed	 **Image 74. Weston Hut existing camping area, cleared/severely disturbed Sub-alpine Woodland and ground water seepage area north eastern section, (February 2024) (Image: Louise Rodda)**	 **Image 75. Weston Hut existing camping area, cleared/severely disturbed Sub-alpine Woodland, eastern section (February 2024) (Image: Louise Rodda)**

3.6 Fauna values

A total of 78 fauna species were recorded in the updated assessment area (combined data from 2020/2021, 2022 and 2024 field assessments), comprising 73 (94%) native species and 5 (6%) pest species (Tables 11 and 12, Appendix 5).

They include:

- 12 mammals;
- 30 birds;
- 14 reptiles;
- 2 frogs;
- 2 fish; and
- 17 invertebrate species.

Fish in the Mountain Galaxias *Galaxias olidus* complex, caddisflies, stonefly nymphs and mayfly nymphs were recorded but their identification and taxonomic status remains uncertain. The identification of these species requires more specialist input that was not within the scope of this project.

The number of species recorded in the different track sections and OVs included:

- 78 along the track alignment, comprising 73 native species and 5 pest species; and
- 2 native species in the OVs.

Track

The greatest number of native fauna species were recorded along track section 12 in the West Kiewa Valley (35 species), followed by track section 18 (Bungalow Spur Track) (21 species) (Table 11, Appendix 5).

Overnight nodes

Two fauna species were recorded in two OVs. As they are both threatened, the specific locations of these records have been redacted in this report to protect the species (i.e. they are threatened and are potential targets for poaching and/or habitat disturbance). Their locations have been provided to PV separately.

3.7 Threatened fauna species

Ten threatened fauna species were recorded in total in the assessment area (Appendix 5) including:

- 7 EPBC Act listed species, including:
    - 6 listed as Endangered
    - 1 listed as Vulnerable
- 10 FFG Act listed species, including:
    - 2 listed as Critically Endangered

- 5 listed as Endangered
- 3 listed as Vulnerable

Track

The number of threatened species recorded along the track included:

- 7 EPBC Act listed species, including:
  - 6 Endangered
  - 1 Vulnerable
- 10 FFG Act listed species, including:
  - 2 Critically Endangered
  - 5 Endangered
  - 3 Vulnerable

Threatened fauna species recorded in each section of the track alignment and others for which suitable habitat is present are shown in Table 11. The greatest number of threatened species was recorded along the track alignment on the Bogong High Plains where the highest number of threatened species (six) were recorded. Specific locations for several of these species are not provided in this report due to their sensitive nature (i.e. being potential targets for poaching or habitat disturbance) and have been provided to PV separately.

Table 11. Threatened fauna species and suitable habitat recorded along the proposed trail alignment in the Falls to Hotham Alpine Crossing assessment area (November-December 2020/December 2022)

Legend:

R = recorded in the assessment area

H = suitable habitat or potential to occur in the assessment area

= redacted sensitive species locations

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

V = Vulnerable,

E = Endangered

CR = Critically Endangered

M = Migratory

FFG Act = *Flora and Fauna Guarantee Act 1988*:

th = listed as threatened and pending assessment

vu = Vulnerable

en = Endangered

cr = Critically Endangered

Scientific name	Common name	EPBC Act	FFG Act	Track section																	
				1a	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18
Mammals																						
Burramys parvus	Mountain Pygmy Possum	E	en					H													H	
Canis lupus dingo	Dingo		vu	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Dasyurus maculatus maculatus	Spot-tailed Quoll	E	en													H						H
Mastacomys fuscus mordicus	Broad-toothed Rat	E	vu	H					R			H									H	H
Ornithorhynchus anatinus	Platypus		vu													R						H
Petauroides volans	Southern Greater Glider	E	en													R						H

Scientific name	Common name	EPBC Act	FFG Act	Track section																	
				1a	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18
Petaurus australis australis	Yellow-bellied Glider	V	vu													R						H
Potorous longipes	Long-footed Potoroo	E	en													H						H
Pseudomys fumeus	Smoky Mouse	E	en													H						H
Birds																						
Callocephalon fimbriatum	Gang-gang Cockatoo	E	en																			
Gallinago hardwickii	Latham's Snipe	V, M		H					H	H		H										
Hirundapus caudacutus	White-throated Needletail	V	vu	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Ninox strenua	Powerful Owl		vu													H						H
Pycnoptilus floccosus	Pilotbird	V	vu													H						H
Tyto tenebricosa	Sooty Owl		en													H						H
Reptiles																						
Cyclodomorphus praealtus	Alpine She-oak Skink	E	cr																			
Eulamprus kosciuskoi	Alpine Water Skink		en																			
Liopholis guthega	Guthega Skink	E	cr																			
Liopholis montana	Mountain Skink	E	en													H	H		H	H		H
Pseudemoia cryodroma	Alpine Bog Skink	E	en																			
Pseudemoia pagenstecheri	Tussock Skink		en		R	H	H	H	R	R	H	H	H	H	H		H	H	H	H	H	

Scientific name	Common name	EPBC Act	FFG Act	Track section																	
				1a	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18
Fish																						
Galaxias olidus complex	Mountain Galaxias species complex	TBC	TBC																			
Amphibians																						
Litoria spenceri	Spotted Tree Frog	CR	cr													H						
Litoria verreauxii alpina	Alpine Tree Frog	V	cr				H		H	H					H						H	
Invertebrates																						
Austroaeschna flavomaculata	Alpine Darner Dragonfly		vu						H	H		H									H	H
Colubotelson joyneri	freshwater isopod		cr				H		H	H											H	H
Euastacus armatus	Murray Spiny Crayfish		th													H						H
Euastacus crassus	Alpine Spiny Crayfish		en				H		H	H						H					H	H
Riekoperla intermedia	stonefly		vu				H		H	H		H				H					H	H
Thaumatoperla alpina	Alpine Stonefly	E	en				H		H	H		H				H					H	H

Overnight nodes

Threatened fauna species recorded in overnight nodes (one EPBC Act listed and an additional FFG Act listed species), and those where there is suitable habitat for other threatened fauna species, are shown in Table 12.

The specific locations of the threatened fauna records in OVs are not provided in this report due to their sensitive nature and have been provided to PV separately.

Table 12. Threatened fauna species and suitable habitat recorded at proposed overnight nodes within the Falls to Hotham Alpine Crossing assessment area (November-December 2020/December 2022)

Legend:

R = recorded in the assessment area

H = suitable habitat or potential to occur in the assessment area

■ = redacted sensitive species locations

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

V = Vulnerable,

E = Endangered

M = Migratory

FFG Act = *Flora and Fauna Guarantee Act 1988*:

th = listed as threatened and pending assessment,

vu = Vulnerable

en = Endangered

cr = Critically Endangered

				Overnight nodes and associated tracks							
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1P**	**OV1A**	**OV2P (including two access loop tracks)**	**OV2A (including access track from track section 9)**	**OV3**	**OV4**	**Westons Hut**	**Cope Hut**
Mammals											
Canis lupus dingo	Dingo		vu	H	H	H	H	H	H	H	H
Burramys parvus	Mountain Pygmy Possum	E	en								
Dasyurus maculatus maculatus	Spot-tailed Quoll	E	en					H			
Mastacomys fuscus mordicus	Broad-toothed Rat	E	vu	H	H	H	H	H			
Ornithorhynchus anatinus	Platypus		vu					H			
Petauroides volans	Southern Greater Glider	E	en					H			
Petaurus australis australis	Yellow-bellied Glider	V	vu					H			
Potorous longipes	Long-footed Potoroo	E	en					H			
Pseudomys fumeus	Smoky Mouse	E	en								

				Overnight nodes and associated tracks							
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1P**	**OV1A**	**OV2P (including two access loop tracks)**	**OV2A (including access track from track section 9)**	**OV3**	**OV4**	**Westons Hut**	**Cope Hut**
Birds											
Callocephalon fimbriatum	Gang-gang Cockatoo	E	en								
Gallinago hardwickii	Latham's Snipe	V, M			H	H	H				
Hirundapus caudacutus	White-throated Needletail	V	vu	H	H	H	H	H	H	H	H
Ninox strenua	Powerful Owl		vu					H			
Pycnoptilus floccosus	Pilotbird	V	vu					H			
Tyto tenebricosa	Sooty Owl		en					H			
Reptiles											
Cyclodomorphys praealtus	Alpine She-oak Skink	E	cr	H	H	H	H		H	H	H
Eulamprus kosciuskoi	Alpine Water Skink		en		H	H	H				
Liopholis guthega	Guthega Skink	E	cr								
Liopholis montana	Mountain Skink	E	en						H		
Pseudemoia cryodroma	Alpine Bog Skink	E	en	H	H	H	H		H		
Pseudemoia pagenstecheri	Tussock Skink		en								
Fish											
Galaxias olidus species complex	Mountain Galaxias species complex	TBA	TBA								
Invertebrates											
Ausrtoaeschna flavomaculata	Alpine Darner Dragonfly		vu			H	H	H			
Colubotelson joyneri	freshwater isopod		cr			H	H				
Euastacus armatus	Murray Spiny Crayfish		th					H			

				Overnight nodes and associated tracks							
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1P**	**OV1A**	**OV2P (including two access loop tracks)**	**OV2A (including access track from track section 9)**	**OV3**	**OV4**	**Westons Hut**	**Cope Hut**
Euastacus crassus	Alpine Spiny Crayfish		en				H	H			
Riekoperla intermedia	stonefly		vu			H	H	H			
Thaumatoperla alpina	Alpine Stonefly	E	en			H	H	H			

Habitat descriptions and general locations of threatened fauna species recorded within the FHAC project area are provided below.

Alpine She-oak Skink *Cyclodomorphus praealtus*

An Alpine She-oak Skink (Listed as Endangered under the EPBC Act and Critically Endangered under the FFG Act) was seen incidentally in the study area (Image 76). Habitat for this restricted alpine species exists more broadly throughout the assessment area on the high plains. This species is an alpine specialist and highly restricted, it is usually found above 1500 m in areas with relatively open or no tree cover that support dense grass tussocks, or low-growing heath or otherwise open shrub cover (Robertson and Coventry 2019).

The overnight node 1 location option currently being considered along the Langford West Aqueduct Road supports suitable habitat for the species (see Attachment 2). There is suitable habitat for the species surrounding Weston Hut and Cope Hut, and it may occur at High Knob, although parts of those assessed overnight node extents were determined to support less suitable habitat for it (i.e. mainly very short grass with areas of burnt and otherwise bare ground heavily impacted by hikers and campers). It is possible that the Alpine She-oak Skink occurs in the track sections along the Razorback to Mount Feathertop and High Knob to Diamantina Spur Track, although there has been a lack of targeted survey for the species in those areas (N. Clemann pers. comm.).

Image 76. Alpine She-oak Skink on the Bogong High Plains (February 2019 pre FHAC project), (Image credit: Zak Atkins)

Alpine Water Skink *Eulamprus kosciuskoi*

The Alpine Water Skink (Image 77) is listed as Endangered under the FFG Act, being restricted to alpine areas above 1300 m in elevation (Robertson and Coventry 2019). Within the study area, this species was found along creeks and smaller tributaries intersecting the track on the Bogong High Plains. The species is known to occur across the Bogong High Plains, including in drier habitats such as low heathlands and tussock grasslands, although usually within a few hundred metres of more typical damp habitats.

Image 77. Alpine Water Skink on the Bogong High Plains within the FHAC PEVA assessment area (November 2020), (Image credit: Zak Atkins)

Guthega Skink *Liopholis guthega*

The Guthega Skink (Image 78) is listed as Endangered under the EPBC Act and Critically Endangered under the FFG Act, being restricted to alpine areas of Victoria and New South Wales above 1600 m (Donnellan et al. 2002). The species is known to occur along the track alignment on the Bogong High Plains (Z. Atkins unpubl. data). Potential burrows requiring verification were identified during this assessment in parts of the alignment.

Image 78. Guthega Skink on the Southern Bogong High Plains within the FHAC PEVA assessment area (November 2020), (Image credit: Zak Atkins)

Alpine Bog Skink *Pseudemoia cryodroma*

The Alpine Bog Skink is listed as Endangered under the EPBC Act and FFG Act. Suitable habitat for this species was noted in the same locations as habitat for the Alpine Water Skink, and more broadly where open damp heath, grassland or bogs occur. The species also occurs in drier

habitats, such as low heath on Mt Hotham (and snow gum woodland between Mts Buller and Stirling); as with many reptiles, Alpine Bog Skinks may pass through or occur in areas dissimilar from more typical habitat (e.g. grassland or heathland between bogs or riparian areas). For example, during this work an individual was found at the edge of the trail on a hillslope above a tributary.

Tussock Skink *Pseudemoia pagenstecheri*

The Tussock Skink (High Country populations listed as Endangered under the FFG Act) was recorded or is likely to occur along most of the alignment wherever there is a cover of grasses, tussocks or low-growing shrubs with little or no tree cover (Hutchinson and Donnellan 1992; Robertson and Coventry 2019). This was the most numerous and widespread reptile species recorded in the assessment area, recorded in track sections 2, 6 and 7, and suitable habitat was identified in all other sections of track apart from sections 1 and 12.

This species was also recorded basking on rocks in two of the assessed OVs. These locations have been provided to Parks Victoria separately. While individuals are expected to occasionally cross already impacted sections of those assessed areas (e.g. bare ground and lawn already maintained by regular unauthorised camping), less heavily impacted (slightly longer) grass, low shrubby vegetation and rocks and logs surrounding those disturbed sections provide more optimal habitat structure for the species.

Broad-toothed Rat *Mastacomys fuscus mordicus*

Burrows and scats of the Broad-toothed Rat (Listed as Endangered under the EPBC Act and Vulnerable under the FFG Act) were recorded in the assessment area on an unnamed headwater tributary crossing the track between Cope Hut and Cope Saddle Hut (track section 6) (Image 79). There is potential for this species to occur along other waterways and damp habitats in the assessment area, including the tributaries and bog system at Tawonga Huts.

Image 79. Burrow entrance belonging to the Broad-toothed Rat on the bank of a headwater tributary at Cope Saddle (November 2020), (Image credit: David De Angelis)

Platypus Ornithorhynchus anatinus

A Platypus (Listed as Vulnerable under the FFG Act) was seen in the Diamantina River beside the Horse Yards. Platypus burrows are often difficult to find and identify (Serena et al. 1998), but it is possible that they could be located along the banks of the Diamantina and West Kiewa River (track section 12), with entrances potentially underwater and/or concealed by overhangs, vegetation or debris. Suitable foraging habitat for the Platypus has also been identified in Tawonga Hut Creek at Tawonga Huts, and in the unnamed creek at the western end of Bungalow Spur Track (track section 18). The species is less likely to breed within those reaches due to being mostly narrow and shallow with few deep pools or runs. Additionally, if the species is present in either of those waterways, those sections of creek are likely to represent only a portion of the platypus' home range and regular foraging habitat.

Gang-gang Cockatoo *Callocephalon fimbriatum*

A pair of Gang-gang Cockatoos (listed as Endangered under the EPBC Act and FFG Act) were observed flying through and landing in trees towards the western end of Bungalow Spur Track and discarded nest material consisting of eucalypt bark and feathers was found in a section of the study area within the current proposed footprint. The species was identified incidentally as it is easily recognised by its distinct call and plumage.

Southern Greater Glider *Petauroides volans*

Three Greater Gliders (listed as Vulnerable under the EPBC Act and FFG Act) were seen while spotlighting at Diamantina Horse Yards, including one on track section 12 between the formerly proposed OV3 and vehicle bridge crossing the Diamantina River. The survey effort was not comprehensive enough to inform abundance. Suitable habitat exists elsewhere for this species along track section 12 and in OV3.

Yellow-bellied Glider Petaurus australis

Yellow-bellied Gliders *Petaurus australis* (listed as Vulnerable under the EPBC Act) were recorded while spotlighting at both Diamantina Horse Yards and Blairs Hut during the initial assessment (two individuals at each location). We therefore consider it likely that this species occurs elsewhere in the West Kiewa Valley along section 12 of the track alignment, and potentially in OV3.

Mountain Galaxias *Galaxias olidus* species complex

While not threatened as a taxonomic group, the Mountain Galaxias *Galaxias olidus* (sensu stricto) was collected while dip netting in a tributary of Tawonga Hut Creek (track section 9) and galaxiids belonging to the same species complex (*G.* cf. *olidus*) were caught in a bog system on the Bogong High Plains (Image 80). The proposed FHAC track alignment intersects the former tributary. Specimens and tissue samples (fin clips) were collected from both locations and delivered to Tarmo Raadik at the Arthur Rylah Institute for Environmental Research, Heidelberg, to confirm their identity, which is still pending for the specimens collected from the Bogong High Plains.

Image 80. *Galaxias* cf. *olidus* found on the Bogong High Plains (November 2020), (Image credit: David De Angelis)

3.7.1 Likelihood of occurrence determinations

The field assessment indicates that the current project area supports known or potential habitat for 19 threatened fauna species not recorded during the surveys undertaken to date.

The VBA database search and PMST reports identified records or potential for an additional eight threatened fauna species that may occur in or nearby to the study area (resulting in a total of 27 threatened species for which potential impacts were considered).

The determination of the likelihood of occurrence identified 19 of the 27 species as likely to occur within or nearby to the study area (Attachment 2). The rationale behind the decisions are detailed in Attachment 2. The species include:

- 11 EPBC listed species:
    - 1 listed as Critically Endangered;
    - 6 listed as Endangered; and
    - 4 listed as Vulnerable.
- 18 FFG listed species:
    - 3 listed as Critically Endangered;
    - 8 listed as Endangered;
    - 6 listed as Vulnerable; and
    - 1 species listed as threatened pending assessment.

Nineteen of these species are considered likely to occur along the track, and eight are considered likely to occur in the OVs:

Track

- 11 EPBC Act listed species; and
- 18 FFG Act listed species.

Overnight nodes

- Four EPBC Act listed species (OV1 preferred, OV1 alternate, OV2 preferred, OV2 alternate, OV3, OV4, Weston Hut and Cope Hut); and
- Eight FFG Act listed species (OV1 preferred, OV1 alternate, OV2 preferred, OV2 alternate, OV3, OV4, Weston Hut and Cope Hut).

A number of these fauna species are particularly significant given their limited distribution, including:

- One likely Victorian endemic species;
- One possible Victorian endemic species; and
- 13 species confined to alpine areas (see Attachment 2).

We consider at least six of these species to be highly prone to habitat vandalism (e.g. rock removal and disturbance) or poaching.

3.7.2 Targeted surveys

Targeted surveys would need to be undertaken to identify the presence and distribution of 17 of the 19 threatened species identified by the likelihood of occurrence determination (Attachment 2). The remaining two species, Dingo and White-throated Needletail range widely throughout the study area so significant amounts of suitable habitat for these species is unlikely to be impacted by the proposed FHAC.

Further, targeted surveys need to be undertaken for seven of the 10 threatened species that were recorded within the study area, in areas of suitable habitat where they have not been recorded during this project.

Three of the 10 species are particularly difficult to detect and they should be presumed present in areas supporting suitable habitat for them. These include Mountain Skink, Alpine She-oak Skink, and Alpine Tree Frog.

Habitat descriptions and locations where suitable habitat was identified for threatened fauna species that have not been recorded within the FHAC project area are provided below.

Mountain Pygmy Possum *Burramys parvus*

The Mountain Pygmy Possum is listed as Endangered under the EPBC Act and FFG Act. Habitat for the Mountain Pygmy Possum includes rock screes and boulder fields supporting shrubland and heath, including any dominated by Mountain Plum Pine *Podocarpus lawrencei* which is particularly favoured by the species, especially by breeding females (Mansergh et al. 1989).

Suitable habitat for the Mountain Pygmy Possum was identified in parts of track section 5 of the assessment area, in the form of basalt blockstreams (in Alpine Conifer Shrubland dominated by *Podocarpus lawrencei*) occurring on part of the Fainter Firetrack (track section 17). Targeted surveys would be needed to better inform the likelihood of the species occurring in this latter area and hence, potential impacts to it.

Smoky Mouse *Pseudomys fumeus*

The Smoky Mouse (listed as Endangered under the EPBC Act and FFG Act) has not been previously recorded in the West Kiewa Valley (track section 12) or the lower reaches of Bungalow Spur Track (section 18) however, this may be due to a lack of survey effort in the

greater region. Potential habitat for this species has been identified in parts of these two track sections, with targeted surveys required to better inform the likelihood of it occurring there. The species is known to occur within the catchments of the Wonungarra River and Buckland River approximately 20 km further west of the study area (DEECA 2024b).

Long-Footed Potoroo *Potorous longipes*

The Long-footed Potoroo (listed as Endangered under the EPBC Act and FFG Act) was recorded near the assessment area in the West Kiewa Valley (track section 12) in 2019 (DEECA 2024b), and is therefore assumed to be present there, although possibly in low densities. Other forested sections of the project area at lower altitudes, mainly towards the western end of Bungalow Spur Track (section 18) also contain potential habitat for Long-footed Potoroo.

Spot-Tailed Quoll *Dasyurus maculatus maculatus*

This species (listed as Endangered under the EPBC Act and FFG Act) is now considered to occur rarely in alpine areas on the Australian mainland, being reported infrequently from below the treeline (Green and Osborne 2012). Following historic declines throughout most of its distribution, the study area is not known to be a stronghold for the species. However, there are more recent records in the VBA from north and south of the 5 km search area (from 2001 and 2007 respectively) (DEECA 2024b), and given the species is particularly wide-ranging, surveys are recommended to be undertaken in lower elevation sections of the assessment area (track sections 12 and 18) to provide more information on its likelihood of occurrence there.

Dingo Canis *lupus dingo*

Dingoes (listed as Vulnerable under the FFG Act) are most commonly seen in grassland and woodland below the winter snowline (Newsome and Catling 1979), although they may travel through and seasonally take up residence at higher altitudes (Green and Osborne 2012). All track sections and OVs are considered to be potential habitat for the Dingo, with individuals at least passing through if not including some areas in their core territory, however not all sections of track or OVs would be occupied or visited consistently throughout the year.

Latham's Snipe *Gallinago hardwickii*

Latham's Snipe (listed as Vulnerable and a migratory marine bird under the EPBC Act) was not recorded in the study area during the field assessment, although may potentially roost, seek cover and forage among grasses, sedges and rushes in and adjacent to bogs and riparian areas, including within track sections 1a, 6, 7 and 9.

White-throated Needletail *Hirundapus caudacutus*

The White-throated Needletail (listed as Vulnerable under the EPBC Act and FFG Act) remains airborne for much of the day and may roost aerially at night (Higgins 1999), and may also roost in trees (Tarburton 1993). It is assumed that larger trees within the assessment area could provide roosting sites for this species, but it is otherwise expected to occasionally fly over.

Powerful Owl *Ninox strenua*

This species (listed as Vulnerable under the FFG Act) is generally absent from alpine areas (Green and Osborne 2012), but may potentially occur at lower altitudes in the study area particularly in the West Kiewa Valley between the western section of Westons Spur Track, the start of the Razorback Track (track section 12), and the western section of Bungalow Spur Track (section 18) and in OV3.

Pilotbird *Pycnoptilus floccosus*

The Pilotbird (listed as Vulnerable under the EPBC Act and FFG Act) occurs in a variety of wooded habitats including subalpine areas, particularly wetter sclerophyll forests and often in gullies (Menkhorst et al. 2017). Within the assessment area, at lower elevations, there are forested areas in the West Kiewa Valley between the western section of Westons Spur Track and start of the Razorback Track (track section 12), western section of Bungalow Spur Track (section 18) and OV3 that may be used by Pilotbirds.

Sooty Owl *Tyto tenebricosa*

The Sooty Owl (listed as Endangered under the FFG Act) was recorded in 1996 in the vicinity of Blair's Hut, close to OV3. Overnight node 3 provides potential roosting, nesting and foraging habitat for this species, and would require targeted surveys to better inform the species' likelihood of occurring there. The remainder of track section 12 and the western end of Bungalow Spur Track (section 18) also provide potential habitat for this species.

Mountain Skink *Liopholis montana*

The Mountain Skink is listed as Endangered under both the EPBC Act and FFG Act. The species is often associated with rocky areas and also basks on logs in relatively open, wooded alpine to subalpine habitats (Robertson and Coventry 2019). Potential habitat was identified for the Mountain Skink along Diamantina Spur Track, the Razorback Track from below Mount Feathertop to just after the southern side of the Great Alpine Road, Bungalow Spur Track, and near OV4. Areas supporting rocks or logs with relatively open or low shrubby or grassy understorey and a somewhat open canopy support the most likely habitat for this species. Possible burrows were also recorded towards the western end of the track alignment. This species has been recorded from Machinery Spur north of Mt Hotham and must be presumed to occur in the study area.

Spotted Tree Frog *Litoria spenceri*

The Spotted Tree Frog (listed as Critically Endangered under the EPBC Act and FFG Act) occurs in dissected mountainous country, usually among vegetation, rocks and fallen debris along the riffle sections of streams and rivers (Gillespie and Hollis 1996), including downstream of the study area on the West Kiewa River. While this species is considered less likely to occur in the study area than the downstream reaches from which it is known (M. West pers. comm.), further surveys are recommended to be undertaken for this species as a precaution, either side of track section 12 where it crosses the Kiewa River West Branch. Additionally, any works in the West Kiewa Valley will need to consider potential downstream impacts for this species, particularly from sediment runoff.

Alpine Tree Frog *Litoria verreauxii alpina*

The Alpine Tree Frog *Litoria verreauxii alpina* is listed as Vulnerable under the EPBC Act and Critically Endangered under the FFG Act. Although it has apparently disappeared from most of its former range in the Victorian High Country, this frog persists at Mt Hotham, and historic records occur in various places on the Bogong High Plains. Although the subspecies has undergone pronounced declines on the Bogong High Plains (Osborne et al. 1999), it is plausible that it persists in some of these areas, including areas affected by the proposed works. Regardless of whether or not it persists, there are plans to reintroduce this frog to parts of its former range, including in or near the study area (N. Clemann pers. comm.). Therefore, protection of breeding

and non-breeding habitat remains a long-term conservation objective for the Alpine Tree Frog throughout much of the study area.

The subspecies' likelihood of occurrence on the eastern side of the alignment cannot be determined with greater certainty given the absence of recent surveys (which were outside the scope of this assessment).

While it is also critical to consider potential terrestrial (non-breeding) habitat for the Alpine Tree Frog next to and between waterbodies that are used for breeding, the subspecies' use of terrestrial habitat and dispersal between breeding and non-breeding habitat is largely unknown (Clemann and Gillespie 2011).

Where the presence of Alpine Tree Frogs in suitable habitat within the study area cannot otherwise be determined, it should be presumed present. This is due to the lack of exhaustive surveys for the subspecies on and near Mt Hotham, existing evidence of recovery of lowland populations of the species (Scheele et al. 2014), and because recovery planning for this frog includes reintroductions into the general area (N. Clemann pers. comm.).

Freshwater invertebrates

Filtered water samples were collected from 11 tributaries/catchments crossing the alignment for environmental DNA (eDNA) analysis to detect the Alpine Stonefly (Listed as Endangered under the EPBC Act and FFG Act). Sampling locations spanned the alignment from between Heathy Spur and the western end of Bungalow Spur Track. Most of the samples are currently stored at La Trobe University in Wodonga, pending processing for DNA extraction and sequencing. Specimens of stonefly larvae from three of the sites are also pending morphological identification.

Apart from stonefly nymphs, no other freshwater invertebrates suspected as potentially belonging to threatened species were collected while dip netting or kick sampling, and no threatened invertebrates were known to have been observed incidentally or while undertaking other surveys. However, it is possible that species such as the stonefly *Riekoperla intermedia* (Vulnerable under the FFG Act), freshwater isopod *Colubotelson joyneri* (Critically Endangered under the FFG Act), or Alpine Darner (Vulnerable under the FFG Act) would have been overlooked due to their small size, cryptic behavior or similarity to other species.

Further, while there are no records in the VBA for the Alpine Spiny Crayfish (listed as Endangered under the FFG Act) close to the assessment area, it is noted that a specimen in the Melbourne Museum was collected by P. Horwitz in 1982 from Pretty Valley Creek just upstream of the confluence with Bald Hill Creek off Bogong High Plains Road, and another was collected at Mount Hotham by A. Martin in 1972. Given these records, a lack of survey for the Alpine Spiny Crayfish in the assessment area and the species' cryptic habits, there remains potential for it to occur in suitable habitat there (T. Raadik pers. comm. 2021).

It is also possible that the Murray Spiny Crayfish *Euastacus armatus* (listed as a threatened species under the FFG Act) occurs in waterways at lower altitudes in the study area, including the Kiewa River West Branch (track section 12) and unnamed creek at the west end of Bungalow Spur Track (section 18).

3.7.3 Introduced fauna species

Five introduced fauna species were recorded in the assessment area:

- Sambar Deer *Cervus unicolor*
- Feral Horse *Equus caballus*
- European Hare *Lepus europaeus*
- European Rabbit *Oryctolagus cuniculus*
- Brown Trout *Salmo trutta*

Evidence of Sambar including trampled vegetation was noted in track section 2, and scats and tracks in track section 5 of the assessment area where the species has been seen previously (L. Rodda pers. obs.). Two Sambar were also seen while spotlighting for owls and arboreal mammals in the West Kiewa Valley (track section 12), and there was evidence of deer grazing in track sections 2-9 (Image 81). Previous remote camera surveys on the Bogong High Plains by N. Clemann and Z. Atkins found Sambar to be very common in the area.

Image 81. Evidence of deer browsing on shrubs at Tawonga Huts (December 2020), (Image credit: Louise Rodda)

Horses including a stallion, several mares and a foal were seen on the Bogong High Plains (Image 22) near Tawonga Huts, with additional evidence of their presence found including dung and grazing impacts seen in track sections 2, 7, 8, 9 and 10 (Images 82 and 83). Additionally, recreational horse riding and associated camping occurs on the Bogong High Plains, and these horses cause damage similar to that caused by feral horses.

Hares and rabbits were seen in the vicinity of the aqueducts (track sections 2 and 5), the area impacted by all observed introduced mammals is known to encompass the entire project area.

Brown Trout were observed in the aqueducts, Cope Creek, the Diamantina River and West Kiewa River.

Image 82. Evidence of horses along Heathy Spur Track (December 2020), (Image credit: Louise Rodda)

Image 83. Evidence of horses at Tawonga Huts (December 2020), (Image credit: Louise Rodda)

3.8 Geomorphology

A detailed description of the geology and terrain of the Bogong High Plains and surrounds is provided in (Attachment 3a and 3b) and excerpts from those reports are provided here.

Attachment 3a covers the track section below Pretty Valley Dam wall, Fainter Firetrail and short section of track south of Tawonga Huts on the Bogong High Plains, OV1, and OV2 (Rosengren 2023).

Attachment 3b provides a description of Bungalow Spur Track, OV3 and OV4 (Webb 2023).

The preliminary geomorphology assessment of the remainder of the current track alignment and description of waterway types was undertaken by Water Technology in 2020/21. The information has been updated to remove track sections and OVs no longer included in the current alignment and is provided below.

3.8.1 Sites of geological significance

The 2020 desktop assessment undertaken by Water Technology identified discrete sites of geological and geomorphological significance in the form of rock formations and other geomorphic features across the landscape that are susceptible to degradation (e.g. waterway crossings).

Sites of geological and geomorphological significance are determined on the basis that they either represent a specific characteristic of the region, or that they include an outstanding, rare, or possibly unique geological or geomorphological feature. A review of Victorian Resources Online

in 2020 (AV 2020a) identified that the proposed FHAC is located near a number of recognised sites of geological and geomorphological significance including:

1. **Sites of National Significance:** Bogong High Plains South includes the areas of Mount Cope, Mount Jim, Cobungra Gap and Mount Loch (Figure 1). This area includes the best natural example of the High Plains in Victoria and represents a substantial part of one of the major alpine and sub-alpine environments of continental Australia. Distinctive types of High Plains Gneiss are exposed on Mount Cope, while in the Mount Jim and Mount Loch areas, the Bogong Volcanics, together with the intercalated and pre-volcanic sediments, are exposed. Landforms related to differential erosion along fault lines and consequent stream capture occur at Cobungra Gap, while well-developed stepped topography occurs on Mount Jim and in the head of Middle Creek. Bog-peat environments of importance occur throughout the area, particularly on Mount Cope.
2. **Sites of Regional Significance:** Basalt Hill (Figure 1) including the area surrounding Basalt Hill and Langfords Gap. Basalt Hill is a columnar basalt structure that has been formed by at least three volcanic flows that have been shaped by ice. Basalt Hill is surrounded by a boulder field that extends over Langford Gap into the head of Middle Creek and is the most accessible representative example of Bogong Volcanics.

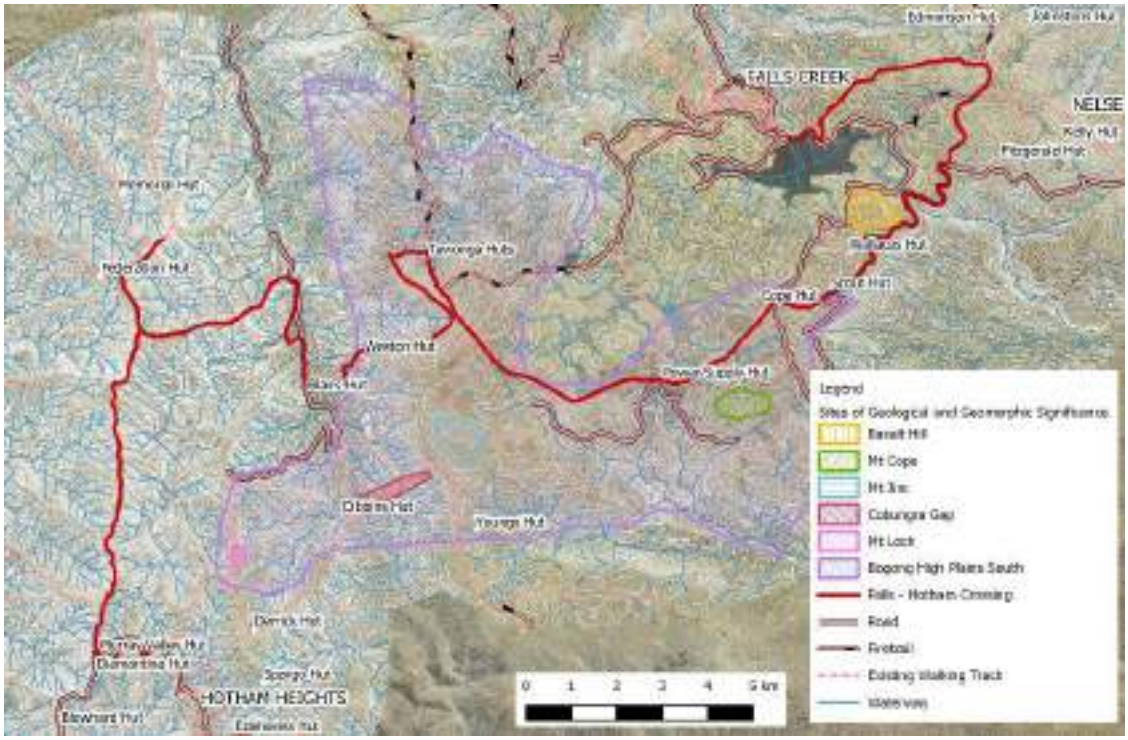


Figure 1. Bogong High Plains South sites of geological or geomorphological national significance: Mount Cope, Mount Jim, Cobungra Gap and Mount Loch, and a site of regional significance: Basalt Hill (AV2020b) (Figure produced by Water Technology)

3.8.2 Geology of the 2022 assessment area

Published 1:50,000 geological mapping (Seamless Geology 2014) emphasises local bedrock geology (Figure 2). The bedrock units are Silurian migmatite, gneiss and schist of the Omeo Metamorphic Complex (Som) at OV1, the alignment below the Rocky Valley Dam, and the central and eastern end of Fainter Firetrail. The bedrock at OV2 and the western end of Pretty Valley Track is Devonian Jaithmathang Granodiorite (G153) whereas that at part of the Fainter

Firetrail and the short track south of Tawonga Huts is Eocene basalt of the Mount Jim Volcanic Group (-Puj). At that mapping scale it is not possible to differentiate areas of wetland or other unconsolidated surficial material that may be derived from adjacent higher terrain of different geology. An example is at OV2 preferred where the slopes are mapped as granite but the surficial geology of much of the area is derived from the remnants of basalt to the west as described below.

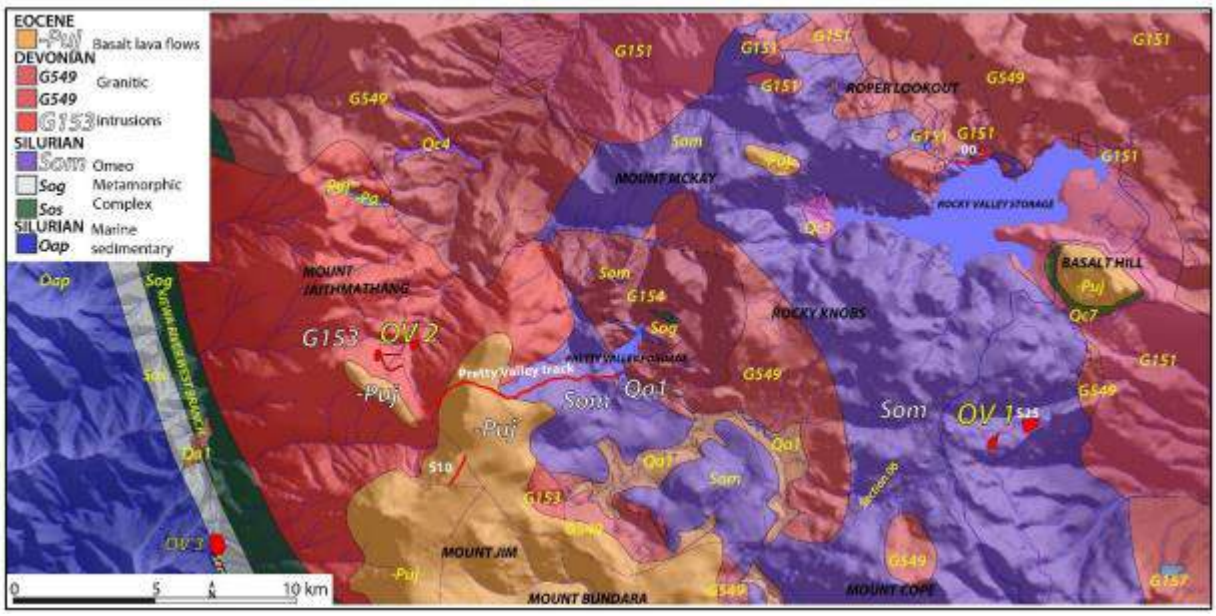


Figure 2. Bedrock geology of part of southern Bogong High Plains (Seamless Geology 2014). The map shows the location of overnight node 1 and overnight node 2 and surveyed tracks.

3.8.3 Track geomorphology

3.8.3.1 Track below Pretty Valley Dam wall

The 600 m long track below Pretty Valley Dam wall is situated immediately downstream of the constructed embankment of Rocky Valley Storage. The geology along the 600 mm track below Pretty Valley Dam wall is migmatite gneiss intruded by East Kiewa Granodiorite. The area has been substantially disturbed by the construction and maintenance of the dam wall and related facilities including a constructed vehicle track. Geological and landform relationships have been compromised by these works to the extent that potential impacts of the proposed new track are minimal in that context.

3.8.3.2 Fainter Firetrail

The Fainter Firetrail is a 3 km section of the assessment area between Pretty Valley Pondage west to the head of Tawonga Huts Creek (Figure 3). The underlying geology progresses from metamorphic migmatite gneiss in the east to Jaithmathang Granodiorite in the west.

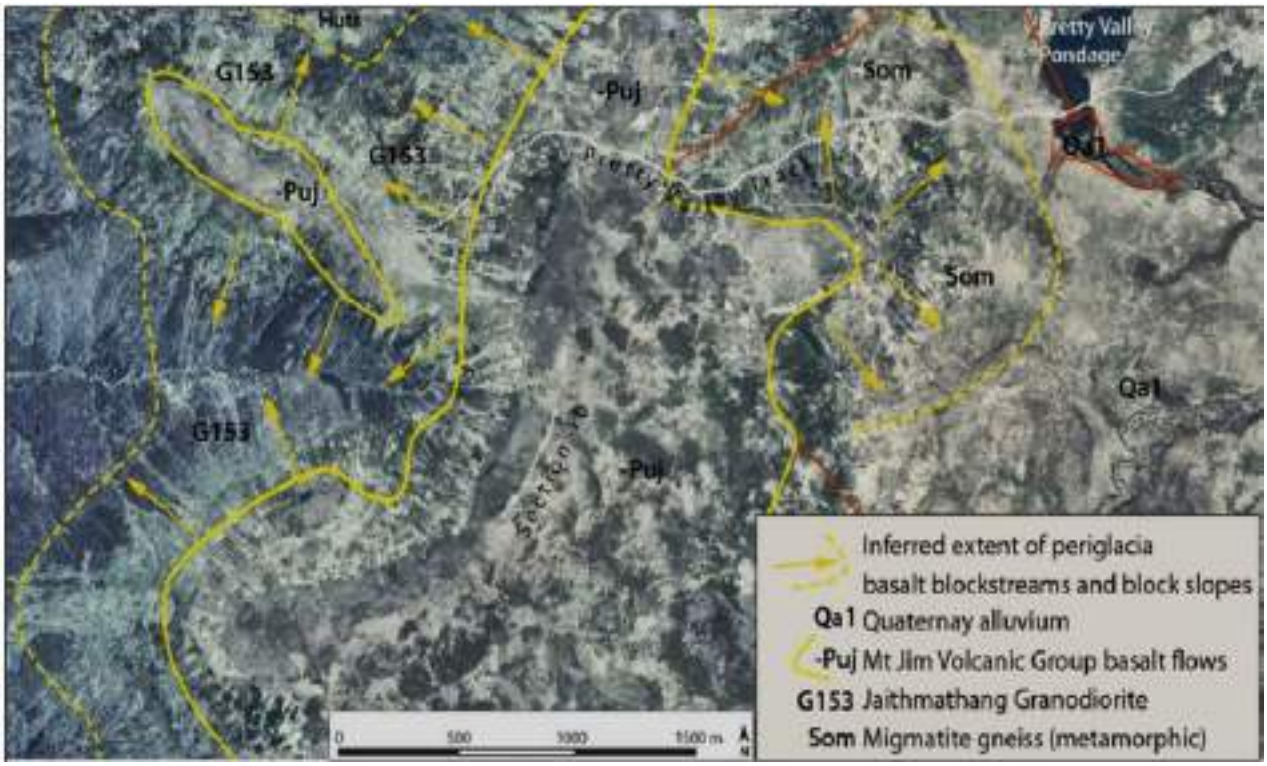


Figure 3. Geology of the Fainter Firetrail (after Seamless Geology 2014). The inferred distribution of periglacial basalt debris is shown by broken yellow line and arrows

A central ridge about 800m wide is the highest area along the track at 1800 m and forms the divide between Pretty Valley Creek and Tawonga Huts Creek. The ridge is capped by in situ basalt lava of Mount Jim Volcanic Group exposed as weathered angular blocks in an earthy matrix (Image 84).

Image 84. Basalt outcrop on central ridge of Fainter Firetrail (December 2022) (Image credit: Neville Rosengren).

Most of the surface of the entire track regardless of bedrock has a veneer of basalt blocks emplaced by Pleistocene cryogenic processes as linear blockstreams, steeper block slopes and widely distributed blockfields by Pleistocene cryogenic processes. The materials were sourced from basalt scarps on the northern slopes of Mount Jim.

Linear blockstreams are narrow elongate accumulations of broken rocks that occur on moderate to very low angle slopes (Image 85a). They are open-fabric and typically contain blocks of 200 – 400 mm length with occasional larger blocks and are 1 to 3 m thick. They often occur in shallow depressions with intermittent stream flow from surface or ground water (Image 85a-b). Block slopes are composed of larger blocks typically >400 mm and form thicker deposits and steeper slopes (Image 85c). Blockfields are relict landforms of stones enclosed in fine sediments across a wide area on low slope angles. They were moved by gelifluction— a slow downslope movement as a slurry of mud and blocks due to seasonal freeze-thaw of upper layers of permafrost soil (Image 85d). In the modern climate on the high plains this process is inactive.

Image 85 a-d. Periglacial deposits along Fainter Firetrail: linear blockstream (a), narrow linear blockstreams (b), steep block slope (c). blockfield resting on fossil soil (d). (December 2022) (Image credit: Neville: Rosengren).

The linear blockstreams east of the ridge appear to be composed predominantly of basalt with minimal material derived from the metamorphic migmatite gneiss, as this rock type does not break down to become small boulders or cobbles. Blockstreams or blockfields west of the basalt ridge at the head of Towanga Hut Creek may contain granodiorite blocks derived from the underlying Jaithmathang Granodiorite parent material (as at OV2 preferred site) but none were recorded in this survey.

Soils are highly variable along the Pretty Valley Track corridor but much of the surface is covered by block deposits. Soils developed on weathered gneiss and granodiorite are sandy tenosols and lithosols. Those developed on basalt are clayey tenosols and may be deeper soils than those on gneiss. Soils preserved below the blockstream will be relict from the times when the blockstream moved 20,000 to 15,000 years ago and will pre-date that period. Where the blockstreams are in an active drainage line, the soil will have been washed away and the blockstream may rest on bedrock.

Several areas of organosols and hydrosols occur due to surface and groundwater outflow. The present-day soil is developed on a fossil soil (Image 86a). Vegetation loss and disturbance exposing the soil surface soil can lead to loss of the fine material by water and wind action (Image 86b).

Image 86 a-b. Fossil soil exposed in a track side-cut below a modern organosol (a). Eroding surface of bare tenosol on a disturbed block blockfield (b) (December 2022) (Image credit: Alistair Smith)

3.8.3.3 Short track south of Tawonga Huts

The short track south of Tawonga Huts is approximately 500 m long and crosses an almost flat surface of outcropping Mount Jim Volcanic Group basalt with periglacial basalt blocks from higher exposed slopes of the same geology. The proposed track is between 40 and 120 m east of the break of slope above Jaithmathang Creek. Light snowfall before and during the field inspection obscured ground surface details and distinguishing whether the subtle hummocks were caused by vegetation or were partially earthy as described below was difficult.

Although of low overall relief, this apparently flat surface has substantial microtopography defined as discrete landforms or surface shapes with relief ranging from decimetres to around 1 m vertically and ±10 m laterally. The smallest features are small close-spaced mounds 10-20 cm high that have the appearance of parallel ridges (Image 87). They may be vegetation artefacts or formed by active seasonal freeze-thaw producing ice needles in the clay loam tenosol soil. Larger features illustrated in Image 88 a-d (20 to 40 m east) of the proposed track were not observed at any other sites in the current survey area.

A mound of basalt partly obscured by shrubs includes detached blocks, but a solid core is taken to be basalt outcrop rather than transported blocks (Image 88a).

Of particular interest are shallow elongate to sub-circular depressions occurring singly or in close-spaced groups (Image 88d). Analysis of possible (multiple cause) origins is beyond scope of

this report but they are flagged as of high geoscience significance and are highly sensitive to physical disturbance.

Image 87. Low vegetated soil mounds forming parallel ridges (December 2022) (Image credit: Neville Rosengren)

Image 88 a-d. Basalt outcrop (a). Shallow depressions dry (b-c). Group of water-filled depressions along track section 10 (d). (December 2022) (Image credit: Neville Rosengren)

Soils on basalt outcrop on gentle slopes are some of the deepest mineral soils on the higher terrain. They are now classified as Chernic Tenosols (previously Alpine Humus Soil) and distinguished by a clay-loam A horizon rich in organic matter overlying a C horizon without an intervening B horizon (McKenzie et al. 2004)

3.8.3.4 Bungalow Spur Track

Bungalow Spur Track is a cut track formerly used by packhorses and tractors to ferry people and supplies to a hotel/chalet near the top of the spur (no longer extant). The track was originally consistently 1.5-2 m wide; the current walking track runs through the centre of it or towards the outside edge. Widening the walking track within the confines of the original track would have no geomorphological impact.

There are two interesting geological outcrops along the Bungalow Spur Track; these should be preserved if the track is widened.

At Picture Point the cutting on the inside of the track is a good exposure of Pinnak Sandstone, which shows the typical lithologies of this formation and allows an interpretation of the depositional environment. The outcrop is composed of two stacked turbidites (Image 89), each consisting of a sandstone bed fining upwards to mudstone which has been metamorphosed to phyllite. The presence of stacked turbidites is indicative of deep water deposition. The beds gently dip to the northeast.

Image 89. Outcrop at picture point, showing stacked turbidites (December 2022) (Image credit: John Webb)

About halfway between Federation Hut and the junction of the Bungalow Spur Track with the track along the Razorback, there is an outcrop of thin-bedded Pinnak Sandstone that displays

well-developed small cylindrical folds (Image 90). The track climbs over this outcrop, and any redevelopment of the track here should avoid damage to the outcrop.

Image 90. Outcrop between Federation Hut and Razorback, showing cylindrical folding. (December 2022) (Image credit: John Webb).

There are also two springs along Bungalow Spur Track; one just upslope (north) of the track (coordinates: -36.8949, 147.1053), and one to the east south east (ESE) on a side track (coordinates: -36.8971, 147.1137). These springs are at a high elevation (1400-1500 m asl) and within 350 m of the ridge summit to the east of each, i.e. they both have limited catchment areas. It is likely that an impermeable geological unit is forcing shallow groundwater flow to the surface at these locations. This could be an impermeable bed; bedding around the springs strikes north west (NW) to south east (SE) and dips 70° north east, an orientation that is approximately perpendicular to the downslope direction of groundwater flow. Alternatively a dyke or fault could be responsible for the location of the springs. Although no faults are mapped near the springs, there is a nearby dyke trending NW-SE that could potentially extend to the ESE spring.

Any track redevelopment should avoid disruption to the western spring; the other spring is located well off the track so is unlikely to be affected.

3.8.4 Overnight nodes geomorphology

3.8.4.1 Overnight node 1

Both OV1 preferred and OV1 alternate options are located on regional metamorphic migmatite gneiss of the Silurian Omeo Metamorphic Complex on the southern valley slope of an unnamed tributary of Middle Creek below the divide separating Middle Creek to the east and Cope Creek to the west (Figure 4). The slope is gently undulating with a shallow concave centre rising in

height to the south to the rim of the main stream catchments of Middle Creek. This rim and steep slopes below marks the topographic eastern margin of the southern Bogong High Plains.

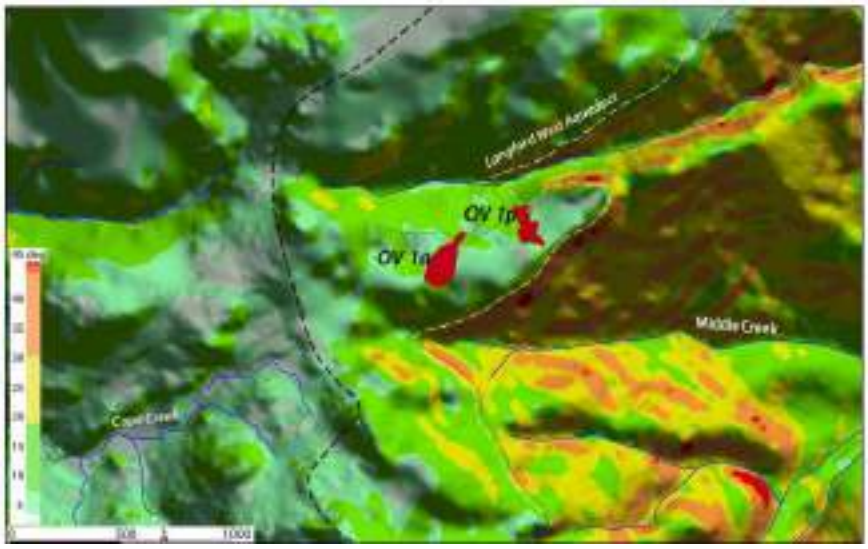


Figure 4. Location of overnight node 1 on broad spur above Middle Creek. (Digital Elevation Model) DEM 10 m slope at 5º interval.

Outcropping rock across both OV1 options is coarse-grained gneiss with thin layers and patches of leucogranite and pegmatite in dark biotite-sillimanite-cordierite gneiss and schist with small bodies of fine to medium-grained leucogranite. The texture is distinctive and appears as alternating dark and light-coloured layers and streaks in fresh exposures but becomes more uniform when weathered (Morand et al. 2005).

The gneiss crops out in the centre of the OV1 preferred option as weathered irregular broken slabs and subrounded blocks forming local overhangs and crevices with several semi-detached blocks and irregular sheets (Image 91 a-b). Two detached boulders 3+ m high occur on the south eastern edge of OV 1 alternate. The base of each is a fracture plane. They are unusually large in the context of the common form of gneissic exposures and of complex form with overhangs, pinnacles and semi-enclosed enclaves (Image 92 a-b).

The planar and gently undulating surfaces reflect the structure of the gneissic rocks, notably the separation planes that occur throughout this rock unit that forms the eastern margins of the southern Bogong High Plains. Exposures along the Langford West Aqueduct excavations show the gneiss is unevenly weathered and the planar surfaces are likely to have extensive areas of shallow regolith and soil. A characteristic of the high elevation areas of gneissic rock is the occurrence of elongate areas with minimal or no tree cover and the treeless boundary is usually sharply defined (Image 93 a-b).

Image 91 a-b. Gneiss outcrop in centre of OV1 preferred (December 2022) (Image credit: Alistair Smith)

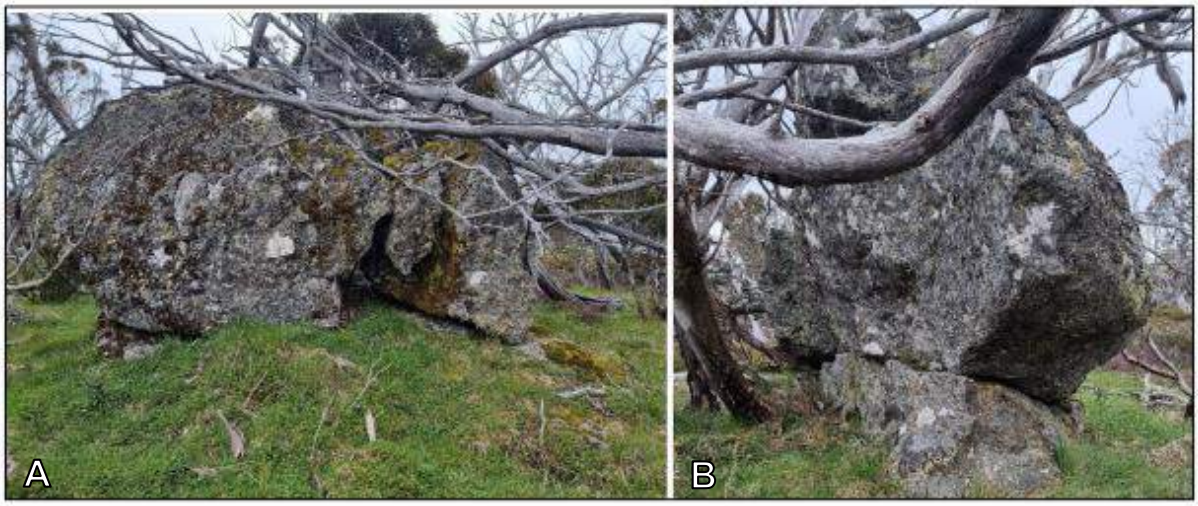


Image 92 a-b. Unusually large gneiss boulders with overhang and cavity at southeast edge of OV1 alternate (December 2022) (Image credit; Alistair Smith)

Image 93 a-b. Outcrop in OV1 alternate (a) shallow soil depth may be the reason for a lack of tree cover in sections of OV1 preferred (b) (December 2022) (Image credit: Neville Rosengren)

Soils developed on gneissic parent material are Tenosols—soils with weak pedologic organisation apart from the A horizon and minimal B horizon (Isbell 2021). An abrupt boundary

between parent rock material and soil may limit the development of deep root systems. The Tenosols developed on gneiss are sandy textured and on long open slopes are free-draining, a factor that may limit the capacity for tree growth (Image 94a). Conversely, areas where the sub-surface rock has weathered to form broad concave depressions will have impeded lateral and vertical drainage, further limiting development of shrub and tree vegetation and promoting wetland communities (Image 94b).

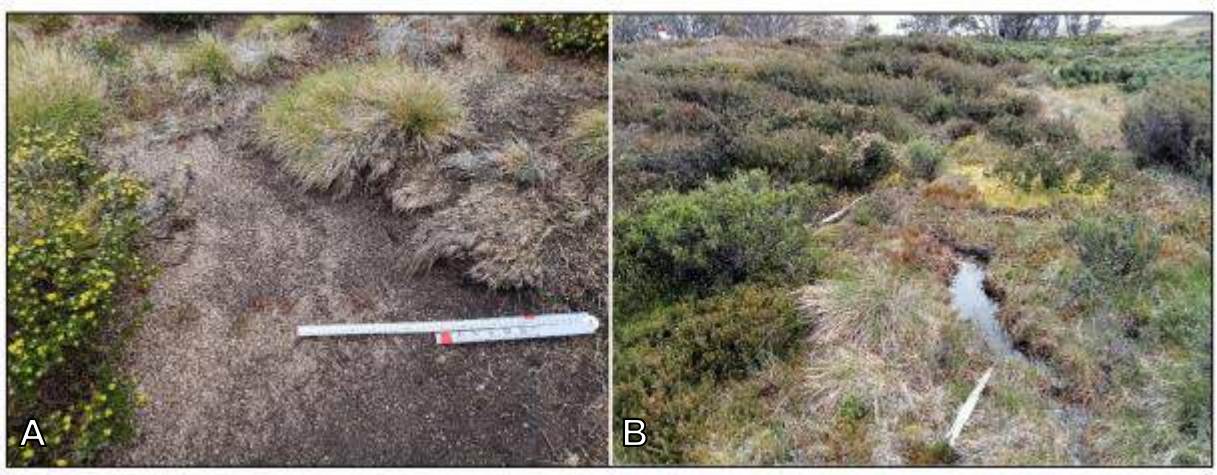


Image 94 a-b. Course tenosol free-draining soil (A) and impeded drainage on shallow rock promoting wetland (B) may be factors in promoting treeless areas (December 2022) (Image credit: Alistair Smith)

3.8.4.2 Overnight node 2

Overnight node 2 preferred and alternate sites are situated west of Pretty Valley Pondage between Mount Jim and Mount Jaithmathang and along Tawonga Creek and the headwaters of Jaithmathang Creek (Figure 5).

Figure 5. Location of OV2, Fainter Firetrail and short track south of Tawonga Huts (Base: 1: 25,000 Topographic map) (Source: Neville Rosengren)

The basement geology is Omeo Metamorphic Complex migmatite gneiss intruded by granites—including the large body of granodiorite forming the summits and ridges of the Jaithmathang Range—covered in part by Mount Jim Volcanic Group basalt lava (Figure 6).

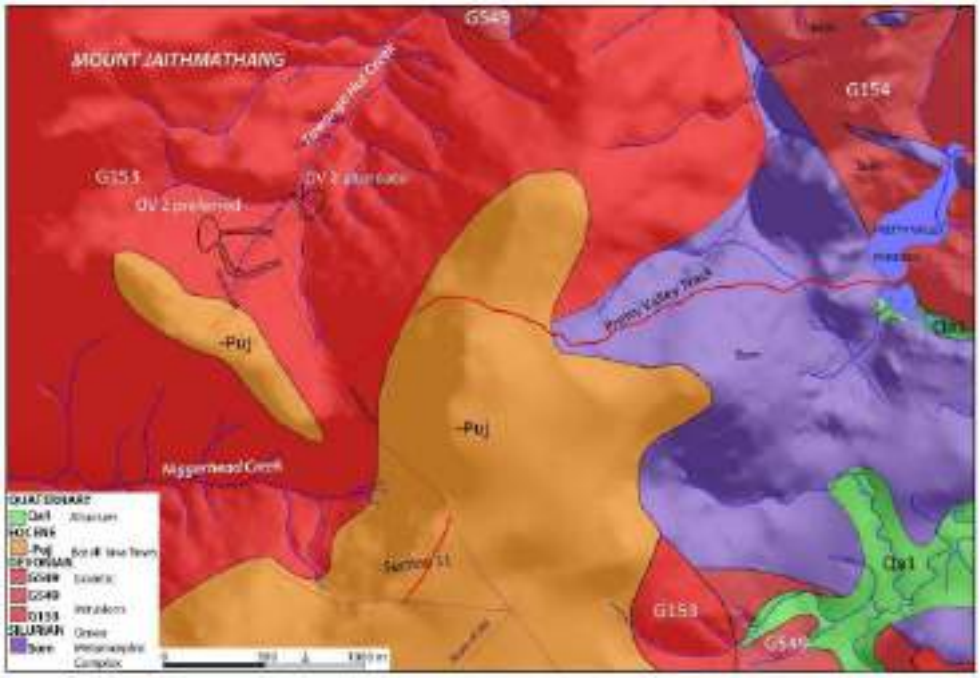


Figure 6. Location and geology of OV2, Fainter Firetrail and short track south of Tawonga Huts (Source: Seamless Geology 2014).

Mount Jim Volcanic Group basalt lava flows form the high landscape southwest of Pretty Valley Pondage including the broad 1800m summit of Mount Jim. Total lava thickness of the Mount Jim lavas has been shown by drilling to be over 150 m comprised of at least seven flows separated by inter-flow lake and fluvial sediments. Minty (1989) suggested the multiple flows, total preserved lava thickness and wide columnar joints at Mount Jim was evidence for Mount Jim as an eruption point and possible source of the lava remnants elsewhere on the Bogong High Plains.

The north- and east-facing slopes below the plateau south of—and crossed by—the Fainter Firetrail have a stepped terrain of gently inclined benches terminating in a 2 to 4 m high scarp. This terrain does not display obviously on the available contour maps or derived DEM due to the 10 m resolution but the relief can be distinguished in the field by the change in slope and vegetation (Figure 7).

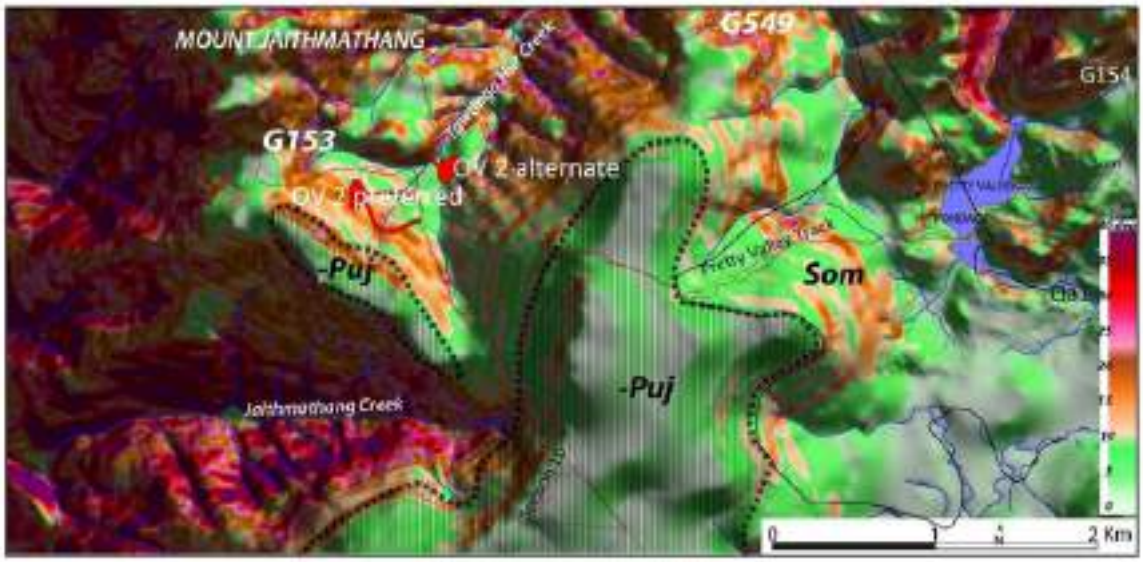


Figure 7. Slope map at 5 degree intervals (derived from 10m DEM) showing OV 2, Fainter Firetrail and short track south of Tawonga Huts, and geological boundaries. Som is migmatite gneiss, G153 is Jaithmathang Granite and _Puj is Mount Jim Volcanic Group basalt (Source: Neville Rosengren).

Basalt possibly 40 m thick caps the NW-SE ridge west of Tawonga Creek above OV2 preferred site and has similar terrain on the lower slopes. Basalt colluvium including cobbles and boulders transported by mass movement extends downslope beyond the limit of mapped basalt outcrops overlying granite and migmatite but is not shown on the published geological maps due to scale limitation. This is an important omission as basalt rubble overlying granite and migmatite is an important component of surficial geology and soil at OV2 preferred site and access tracks and along most of the Fainter Firetrail.

Overnight node 2 preferred

The OV2 preferred site is positioned on the western valley of Tawonga Creek southeast of Mount Jaithmathang on slopes with downslope angles between 6 and 14 degrees (Figures 8-9).

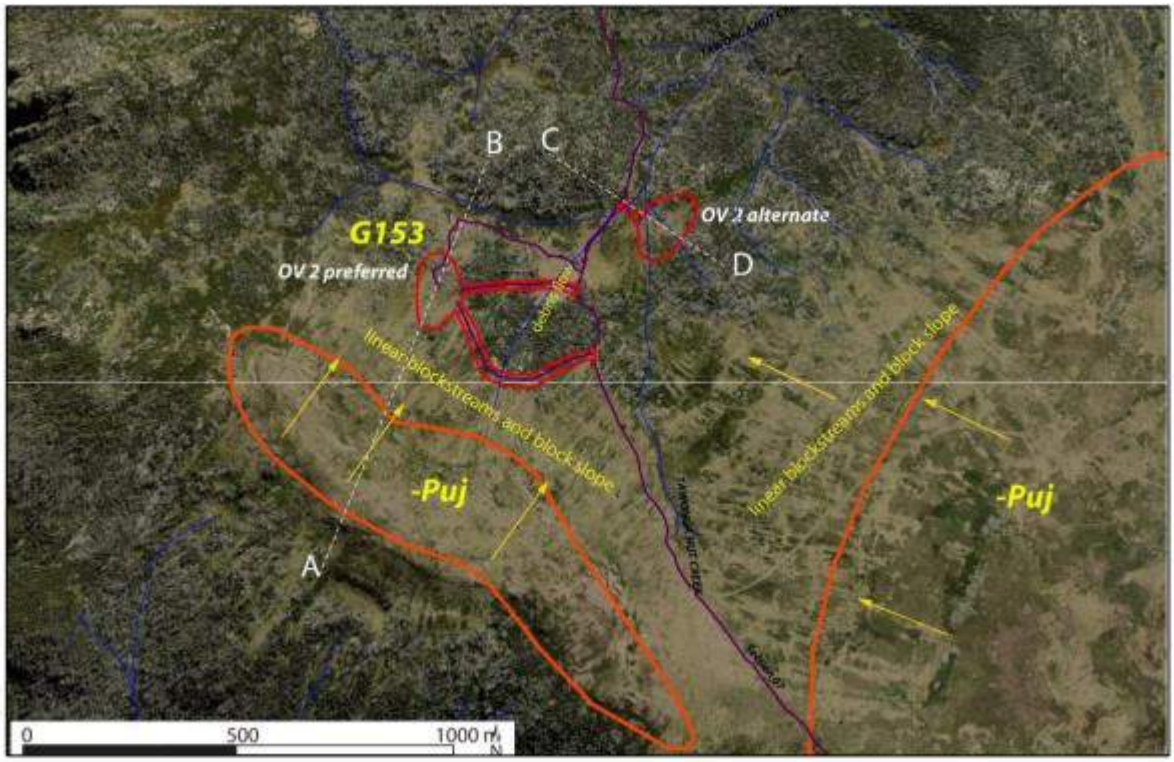


Figure 8. OV2 sites shown on World Imagery (source: Blue Marble Graphics). Overlay shows basalt (-Puj) as mapped on Seamless Geology (2014) and interpretation of surface features. A-B and C-D are topographic profiles shown in Figure 9 and 11) (Source: Neville Rosengren)

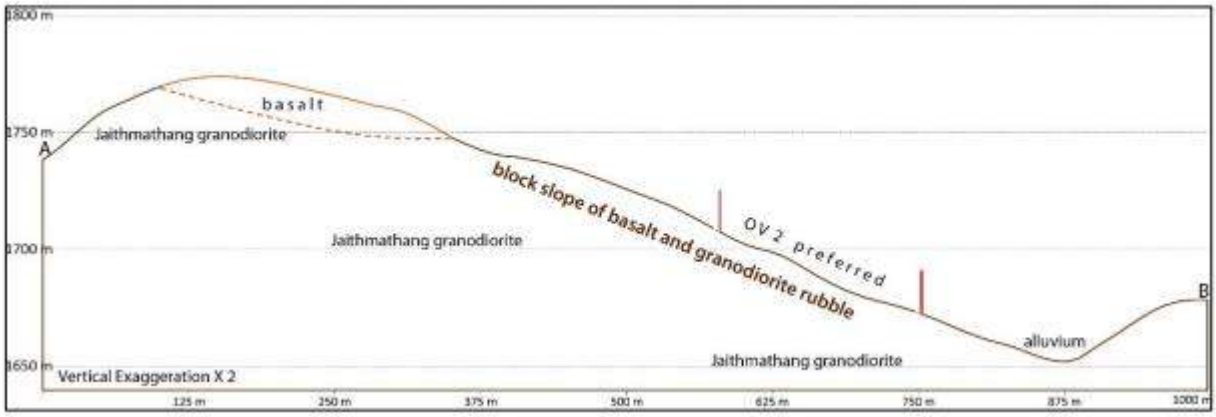


Figure 9. Profile from 10 m DEM across basalt-capped ridge and downslope through proposed overnight node 2 preferred (see Figure 8 for location of profile).

The site is underlain by Jaithmathang Granodiorite that crops out as steep smoothed rounded slopes with detached slabs only on part of the northern access track to OV2 (Image 95 a-b)

Image 95. Outcrop of smoothed granodiorite (A). Outcrop and detached transported slabs on access track to OV2 preferred (B) (December 2022) (Image credit: Alistair Smith)

The surficial geology and geomorphology are determined by relict periglacial debris of small cobble to coarse gravel mainly of basalt with some slabs and blocks of granodiorite (Image 96 a-b).

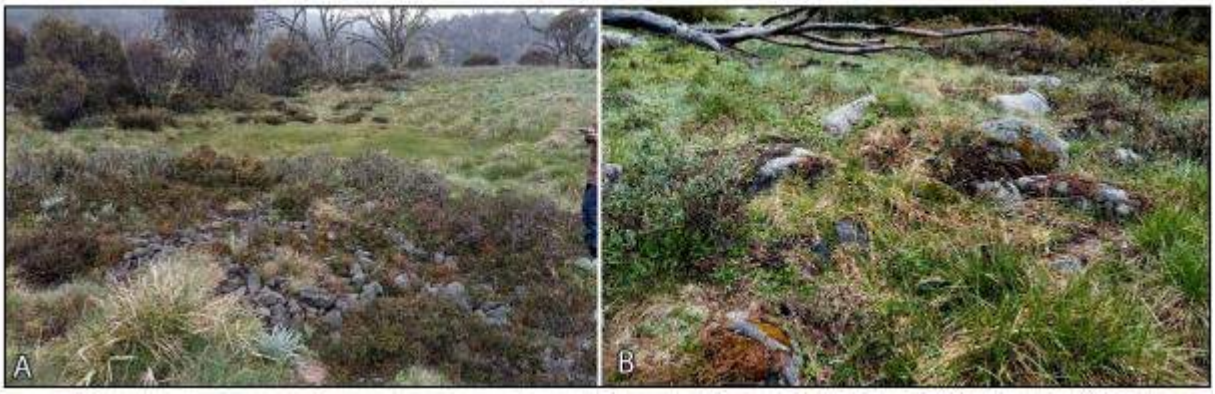


Image 96. Relict periglacial debris of basalt and granodiorite gravel covers much of the surface of OV2 preferred (December 2022) (Image credit: Neville Rosengren)

The basalt is derived from the isolated remnant capping of the narrow ridge upslope of the OV2 site. The blocks were initially quarried by repeated freeze-thaw action during the coldest phase of the Last Glacial Maximum between 23,000 and 17,000 years ago. The persistent close-spaced joint fractures of basalt facilitated freeze-thaw wedging and detachment of the blocks to accumulate as steep piles of broken rock scree on the higher slopes. Development and expansion of interstitial ice and episodic freezing and thawing of the underlying soil created conditions where unconsolidated rock debris slid downslope and was distributed across low angle slopes hundreds of metres from the source rock. With subsequent warming during the post-glacial climate the agents that mobilised the blocks diminished in intensity and frequency and the block accumulations became stabilised by soil and vegetation (Image 97). The deposits across much of the OV2 site are therefore relict (fossil) landforms from the late Pleistocene cold phase. As such they are of high geoscientific significance.

Image 97. OV2 preferred showing basalt ridge, cliffs, talus and periglacial block and blockstream slopes below (December 2022) (Image credit: Neville Rosengren)

The topography and drainage of OV2 preferred is determined by the distribution of the rock debris described above. While the larger rock debris is inactive under present conditions, local slumping and surface instability occurs where lateral and vertical drainage is impeded by accumulation of organic and fine sediment, resulting in high water tables with wetlands, ponds and shallow streams (Image 98 a-b).

Image 98 a-b. Slumped depression and shallow streams in OV2 preferred (December 2022) (Image credit: Alistair Smith)

Soils across the OV2 site are extremely varied and include almost all the main Soil Orders listed above. Given the widespread periglacial stony cover it is very likely there are extensive buried soils of more than one soil order. An area of exposed organosol with evidence of burnt peat was observed on the OV2 track and a buried organosol in the OV2 area (Image 99 a-b).

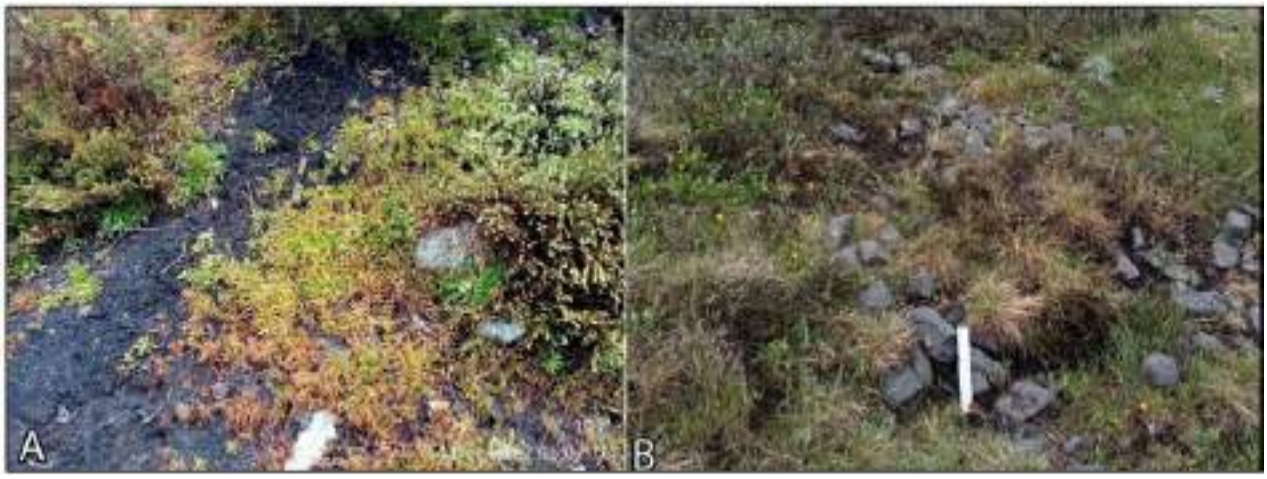


Image 99 a-b. Organosol and possible burnt peat enclosing granodiorite cobbles— OV2 access tracks (A). Organosol buried by basalt blockstream in OV2 area (B) (see Figure 10) (December 2022) (Image credit: Neville Rosengren).

This OV2 track also crosses a possible debris flow that travelled down the tributary of Tawonga Huts Creek shown in Figure 10.

Figure 10. Location of possible debris flow down tributary of Tawonga Hut Creek. (Vertical photo from World Imagery) (December 2022) (Image credit: Neville Rosengren)

OV 2 Alternate

The OV2 alternate site is at the base of the ridge east of Tawonga Hut Creek and includes the lower hillslope and alluvial flat along Tawonga Hut Creek (Figures 11-12).

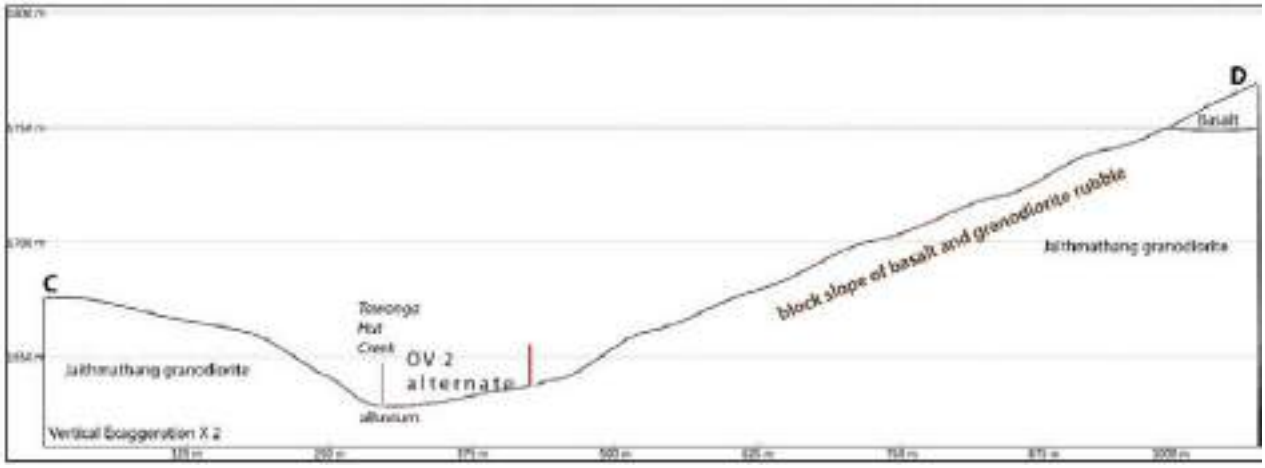


Figure 11. Profile from 10 m DEM across basalt-capped ridge and downslope through proposed overnight node 2 alternate (See Figure 8 for location of profile).

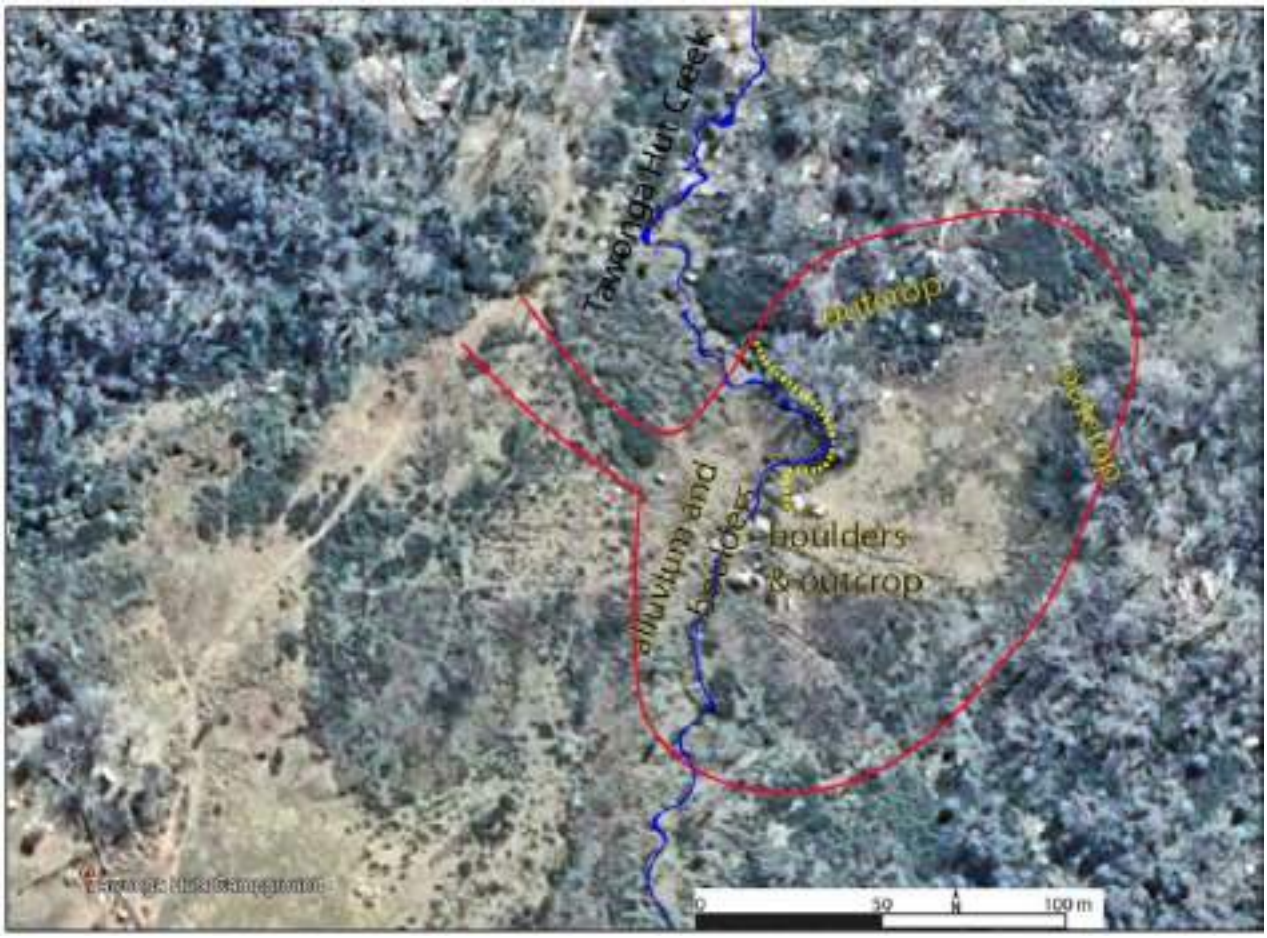


Figure 12. Landform features at overnight node 2 alternate. Broken yellow line is steep slope above the creek channel

The terrain inside the proposed OV2 alternate area slopes to the southwest from around 8 degrees at the higher land grading to 2 degrees or less along the creek channel. An area of 30degree slope occurs along the right bank of the creek where the channel is against the base of the slope.

Granite crops out along this steeper slope and extends around the treed northern and eastern parts of the site. The channel of Tawonga Hut Creek flows around outcrop and boulders across the lower western part of the site. Some boulders are weathering residuals, but some are of periglacial transport origin. All rock materials observed were granitic but it is likely there are cryogenic transported basalt materials in the alluvium and on lower slopes (Image 100 a-b).

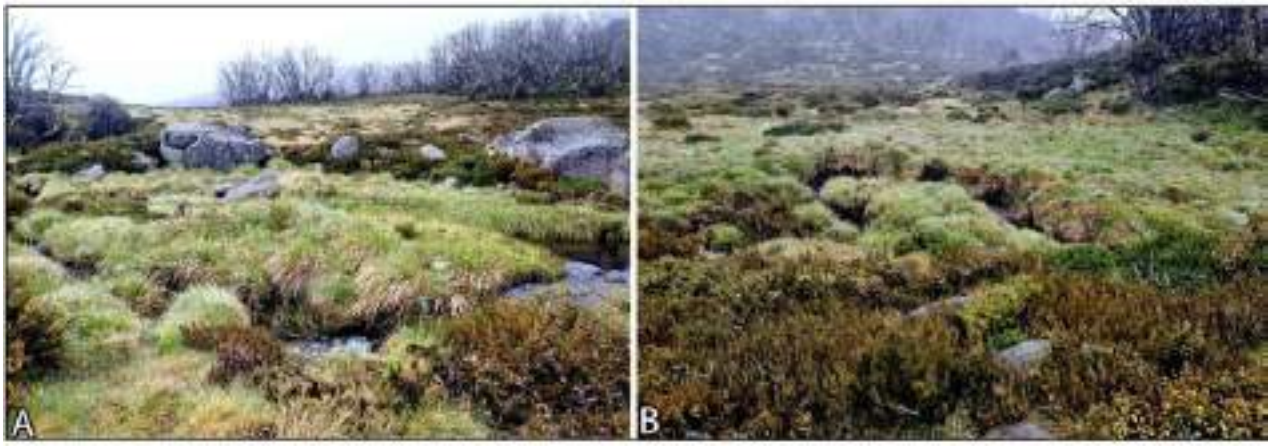


Image 100 a-b. Boulders and cryogenic deposits along Tawonga Hut Creek at OV2 alternate site (December 2022) (Image credit: Alistair Smith)

The most widespread soil of the elevated free-draining slopes of OV2 alternate is likely to be a shallow sandy tenosol on impermeable granodiorite parent material. The irregular hummocky surface of these slopes suggests soil and slope disturbance because of seasonal shallow soil freezing (Image 101).

Image 101. Hummocky ground surface of sandy tenosol across part of OV 2 alternate (December 2022) (Image credit: Neville Rosengren).

As with a number of land surfaces across the Bogong High Plains, the lingering imprint of cattle grazing and ongoing impact of horses and deer is difficult to separate from ambient or past cryogenic processes. The alluvial surface along Tawonga Hut Creek is dominantly hydrosol, but reasonably well-drained with limited development of organosol.

3.8.4.3 Overnight node 3

This site is located south of Blair Hut on the eastern bank of the West Kiewa River. The site covers most of a small, relatively steep alluvial fan that has developed at the toe of a gully extending eastwards towards Weston Hut (Figure 13). The stream that flows down this gully has been diverted along the southern side of the alluvial fan and is incised ~2 m into its surface. The LiDAR DEM of the alluvial fan shows three old stream courses across the fan, the most obvious of which runs more or less straight down the middle of the fan. This abandoned stream course is evident as a shallow gully with large trees growing in it (Image 102); it has not been active for decades if not hundreds of years.

Exposures along the track running eastwards (upslope) from Blair Hut show that the fan is composed of very poorly sorted sediment (mud to boulders); it is dominated by pebbles to boulders of subrounded to subangular basalt, with a minor component of gneiss clasts of similar size and shape (Image 103).

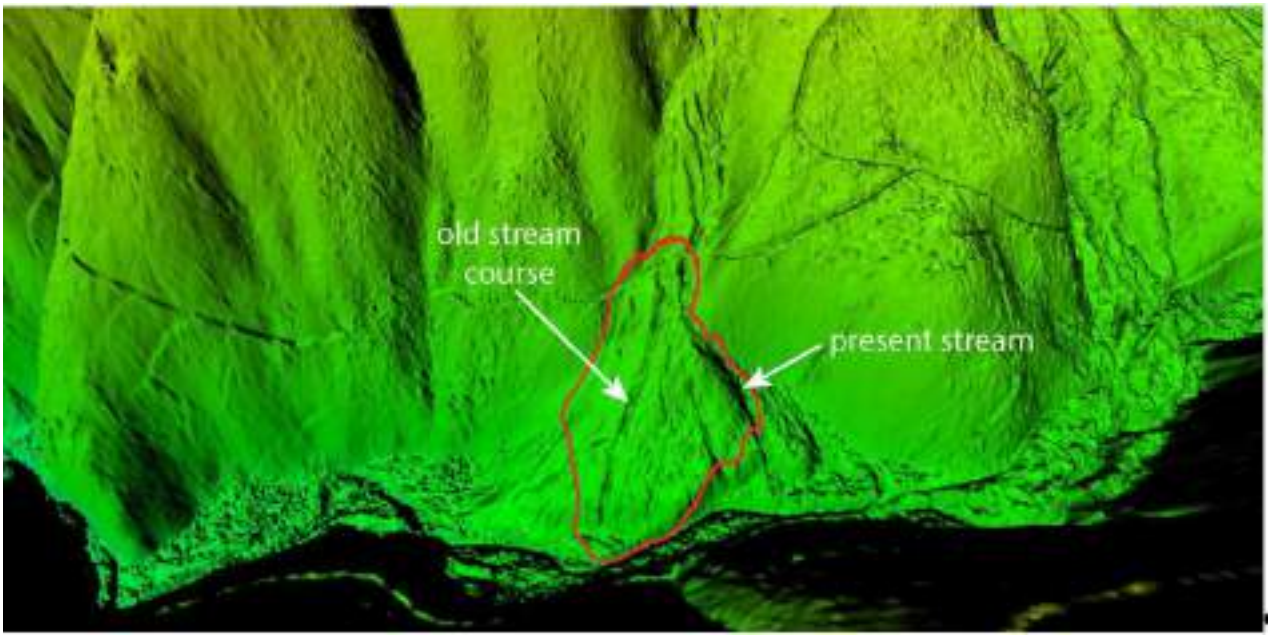


Figure 13. LiDAR DEM of OV3 (red outline), looking east; showing alluvial fan with present stream down southern side and old stream course through middle of fan.

Image 102. Old stream course across alluvial fan at overnight node 3, marked by shallow depression evident beneath fallen tree (December 2022) (Image credit: John Webb)

Image 103. Sediment of alluvial fan exposed in track at overnight node 3; clasts are dominantly basalt, with some gneiss (arrowed). (December 2022) (Image credit: John Webb)

The alluvial fan was probably created largely by a single slump/debris flow. At the head of the gully that runs upslope from the fan is an arcuate section of the basalt cliffs that marks the curved headwall scar of a major slump; below this is an elongate area of slumped material with less tree cover than the surrounding area (Images 104 and 105).

Some of the slumped material travelled downslope as a debris flow through a curved gully to be deposited at the toe of the gully as an alluvial fan. The relatively steep slope of the alluvial fan and the poorly sorted nature of the sediment suggests that it was deposited predominantly by a debris flow. There are no other noticeable arcuate scars in the basalt cliffs in this area and no other obvious alluvial fans along the West Kiewa River, indicating that the major slump/debris flow that deposited the alluvial fan was an unusual event.

Image 104. Location of alluvial fan in relation to slump that formed it (red outline shows overnight node 3). (December 2022) (Image source: John Webb, Google Earth oblique image view).

Image 105. View of slump and alluvial fan, looking east (December 2022) (Image source: John Webb, Google Earth oblique image view)

The slump that formed the alluvial fan may have occurred during the Last Glacial Maximum (~20,000 years ago), when periglacial conditions on the high plains would have destabilised the basalt cliffs due to frost wedging and supplied abundant detritus. The lack of trees on the main area of slumped material may be due to the thin soils on this area; the alluvial fan is heavily treed, probably because there is a higher proportion of fine-grained sediment in the debris flow material.

It is unlikely that another slump/debris flow will occur in this gully; slumped areas are typically more stable than adjacent areas due to the removal of formerly unstable material by the slump. However, it should be kept in mind that if another slump did occur, it would most likely deposit debris across much, if not all, of the alluvial fan.

Construction of huts, camping platforms etc. at this site should also keep in mind that the stream flowing across an alluvial fan can change its path, as is evident by the old stream courses on this fan. The present stream is incised ~2 m and is able to carry the flows associated with spring thaws. However, there is the possibility that an exceptional flood could exceed the carrying capacity of the stream and the entire fan could flood; during such events stream diversion can occur, such that the stream could reoccupy one of its old courses.

3.8.4.4 Overnight node 4

This site is located on a flat area near the top of Diamantina Spur, below High Knob (Image 106). It is unclear why the ridgetop in this area is flat, in contrast to further downslope and upslope. Overnight node 4 is underlain by steeply dipping beds of Pinnak Sandstone, as are High Knob and the entire Diamantina Spur; thus, there is no lithological control on the topography of OV4. The flat area is not obviously glacial or periglacial in origin; there is no evidence of nivation hollows or solifluction lobes.

Image 106. Flat area at OV4, looking west with High Knob in the background (December 2022) (Image credit: John Webb)

Construction of huts, camping platforms and supporting infrastructure at this site will not impact its geomorphological significance.

3.9 Waterway types

A review of the proposed main track alignment and associated waterway network, along with the contributing catchment area, found that there are numerous locations where the track intersects waterways. However, there are also large sections of the track where the alignment is positioned on ridgelines. Broadly, the waterways present across the alpine region, including those that intersect the proposed track corridor, are highly variable in terms of their processes and behaviour. Hence, the extent to which of these waterways might be impacted by the track is also highly variable.

For the purposes of this investigation, a broad classification of the waterways present in the assessment area, mainly based on the type and degree of lateral confinement placed upon each waterway, has been made and is summarised in Table 13. The confining feature limits the ability of the stream to migrate or adjust laterally and is usually associated with where the channel comes in contact with the bedrock valley margin. This in turn indicates the potential for the waterway to degrade/erode in response to the track upgrade. Note that this information is general in nature, and the project scope did not include the classification of each waterway that intersected the proposed track alignment.

The waterway types summarised in Table 13 (Images 107-110) vary from the highly sensitive Alpine Bog Community and marshes to robust bedrock-controlled streams that have little capacity to adjust. The typical waterway processes and morphology features associated with these waterway types are discussed below.

Table 13. General classification of waterways within the assessment area (December 2020/January 2021)

Stream Type	Channel controls and behaviour	Example
Bedrock-controlled	High energy flows flush fine sediments through this setting. There is strong longitudinal (bed) and horizontal (banks) control placed on the channel as much of the channel boundary is on or very close to bedrock. As such, there is limited capacity for lateral or vertical adjustment. Typical features within these streams include cascades, waterfalls and plunge pools.	 **Image 107. Tawonga Hut Creek, downstream of the Tawonga Huts Camping Area (December 2020), (Image credit: Julian Martin, Water Technology)**

Stream Type	Channel controls and behaviour	Example
Confined (with occasional floodplain pockets)	These systems are high energy waterway environments that are capable of flushing fine sediments and mobilising coarse bed load material. These streams generally only have a small potential for lateral or vertical adjustment caused by fluvial processes, except for small discontinuous floodplain pockets. It is these floodplain pockets that can be subject to inundation and erosion.	 **Image 108. Diamantina River, (January 2021), (Image credit: Tom Atkin, Water Technology)**

Stream Type	Channel controls and behaviour	Example
Alpine Bog Community	The channel arrangement within Alpine Bog Communities generally comprises a continuous channel or series of braided channels of varying sinuosity within a boggy (waterlogged) and densely vegetated (although treeless) valley floor/floodplain. Conversely, the channel may also be poorly defined or discontinuous in some parts. Wetlands and ponds are also commonly present on the valley floor. In some instances, these wetlands are associated with prior (abandoned) channel courses. These systems have a significantly higher risk of disturbance compared to other stream types within the project area, on the basis that they are generally free to move laterally and vertically. The degradation of these systems involving lateral and vertical adjustment at individual sites/reaches will be dependent on specific site/reach features including the depth to bed rock, relative position of the channel to the floodplain margin, floating boulders, road crossings, etc. Vegetation cover is considered critical to maintaining resilience. Alpine Bog Communities are protected under the Commonwealth EPBC Act on the basis that they are threatened ecological communities that provide significant benefits to the natural environment, including contributing to plant and animal diversity, carbon storage, water quality and hydrologic processes (DEWHA 2009, DEECA 2023e).	 **Image 109. Alpine Bog Community and wetland between the Bogong High Plains Road and Cope Saddle Hut (December 2020), (Image credit: Tom Atkin, Water Technology).**

Stream Type	Channel controls and behaviour	Example
Aqueduct	Aqueducts are artificially constructed channels positioned outside of the valley floor. In the context of this project, aqueducts typically follow the contours of the terrain and were designed to the convey water from one catchment to another (e.g. the Langford Aqueduct carries water to Rocky Valley Dam). Management vehicle tracks are typically located on the downhill side of the aqueduct and act as a levee. Throughout the aqueduct network, formal spillways allow excess water to spill from the aqueduct over the track/levee and into a receiving waterway. Aqueducts have a relatively flat longitudinal gradient and trapezoidal cross section. However, the aqueducts are piped in some sections. These systems are relatively stable, in part due to a relatively flat longitudinal gradient. Some minor bed and bank erosion was observed. It is expected that these systems are regularly monitored and maintained.	 **Image 110. The Langford Aqueduct (December 2020), (Image credit: Tom Atkin, Water Technology).**

3.9.1 Waterway processes

In combination with natural stream processes, the proposed works (i.e. track and OV development) have the potential to negatively impact waterway values and processes. Most waterway processes are associated with natural stream function and can be exacerbated by changes in discharge and/or land use, disturbance (e.g. vehicle and pedestrian traffic, construction activities, cattle, deer and horses), and reduced riparian vegetation (in part as a result of such disturbance). An overview of potentially relevant waterway processes is provided in Appendix 6.

3.9.2 Track section summary

A brief summary of the observations noted within each track section of the proposed track is summarised in Table 14 (Images 111-118).

Table 14. Feature summary within in each track section along the proposed FHAC route (December 2020/January 2021)

Section 1a — Below the Rocky Valley Dam wall
Key features Nil

Section 2 — Heathy Spur Track
Key features The proposed track alignment follows an existing walking track that is positioned on hill slopes separated by segments where the alignment runs parallel to or intersects sensitive waterways (i.e. Alpine Bog Communities and ground water discharge seepage areas) within the catchment headwaters. The track alignment also passes over the surrounding hill slopes (outside the valley floor). In some areas the track is entrenched and as a result, concentrates flow.

Image 111. Alpine Bog Community, Heathy Spur Track (December 2020), (Image credit: Julian Martin, Water Technology)

Section 3 —Big River Track

Key features

The proposed track alignment within this section follows an existing vehicle track that incorporates one major waterway crossing over an Alpine Valley Peatland in the form of a culvert crossing.

Image 112. Existing Culvert crossing on Watchbed Creek, Fainter Fire Tail (December 2020), (Image credit: Tom Atkin, Water Technology)

Section 4 —Australian Alps Walking Track

Key features

The proposed track alignment within this section follows an existing walking track that intersects and runs parallel to minor drainage lines within the catchment headwaters.

Section 5 — The Langford Aqueduct Road

Includes proposed overnight node 1 preferred and alternate, Bogong High Plains

Key features

The proposed track alignment is situated adjacent to an aqueduct and proposed OV1 (preferred and alternate) on the Bogong High Plains.

Image 113. Langford Aqueduct track, (December 2020), (Image credit: Tom Atkin, Water Technology

Section 6 — Australian Alps Walking Track

Key features

The proposed track alignment within this section follows an existing walking track over undulating terrain that incorporates several discrete waterway crossings. The existing crossing types include a small, grated bridge, a culvert, stepping stones and a pedestrian bridge over the downstream end of a constructed channel at the confluence with the Cope East Aqueduct.

Image 114. Existing waterway crossing in the form of a small, grated bridge on Cope Creek (December 2020), (Image credit: Julian Martin, Water Technology)

Section 7 — located between a point north of Mount Jim and Fainter Firetrail

Key features

The proposed track alignment within this section follows an existing walking track over a ridgeline and along the western edge of the High Plains. The track intersects minor surface water flow paths at the head of the catchment.

Image 115. The existing track intersects a minor surface water flow path between pole 333 and Fainter Firetrail (December 2020). (Image credit: Tom Atkin, Water Technology)

Section 8 — Fainter Firetrail

Includes proposed overnight node 2 preferred, Tawonga Huts

Key features

The proposed track alignment follows an existing vehicle track downslope towards Tawonga Huts. The track runs parallel to Tawonga Hut Creek.

Image 116. Tawonga Hut Creek adjacent to Fainter Firetrail, south of Tawonga Huts (December 2020), (Image credit: Julian Martin, Water Technology)

Section 9 — Section of track between Tawonga Huts and access track to overnight node 2 alternate

Includes proposed overnight node 2 alternate, Tawonga Huts

Key features

The proposed track would provide access to proposed OV2 alternative. The track intersects multiple sensitive waterways including an Alpine Valley Peatland community that incorporate a series of deep and narrow braided channels within a densely vegetated (treeless) valley floor/floodplain. The proposed track alignment will also include a bedrock-controlled section of Tawonga Hut Creek.

Image 117. Track to alternate overnight node 2 along Tawonga Hut Creek on the Fainter Firetrail (December 2020), (Image credit: Tom Atkin, Water Technology)

Section 10a — Short section south of Tawonga Huts

Key features

Waterway processes not assessed in 2022 – see Geomorphology Section 3.6 above.

A series of ponds were recorded at the eastern end of the track.

Section 11 — Eastern end of Westons Spur Track ending at Pole 333

Key features

The proposed track alignment within this section follows an existing walking track over a ridgeline upstream of concentrated flow paths/waterways.

Section 12 — Westons Spur Track from Weston Hut including West Kiewa Logging Road to the eastern end or Diamantina Spur Track

Includes proposed overnight node 3, Blairs Hut

Key features

The proposed track alignment traverses down a forested hill slope (Westons Spur Track) intersecting several steep watercourses and partially occupying an existing informal 4WD vehicle track which connects with the West Kiewa Logging Road. The logging road then transitions onto the Kiewa River West Branch floodplain at Blairs Hut. The logging road runs parallel to the river for approximately 2 km before heading west up the Diamantina Spur Track.

Image 118. Upstream view of Kiewa River West Branch near Blairs Hut (January 2021), (Image credit: Tom Atkin, Water Technology)

Section 13 — Diamantina Spur Track

Includes proposed overnight node 4 at High Knob

Key features

The proposed track alignment within this section follows an existing walking track, mainly following a ridgeline up a steep rocky slope to High Knob. An OV is proposed at High Knob.

Section 14 — Section of the Razorback track between foot and summit of Mount Feathertop

Key features

The proposed track alignment within this section follows an existing track on the rocky and steep ridgeline up to Mount Feathertop.

Section 15 — The Razorback track
Key features The proposed track alignment within this section generally follows an existing track, positioned on a rocky steep ridgeline between Mount Feathertop and the Great Alpine Road.

Section 16 — Section of track within the Mount Hotham Alpine Resort between the southern end of the Razorback and Mount Loch car park
Key features The proposed track alignment follows an existing narrow walking track between the Razorback track and the weather station at Mount Hotham. The track then widens into an unsealed maintenance track that briefly follows the rocky ridgeline of Hotham Heights before turning north and intersecting with the southern side of the Great Alpine Road. The alignment then continues as an informal walking track on the northern side of the Great Alpine Road eastward to the Mount Loch carpark and water storage dam.

Section 17 — Fainter Firetrail
Key features Waterway processes not assessed in 2022 – see Geomorphology Section 3.6 above. General observations included numerous ground water seepage courses and drainage lines running south to north that are intersected by Fainter Firetrail, a Fen (Bog Pool) community at the eastern end on the edge of Pretty Valley Dam and several small Alpine Valley Peatlands scattered midway along and intersected by Fainter Firetrail.

Section 18 — Bungalow Spur Walking Track (assessed in December 2020)
Key features Waterway processes not assessed in 2022 – see Geomorphology Section 3.6 above. Two groundwater springs were recorded along the track.

3.9.3 Flooding risk

The proposed track alignment intersects both the Kiewa River West Branch and Diamantina River (Appendix 1a and 1b). Planned OV3 is currently proposed to be located near the Kiewa River West Branch. Both the Kiewa River West Branch and the Diamantina River are relatively high energy and flashy rivers. As such there is the potential risk of flooding, the impacts include:

- Damage to infrastructure proposed near the rivers or on the floodplain; and
- Safety issues resulting from damage to proposed infrastructure caused by floodwaters.

4 Potential impacts on environmental values

The construction activities associated with the proposed FHAC may compound existing environmental impacts in the study area outlined in Section 1.4 but will need to be confirmed when the project scope is finalised.

An overview of the potential impacts of the FHAC on environmental values in the assessment area is provided here. The calculation of the extent of disturbance from the construction of the proposed track and OVs assumes that disturbance will be contained within the track alignment and buffer, and within the OV boundaries.

Significant vegetation communities, significant flora, long unburnt snow gums, significant fauna habitat, sites of geomorphological significance, and waterways and wetlands in the assessment area have the potential to be impacted by:

- Track widening and construction (final scope and extent yet to be finalised) including:
    - Construction of new access tracks.
    - Minor realignments.
    - Track widening or reformation.
    - Drainage works.
    - Construction of steps, board walks or installation of stepping stones.
- Ongoing track management and maintenance.
- Construction of OVs (structures and plans yet to be finalised).
- Ongoing maintenance and management of OVs.
- Increased numbers of hikers.

Track

The FHACMP indicates that the track construction works would impact the entire length of track. Potential impacts during construction would include vegetation removal, soil movement and soil compaction and loss or disturbance to flora and fauna habitats resulting from widening and resurfacing the existing track and installation of waterway crossings.

Within the track buffer there are likely to be impacts to vegetation from the temporary stockpiling of cleared vegetation and soil, and the movement of personnel and construction machinery which would disturb flora and fauna habitats.

Ongoing impacts are likely to include soil compaction, vegetation damage and ongoing loss or disturbance of flora and fauna habitats as part of ongoing track maintenance activities (e.g. track repairs and vegetation management to keep tracks clear) and hiker foot traffic.

Overnight nodes

The calculation of the extent of impacts from the proposed construction of the OVs assumes that the entire area at each OV location shown in the FHACMP or identified by PV would be impacted. However, it is noted that accommodation and associated infrastructure may be contained within smaller areas within the OVs following detailed design.

The impacts would result from vegetation removal to construct proposed infrastructure including accommodation huts/camping platforms, access tracks, water tanks, grey-water treatment, toilets, communal eating areas, solar panels and helicopter landing sites.

Ongoing impacts may include trampling of native vegetation and fauna habitat by maintenance personnel and by hikers beyond the immediate footprint of the buildings when hikers access the facilities and explore their accommodation surrounds. This type of disturbance was observed in the form of trampled vegetation beyond existing camping areas at Cope Hut and Tawonga Huts.

Small and large woody debris (branches and logs which provide fauna and flora habitat) are also likely to be lost due to hikers illegally collecting wood for campfires. Rocks may be illegally removed and used for rock stacking and to create a border around campfires which removes fauna habitat and disturbs and alters geological features. Evidence of these activities was observed at the proposed OVs at Tawonga Huts and Cope Hut existing camping area, Weston Hut existing camping area and High Knob (Images 69, 71, 119a and 119b).

Image 119 a-b. Informal campfires built with rocks, branches and logs illegally cleared from the surrounding area destroying habitat for reptiles, invertebrates and other terrestrial fauna, disturbing geoscience features, and potentially impacting snow gums if branches are taken from living trees. Image 1119a, Tawonga Huts, OV4 preferred (December 2022) (Image credit: Alistair Smith). Image 119b, High Knob (December 2020) (Image credit: Dr. Matthew Hatton)

4.1 Significant flora species

Threatened flora species were recorded in every track section and OV.

Potential impacts to threatened flora species in the assessment area include:

- Direct loss of plants through removal;
- Degradation of habitat caused by trampling, soil disturbance, erosion, weed invasion and sedimentation;
- Fragmentation of plant populations;
- Altered hydrology.

The FHAC, as proposed in the Master Plan has the potential to impact the following listed flora:

1 EPBC listed species: Shining Cudweed recorded in:

- Track section 1a, Shining Cudweed plants were located off the existing and potential new sections of track, so are not likely to be impacted by the proposed works unless the track alignment is altered; and
- Track sections 2, 3 and 6, Shining Cudweed plants were growing on and beside the existing track so they would be impacted by any works taking place there.

65 FFG Act listed species recorded in various track sections and OVs (Table 5 and 6); and

137 threatened species listed under the EPBC and/or FFG Act (including the 66 threatened species recorded during this project) for which suitable habitat was identified throughout the assessment area (Attachment 1). Targeted surveys would be required during their active growing season to detect their presence, location, extent and population size so a full assessment of impacts on threatened species can be provided.

4.2 Long unburnt snow gums

The potential impacts on long unburnt snow gums, (and recently burnt snow gums and recruits) in the assessment area include:

- Damage to canopies from construction and routine track maintenance;
- Damage to root zones from construction and routine track maintenance;
- Soil compaction from construction and ongoing foot traffic which may impact roots; and
- The removal of, or damage to, trees as a result of firewood collection. Informal fireplaces were observed at High Knob and Tawonga Huts and the existing camping areas around Cope Hut and Weston Hut during field assessments (Images 69, 71 and 119).

Damage to the roots and/or canopy of a tree can affect the stability of the tree and affect tree health, and ultimately lead to its death and fall/collapse.

If construction activities encroach on Tree Protection Zones (TPZs) by more than 10% or Structural Root Zones (SRZs) then trees are considered lost under the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a) (Guidelines). Details are provided in the *Assessor's handbook. Applications to remove, destroy or lop native vegetation* (DELWP 2018a);

Long unburnt snow gums occur in:

- Three track sections: 4, 5 and 18.
- Two OVs: Cope Hut existing camping area and OV4 (High Knob).

4.3 Significant vegetation communities

The potential impacts construction and ongoing impacts to federal and state listed vegetation communities and rare or threatened EVCs recorded in the assessment area include direct loss and degradation caused by:

- Direct loss or reduction in extent through removal;
- Degradation from vegetation trampling, soil disturbance, erosion (leading to sedimentation of waterways, impacts on water quality and weed invasion); and
- Altered hydrology.

The most significant communities include:

Alpine Sphagnum Bogs and Associated Fens Community (EPBC, FFG)

- Track sections 1a, 2, 3, 4, 5, 6, 7, 9, 11 and 17 on the Bogong High Plains and OV1 and OV2 (Appendix 1b and 1c).

Alpine Snowpatch Community (FFG)

- Track section 14 and 15 (Appendix 1b, map 16).

Sub-alpine Pond Herbland

- Track section 7 and 10a (Appendix 1b, map 12).

Fen (Bog Pool) Community (FFG)

- Track section 17 (Appendix 1b, map 22).

Of particular concern is potential impact on the nationally threatened Alpine Sphagnum Bogs and Associated Fens community which is possibly the vegetation community that is most susceptible to disturbance in the study area. The national listing of the Alpine Sphagnum Bogs and Associated Fens community recognises that there are threats to the long-term survival of the community and aims to prevent further decline and promote recovery via landholder/land manager and community management efforts for future generations (DEWHA 2009).

The EPBC listing advice for Alpine Sphagnum Bogs and associated Fens (DEWHA 2009) states:

> *The listing of the Alpine Sphagnum Bogs and Associated Fens ecological community under the EPBC Act does not prevent land managers from continuing to use land in the same way they were before the EPBC Act came into force, providing that they do not significantly change or intensify their activities (and the activity is lawful).*
>
> *National protection means any new or intensified activities that may have a significant impact on the listed ecological community should be referred to the Australian Minister for the Environment, Heritage and the Arts for assessment.*

Alpine Sphagnum Bogs and Associated Fens are very sensitive to disturbance. Trampling and weed invasion are recognised threats causing vegetation loss which results in soil erosion and altered hydrology (DEWHA 2009).

Bushwalkers can negatively impact these systems through trampling vegetation, soil compaction and spreading weeds and pathogens on footwear. The listing advice for this community states:

> *Recreational demands on alpine and subalpine regions continue to rise as more people visit the area in the summer months, as well as the more traditional winter ski season (McDougall and Walsh, 2007). Trampling of vegetation by walkers not keeping to pathways is a growing problem (Whinam and Chilcott, 2002).*

This ecosystem experiences extreme climatic conditions and has a short growing period, so recovery from any impacts takes a long time (DEWHA 2009). This is especially the case where disturbance is ongoing which is occurring in the assessment area largely due to activity by feral horses, deer, recreational horse riding, bushwalking and mountain bike riding.

The project impacts on this community and other threatened ecosystems can occur during construction, maintenance and ongoing use and are outlined below:

- Vegetation and fauna habitat loss caused by clearing of vegetation, logs and organic litter removal to clear areas for construction works and as part of ongoing maintenance;
- Vegetation trampling/crushing caused by foot traffic and machinery around work areas during construction and ongoing use by hikers and maintenance vehicles and personnel;
- Altered hydrology from construction works such as bridging, track widening and track resurfacing near and over waterways, potentially leading to vegetation loss, sedimentation and weed invasion which in turn may alter vegetation structure, and reduce species diversity;
- Soil compaction caused by movement of machinery and foot traffic during and after construction and as a result of the construction of surface tracks within nodes. Soil

compaction may also occur along the walking track alignment as a result of any proposed track works (if included in the final scope) and ongoing hiker use and maintenance access;

- Soil disturbance caused by any soil excavation such as trenching and excavation for the installation of structures such as posts, drainage, walking tracks, steps, raised walkways, track resurfacing and widening etc.;
- Soil erosion caused by vegetation removal, soil disturbance and altered hydrology which in turn causes vegetation loss which alters vegetation community structure and species diversity and can destroy vegetation communities e.g. altered hydrology can cause drying of Alpine Sphagnum Bogs and Associated Fens resulting in their loss;
- Introduction of weed seeds and Chytrid fungus carried in on machinery, vehicle tyres and footwear which would impact native flora and fauna habitat and amphibian health;
- Loss of flora and fauna habitat due to illegal firewood collection and illegal rock movement to create informal fireplaces (multiple examples were observed within the FHAC project area); and
- Increased risk of wildfires starting from poorly managed campfires associated with the increased opportunities for this to occur due to an increase in the number of accommodation areas and hikers accessing the project area

These physical impacts can create a negative feedback cycle of decline in Alpine Sphagnum Bogs and Associated Fens with eventual loss which is well documented in a number of papers (Gates 2023, Treby and Grover 2023, Rowland et al. 2023) and (Carr and Turner 1959, Hughes 2003, Pickering et al. 2004, Hennessy et al. 2005, McDougall 2007, Pickering 2007, Hope et al. 2009, Whinam et al. 2010, Bhend et al. 2012, Duursma et al. 2013, IPCC 2014, Clarke et al. 2015, DOTE 2015, Harris et al. 2016, Karis et al. 2016, Petitpierre et al. 2016, Camac et al. 2017, Clarke and Evans 2019, Hoffmann et al. 2020, Nolan et al. 2020, Prior et al. 2020, Van Oldenborgh et al. 2020, Silvester et al. 2021, cited in Rowland et al. 2023):

Destruction of key structural vegetation components such as *Sphagnum* species (and therefore peat formation), shrubs and graminoids including endemic and threatened species, combined with soil compaction are likely to result in increased soil density. This may cause a reduction in soil water holding capacity of and in turn impact plant health.

Soil compaction reduces interstitial soil spaces reducing water penetration and access by plant roots and the soil biota to nutrients, water and air. The soil biome is necessary for nutrient cycling so impacts to soil biota may reduce available nutrients for native plants and cause a decline in plant health.

Loss of vegetation would result in increased bare ground providing space and a more suitable habitat for weed invasion which could be further facilitated by weed seeds transported in on machinery, vehicle tyres and workers and hikers shoes and clothes. Weeds such as *Gray Sallow and *Soft Rush outcompete native species for nutrients, water and space. They also affect the nutrient balance. This results in a reduction in diversity, cover and abundance of native plant species and altered vegetation structure can reduce native flora and fauna habitat.

Any vegetation decline would cause a loss of fauna (and flora) habitat including shelter (fewer trees, plants, logs, litter and water), food sources (such as leaves, pollen, nectar, roots, litter, seeds), reduced resources and shelter for plant recruitment and protection of fauna from climate extremes and predators.

The loss of vegetation and peat combined with increased soil density may lead to changes in hydrology including increased water run off which in turn can cause channelisation, erosion and sedimentation which affects downstream water quality. It may also alter the retention and regulation of the slow release of water into surrounding catchments.

Drying of these communities as a result of declining water holding capacity combined with global warming would make this community more susceptible to bushfire which it may not recover from or at a minimum would take decades to recover (in the absence of any further disturbance).

Fire has not been a frequent occurrence in this ecosystem up until 20 years ago when the fire frequency increased. This community takes decades to recover from low intensity fires. Fires, particularly high intensity fires are more likely with dryer conditions. Fire removes peat (particularly if dry as it is more combustible) and vegetation, increases bare ground and erosion which improves habitat suitability for weeds. This would further impact threatened and endemic species.

Ultimately these changes may result in this community being lost and replaced by the expansion of adjacent dryer grassland or shrubland species and lower altitude species.

4.4 Weeds

Weeds already present in the assessment area include designated noxious weeds, WONS, and other high risk environmental weeds which provide ready sources of seed and propagules (Image 120). The proposed track widening and resurfacing, and establishment of OVs may result in the following impacts in the assessment area:

- Native vegetation removal and exposed soils providing opportunities for weed invasion;
- Transport of weed seeds and propagules into these newly disturbed areas during construction on work boots and construction equipment, leading to new weed infestations;
- After construction is complete, weed seeds may be carried on walkers' shoes and clothing, and spread along the proposed FHAC and into the proposed OVs; and
- Weeds may spread via waterways into downstream catchments, causing infestations in the broader landscape which could degrade threatened vegetation communities and rare or threatened EVCs, and result in significant impacts to flora and fauna habitat in the wider landscape.

Image 120. Grey Sallow ****Salix cinerea* **subsp. *cinerea* **recorded outside the study area at Tawonga Huts (December 2020), (Image credit: Louise Rodda)**

4.5 Significant fauna species

Threatened fauna species and/or potentially suitable habitat for them was recorded in all track sections and each OV.

Potential direct and indirect impacts on fauna species include:

- Habitat loss and fragmentation.
- Habitat degradation (e.g. through weed invasion and trampling).
- Direct mortality.
- Spreading pathogens such as the Amphibian Chytrid Fungus.
- Soil disturbance (e.g. resulting in runoff into bog systems and waterways).

In addition to loss of habitat connectivity (necessary to maintain gene flow, genetic diversity and access to mates to sustain fauna populations), habitat (including shelter and foraging resources), water quality and access to water), direct mortality (caused by crushing by machinery, vehicle traffic, foot traffic, vegetation removal, soil excavation etc.), and impacts of disease, there are the ongoing potential negative effects of light and noise pollution to consider.

Light pollution

The following information was largely informed by the recently released National Light Pollution Guidelines for Wildlife (DCCEEW 2023d), which also provide guidance on minimising impacts to nocturnal fauna from artificial light.

Light pollution is caused by any activity that involves externally visible artificial lighting produced by humans at night, for example, by torches, light fixtures and fire.

Many native mammals have evolved to be mainly active at low light levels (dusk, nighttime and dawn), and require darkness to hide from predators. Darkness can also act as a cue to leave their shelter to forage and breed.

Even so, impacts to local fauna from artificial lighting are likely to vary, with some nocturnal birds such as Tawny Frogmouths and Southern Boobook Owls potentially unaffected in terms of remaining resident in the area (e.g. Weaving and Cooke 2010). Alternatively, artificial light at short wavelengths may suppress nocturnal melatonin in marsupials, interfering with physiological processes that may impact on health (e.g. Dimovski and Robert 2018).

Artificial light can also send confusing signals about daytime and day length which can disturb fauna sleep patterns, reduce feeding opportunities and growth, affect reproduction and migration, and increase their exposure to predators. It can also fragment habitats when animals avoid areas with artificial lighting.

Artificial lighting can affect native plants as they rely on pollination and seed dispersal by nocturnal animals including bats, possums, moths, and native rats. Restriction of movement of pollinators and seed dispersing animals may reduce recruitment and artificial light can affect flowering and seed production of plants.

Noise pollution

Anthropogenic noise pollution is known to impact wildlife, with some animals reported to temporarily or permanently avoid areas affected by noise. Noise can interfere with communication between animals, in so far as if they cannot hear one another clearly so they may not find mates (cannot hear them to locate them) or hear predators approaching.

Studies have shown higher levels of stress hormones in animals in areas impacted by noise which can in turn weaken their immune system and reduce reproduction. Different species have different levels of sensitivity to noise (Ecosure 2021). Most of the studies on noise impacts on wildlife have been on transportation and industrial noise impacts on mammals, birds and fishes (Ecosure 2021).

There is little information about impacts of outdoor recreation on the species that occur or potentially occur within the project footprint but it is likely that noise from construction and ongoing maintenance and use by hikers will have some impact on fauna.

Fauna species most likely to be impacted

The proposed FHAC would potentially have the greatest impact on reptile and mammal species.

Targeted surveys are required to further assess the presence and distribution of several of these threatened fauna species in the assessment area, and the extent of the potential impacts of the FHAC project on these species (Attachment 2).

4.6 Significant geoheritage values and landform sensitivity

Geoheritage sites

A geoheritage site—also known as a site of geological and geomorphological significance—is a discrete area that displays one or more geoscience attributes of particular importance for the scientific comprehension of the history of Earth. The principle applies to all disciplinary fields of geosciences[7]. Geosites are archives that store the materials, processes and time scales that have produced the present landscape. They allow interpretation of the tectonic evolution, past environments, geological processes, and the history of life on Earth. A class of geosites allows observation of present processes that are producing new landforms and modifying existing materials and landforms. To allow geosites to be available for future generations, and for ongoing field research and teaching, an inventory is necessary to assess the nature, size, distribution, and frequency of site occurrence. This will enable application of protection and management strategies to maintain the integrity of a site.

Although primarily recognised for scientific values, geoheritage sites may also have distinctive ecological associations and cultural and aesthetic values stemming from visual appeal, cultural use, or customary association. The latter values are in part subjective and not easily quantified. Inventory of geosites is a continuing process and systematic evaluation and re-evaluation is necessary in the context of present or proposed land uses.

Victoria

The assigning and reviewing of geoheritage significance is currently undertaken in Victoria by the Geological Society of Australia Inc (Victoria Division) (GSAV), Heritage subcommittee. The GSAV maintains a database of sites based initially on previous surveys (e.g. Rosengren 1978 et seq.) and updated as occasion arises. No Victorian government department undertakes this process systematically.

Geoheritage sites range in size from a few metres to hundreds of square kilometres and may include exposures created by excavation such as road and rail cuttings and quarries. If processes

[7] This term includes areas where geological—mineralogical, lithological, structural, palaeontological (fossil), and stratigraphical properties of rocks and regolith, and geomorphological features—surface and sub-surface landforms and the processes that produce these—are displayed.

are involved these can be active or relict. Geoheritage sites should possess at least one of the following attributes to be considered for assessment on their significance:

- a type section of a geological unit;
- a fossil locality;
- exposures of a range of features characteristic of a rock unit;
- exposures of features which are unusual in the rock unit;
- an unusual occurrence of a particular feature or mineral;
- an illustration of tectonic or volcanic processes;
- displays of the effects of weathering, erosion or deposition on landform evolution;

  features which are relict from former geomorphic processes and enablereconstruction of past climates;
- an outstanding to representative example of a landform type.

The criterion for significance is related to whether a site can be regarded as important, as representative or outstanding. Sites are described according to size, physical or geoscience type and age.

The level of geoheritage significance is classified at local, regional, state, national or international level by documentation, assessment and comparison by the Geoheritage Register[8]. The significance rating assigned to a site is periodically reassessed in the light of new information or site condition.

There is no specific legislative protection for geoheritage at any level of government in Australia (McConnell et al. 2021). Apart from general provisions that may be in the Victorian *National Parks Act 1975*, *Environmental Effects Act 1978*, EPBC Act and management plans for particular parks and reserves, there is no specific legislation in Victoria to recognise and manage on either public land or private land the wide range of types of geoheritage sites that occur.

Cold climate landforms

Cold climate landforms are of National geoheritage value. They are listed as National Significance by the GSAV. The National Heritage List (Australian Government DCCEEW National Heritage Places - Australian Alps National Parks and Reserves) lists The Australian Alps (NSW, ACT, VICT) and identifies the high altitude peaks and plateaus as..."important in the pattern of Australia's natural history". The Bogong High Plains and (then) Bogong National Park were included as a Provisional Listing in the (now archived) Register of the National Estate as containing: "Contrasting geomorphic features show remnants of old erosion surfaces (high tablelands) abutting ruggedly dissected terrain. Geologic features area varied in age and type'.

The listed place map encloses the area of the current proposal. The statement of Official Values includes: "Periglacial features, both fossil and modern, includes block streams, permafrost and

[8] The Geoheritage Register for Victoria is maintained by the Geoheritage Subcommittee of the Geological Society of Australia - Victoria (GSAV). This a subcommittee of the National Geological Heritage Standing Committee (NGHSC) of the Geological Society of Australia (GSA).

solifluction deposits. These features are the material expression of the cold-climate, high-altitude history of the Australian Alps National Parks, unique in the low-latitude, low-altitude Australian continent. The glacial and periglacial features contribute uniquely to our understanding of the nature of landscape response to climate during the ice ages of the late Quaternary and into the present and therefore has outstanding heritage value to the nation for its importance in the pattern of Australia's natural history. By virtue of their rarity in relation to Australian continental physical and climatic attributes, the areas examined in this study are of national geoheritage significance. Their stock is limited and none are considered "expendable". The highest rating of geoheritage significance (national and arguably international) goes to the extensive periglacial landforms and deposits described at OV2 preferred, the full length of Fainter Firetrail and short section of track south of Tawonga Huts.

Bogong High Plains

Landforms—ancient and modern—shaped by cold climates are rare in Australia and evidence of former glaciations occur infrequently in the entire geological record. The glacial climates of the Late Cenozoic produced small valley head glaciers in the Kosciuszko mountains and more extensive ice sheets and valley flow glaciers at lower altitudes in central and western Tasmania but there is no unequivocal evidence of glacial activity in the Victorian highlands.

Evidence of previously frozen ground is more extensive and extends to lower elevations but is often masked by other slope materials and vegetation. In Victoria, the record of the Pleistocene cold climates is expressed as solifluction boulder blockstreams of predominantly igneous rocks—basalt, granitic and rhyodacite rocks at elevations above 1600m between Mount Buller, the Bogong High Plains and Mount Cobberas.

The most evident extreme cold climate landforms of the study area are on the Bogong High Plains. The sedimentary basement geology of the Feathertop area described in Webb (2023) does not produce large ice-wedged clasts and the periglacial material is a shallow surface litter of small sandstone blocks and angular platy phyllite. Apart from the distinctive broken rock materials and landforms of past glacial and periglacial processes, seasonal low temperature as a landscaping factor is expressed in thin, stony soil material and vegetation species and communities adapted to frost, seasonally frozen soil and several months snow cover.

The Bogong High Plains are not alpine in the global context but they comprise one of the major contiguous areas of high altitude landscape on the Australian continent. As with many landscapes in this country, they are in large part inherited from a complex of earlier land forming processes—often controlled by different climatic and tectonic regimes from the present. The landscapes and materials of the High Plains therefore preserve clues to the ancient environments of Australia, especially those resulting from recent colder and drier climates. A feature of Australian mountains is the thick cover of regolith and soil, preserved because of gentle slopes and the absence of denuding glacial processes. The landforms and regolith are therefore of considerable scientific interest. They are also of limited area and sensitive to disturbance.

There is debate as to the impact of human induced disturbance in Australian landscapes. These impacts range from the former seasonal migratory movements of First Peoples to the more recent concentrated effect of stock grazing, hydro-electric and road construction projects, to the ongoing and expanding consequences of recreational use of the High Plains in winter and summer. Skiing, bushwalking, orienteering and oversnow vehicles can seriously and quickly damage alpine and sub-alpine vegetation, soils, landforms and waterways. These ongoing activities have the potential to continue the degradation and destruction of the integrity of the scientific value of sites, particularly wetlands and sensitive periglacial features.

A disturbance factor that spans the history of the alpine region from pre-human to present-day is fire regimes that via vegetation influence landscape physical properties and processes. Disturbance from fire or other sources has evident feedback e.g., soil structure will respond to a change in vegetation cover and vegetation will respond to a change in surface conditions such as increase or decrease in soil moisture and runoff.

The rate of recovery of human impacted alpine systems is slow and as many are relict (fossil) landforms, they will not reform and the scientific data they contain will be lost with continuing disturbance. As with other extreme environments e.g., arid zones and coastlines, the Australian alpine region—including the Bogong High Plains—is a region where environmental damage takes long periods to rehabilitate.

Geoheritage site sensitivity

Geoheritage sites in this environment that display evidence of Pleistocene climates by virtue of deposits and landforms are extremely sensitive to physical impact including compression of soil and deliberate and accidental movement of surface materials. Periglacial solifluction deposits are more widespread than is immediately obvious, as they are often mantled by vegetation cover. In many places, such as OV2 preferred they are multi-layered and they play a critical role in determining surface and sub-surface hydrology. Construction and ongoing use that involves removal, covering, slope alteration and other physical disturbance can compromise much larger areas and have off-site impacts. The proposed change in land use at these locations is seen as having the potential to substantial and possibly irreversibly impact sensitive landscapes and the heritage values they display.

4.6.1 Land surface: impacts, resilience and tolerance

Existing land surfaces

The existing condition and natural values of the present land surface of the treeless and treeline uplands are the inherent biophysical properties modified by past and ongoing human-induced disturbance shown in the present landforms, landform processes and vegetation distribution (species and communities). The key land surface elements, components and inherent constraints of all land use of the treeless and treeline areas are outlined in Table 15.

Table 15. Treeless and treeline land surface elements relevant to land use constraints

ELEMENT	COMPONENTS	POTENTIAL CONSTRAINTS
elevation	1,300 to 1,750m. Seasonal snow, snow patches, frost, soil freezing, needle ice.	Short growing season, climatic limitations for plant establishment or recovery from fire and other disturbance.
relief	±200m	Surface instability, accelerated runoff
aspect	All orientations	Highly variable response to weather
steep slope	+30 degrees	Surface instability, accelerated runoff,
soil	Friable acidic organic loam. Highly variable thickness max <1000mm – commonly <300mm.	Shallow rooting depth, high % of stone, slow rate of organic decomposition, pH 4-5, nutrient-poor, high erodibility
regolith	Extensive surface blockstreams, minor scree, widespread rock rubble.	Unstable surfaces, thin soil, very high geoheritage values.
rock outcrop	Minimal weathering	Lack of soil
landforms	Periglacial solifluction deposits	Boulder and gravel-strewn slopes, minimal soil, dry, geoheritage sensitivity
wetness	Arid to saturated surfaces	Change of moisture status impacting surface stability and vegetation, soil drainage-storage capacity deterioration.
vegetation	Wetland, grassland, heathland, shrubland, woodland	Slow growth rate, selective of substrate, soil and aspect, variable frost tolerance.

Most land surfaces in the study area have some vegetation cover ranging from woodland, isolated trees, shrublands to grassland. Bare ground typically supports a cover of cryptogams (bryophytes and lichens, algae), as do most rock surfaces including outcrop, boulders and fragmented blocks. Apart from freshly broken rock faces, barren land surfaces are areas of existing track with paved or other introduced managed materials and unpaved soil compressed by foot, horses and other animals, bike and other wheeled traffic.

Potential impacts of the proposed FHAC

Singly or in combination, altitude, aspect, steep slopes, rock outcrop, thin soil, slow rates of vegetation growth, seasonally active freeze-thaw processes, fire regimes, significant relict landforms, and land use history produce a complex of potential impacts and responses of land surfaces to the proposed Falls to Hotham Alpine Crossing walking tracks and OVs.

The degree of impact is related to the nature of the activity and the inherent durability of the environment including the ground surface to respond to those impacts. New constructed track surfaces, realignment, widening, regrading and resurfacing of existing tracks will likely lead to increases in the number of hikers using tracks and possibly walking off-track. There will be concentrated people movement at and around the OVs. The process of installing and maintaining the facilities has the potential to introduce concentrated impacts on soil disturbance and soil moisture.

Soil compaction

The principal direct and associated impacts related to these activities on vegetation, surface materials and soil structure is the physical impact of trampling (foot traffic) and the consequences of shading from built structures by direct cover or cast shadows.

Trampling damages vegetation and compacts soil by particle rearrangement resulting in loss of pore space, increased soil density, reduced infiltration and reduced soil moisture storage capacity (Growcock 2006). These changes impact land surface stability and have likely ongoing implications for plant growth and establishment. Compacted soil affects future vegetation growth thus triggering a feedback loop (Martin and Butler 2017).

Due to reduced permeability, compacted surfaces generate increased runoff with potential sheetwash and rilling extending onto adjacent surfaces. Exposed ground experiences more frequent frost heave and needle ice formation with rearrangement of soil particles and degradation of soil structure. Compacted, constructed and paved walking tracks destroy microtopography, interrupt surface and shallow sub-surface water flow and create linear waterways during intense rainfall and rapid snowmelt—with land instability consequences (Yuejin et al. 2022).

Buildings, camping platforms, walkways and other structures even if elevated above the ground surface alter the soil-atmosphere-biosphere interface with subsequent changes to infiltration, soil moisture and runoff. In part these accrue from changes in accumulation and decomposition of organic litter and have implications for soil structure and soil moisture recharge.

It is reasonable to expect that impacts will occur off-site related to increased people numbers and movement off tracks and around OVs. A potential significant impact is on surface wetness. There may be an observable or measurable change in runoff and infiltration that affects surface stability and landform character. Potential changes in flora (including bryophytes) and fauna may also change landform dynamics.

Wetness – soil moisture

Existing track and surfaces to be impacted by proposed new installations have wetness status from dry-to-touch to saturated, ephemeral to permanent in occurrence and daily, seasonal and annual variation. Controlling factors are precipitation, evapotranspiration, infiltration, runoff and groundwater flow. A change in wetness status has potential for significant direct impact on surface stability and indirectly on vegetation.

A measure of wetness is the Topographic Wetness Index (TWI) (Beven and Kirkby, 1979) that relates upslope area as a measure of water flowing towards a certain point, to the local slope, which is a measure of subsurface lateral transmissivity. The TWI can be used to infer information about the spatial distribution of wetness conditions (i.e., the position of shallow groundwater tables and soil moisture).

Soil and land surface impacts

The initial impact of trampling is on vegetation. The impact on soil and ground surfaces is buffered by vegetation and delayed until such time as boots literally hit the ground. Cole (1995) devised quantitative measures of the tolerance of vegetation to tramping/camping damage as resistance (ability to resist change when impacted) and resilience (ability to recover following cessation of damage). Resilience for a soil was further defined by Smith et al. (2022) as "the capacity of the soil to recover its functional and structural integrity after a disturbance; where this integrity can be considered as soils capacity to perform essential soil functions." For different plant communities in the treeless and treeline environments of this study, a subjective index of

tolerance of the land surface to disturbance of each vegetation type—based on ground wetness, ground exposure, soil strength and surface resilience when overlying vegetation is destroyed from very low to high is shown in Table 16.

Table 16. Land surface tolerance to disturbance of main alpine treeless communities

PLANT COMMUNITY [1]	VICTORIAN (EVC)	WETNESS [2]	GROUND EXPOSURE [3]	REGOLITH STRENGTH [4]	SURFACE RESILIENCE [5]	LAND SURFACE TOLERANCE [6]
Bog	Alpine Valley Peatland EVC 288, Alpine Peaty Heathland EVC 1011, Alpine Fen EVC 171	Very High	Low	Low	Low	Very Low
Snowpatch	Late-lying Snowpatch Herbland-EVC 1014 *or* Snowpatch Grassland-EVC 1012	High to Low (seasonally)	Moderate	Very Low	Very Low	Very Low
Grassland	Alpine Grassland EVC 1001, Alpine Damp Grassland EVC 1002, Alpine Grassy Heathland EVC 1004	Moderate	Low	Moderate	Moderate	Moderate
Heathland (includes open and closed heathland)	Alpine Dwarf Heathland-EVC 170, Sub-alpine Shrubland EVC 42, Sub-alpine Dry Shrubland- EVC 1003, Sub-alpine Riparian Shrubland EVC 208, Sub-alpine Wet Heathland EVC 210, Alpine Rocky Outcrop Heathland-EVC 1013, Alpine Peaty Heathland EVC 1011	Moderate	Low	Moderate	Low to Moderate [7]	Low to Moderate [7]
Rock outcrop	Alpine Rocky Outcrop Heathland-EVC 1013, Sub-alpine Dry Shrubland-EVC 1003	Low	Very High	High to Moderate	Moderate [8]	Moderate [8]
Blockstream	Alpine Conifer Shrubland EVC- 156	Very Low	High	Moderate	Very Low [9]	Very Low [9]
Bare surface [10]		Wet to dry	Very high	Low to high	Very low	Low

NOTES

1: McDougall (1982), McDougall and Walsh (2007).

2: Qualitative measure from open pool to moist-to-touch.

3: Degree of shading from plants (ignores cryptogams).

4: Mechanical properties such as density and shear-compressive-penetration strength.

5: Response to compression and abrasion. Persistent trampling progressively damages vegetation with the impact determined by the potential to continue its pre-disturbance function.

7: Open grassy examples will have higher relative resilience and tolerance than very closed examples.

8: Cryptogams variably impacted.

9: Blockstreams are relict landforms – displacement of clasts is non-reversible damage.

10: Exposed by trampling or engineered disturbance

Persistent trampling progressively damages vegetation with the impact determined by the number of trampling passes and the interval between passes as this effects vegetation recovery time.

No controlled examples of measurement of trampling or ground exposure on the Bogong High Plains or Feathertop has been sourced for this assessment, but studies of broadly comparable environments have been undertaken in Tasmania (Whinam and Chilcott 1999, 2003).

These and other research on upline treeless environments in other countries (cited by Whinam and Chilcott 2003) have observed ongoing degradation of soils with compaction, pugging, accelerated surface wash and ponding from this runoff in depressions below the trampled ground. While plant morphology is a key determinant of resistance, site factors such as slope, wetness and soil consistency are likely to be more significant in some areas. A summary of land surface tolerance of treeless and treeline areas examined in December 2022 is given in Table 17.

Table 17. Land surface tolerance of selected alpine EVCs and areas of proposed Falls to Hotham Crossing (December 2022)

SECTOR	EVC	TOLERANCE	MAIN FACTORS
OV1 pref	43, 1004, 1001	Moderate to Low	Grassland with microtopographic hummocks and exposed ground, subject to ponding, thin soil, compaction, shading.
OV1 alt	42, 43, 288, 1001, 1004/43, 1004	Moderate to Low	Diverse topography and vegetation of varied sensitivity. Shrubland sensitive to trampling. Areas of bare soil, spring, pools.
OV2 pref	42, 43, 288, 1004, 1004/43	Very Low	Extensive blockstream deposits, spring, patchy wet ground, organic soils, high geoheritage values,
OV2 alt	42, 43, 288, 288/42, 1004	Very Low	Stream channel, grassland with microtopographic hummocks and exposed ground, thin soil.
OV4	43	Low	Thin stony soil, constricted runoff.
ROCKY VALLEY DAM	42,288, cleared	Very High	Highly disturbed by engineering works.
SECTION 10a	913, 1002/1004,	Moderate	Thin soil, constricted runoff.
FAINTERS FIRE TRAIL	1001, 1004, 299, 288, 171,	Moderate to Low	Complex periglacial blockstreams and outcrop surface, local wetland, geoheritage values, thin soil in places.

The key physical impacts of the proposed Falls to Hotham Crossing have been identified here as direct and inadvertent damage to cold climate landforms of inherent high geoheritage values through the degradation of natural ground surfaces caused by an increase in human activities including:

- Increased trampling and damage to vegetation that will ultimately result in exposed soil increasing the risk of erosion exposing features of geoheritage value;

- Engineered track construction that may result in damage, removal or covering of features of geoheritage value;
- Construction of facilities at OVs that may directly remove, damage or cover features of geoheritage value; and
- Construction of facilities at OVs that create a discontinuity in slopes and slope processes in areas containing features of geoheritage value.

4.7 Waterways and wetlands

The proposed FHAC has the potential to impact waterways and wetlands during its construction and operation beyond.

4.7.1 Track and overnight node construction impacts

The potential general impacts associated with construction include:

- Construction materials and waste may be washed into the nearby waterways; and
- Construction activities may require the removal and destruction of vegetation cover contributing to an increased risk of erosion and excessive sediment inputs.
- During the operation phase, water quality may be impacted through increased sediment inputs from:
    - Eroding sections of track;
    - Areas where vegetation cover is reduced due to construction or off-track trampling by hikers; and
    - Concentrated flow paths (concentrated water runoff).

4.7.2 Waterway crossing impacts

The proposed track alignment intersects numerous waterways along its length. As a result, numerous new waterway crossing structures may need to be incorporated into the track. The potential impacts associated with waterway crossings are site-specific, but may generally include:

- Altering the natural flow pattern of streams (both in-channel and floodplain flows), including:
    - The reduction in hydraulic capacity through the structure;
    - The raising of water levels (an increased afflux or backwater effect) upstream of the crossing structure, potentially increasing the flooding upstream; and
    - Increased hydraulic forces and hence erosion potential surrounding the crossing structure (both upstream and downstream) through the concentration of flows and poor design arrangements.
- Disturbing and/or removing riparian and in-stream vegetation;
- Impeding the movement of fish and other aquatic fauna through the crossing structure;
- Reducing sediment transport through the crossing structure;

- Increased sediment and nutrient loads due to altered roadside/trackside drainage arrangements. This may also have potential to impact habitat for threatened species downstream of crossings, including the Spotted Tree Frog in the Kiewa River West Branch and members of the Mountain Galaxias complex on the Bogong High Plains and elsewhere in or near to the assessment area; and
- Physical damage (i.e. erosion) to the waterway.

4.7.3 Water runoff erosion risk

The track, drainage infrastructure, waterway crossings and impervious surfaces (e.g. roofs of buildings at all proposed OVs) have the potential to concentrate water runoff. The concentration of runoff combined with the potential loss of vegetation, particularly on steep slopes, may contribute to additional erosion.

5 Comparison of 2020 and 2022 project footprint potential environmental impacts

A comparison of the potential environmental impacts of the proposed project footprint assessed in 2020 with the updated 2022/2024 project footprint is provided below and summarised in Table 18.

Extent

The updated 2022/2024 project footprint included an increase in track length and therefore potential track construction impact area from 15.1 to 16.7 ha (this may change once the project scope is finalised). The planned OV construction footprints have been reduced but the figure cannot be calculated until plans are finalized.

Flora and vegetation communities

The number of flora species likely to be impacted including threatened species, vegetation communities and locations of long unburnt snow gums along the track increased in the 2022 updated project design (Table 18). This is largely due to the addition of Fainter Firetrail and Bungalow Spur Track alignment. The largest number of threatened species including additional species recorded in the 2022 assessment area were recorded along Fainter Firetrail (Table 5, Table 6). Two additional EVCs were also recorded on Fainter Firetrail which have a threatened conservation status (Table 9). Five additional EVCs and an additional area of long unburnt snow gums were recorded along Bungalow Spur Track (Table 9, Table 18).

In 2024, an additional area of long unburnt snow gums was recorded at Cope Hut existing camping area.

Fauna

The inclusion of additional track sections and the revised OV areas in the 2022 project footprint has resulted in an increase in one additional threatened fauna species recorded within the proposed project area. The additional track sections with suitable habitat for threatened species (e.g. potential habitat for the Powerful Owl at lower elevations on Bungalow Spur Track) has also increased the number of recommended targeted surveys within the project footprint, from eight species in 2020 to 28 in 2022.

However, updated species listings under the EPBC Act and FFG Act (e.g. Yellow-bellied Glider and Gang-gang Cockatoo), and additional threatened species records lodged in the VBA since the initial report have had the largest influence on the numbers of threatened species requiring further assessment and consideration.

Geomorphology

Significant geomorphological values recognised under the EPBC Act were recorded in the updated 2022 project area along Fainter Firetrail and in OV2 preferred (Table 18). A detailed geological assessment of the entire assessment area may reveal additional significant sites in the project area.

Table 18. Comparison of potential environmental impacts between 2020 and 2022 proposed FHAC project areas[9]

	2020	2022	2024
Construction area			
Track length	61 km	64 km	Not assessed
Track construction area	15.1 ha	16.7+ ha	Not assessed
OVs extent (see Section 2.8.2 for details)	30+ ha	Will be determined when overnight node plans are finalised	Will be determined when overnight node plans are finalised
Total combined areas	**45+ ha**	**To be determined**	**To be determined**
Flora records			
Number of native plant species recorded in the project area	251	329	No change
EPBC Act listed species	1	1	No change
FFG Act listed species[10]	**57:** • 3 Critically Endangered • 43 Endangered • 11 Vulnerable	**65:** • 3 Critically Endangered • 51 Endangered • 11 Vulnerable	No change
Long unburnt snow gums	**Track sections:** • 4 and 5 **Overnight nodes:** • OV1F and OV4	**Track sections:** • 4, 5, 18 (Bungalow Spur Track) **Overnight nodes:** • OV4	**Track sections:** • Not assessed **Overnight nodes:** • Cope Hut existing camping area • OV4
Vegetation communities			
EPBC Act listed communities	1	1	No change
FFG listed communities	2	3	No change
EVCs	**14:** • 2 Endangered • 7 Rare • 3 Least Concern • 2 no allocated status	**19:** • 3 Endangered • 8 Rare • 1 Vulnerable • 6 Least Concern • 1 no allocated status	No change
Fauna records			
Number of native species recorded in the project area	58	73	No change
EPBC Act listed species	**4:** • 2 Endangered • 2 Vulnerable	**7:** • 5 Endangered • 2 Vulnerable	No change
FFG Act listed species	**6:** • 2 Critically Endangered • 3 Endangered • 1 Vulnerable	**10:** • 2 Critically Endangered • 6 Endangered • 2 Vulnerable	No change
Geomorphology			
Values	Bogong High Plains south geologically significant area	Bogong High Plains south geologically significant area Periglacial values included on the EPBC National Heritage List: • Fainter Firetrail • OV2	Not assessed

[9] It should be noted that these findings were the results of a preliminary survey and additional threatened flora and fauna species and geological features of significance may be identified during targeted flora and fauna surveys and a detailed geological assessment.
[10] Threatened species recorded in 2020 were updated from the Victorian Advisory list classifications to their FFG Act threatened list conservation status for comparison here.

6 Legislation and policy

The proposed FHAC is located on Crown land. The key biodiversity protection legislation and policies relevant to the assessment area are:

6.1 Environment Effects Act 1978

The *Environment Effects Act 1978* (EE Act) requires a referral of works that individually or in combination are capable of significantly affecting the environment. The Minister administering the EE Act will assess the referral and may request the preparation of an Environment Effects Statement (EES) (DTP 2023b).

The EE referral criteria relevant to the scope of this EVA are listed here.

Individual referral criteria

Individual types of potential effects on the environment that warrant referral of a project include:

- Potential removal, destruction or lopping of 10 hectares or more of native vegetation[11], that consists of, or comprises a combination of:
    - an ecological vegetation class (EVC) classified as endangered; or
    - an EVC that is classified as vulnerable (with a condition score[12] of 0.5 or more) or rare (with a condition score of 0.6 or more); and
    - that is not authorised for removal under an approved forest management plan[13] or fire protection plan.
- Potential clearing of an area determined as 'critical habitat' under the FFG Act.
- Potential long-term loss of a significant proportion (e.g. 1 percent or greater) of known remaining habitat or population of a threatened species within Victoria.
- Potential for long-term change to the ecological character of a wetland listed under the Ramsar Convention or in *A Directory of Important Wetlands in Australia*.
- Potential for extensive or major effects on the use and environmental values of water resources due to changes in water quality, water availability, stream flows, water system function, or regional groundwater levels, or the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.

Combined referral criteria

A combination of two or more of the following types of potential effects on the environment that warrant referral of a project:

[11] Native vegetation is defined in the Guidelines for the removal, destruction, lopping of native vegetation (DELWP 2017a).
[12] The condition score, although not defined in the Ministerial Guidelines (DEECA 2023), is assumed to be the condition score calculated using the methods outlined in the Vegetation Quality Assessment Manual, Version 1.3, (DSE 2004).
[13] Forest management plan defined as an approved working plan under Section 22 of the *Forests Act 1958*

- Potential removal, destruction or lopping of 10 ha or more of native vegetation[11] unless authorised under an approved forest management plan[13] or fire protection plan.
- Matters listed under the *Flora and Fauna Guarantee Act 1988*:
    - potential loss of a significant area of a listed ecological community; or
    - potential loss of a genetically important population of an Endangered or threatened species (listed or nominated for listing), including from loss or fragmentation of habitats; or
    - potentially significant effects on habitat values of a wetland supporting migratory bird species.
- Potential for extensive or major effects on landscape values of regional importance, especially:
    - where recognised by a planning scheme overlay;
    - declared as a distinctive area and landscape under the *Planning and Environment Act 1987*; or
    - within or adjoining land reserved under the *National Parks Act 1975*.
- Potential for extensive or major effects to the environment due to changes in land stability, disturbance of acid sulphate soils or project-induced soil erosion over the short or long term.

Implications

The following referral criteria are relevant to the currently proposed project:

Individual environmental effects referral criteria:

- *Potential clearing of 10 ha or more of native vegetation that consists of, or comprises a combination of:*
    - *an ecological vegetation class (EVC) classified as endangered; or*
        - Three EVCs classified as Endangered were recorded in the project area.
    - *an EVC that is classified as vulnerable (with a condition score[14] of 0.5 or more) or rare (with a condition score of 0.6 or more); and*
        - One EVC that is classified as Vulnerable and eight EVCs that are classified as Rare were recorded within the project area.

          The EVCs in some parts of the project area were considered to be in good condition so likely to score 0.6 or more. Habitat hectare assessments and the calculation of EVC condition scores were not included in the project scope. Confirmation of scores would require habitat hectare assessments to be undertaken of all EVCs with a bioregional conservation significance of Rare or Vulnerable throughout the project area. Habitat hectare

[14] The condition score, although not defined in the Ministerial Guidelines (DEECA 2023), is assumed to be the condition score calculated using the methods outlined in the Vegetation Quality Assessment Manual, Version 1.3, (DSE 2004).

assessments are undertaken by DEECA accredited habitat hectare assessors.

- *that is not authorised for removal under an approved forest management plan or fire protection plan.*
    - The planned vegetation removal is not authorised for removal under an approved forest management plan or fire protection plan.

- *Potential for loss of a significant proportion (e.g. 1 percent or greater) of known remaining habitat or population of a threatened species within Victoria.*
    - Threatened flora and fauna species habitat and populations are likely to be impacted by the proposed project. An assessment of the level of impact was beyond the scope of this EVA. A detailed environmental values assessment would be required to assess the significance of the proportion of loss. for each of the threatened species recorded and/or considered likely to occur within the project area.
- *Potential for extensive or major effects on the use and environmental values of water resources due to changes in water quality, water availability, stream flows, water system function, or regional groundwater levels, or the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.*
    - There is the potential for major effects on environmental values of water resources resulting from the proposed works as there are a number of waterways including drainage lines, creeks, rivers, fens, Alpine Sphagnum Bogs and Associated Fens within the project area. The extent of the impacts cannot be determined until the final structures (e.g. drains, track surfacing etc.), construction methods, location and extent of the proposed works are determined.

Combined (two or more) environmental effects referral criteria

- *Potential removal, destruction or lopping of 10 ha or more of native vegetation unless authorised under an approved forest management plan or fire protection plan.*
    - The current project plans would include the potential removal, destruction or lopping of 10 ha or more of native vegetation that is not authorised under an approved forest management plan or fire protection plan.
- *Matters listed under the Flora and Fauna Guarantee Act 1988*:
    - *Potential loss of a significant area of a listed ecological community; or*

    The following listed ecological communities may be impacted by the proposed works and given their rarity any amount of loss should be considered significant:

        - Alpine Bog Community;
        - Fen (Bog Pool) Community; and
        - Alpine Snowpatch Community.

    - *Potential loss of a genetically important population of an Endangered or threatened species (listed or nominated for listing), including from loss or fragmentation of habitats; or*

    There is the potential for loss of genetically important populations of Endangered or threatened species including:

- Listed flora species:
  - 65 FFG Act listed species recorded in within the impact area; and
  - an additional 71 FFG Act listed species that are considered likely to be present.
- Listed fauna species:
  - 10 FFG Act listed species recorded within the impact area; and
  - an additional 18 FFG Act listed species that are considered likely to be present.

Detailed genetic studies would be required to confirm the importance of several species populations for which such studies have not already been undertaken, or a conservative approach taken with each population considered genetically important.

- *Potential for extensive or major effects on landscape values of regional importance, especially:*
  - *within or adjoining land reserved under the National Parks Act 1975.*
    - The entire project area is situated within the Alpine National Park reserved under the *National Parks Act 1975* except for a short section within the Mount Hotham Alpine Resort boundary that adjoins the Alpine National Park. The proposed project includes potentially extensive or major effects on flora, fauna, geological and hydrological values in the Alpine National Park.
- *Potential for extensive or major effects to the environment due to changes in land stability, disturbance of acid sulphate soils or project-induced soil erosion over the short or long term.*

  The potential effects of the project include:
  - Erosion resulting from track widening along narrow ridgelines with steep sides including the Razorback, the eastern end of Diamantina Spur and the eastern end of Bungalow Spur Track.
  - Erosion caused by track widening on the Bogong High Plains through Sub-alpine Pond Herbland, Alpine Bog Communities and Fen (Bog Pool) communities which have highly erodible soils.
  - Erosion as a result of overnight node development within and near Alpine Bog Communities which have highly erodible soils including:
    - OV1 alternate;
    - OV2 preferred including the loop access track; and
    - OV2 alternate including the access track.
  - Land instability resulting from overnight node development on unstable boulder fields that may be prone to major instabilities[15] including:
    - OV2 preferred including the loop access tracks.

[15] Geotechnical advice is required to assess land stability.

        - Potentially Weston Hut existing camping area OV (requires geological risk assessment) (Rosengren 2024).
    - Erosion and land instability caused by OV construction near waterways which could be prone to flooding causing land instability and erosion including:
        - OV2 alternate including access track (Tawonga Hut Creek); and
        - OV3 Blairs Hut.

6.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the primary Commonwealth legislation for environmental protection. Under the Act, an action will require approval from the Commonwealth Minister for the Environment if it has, will have, or is likely to significantly impact on an MNES under the act (DCCEEW 2023c).

MNES include:

- Listed (nationally) threatened species and ecological communities.
- Migratory species protected under international agreements.
- Ramsar wetlands of international importance.
- The Commonwealth marine environment.
- World Heritage properties.
- National Heritage places.
- The Great Barrier Reef Marine Park.
- Nuclear actions.
- Water resources in relation to coal seam gas development and large coal mining development.

There are several MNES in the assessment area including:

- National Heritage Places:
    - The majority of the assessment area is located within the Australian Alps National Parks and Reserves, National Heritage Place; and
    - Periglacial values such as those recorded within the study area are included on the EPBC National Heritage List.
- Listed (nationally) threatened ecological communities:
        - Alpine Sphagnum Bogs and Associated Fens
- Listed (nationally) threatened flora species:
        - Shining Cudweed
        - Potentially Thick Eyebright, Bogong Eyebright and Snow Daphne.
- Listed (nationally) threatened fauna species:
        - Guthega Skink
        - Alpine She-oak Skink

- Alpine Bog Skink
- Southern Greater Glider
- Yellow-bellied Glider
- Broad-toothed Rat
- Gang-gang Cockatoo
- Potentially the Alpine Stonefly, Alpine Tree Frog, Spotted Tree Frog, Mountain Skink, Latham's Snipe, Pilotbird, Mountain Pygmy Possum, Smoky Mouse, Long-footed Potoroo and Spot-tailed Quoll.

Activities that may have a significant impact on MNES must be identified through a review of significant impact guidelines, conservation advices and individual policy statements. There are likely to be numerous proposed activities that may have a significant impact on MNES and require a referral under the EPBC Act.

Implications

A referral under the EPBC Act 1999 will be required given the number of MNES potentially impacted and the potential for significant impacts on MNES, particularly Alpine Sphagnum Bogs and Associate Fens. The listing advice for Alpine Sphagnum Bogs and Associated Fens (DAWE 2009) states:

> *The listing of the Alpine Sphagnum Bogs and Associated Fens ecological community under the EPBC Act does not prevent land managers from continuing to use land in the same way they were before the EPBC Act came into force, providing that they do not significantly change or intensify their activities (and the activity is lawful).*
>
> *National protection means any new or intensified activities that may have a significant impact on the listed ecological community should be referred to the Australian Minister for the Environment, Heritage and the Arts for assessment.*

An EPBC referral must include detailed plans of the final track alignment, width and treatment, and the location and extent of OVs, the location and type of all infrastructure and construction works that may impact natural values within each OV. A detailed environmental values assessment of potential impacts to MNES based on the final plans will be required. This must include details of activities that may have a significant impact on MNES, direct impacts as well indirect impacts, facilitated impacts (e.g. increase in visitation and impacts of recreational uses), and cumulative impacts (past and present).

6.2.1 National Light Pollution Guidelines for Wildlife (May 2023)

These National Light Pollution Guidelines for Wildlife provide technical information to guide the management of artificial light for the EPBC Act listed threatened and migratory species, species that are part of a listed ecological community, and species protected under state or territory legislation for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction.

The National Light Pollution Guidelines for Wildlife outline the process to be followed where artificial light may affect wildlife and if there is important habitat for listed species located within 20 km. They apply to new projects, lighting upgrades, and where there is evidence of wildlife being affected by existing artificial light. These guidelines provide theoretical, technical, and

practical information required to assess whether artificial lighting is likely to affect wildlife and the management tools to minimise and mitigate that effect.

The aim of the guidelines is to manage artificial light so wildlife is:

1) Not disrupted within, or displaced from, important habitat.
2) Able to undertake critical behaviours such as foraging, reproduction and dispersal.

These guidelines recommend:

1) Always using best practice lighting design to reduce light pollution and minimise effect on wildlife.
2) Undertaking an Environmental Impact Assessment (EIA) of effects of artificial light on listed species for which artificial light has been demonstrated to affect behaviour, survivorship or reproduction.

Implications

No artificial light is proposed in the FHACMP however if any artificial lighting sources area proposed as part of the detailed planning for this project, these guidelines should be consulted to ensure artificial lighting sources are managed and impacts mitigated.

6.3 Flora and Fauna Guarantee Act 1988

The FFG Act is the primary Victorian state legislation for the protection and conservation of threatened native plants, animals and ecological communities, and for the management of potentially threatening processes on public land and within waterways in the state (DEECA 2023e).

The Act includes lists of threatened flora and fauna species and threatened ecological communities, as well as a list of potentially threatening processes (DEECA 2023e and DEECA 2024).

The listing status of flora and fauna species, and the species records recorded during the preliminary assessment in 2020 have been updated in line with the FFG Act threatened species list to ensure implications for all currently threatened species are considered.

Items included on the list either have an action statement prepared or will have an action statement prepared some time in the future. Action statements set out the actions to conserve or manage the species, community or threatening process. The action statement is informed by current literature, database information and expert consultation. In 2023 and 2024 action statements will be prepared for 1020 species which is the largest number of action statements every published (DEECA 2024c).

The FFG Act also includes a list of protected flora that have legal protection under the act, comprising threatened flora species listed under the act, species included in FFG listed communities, and species that need protection for other reasons such as overcollection (see the DEECA website for current lists) (DEECA 2024a).

It is an offence to take (kill, injure, disturb or collect), trade, keep, move, or process protected flora without a permit or by Order of the Governor in Council published in the Government Gazette (GIC order), or if the above obligations do not apply (e.g. on freehold land) (DEECA 2023e).

The FFG Act was amended in 2019 (the *Flora and Fauna Guarantee Amendment Act 2019*) which came into effect on June 1, 2020 (DEECA 2023e). The updates include:

- Guidance around the implementation of the FFG Act, including the rights and interests of traditional owners and impacts of climate change.
- Requirement for government departments to properly consider potential impacts on biodiversity (see below).
- Clarification around the existing process for determination of critical habitat and protection through cooperative management (see below).
- The introduction of a national method of assessing listed threatened species using the Common Assessment Method (CAM) to create an updated threatened species list (Threatened List) (see below).
- Revised enforcement process including increased penalties.

Public authority duty

The revised act includes a requirement for public authorities and the relevant ministers to consider potential biodiversity impacts when performing their duties (DELWP 2021). This includes consideration of the Biodiversity Strategy, management plans or critical habitat determinations and relevant Action Statements (if available) (DEECA 2023e). The actions statements prepared between 2023 to 2024 for species recorded within the study area will need to be reviewed when they become available.

Different types of impacts on biodiversity must be considered, including:

- Long and short-term impacts.
- Detrimental and beneficial impacts.
- Direct and indirect impacts.
- Cumulative impacts.
- Potentially threatening processes.

Ministerial guidelines are being developed to provide practical steps to assist public authorities and ensure biodiversity is given proper consideration (DEECA 2023e).

The Act aims to protect threatened species and communities from direct impacts such as habitat clearing which must have approval (DEECA 2023e). The public authority may also be required to provide information to the Minister for DEECA to demonstrate that their duty is being performed or that actions do not threaten listed species, communities, or critical habitat (DEECA 2023e).

Determination of critical habitat

The determination of critical habitat is a process that will involve a decision being made by the state Minister for Environment with input by the Scientific Advisory Committee (SAC) and in consultation with stakeholders through a public consultation period. Currently, no standing determinations of critical habitat have been made.

Updated FFG Act Threatened List

Prior to June 2020, threatened species were classified in one of three Victorian Advisory Lists: Advisory List of Rare or Threatened Plants in Victoria, Advisory List of Threatened Vertebrate

Fauna, and the Advisory List of Threatened Invertebrate Fauna in Victoria. The amendments to the FFG Act included a review of the advisory lists using the Common Assessment Method (CAM) to provide a consolidated list of species listed under the FFG Act (the Threatened List) consistent with the conservation status classifications under the EPBC Act. The consolidated list replaces the advisory lists which were revoked and is known as the 'FFG Act Threatened List' (DEECA 2023e).

EPBC ACT and FFG ACT threatened criteria categories

The CAM was adapted from best practice standards developed by the International Union for Conservation of Nature (IUCN). The CAM therefore uses IUCN criteria, thresholds and definitions. The categories include:

- **Critically Endangered**: considered to be facing an extremely high risk of extinction in the wild.
- **Endangered**: considered to be facing a very high risk of extinction in the wild.
- **Vulnerable**: considered to be facing a high risk of extinction in the wild.

Protected flora

The protected flora list has been reviewed under the amended FFG Act and there will be two categories each with different penalties if the Act is not adhered to. They include 'restricted use protected flora' and 'generally protected flora' (DEECA 2023e).

Implications

Threatened flora

Sixty five FFG Act listed species recorded within the project assessment area are likely to be impacted by the proposed works and there is the potential that an additional 72 FFG Act listed species may be impacted as suitable habitat for these species was identified within the project assessment area.

Protected flora

As the project area is located on public land the FFG Act applies. One hundred and seventeen plant species that are protected flora under the FFG Act were recorded during the field assessment and a protected flora permit will be required to remove them. A list of protected flora in each proposed section of track and each proposed OV is provided in Appendix 8 (as of February 2024). This list will need to be reviewed for changes (which occur from time to time) and updated when the project scope is finalised.

Threatened vegetation communities

Three FFG Act listed vegetation communities may be impacted by the proposed project including Alpine Bog Community, Fen (Bog Pool) community and Alpine Snowpatch Grassland.

Threatened fauna

Twenty-seven threatened fauna species listed under the Act have potential to be impacted by the FHAC proposal, which includes 10 listed species recorded within the project area and habitat for an additional 17 listed threatened fauna species (as of February 2024). Threatened species listings

are updated from time to time so this list will need to be reviewed and updated when the project scope is finalised.

Threatening processes

As public land managers, PV have a legislative obligation to manage and mitigate threatening processes. The potentially threatening processes listed under the FFG Act that may occur as a result of the project or be increased by the project include:

- Alteration to the natural flow of rivers and streams.
- Degradation of native riparian vegetation along Victorian rivers and streams.
- Habitat fragmentation as a threatening process for fauna in Victoria.
- High frequency fire resulting in disruption of life cycle processes in plants and animals and loss of vegetation structure and composition.
- Inappropriate fire regimes causing disruption to sustainable ecosystem processes and resultant loss of biodiversity.
- Increase in sediment input into Victorian rivers and streams due to human activities.
- Infection of amphibians with chytrid fungus, resulting in chytridiomycosis. Infection by the Amphibian Chytrid Fungus has been identified as a threat to the Alpine Tree Frog *Litoria verreauxii alpina* (Clemann and Gillespie 2011).
- Invasion of native vegetation by Blackberry *Rubus fruticosus* L. agg.
- Invasion of vegetation by 'environmental weeds'.
- Loss of coarse woody debris from Victorian native forests.
- Loss of hollow-bearing trees from Victorian native forests.
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases.
- Prevention of passage of aquatic biota as a result of the presence of instream structures.
- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority.
- Use of *Phytophthora*-infected gravel in construction of roads, bridges and reservoirs.
- Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.

As there are likely to be direct impacts to a high number of threatened Victorian species and communities (vegetation and habitat removal) listed under the FFG Act resulting from the planned works, it is recommended that the project is referred to DEECA for approval when the proposed alignment and locations of OVs are finalised. This is to ensure compliance with the amended FFG Act and to avoid potential penalties. These matters are also considered under the EE Act, and PV has advised that they have commenced consultation with DEECA.

If a species has an Action Statement, it should be considered when assessing impacts and potential avoidance/mitigation measures.

If ministerial guidelines become available, they should be followed to ensure biodiversity is given due consideration.

6.4 National Parks Act 1975 and National Parks (Wilderness) Act 1992

The Alpine National Park is designated under Schedule 2 of the *National Parks Act 1975* (NP Act) which is the Victorian legislation for the protection and management of national and other protected parks across the state (NPA 2020). It is also covered by Public Land Management Overlays designated under Schedule 6. The NP Act also covers the protection of remote and natural areas (NPA 2020). Section 21C of the Act, 'Protection of remote and natural areas' requires PV to control and manage each remote and natural area in accordance with the Act to protect and preserve the natural environment, including indigenous flora and fauna, and features of ecological, geological, scenic, archaeological, historic or scientific significance (NPA 2020).

Sections of track of the proposed FHAC pass through a remote and natural area; the Bundara-Cobungra RNA and pass nearby the Bogong RNA. Parks Victoria must ensure that in these areas:

- No new vehicle tracks are established;
- Existing vehicle tracks are not upgraded to carry heavier vehicles;
- No new structures are constructed;
- No new facilities are installed;
- No works are carried out including (but not limited to):
    - Excavation works; and
    - The destruction, removal or lopping of vegetation.

In addition, under the *National Parks (Wilderness) Act 1992* the following applies under Section 21D 'Management of remote and natural areas', subject to conditions and restrictions (NPA 2020):

- Lawful uses of the land existing prior to the land being included as a remote and natural area may continue;
- Lawful activity or works begun on the land prior to it being included as a remote and natural area may continue;
- Structures lawfully constructed on the land prior to it being included as a remote and natural area may be used for their intended purpose; and
- Any works lawfully carried out on the land prior to it being included as a remote and natural area may continue to be carried out for their intended purpose.

In a remote and natural area, anything necessary may be undertaken for:

- The eradication or control of non indigenous flora and fauna; or
- Protection of the natural environment; or
- Health and safety of the public; or
- Prevention or control of fire; or
- Dealing with emergencies relating to disease.

With ministerial approval, actions may be undertaken that:

- Are essential for the responsible management of a remote and natural area; or
- Are necessary to be done in the public interest, in relation to a remote and natural area; and
- Do not substantially degrade the natural condition or appearance of the area.

Loss or degradation to the natural condition or appearance of the remote and natural area must be minimised through rehabilitation or other work if:

- The loss or degradation has resulted or is likely to result from activities under this Section; or
- There is evidence of increasing disturbance of the natural condition or appearance of the area, however caused.

Implications

Part of the proposed FHAC runs through the Bundara-Cobungra RNA. Any works in this area would need to be for the purpose of protecting significant and sensitive vegetation such as Sub-alpine Pond Herbland, Alpine Sphagnum Bogs and Associated Fens/Alpine Valley Peatland/Alpine Bog Communities, Fen (Bog Pool) Community and threatened flora and fauna species (not for the construction of walking tracks). These communities and threatened species are being impacted by hikers and horses using the existing walking track. Some track works to mitigate such impacts may be permitted in line with the legislation and should be considered.

6.5 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (the CaLP Act) is administered by Agriculture Victoria (AV 2020b). The purpose of the Act is to protect primary production, Crown land, the environment and community health from the effects of noxious weeds and pest animals. Under the Act, all landowners and managers have legal obligations regarding the management and control of declared noxious weeds and pest animals on their land.

There are four categories of noxious weeds under the CaLP Act: State Prohibited, Regionally Prohibited, Regionally Controlled and Restricted. The Victorian Government is responsible for managing State Prohibited weeds. They either do not occur in Victoria or if present, can be expected to be eradicated. Landowners/occupiers must take all reasonable steps to eradicate Regionally Prohibited weeds and manage the growth and spread of Regionally Controlled weeds on their land. The trade in Restricted weeds or their propagules (plants, seeds, contaminants in other materials) is prohibited.

Under the CaLP Act, landowners/occupiers have a legal duty to prevent the spread of, and as far as possible, eradicate established pest animals. There are four categories of pest animals: Prohibited, Controlled, Regulated (collectively referred to as Restricted pest animals), and Established pest animals. Restricted pest animals are not established in the wild in Victoria but have the potential to become a serious threat to primary production, Crown land, the environment or community health in Victoria, and cannot be kept without a permit. Established pest animals pose the same threat but are established in the wild in Victoria. Landowners/occupiers have a responsibility to prevent their spread and where possible, eradicate established pest animals.

The European Rabbit **Oryctolagus cuniculus* and European Hare **Lepus europaeus* are present in the assessment area, and the Red Fox **Vulpes vulpes* is the most common introduced predator

found above the winter snowline (Green and Osborne 2012). The European Rabbit (feral or wild populations), European Hare and Red Fox are declared (established) pest animals under the CaLP Act. Other established pest animals with relevance to the assessment area include wild dogs and cats (feral or wild). All of these species are also priority pest animals in Victoria (AV 2020b).

Landowners/occupiers have a legal responsibility under the CaLP Act to undertake ongoing control measures to prevent the growth and spread of these weeds and pest animals on their land.

In addition, under the *Parks Victoria Act 1988* as well as the CaLP Act, the chief executive officer has park responsibilities in relation to managing noxious weeds and pest animals on PV managed land as the director of National Parks under the NP Act (AV 2020b) which includes much of the assessment area.

Implications

Four Restricted and five Controlled CaLP Act listed weeds were recorded in the assessment area. As land public managers, PV is responsible for controlling declared noxious weeds in the Alpine National Park. The Mount Hotham Alpine Resort Management Board is responsible for managing weeds on crown land within the Mount Hotham Alpine resort.

In addition, there are management priority weeds that are a threat to the Alpine National Park such as Hawkweeds **Pilosella* species (PV 2016). These weeds were not recorded in the assessment area and adequate vehicle, footwear, equipment and clothing hygiene protocols will need to be implemented to reduce the risk of these weeds being spread into the project area. If management priority weeds do appear they will need to be managed.

Five or more established pest animals are also known or likely to occur in the assessment area, and are required to be managed with the aim of preventing their spread and a far as possible, eradicating them from affected land.

6.5.1 Declared water supply catchment

Many catchments supplying water for domestic, irrigation or other purposes within Victoria are protected under the CaLP Act (AV 2020c). These catchments have significant values as a source of water for both stock and domestic use (AV 2020c). Once a catchment is Declared, approvals for activities conducted under other statutes and statutory planning schemes must be referred to the responsible land management authority (water authority, CMA or DEECA) for approval (AV 2020c). Information provided in a referral assists planners and those managing land disturbance or development activities to readily determine the suitability of proposed activities within these catchment areas (AV 2020c).

Implications

The majority of the FHAC track is located within the Upper Kiewa Declared Water Supply Catchment and Bungalow Spur Track is located in the Ovens River (Bight) Water Supply Catchment (AV 2020c). Therefore, approval will be required from the relevant water authority, North East CMA or DEECA.

It is likely that further design details will be required for both the proposed track and OVs prior to seeking approval from relevant authorities. Potential conditions of approval from relevant

authorities may include the determination of appropriate waterway buffers and wastewater management requirements (e.g. self-contained waste water systems).

6.6 Water Act 1989

The Water Act provides a legal framework for managing Victoria's water resources (MW 2020). The main purpose of the Water Act is to:

- Promote the equitable and efficient use of our water resources;
- Make sure our water resources are conserved and properly managed for the benefit of all Victorians; and
- Increase community involvement in conserving and managing our water resources.

Under the Act, the CMAs are responsible for regulating works on waterways. The regulation of works on waterways is managed through Works on Waterways Permits. These permits are required for any works or activities in, under, on, or over the bed and banks of a designated waterway in Victoria (North East CMA 2020). The FHAC track is located within the North East CMA region.

Designated waterways can be named or unnamed, permanent or seasonal, and range in size from major rivers to natural depressions or ephemeral drainage lines. Designated waterways are declared under the *Water Act 1989*. The North East CMA has maps of designated waterways in their region, and the CMA will need to be consulted to confirm which of the potential waterway crossings are located on designated waterways (North East CMA 2020).

Some examples of works and activities that are potentially relevant to the proposed track which require a permit include, but are not limited to:

- Waterway crossings, including bridges, fords, and culverts;
- Stabilisation works;
- Services/utility crossings; and
- Stormwater outlets.

To obtain a Works on Waterway Permit, an application form must be completed and submitted to the North East CMA. Depending on the complexity of the works detail provided in the application, the North East CMA may request additional information in order to assess the application. When the application and proposed works are deemed satisfactory, a permit will be issued. Once a permit is received, the North East CMA must be notified at least seven days prior to starting the works and at the completion of the works. A Works on Waterway Permit will generally be valid for 12 months from the date of issue (North East CMA 2020).

Implications

Parks Victoria should consult the North East CMA to identify which waterways are designated waterways within the planned FHAC, and any requirements for a Works on Waterways permit.

6.7 Wildlife Act 1975 and Wildlife Regulations 2002 (Victoria)

The *Wildlife Act 1975* and Wildlife Regulations 2002 is the primary legislation in Victoria providing for the management and protection of wildlife. The objectives of the Act are to

regulate potential harm to, the taking, destruction and control of native wildlife, inform the conduct of those involved in working with wildlife, establish procedures for the protection and conservation of wildlife, and assist in preventing species extinctions. Controls for threatened fauna species listed under the FFG Act (apart from listed fish and invertebrates) are also applied under the Wildlife Act.

Implications

Management Authorisation under the Wildlife Act will be required before undertaking any actions likely to interfere with protected native fauna, including the salvage and release of animals from the works areas.

6.8 Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria. The removal of native vegetation in Victoria is regulated under the Act through local government planning schemes. Within the state, a permit is required to remove, destroy or lop native vegetation. Planning proposals that may impact native vegetation are governed by two provisions: Clause 52.16 *Native vegetation precinct plan* and Clause 52.17 *Native vegetation*, which are incorporated into all Victorian planning schemes under the Act.

6.8.1 Alpine Shire Council, East Gippsland Shire Council and Alpine Resorts planning schemes

The FHAC assessment area starts at the boundary of the Falls Creek Alpine Resort and finishes inside the boundary of Mount Hotham Alpine Resort. It is located on Crown Land and is not covered by a native vegetation precinct plan, so Clause 52.16 does not apply (DEECA 2023d).

The purpose of Clause 52.17 of the Alpine Resorts, Alpine Shire and East Gippsland Shire planning schemes (and all planning schemes) is to prevent net loss to biodiversity caused by the removal, destruction or lopping of native vegetation. This is achieved through the three-step approach to achieve avoidance and minimisation (DELWP 2017a and DEECA 2023d).

Avoidance and minimisation

Under Clause 52.17 of all Planning Schemes, the three-step approach must be applied in accordance with the Guidelines (DELWP 2017a and DEECA 2023d):

… to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation:

1. *Avoid the removal, destruction or lopping of native vegetation.*
2. *Minimise impacts from the destruction or lopping of native vegetation that cannot be avoided.*
3. *Provide an offset to compensate for the biodiversity impacts from the removal, destruction or lopping of native vegetation.*

Under Clause 52.17-2, a planning application to remove, destroy or lop native vegetation must fulfill requirements under the Guidelines unless an exemption applies (DELWP 2017a).

As the assessment area is situated on Crown Land and PV are undertaking the works, the Crown Land Exemption applies, and a permit is not required under Clause 52.17 to remove, destroy or lop native vegetation. Details of the Exemption are provided in Section 6.8.2.

6.8.2 Crown land exemption

Under Clause 52.16 and Clause 52.17, there is a *Crown land exemption* and a *Road safety exemption* from requiring a permit to remove native vegetation by PV or DEECA on Crown land (DELWP 2017b). To rely on these exemptions, the removal of native vegetation must be kept to a minimum (DELWP 2017b).

The document "*Exemptions from requiring a planning permit to remove, destroy or lop native vegetation — Guidance*" (DELWP 2017b), the Alpine Shire planning scheme and East Gippsland Shire planning scheme provisions outline exemptions from requiring a planning permit to remove, destroy or lop native vegetation under Clause 52.17-7 'Table of exemptions' (Planning Victoria 2020), which states that:

> *The requirement to obtain a permit does not apply to:*
>
> ***Crown land***
>
> *Native vegetation that is to be removed, destroyed or lopped to the minimum extent necessary to manage Crown land:*
>
> - *Crown land by or on behalf of the Secretary to the Department of Environment, Land, Water and Planning* (now DEECA) *(as constituted under Part 2 of the Conservation, Forests and Lands Act 1987), or Parks Victoria, and in accordance with the Procedure for the removal, destruction or lopping of native vegetation on Crown land;*
> - *Or with written permission from the Secretary to the Department of Environment, Land, Water and Planning (as constituted under Part 2 of the Conservation, Forests and Lands Act 1987).*

PV must comply with the *Procedure for the removal, destruction or lopping of native vegetation on Crown land — For use by the Department of Environment, Land Water and Planning and Parks Victoria* (Procedure) (DELWP 2018b) to rely on the Crown land and Road safety exemptions under Clause 52.16 and Clause 52.17 of the planning schemes. The Procedure is endorsed by the Secretary to DEECA under Part 2 of the *Conservation Forest and Lands Act*.

The Procedure applies to the removal of all native vegetation by DEECA and PV on Crown Land and is classified as either maintenance or new removal of native vegetation (DELWP 2018b).

Maintenance includes the removal of native vegetation that:

- Has re-established in an area where native vegetation was previously lawfully removed.
- Is encroaching on existing assets and/or maintenance areas.
- Is required to address immediate risk to life or assets.
- Relates to conservation works that provide an overall improvement for biodiversity[16].
- Relates to planned burning.

[16] In accordance with the conservation exemption in Clause 52.17 of all planning schemes

The new removal of vegetation is defined as:

- Any native vegetation removal that is not a maintenance activity as described above.
- Includes the removal of native vegetation in areas where there is an expansion of an existing works or asset footprint, or where new works or assets are constructed (DELWP 2018b).

As with Clause 52.17, a strategy of avoidance and minimisation must be followed, with the Procedure placing a strong emphasis on avoiding and reducing impacts on important biodiversity values outlined in the Procedure (DELWP 2018b).

The Procedure requires consideration of important biodiversity values (as relevant to this project) such as:

- Known critical/important habitat, Endangered EVCs or species locations;
- VBA records for threatened species;
- Important habitat for threatened species whose habitat is dispersed;
- Highly localised habitat for threatened species; and
- Endangered EVCs.

The Procedure provides some approaches to minimising impacts of native vegetation removal. Those that may apply to the FHAC (DELWP 2018b), include:

- Locating activities, use or development in areas with no or low value native vegetation;
- Designing the activity or development to minimise its footprint;
- Placing buildings close to existing roads or close together to minimise the length of new roads or pathways;
- Measures to minimise off-site impacts to the surrounding environment, for example sediment runoff resulting from soil erosion; and
- Using a vegetation removal method that causes minimal impacts on native vegetation. Generally using hand-held tools rather than machinery or herbicides assists with minimising impacts.

Other considerations for minimisation include:

- Whether there is a way to undertake the management activity without removing any native vegetation;
- Whether one management activity can be used to meet multiple objectives, for example, an access track may also serve as a fuel break;
- Only removing vegetation that is necessary to allow the undertaking of the activity, use or development; and
- Ensure those acting on behalf of DEECA and PV, such as contractors, understand their obligations under this Procedure.

The removal of vegetation and resultant loss of biodiversity on Crown land by Parks Victora is to be counterbalanced by actions to improve native vegetation condition, extent or security. Counterbalancing actions also include activities beyond improvement of vegetation condition such as improving waterway habitat.

Implications

Parks Victoria is exempt from requiring a permit to remove native vegetation for the redevelopment of the FHAC under Clause 52.17 of the Alpine Shire and Alpine Resorts Planning Schemes but will still need to demonstrate avoidance or minimisation.

Avoidance and minimisation

Avoidance of any native vegetation removal cannot be achieved under the current project plan so minimisation will need to be demonstrated to reduce impacts on native vegetation.

Counterbalancing

No activities have been proposed that would counterbalance the planned impacts on native vegetation of the proposed FHAC development.

6.8.3 Zones and overlays

The FHAC assessment area is located across three local government areas, the Alpine Shire, the East Gippsland Shire and the Mount Hotham Alpine Resort which is managed by the Mount Hotham Alpine Resort Management Board (Appendix 1a). The assessment area is covered by a number of zones and overlays which stipulate planning requirements that must be met (Table 19) (Appendix 1a).

Table 19. Local government areas, resort management boards, planning zones and overlays that apply to the FHAC assessment area (DEECA 2023d)

Local Government Area	Zone	Zone code	Requirements
Alpine Shire Council	Public Conservation and Resource Zone	PCRZ	A permit is required to construct a building or carry out works under the PCRZ in the Alpine Shire and East Gippsland Shire, and may be required for the construction of the proposed FHAC track and OVs.
East Gippsland Shire Council	Public Conservation and Resource Zone	PCRZ	
Alpine Shire Council	Bushfire Management Overlay	BMO	There are OVs proposed within the Alpine Shire and East Gippsland Shire in areas covered by a BMO (Appendix 1a). Construction of proposed overnight accommodation may need to meet requirements under Clause 44.06-2 'Permit requirement' which states that a permit may be required to construct or carry out works associated with accommodation or leisure and recreation (DEECA 2023d). A permit application must be accompanied by a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire statement, and may also need to meet other conditions (DEECA 2023d). These conditions may be waived, varied or reduced in agreement with the responsible authority (DEECA 2023d).
East Gippsland Shire Council	Bushfire Management Overlay	BMO	
Mount Hotham Alpine Resort (Uninc)	Public Park and Recreation Zone	PPRZ	The western part of the assessment area within the Mount Hotham Alpine Resort is situated within the PPRZ. No requirements were identified for the FHAC under this this zoning.
Mount Hotham Alpine Resort (Uninc)	Comprehensive Development Zone - Schedule 2	CDZ2	The last c. 500 m of the planned FHAC is located within the CDZ2 in the Mount Hotham Alpine Resort. Under the CDZ2 a planning permit may be required for the removal of native vegetation (DEECA 2023d). The permit application must be accompanied by a plan for 'building and works', 'native vegetation', and by a 'site environmental plan' which provides information outlined in Schedule 2 to Clause 37.02 'Comprehensive Development Zone' (Appendix 1a) (DEECA 2023d).

Local Government Area	Zone	Zone code	Requirements
Mount Hotham Alpine Resort (Uninc)	Transport Zone 2	TRZ2	No requirements were identified under the TRZ2 within the Mount Hotham Alpine Resort.
Mount Hotham Alpine Resort (Uninc)	Erosion Management Overlay - Schedule 1	EMO1	Approximately 1 km of the proposed track between the Mount Hotham Alpine Resort and Mount Hotham is covered by an EMO1. Under this overlay, either a permit or a site development plan may be required to remove, destroy or lop native vegetation (DEECA 2023d). The permit must meet application requirements outlined in Clause 44.01-6 of the EMO (DEECA 2023d). Alternatively, a site development plan can be prepared and provided to the satisfaction of the responsible authority (DEECA 2023d). The site development plan must meet the requirements outlined in Schedule 1 to Clause 44.01 Erosion Management Overlay which includes a Preliminary Geotechnical Assessment (DEECA 2023d).
Mount Hotham Alpine resort (Uninc)	Bushfire Management Overlay - Schedule 1	BMO1	The entire Mount Hotham Resort is covered by a BMO1, and a permit is required to construct a building or carry out works associated with a number of uses, one of which is 'leisure and recreation' (DEECA 2023d). A permit application must be accompanied by a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire statement (DEECA 2023d).

Implications

Parks Victoria will need to consult with the Alpine Shire Council, East Gippsland Shire Council and the Mount Hotham Resort Management Board to confirm their permit requirements, in particular, requirements under the BMO for a bushfire hazard site assessment, a bushfire hazard landscape assessment and a bushfire management statement.

7 Recommendations

The environmental assessment indicates that implementation of the current FHACMP could impact federal and state listed flora, vegetation communities, and fauna habitat of conservation significance. A number of waterways are also likely to be affected which could impact soil stability, cause erosion and impact water quality in the assessment area and downstream. Significant geological feature would also be impacted. The following recommendations are provided to assist with the progress of the project planning to avoid or minimise environmental impacts.

7.1 Track design and construction

7.1.1 Overview

These are general recommendations only, and qualified, experienced track designers will need to be consulted to develop effective design options based on those used elsewhere in similar environs (e.g. alpine parks in Tasmania and New South Wales).

Ecologists with appropriate alpine experience should be involved in the design process to ensure impacts on biodiversity are minimised.

7.1.2 Track realignment

The option to realign the existing track around significant communities such as Sub-alpine Pond Herbland and Alpine Bog Community that are highly susceptible to impacts from hikers and horses was examined and is not recommended.

These communities extend for hundreds of metres beyond the assessment area. Building a track around these communities (or realigning the track elsewhere along the FHAC alignment) would entail a significant amount of vegetation removal and destruction, substrate disturbance and associated impacts of soil erosion, potential waterway sedimentation, altered hydrology and wetland impacts, and facilitation of weed invasion. In some locations it may also impact sites of geomorphological significance.

Any track realignment works should be limited to that necessary for the protection of natural values, for example positioning of discrete waterway crossings in more stable/robust locations (e.g. a straight section of waterway or bedrock-controlled areas).

7.1.3 Track widening

If a decision is made to construct new sections of track or widen existing sections of track, then the recommended average track width is 600 mm (or less) rather than the 900 mm outlined in the FHACMP. This may still be a comfortable width for people to walk on but would minimise and avoid some clearing of vegetation and habitat for threatened fauna.

Limit widening of existing tracks to where this may protect natural values, for example:

- Areas already damaged by off-track walking, which may serve to improve track definition and deter hikers from walking off-track; and
- In some locations up on the Razorback and a section of track near Cope Saddle Hut on the Bogong High Plains and near the Cope West Aqueduct and SEC hut (Image 121), walkers have diverged creating two tracks. It is recommended that PV close additional tracks and

define and retain one track to reduce impacts to vegetation and fauna habitat (including habitat for some threatened fauna species).

It is recommended to use existing vehicle tracks to achieve the objective of providing wider tracks. This may not require construction works that would impact environmental values.

Image 121. View toward Cope Saddle Hut (SEC Hut) showing a secondary track parallel to the main track which is marked by a snow pole and located on higher ground further from the aqueduct (out of frame to the south) (December 2020), (Image credit: Louise Rodda)

7.1.4 Track surface

The rubber matting surface on sections of the existing track appeared to have less impact on biodiversity than the other track surface treatments applied in the proposed project area. Native vegetation was observed growing right up to and over the edges of the rubber mats, and some persisted in the grid openings. There was very little bare ground or erosion around rubber mats and as a result, fewer weeds. The grid openings allow water penetration, and the matting is fixed in place so is not likely to move or wash away.

Drawbacks of using rubber matting include potential destruction by fire and the large clean-up effort that would then be required. Even in the absence of fire, eventual deterioration may require significant efforts to remove the rubber to avoid it littering the landscape and eventually making its way into waterways. Black rubber matting may also attract skinks seeking warm places for basking which can lead to them being inadvertently trampled on and killed by hikers, as has been observed by PV staff (Dr. Mark Antos, Parks Victoria, pers. obs.).

Unlike the rubber matting, river pebbles did not support vegetation growth along the path where they remained intact. In places, the pebbles had also moved, leaving exposed bare ground which may then result in weed establishment and erosion. There is a risk that river pebble material may also carry Cinnamon Fungus *Phytophthora cinnamomi* into sites, so they are not a recommended substrate unless they can be sterilised before delivery. The use of *Phytophthora*-infected gravel in the construction of roads, bridges and reservoirs is a threatening process listed under the FFG Act, and PV as public land managers are responsible for managing this threat. River pebbles are fire resistant and are unlikely to deteriorate significantly over time.

Stepping stones are probably the most permanent and stable substrate for wet areas, however different people require different spacing of steps to walk on them comfortably, so they would need to be positioned with this in mind to avoid off-track walking which was observed beside some basalt stepping stones.

Logs are not recommended as a track treatment due to their potential to deteriorate more quickly than other materials, and there was evidence of off-track walking adjacent to parts of the track stabilised with parallel logs. The log surfaces were difficult to walk on and would not be fire resistant.

Steel bridges have been used as waterway crossings in the assessment area and may offer an option to manage impacts on flora, sensitive and significant plant communities, and threatened fauna habitat through good design. This could include long spans between footings to reduce soil and vegetation disturbance during construction. Steel grids may offer a solution that is strong enough to take the weight of snow, allows snow melt to drain away, allows water and light to reach vegetation below, and may withstand fire. This is one track treatment option that could be considered to protect fragile significant and listed vegetation communities. However, installation of steel bridges and associated construction works may significantly impact vegetation and geological features of significance and cause soil disturbance resulting in erosion, leading to the sedimentation of waterways and destruction of fauna habitat.

Any track surfacing should include remediation of sections of channelised track created by hikers and horses.

During the design phase, consideration should be given to the potential effects of introducing perches or clearings that predatory birds could exploit to increase predation on reptiles and other terrestrial fauna in these habitats. Avoiding elevated structures such as handrails is recommended to minimise this risk.

Bridging design and installation anywhere along the proposed FHAC should be undertaken in consultation with scientists/ecologists who have extensive knowledge of alpine flora and fauna, working in collaboration with the track designers and engineers. Engineers, designers, geotechnical consultants, and geomorphologists and are best placed to advise on workable design options and requirements for specific locations dictated by slope, soil, bedrock, landscape aesthetics etc. Ecologists can advise on ecological implications of design options as they are developed (e.g. reducing bird perching opportunities mentioned earlier). This exchange of information during the design process should assist in the development of workable options to minimise environmental impacts.

7.1.5 General track drainage recommendations

The track surface and drainage should be managed along the entire route to protect receiving waterways from sediments resulting from erosion. Physical damage to the waterways will also need to be avoided. Waterway treatments must consider direct impacts to the edges of riparian and threatened bog habitats that may be used by threatened fauna species, as well as indirect impacts from sedimentation.

Particular caution is needed to avoid indirect impacts from the construction and future use of water crossings on threatened aquatic and amphibious fauna occurring downstream of the assessment area. This includes the Spotted Tree Frog in the West Kiewa River valley and members of the Mountain Galaxias species complex in creek systems on the Bogong High Plains and elsewhere. This is additionally important as some of the aquatic species yet to be confirmed

from the assessment area or pending identification could be highly range-restricted, so impacts to tributaries where they occur could affect a significant portion of the population.

The concentration of water flow along or next to the track could result in the degradation (erosion) of the track and surrounding environment. The following general principles are recommended to manage drainage along the alignment and are based on the proposed track arrangement (i.e. a formalised 900 mm wide track) provided in the FHACMP:

- Investigate appropriate drainage arrangements for all track sections. Appropriate drainage arrangements will depend on the final track design;
- Minimise erosion and scouring risk with appropriate reinstatement of any vegetation removed during construction along the track (e.g. clumps of indigenous *Poa* tussock grasses); and
- Where the existing track is retained (e.g. 300-400 mm wide with rubber matting or similar), the extent of drainage infrastructure should be kept to a minimum and aim to avoid the concentration of runoff along or adjacent to the track.

These recommendations are general in nature and should be reviewed and refined in the updated scope of works.

7.1.6 General waterway crossing design principles

In general, most waterway crossings will have some influence on the hydrologic, hydraulic and physical conditions surrounding the crossing site. However, suitably designed and constructed waterway crossings need to consider the long-term stream dynamics and hydrologic and hydraulic conditions at the crossing site to minimise potential impacts. The failure to do so potentially risks long-term physical damage to the surrounding waterway, and potential damage to, and/or failure of the crossing structure.

The following general principles are recommended for the construction of waterway crossings and are general in nature. They should be reviewed and refined as more detailed design information becomes available.

It is recommended that a suitably qualified waterway engineer and geomorphologist is involved in the design of the waterway crossings to ensure the crossings do not negatively impact on waterways.

The proposed track arrangement commonly intersects waterways along its length. As a result, there will be numerous waterway crossings that will need to be incorporated into the track.

Possible waterway crossing types include:

- Low profile ford crossings (typically earthen or rock lined crossings/stepping stones that do not incorporate a culvert);
- Pipe culverts;
- Box culverts; and
- Bridges (inclusive of raised walkways).

The key design considerations, advantages and disadvantages of each of these options is provided in Appendix 7.

Many of the existing waterway crossings can be retained. Where new water crossings are required, the crossing type will need to be determined on a site-by-site basis. However, in general, culverts should typically be avoided for the following reasons:

- Culverts have the potential to catch debris and therefore exacerbate impacts associated with increased afflux upstream of the crossing and maintenance requirements;
- Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing;
- Culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure;
- Culverts could prevent the passage of fish and other aquatic fauna through the crossing; and
- Culverts typically restrict bed load sediment transport through the structure.

Additional recommendations:

- Construction activities should be managed to avoid initiating stream bed or bank erosion. This can be achieved by:
    - Generally ensuring that any works in the bed of the waterway are designed not to lower the existing invert (level) of the stream bed;
    - Returning the stream invert to its pre-works level if excavation works are necessary;
    - Minimising disturbance to the stream bed and banks during construction activities; and
    - As required, placing appropriate rock protection within the stream bed both upstream and downstream of any crossing structure (e.g. pipe or box culvert) for scour protection. We recommend the rock lining arrangements be designed by a suitably qualified engineer. However, the placement of rock beaching or any other methods used to stabilise banks around waterway crossings must involve strict controls to prevent sediment accumulating on the adjacent stream bed.
- The location of all crossings should be sited on a stable section of stream. As such, some minor track realignment may be required. For example:
    - Infrastructure or crossings placed upstream of a knickpoint (a bed erosion feature) should consider the potential for that knickpoint to migrate upstream and harm assets such as crossing infrastructure.
    - Generally, all track crossings should be aligned so that the crossings are perpendicular to the mainstream flow path where practicable.
    - Infrastructure or crossings placed near a waterway should generally not be placed close to an outside bend unless suitable protection is provided.
- Incorporate appropriate drainage arrangements for crossings. Appropriate drainage arrangements include:

  - Ensuring that runoff from access tracks leading to the crossing, other than from the battered access ramp excavated into the stream banks, is diverted away from the waterway into vegetated verges adjacent the waterway; and
  - Drainage lines associated with access tracks leading to the crossing should be armored with rock lining to prevent scouring.
- Ensure that sufficient erosion control measures are implemented to prevent sediment generated from construction activities entering the waterway or moving downstream. This includes sediment fencing buried at its base or adequately weighted down along its entire length to stop sediment from seeping underneath, and/or the use of silt bags or socks as necessary.
- Constrictions to the floodplain and channel cross-sectional area associated with a crossing have the potential to increase the hydraulic forces and erosion potential within the vicinity of the crossing. Where such works are proposed, we recommend that:
  - Appropriate scour protection works (rock armouring of the stream bed and banks) are incorporated into the works; and
  - Any rock lining arrangements are designed by a suitably qualified engineer and informed by ecological considerations, including preventing sediment from accumulating on the streambed. Appropriate rock armouring will also be required where crossing structures are designed to be overtopped during high flow events.
- Although outside of the Melbourne Water region, Melbourne Water's Shared Pathway Guidelines (MW 2009) may provide relevant guidance for shared pathway design adjacent to waterways that may be useful for the proposed track (Section 7.1.7).

Installation of drainage arrangements and water way crossings including flood risk management outlined below in section 7.1.7 may significantly impact vegetation, fauna habitat and geological features of significance and cause erosion, leading to sedimentation of waterways and destruction of habitat for riparian fauna including threatened species. Drainage and waterway crossing design and installation anywhere along the proposed FHAC should be undertaken in consultation with scientists/ecologists who have extensive knowledge of alpine flora and fauna, working in collaboration with the track designers and engineers.

7.1.7 Flood risk management

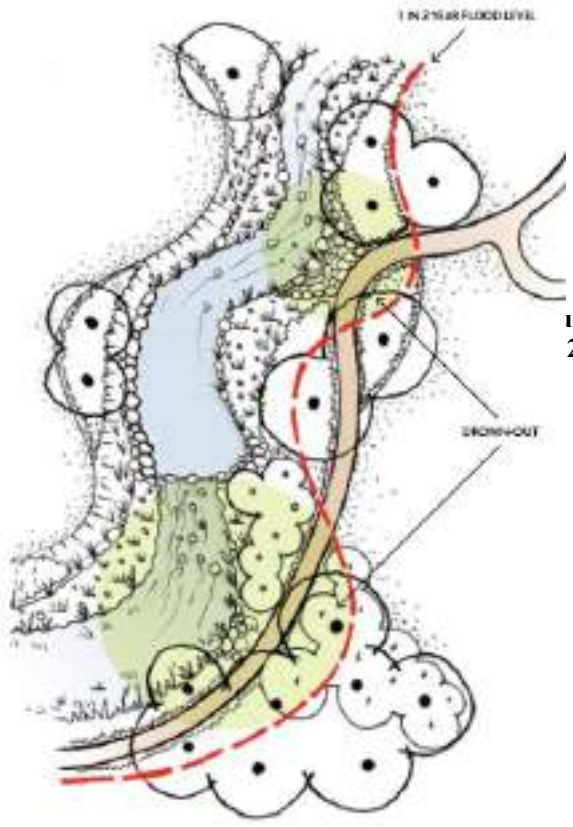
The design of the track should identify measures to ensure the safety of path users, including how access to sections of the path liable to flooding at the 10% annual exceedance probability (AEP)[17] event level will be prevented in high flow events.

While the entirety of its final alignment is yet to be confirmed, the proposed track will likely be partially located in areas prone to flooding. Consequently, it is recommended that the design:

- Allows for crossing structures (e.g. pedestrian bridges or stepping stones).

[17] Annual exceedance probability (AEP) is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year (BOM 2021).

- Allows for well-marked refuge areas.
- Gives path users advanced warning of moderate and high hazard areas. This may include:
    - Additional signage along the trail such as depth gauges.
    - Flood-activated boom gates or other barriers to block access to inundated sections of track in the event of a flood.
    - Non-structural measures, such as integrating responses as part of a Flood Response Plan.
    - The use of drown-outs (a shallow inundated barrier that deters entry to other flooded sections of track that have unsafe depths (e.g. along the Kiewa River West Branch and Diamantina River floodplains) (Figure 14).



Figu **ırce:**
Melb **2009)**

7.1.8 Minimising direct impacts to native fauna

Consult a qualified, experienced, alpine fauna specialist zoologist such as Nick Clemann from Zoos Victoria regarding the identification and flagging of potential Guthega Skink burrows immediately before construction, to ensure they are not disturbed during works. Any flags or markers must be removed immediately after works are completed to reduce risk of interference with habitat and poaching.

Management Authorisation under the Wildlife Act will need to be held by any contractor engaged to spot and potentially salvage and release protected fauna (mainly any native terrestrial vertebrates) from works areas. In accordance with current DEECA policy, this is to

take place in the nearest suitable habitat to the specific point of salvage, and no further than 100 m away for any threatened species. Given the linear nature of the track alignment, any fauna rescued from works is to be released in retained habitat immediately outside of the construction buffer at the same location.

7.1.9 Ongoing track management

Ongoing management that is required to minimise impacts on natural values before, during and after construction includes:

- Undertaking weed control along the existing track and surrounding areas with a focus on WONS, declared noxious weeds and other very high to high-risk environmental weeds, to prevent their further spread in the assessment area and beyond;
- Continue to implement feral horse control;
- Implement feral deer, rabbit and hare control;
- Maintain track surface integrity and remediate damage caused by horses and hikers walking off-track;
- Ensure ongoing maintenance to manage erosion of soil around stepping stones;
- Maintain track runoff drainage controls; and
- Mitigate erosion.

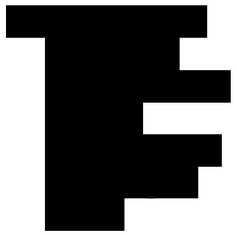
A description, summary of natural values and minimisation recommendations for each section of track is provided in Table 20.

7.1.10 Summary table - proposed track impacts on natural values and recommendations for avoidance and minimisation

Table 20. Summary of flora and fauna values likely to be impacted, potential waterway impacts, and management recommendations to avoid or minimise impacts, FHAC track alignment, December 2020/21 and 2022

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
1a	**Existing vehicle track** **New track** A new section of track is required between the maintenance hut and the western end of dam wall	Located below and extending along the length of the Rocky Valley Dam wall. Situated at around 1600 m ASL. One half of this section of track is located between the western end of the dam wall and a management hut at the centre of the wall. It is dominated by weeds, with no clearly defined track. The other half extends from the management hut to the car park at the beginning of Heathy Spur Track. This part is a management vehicle track providing a ready-made wide section of track. This part is also dominated by weeds along the track and the verges support native vegetation. CaLP Act listed weeds in this section of track include *Spear Thistle, *St John's Wort and *Weld.	Recorded within the study area: • Shining Cudweed (EPBC Vulnerable) Shining Cudweed plants are located beyond the current track alignment and buffer zone but within the assessment area • 15 FFG Act listed species: 1 Critically Endangered 11 Endangered 3 Vulnerable • Suitable habitat for additional threatened species	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 2 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Sub-alpine Shrubland (Rare)	[redacted] • Alpine Water Skink *Eulamprus kosciuskoi* (FFG Endangered) may occur in the bog system there (N. Clemnann pers. comm.) • Alpine Bog Skink *Pseudemoia cryodroma* (EPBC & FFG Endangered) may occur in the bog system there (N. Clemnann pers. comm.) • Potential habitat also exists for: o Dingo (FFG Vulnerable) o Broad-toothed Rat (EPBC Endangered, FFG Vulnerable) o Latham's Snipe (EPBC Vulnerable & Migratory) • White-throated Needletail may fly	• Waterways below the dam have the potential to be negatively impacted through concentration of flows, track runoff and construction activities that lead to physical damage/erosion • No geologically significant features are likely to be impacted beyond historical impact resulting from construction of Rocky Valley Dam	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • New track construction <500 mm is recommended to be confined to exotic vegetation to reduce the extent of impacts on threatened species and communities • Recommend no track realignment or widening to avoid impacting threatened species and communities • Incorporate appropriate track runoff arrangements to avoid concentration of flow and associated erosion along and/or adjacent to the track • Undertake weed control

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					over (EPBC & FFG Vulnerable)		
2	**Existing track**	Heathy Spur Track is a well-used, narrow dirt track located on Heathy Spur. Ascending from around 1600 m ASL from the Rocky Valley Dam wall to around 1760 m ASL near Big River Firetrail. Evidence of off-track walking was observed beside some basalt stepping stones. Off-track brush cutting was evident in some parts where dense shrubs grew up to the track edges. Parts of the track have become channelised making it difficult to walk on and leading to hikers walking off-track and damaging vegetation. There are a number of high threat weeds in this area including CaLP Act listed *Grey Sallow, and other particularly high threat weeds including *Jointed Rush, *Soft Rush and *Slender Rush.	Recorded within the study area: • Shining Cudweed (EPBC Vulnerable) • 24 FFG Act listed species: 1 Critically Endangered 20 Endangered 3 Vulnerable • Suitable habitat for additional threatened species	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 4 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Sub-alpine Shrubland (Rare)	[redacted] • Known habitat for: [redacted] • Suitable habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail may fly over (EPBC & FFG Vulnerable)	• Multiple sensitive waterways in the Alpine Bog Community have the potential to be negatively impacted through the concentration of flows and construction activities that lead to physical damage/erosion and/or the loss of vegetation • Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track widening or realignment to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Install crossings at waterways and ground water expression/seepage points to avoid physical damage • Incorporate appropriate track runoff arrangements to avoid concentration of flows and associated erosion along and/or adjacent to the track • Apply treatments and manage channelised track

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
							areas and off-track walking areas as required • Undertake weed control
3	**Existing track**	Big River Firetrail is a well-used maintenance vehicle track situated at around 1750 m ASL. The track intersects an Alpine Bog Community. There are some weeds along the track edges.	Recorded within the study area: • Shining Cudweed (EPBC Vulnerable) • 22 FFG Act listed species: 1 Critically Endangered 18 Endangered 3 Vulnerable • Suitable habitat for additional threatened species	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 4 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Sub-alpine Shrubland (Rare)	• Known habitat for:  • Suitable habitat for: o Tussock Skink (FFG Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track widening or realignment to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Maintain appropriate track runoff arrangements to avoid erosion and sedimentation into the receiving waterway • Undertake weed control
4	**Existing track**	Consists of a narrow well-used walking track which is part of the Australian Alps Walking Track between Marum Point Track and Langford West Aqueduct Road. Descending	Recorded within the study area: • 19 FFG Act listed species: 16 Endangered	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed)	• Known habitat for: 	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
		from around 1750 m ASL at Big River Firetrail to 1600 m ASL at the aqueduct. Steeper track sections on the descent to the Langford Aqueduct have dense shrubby understory along the track edges.	3 Vulnerable • Suitable habitat for additional threatened species • Patches of long unburnt snow gums	• 4 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Sub-alpine Shrubland (Rare)	[redacted] • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Suitable habitat for: o Alpine Stonefly *Thaumatoperla alpina* (EPBC & FFG Endangered) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Tussock Skink (FFG Endangered) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) o Alpine Spiny Crayish (FFG Endangered)		• To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track widening or realignment to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Install waterway and ground water expression/seepage point crossing arrangements to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track • Undertake weed control
5	**Existing track**	A well-used maintenance vehicle road along the Langford West Aqueduct between the Australian Alps Walking Track and Bogong High Plains Road. Situated at 1600 m ASL. There are a variety of weeds including the high threat environmental weeds. *Jointed Rush, *Soft Rush and *Slender Rush.	Recorded within the study area: • 19 Victorian FFG Act listed species: 1 Critically Endangered 15 Endangered 3 Vulnerable	• 5 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Sub-alpine Wet Heathland/Alpine Valley Peatland	• Known habitat for: [redacted]	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • The track alignment is situated in part within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
			• Suitable habitat for additional threatened species) • Patches of long unburnt snow gums	Mosaic (Endangered) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Sub-alpine Shrubland (Rare)	[redacted] • Suitable habitat for Mountain Pygmy Possum *Burramys parvus* (EPBC & FFG Endangered) • Potential habitat for Dingo (FFG Vulnerable) • White-throated Needletail may fly over (EPBC & FFG Vulnerable)		these species and do not undertake construction in these locations • Recommend no track widening or realignment to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track • Undertake weed control
6	**Existing track**	Consists of a narrow, well used walking track marked by intermittent snow poles. Located between the Bogong High Plains Road and a point north of the end of Cope West Aqueduct Road, east of Mount Jim. Situated around 1700 m ASL. Alpine Bogs and groundwater discharge seepage areas that are intersected by the track are being trampled and degraded by human and horse traffic at present. Although not part of this assessment, it was observed that a bog system between the Bogong High Plains Road and the SEC Hut at Cope Aqueduct was being damaged by hikers via a trail intersecting it and marked by	Recorded within the study area: • Shining Cudweed (EPBC Vulnerable) • 28 Victorian FFG Act listed species: 24 Endangered 4 Vulnerable • Suitable habitat for additional threatened species • Partially in Bundara Cobungra RNA	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 5 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Damp Grassland (Rare) o Alpine Dwarf Heathland (Rare) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare)	• Broad-toothed Rat *Mastacomys fuscus mordicus* (EPBC Endangered, FFG Vulnerable) known to occur here [redacted] • Suitable habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake detailed geological assessment to

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
		intermittent snow poles. It is recommended that this section of track be decommissioned to avoid further impacts on the bog, and walkers be diverted onto the nearby proposed FHAC route. In another area just west of the power supply hut at the Cope Aqueduct, the existing track divides in two and rejoins after a short distance just west of the power supply hut. It is recommended that the northern alignment be retained, and the southern alignment be decommissioned. There were also a number of weeds in this section of track around the Cope Aqueduct area.			Critically Endangered) o Alpine Stonefly (EPBC & FFG Endangered) o Alpine Spiny Crayish (FFG Endangered) o Latham's Snipe *Gallinago harwickii* (EPBC Vulnerable & Migratory) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Alpine Darner Dragonfly *Austroaeschna flavomaculata* (FFG Vulnerable) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) o Alpine Tree Frog *Litoria verreauxii alpina* (EPBC Vulnerable, FFG Critically Endangered) o White-throated Needletail (EPBC & FFG Vulnerable) may occur		identify features and determine their significance • Incorporate appropriate waterway crossing arrangements as part of the track upgrade to avoid physical damage to the waterways and ground water expression/seepage point crossing areas • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track • Undertake weed control • Decommission secondary trails

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7	**Existing track**	Located between a point north of the end of Cope West Aqueduct Track east of Mount Jim and the Fainter Firetrail. Consists of narrow, well-used walking track marked by intermittent snow poles. Situated between 1600 and 1700 m ASL. This section of track is distinct in that it contains several rare or threatened damp vegetation communities along much of its length. The vegetation is being damaged by hikers and horses which are causing soil disturbance and pugging. Hikers are walking off-track to avoid wetter areas.	Recorded within the study area: • 23 Victorian FFG Act listed species: 20 Endangered 3 Vulnerable • Suitable habitat for additional threatened species • Partially in Bundara Cobungra RNA	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 6 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Damp Grassland (Rare) o Alpine Dwarf Heathland (Rare) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Alpine Rocky Outcrop Heathland (Rare) • Sub-alpine Pond Herbland (no conservation status allocated as yet)	• Suitable habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) o Guthega Skink (EPBC Endangered, FFG Critically Endangered) o Alpine Stonefly (EPBC & FFG Endangered) o Latham's Snipe (EPBC Vulnerable & Migratory) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Alpine Darner Dragonfly (FFG Vulnerable) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) o Alpine Water Skink (FFG Endangered) known to occur here o Alpine Bog Skink (EPBC & FFG Endangered) known to occur here	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Design suitable waterway crossings to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to track • Undertake weed control

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					○ Tussock Skink (FFG Endangered) known to occur here • Potential habitat for: ○ Dingo (FFG Vulnerable) ○ Alpine Tree Frog *Litoria verreauxii alpina* (EPBC Vulnerable, FFG Critically Endangered) • White-throated Needletail may fly over (EPBC & FFG Vulnerable)		
8	**Existing track**	Consists of a well-used maintenance vehicle track between the Fainter Firetrail and Tawonga Huts ranging from 1650 to 1750 m ASL. Several weed species were recorded on the roadside.	Recorded within the study area: • 5 Victorian FFG Act listed species: 4 Endangered 1 Vulnerable • Suitable habitat for additional threatened species	• 2 EVCs with a bioregional conservation status of Rare: ○ Alpine Grassland ○ Alpine Grassy Heathland	• Potential habitat for: ○ Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Suitable habitat for: ○ Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) ○ Tussock Skink (FFG Vulnerable)	• Waterways have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species • Undertake detailed geological assessment to identify features and determine their significance

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
							• Suitable waterway crossing arrangements required to avoid physical damage to the waterways • Undertake weed control
9	**Existing track**	This section consists of an informal walking track between Tawonga Huts and OV2 alternate access track. Situated at 1750-1800 m ASL.	Recorded within the study area: • 2 Victorian FFG Act listed species: 2 Endangered • Suitable habitat for additional threatened species	• Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (EPBC Endangered) • Alpine Bog Community (FFG listed) • 4 EVCs with a bioregional conservation status of Endangered or Rare: o Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (Endangered) o Alpine Valley Peatland (Endangered) o Sub-alpine Shrubland (rare) o Alpine Grassland (Rare)	[redacted] • White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Suitable habitat for: o Alpine Bog Skink (EPBC & FFG Endangered) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Tussock Skink (FFG Endangered) o Alpine Darner Dragonfly (FFG Vulnerable) • Potential habitat for: o Broad-toothed Rat (EPBC Endangered, FFG Vulnerable) o Alpine Stonefly (EPBC & FFG Endangered)	• Sensitive waterways and wetlands such as EPBC and FFG listed Alpine Bog Communities have the potential to be damaged through the concentration of flows and construction activities that lead to physical damage/erosion • Steepness of the track creates potential for erosion within/adjacent to the upgraded track • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Suitable waterway crossing arrangements are required to avoid physical damage to waterways

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					o Latham's Snipe (EPBC Vulnerable & Migratory) o Dingo (FFG Vulnerable)		• Undertake weed control
10a	Existing track	A short section of track running between track sections 7 and 11. The track here is an informal walking track on a flat, elevated plateau and is particularly narrow in parts. The track features outcropping from the Mount Jim Volcanic Group basalt with periglacial basalt rocks from higher exposed rocks of the same geology. Substantial microtopography occurs along the track including close spaced mounds in parallel ridges potentially resulting from active vegetative artefacts from seasonal freeze-thaw and shallow depressions (single and close spaced groups) including both dry and water-filled. All features are of high geological significance and sensitive to disturbance. Creative forces unknown.	Recorded within the study area: • 20 Victorian FFG Act listed species: 16 Endangered 4 Vulnerable • Suitable habitat for additional threatened species • Within the Bundara Cobungra RNA	• 6 EVCs with a bioregional conservation status of Rare: o Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (Endangered) o Alpine Damp Grassland o Alpine Grassland o Alpine Grassy Heathland o Alpine Rocky Outcrop Heathland o Alpine Rocky Outcrop Heathland/Alpine Dwarf Heathland Mosaic • Sub-alpine Pond Herbland (no conservation status allocated as yet)	• Suitable habitat for: o Alpine Bog Skink (EPBC, FFG) • Potential habitat for: o Dingo (FFG Vulnerable) o Alpine She-oak skink (EPBC Endangered, FFG Critically Endangered) o Tussock Skink (FFG Endangered) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	• Potentially several minor seepage line intersections – difficult to confirm due to snow cover at the time of the field assessment • Waterways/ponds have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance and potentially includes relict (fossil) periglacial features that are classified as EPBC listed values on the National Heritage List under 'Glacial and Periglacial Features' within the within the Australian Alps National Parks. Activities that disturb or cause the removal of vegetation and overlying soil may impact these features	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Undertake detailed geological assessment to confirm features and determine their significance in the absence of snow cover • Recommend no track realignment or widening to avoid impacting threatened species and communities • Waterway and ground water expression/seepage point crossing arrangements are required to avoid physical damage to ponds and drainage lines • Incorporate appropriate track runoff arrangements to avoid erosion

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
							within/adjacent to upgraded track • Undertake weed control
11	**Existing track**	Consists of an existing narrow dirt walking track along Westons Spur marked by intermittent snow poles. The track is located between the eastern end of Westons Spur Track (Pole 333) and Weston Hut to the west. This section of track was not included in the FHACMP but was assessed in 2020 as an alternative route to the now redundant proposed new track section 10 between Tawonga Huts and Westons Spur Track. It is situated around 1800 m ASL at the eastern end of Westons Track and descends to 1600 m ASL to Weston Hut. Widening the track in wetter sections is likely to lead to additional erosion and degradation, as well as facilitate weed invasion. Several sections of Westons Spur Track interact with minor seepage lines which have logs in place for track management that have now rotted. There are CaLP Act listed weeds in this track section including *Sweet Briar, *Rusty Sallow and *Common Blackberry.	Recorded within the study area: • 21 Victorian FFG Act listed species: 1 Critically Endangered 18 Endangered 2 Vulnerable • Suitable habitat for additional threatened species • Partially in Bundara Cobungra RNA	• 5 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Damp Grassland (Rare) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Alpine Rocky Outcrop Heathland/Alpine Dwarf Heathland Mosaic (Rare)	• White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Suitable habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) o Tussock Skink (FFG Endangered) • Potential habitat for: o Alpine Tree Frog *Litoria verreauxii alpina* (EPBC Vulnerable, FFG Critically Endangered) o Alpine Water Skink (FFG Endangered) o Alpine Bog Skink (EPBC & FFG Endangered) o Dingo (FFG Vulnerable)	• Waterways/ponds have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion • Steepness of the existing track creates potential for erosion within/adjacent to upgraded track • Multiple minor ground water expression/seepage crossings • The track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake detailed geological assessment to identify features and determine their significance • Suitable waterway crossing arrangements should be designed to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control
12	**Existing track**	This track section occurs predominantly at lower	Recorded within the study area:	• None identified	• Southern Greater Glider *Petauroides*	• The proposed track alignment intersects both the Kiewa River	• Under the current project plan, there are no

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		altitudes and within montane vegetation. It includes a narrow walking track between Weston Hut and the eastern end of Diamantina Spur Track. The alignment travels along a narrow walking track that opens to a 4WD track prior to joining the West Kiewa Logging Road, which currently acts as the walking track until the junction with Diamantina Spur Track. This section of track descends from 1600 m ASL at Weston Hut to around 1100 m ASL at eastern end of Diamantina Spur Track before ascending Diamantina Spur. CaLP Act listed weeds in this track section include *Common Blackberry, *Forest Blackberry, *Rusty Sallow and *St John's Wort. There were also *Apple trees possibly spread by apple cores discarded by hikers.	• 6 Victorian FFG Act listed species: 3 Endangered 3 Vulnerable • Suitable habitat for additional threatened species		*volans* (EPBC & FFG Endangered) known to occur here • Platypus *Ornithorhynchus anatinus* (FFG Vulnerable) known to occur here • Long-footed Potoroo (EPBC & FFG Endangered) expected to occur here • Suitable habitat for: o Yellow-bellied Glider (EPBC & FFG Vulnerable) o Pilotbird (EPBC & FFG Vulnerable) o Gang-gang Cockatoo (EPBC & FFG Endangered) o Powerful Owl (FFG Vulnerable) o Spot-tailed Quoll (EPBC & FFG Endangered) • Potential habitat for: o stonefly Riekoperla intermedia (FFG Vulnerable) o Dingo (FFG Vulnerable) o Murray Spiny Crayfish (FFG threatened) o Spotted Tree Frog (EPBC & FFG	West Branch and the Diamantina River within this track section. The waterways within this section of track have the potential to be negatively impacted through poorly designed and constructed crossing arrangements • Multiple waterway crossings over the Kiewa River West Branch and Diamantina River • Steepness of existing track creates potential for erosion within/adjacent to upgraded track • Part of the track alignment is situated within the Bogong High Plains South site of Geologic/Geomorphic national significance requiring detailed assessment to determine impacts	opportunities to avoid habitat destruction for threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species • Undertake detailed geological assessment to identify features and determine their significance • Suitable waterway crossing arrangements should be designed to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					Critically Endangered) o Alpine Stonefly (EPBC & FFG Endangered) o Smoky Mouse (EPBC & FFG Endangered) o Mountain Skink (EPBC & FFG Endangered) o White-throated Needletail (EPBC & FFG Vulnerable) may occur		
13	**Existing track**	Well-used narrow walking track between the eastern end of Diamantina Spur Track and the Razorback track, ascending from 1500 to 1800 m ASL. The eastern third of the existing track is very steep. CaLP Act listed weeds include *Common Blackberry and *Forest Blackberry.	Recorded within the study area: • 9 Victorian FFG Act listed species: 2 Critically Endangered 4 Endangered 3 Vulnerable • Suitable habitat for additional threatened species	• 4 EVCs with a bioregional conservation status of Rare: o Alpine Grassland o Alpine Grassy Heathland o Sub-alpine Shrubland o Alpine Rocky Outcrop Heathland	• White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Potential habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered), although less likely to occur here (N. Clemann pers. comm.) o Tussock Skink (FFG Endangered) o Mountain Skink (EPBC & FFG Endangered) o Dingo (FFG Vulnerable)	• Steepness of track creates the potential for erosion within/adjacent to upgraded track. • Shallow bedrock has the potential to limit erosion in some areas	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species • Undertake detailed geological assessment to identify features and determine their significance • Incorporate appropriate track runoff arrangements

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
							to avoid erosion within/adjacent to the upgraded track • Undertake weed control
14	**Existing track**	This section of track was steeper and more exposed than the rest of the Razorback track. It is a narrow well-used walking track between the foot (c. 1800 m ASL) and top (c. 1940 m ASL) of Mount Feathertop. Many parts of the alignment along the ridgeline have inadequate space to widen the track without potentially significant excavation.	Recorded within the study area: • 15 Victorian FFG Act listed species: 11 Endangered 4 Vulnerable • Suitable habitat for additional threatened species	• Alpine Snowpatch Community (FFG listed) • 2 EVCs with a bioregional conservation status of Rare o Alpine Grassland o Snowpatch Grassland	• Potential habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered), although less likely to occur here (N. Clemann pers. comm.) o Dingo (FFG Vulnerable) • Suitable habitat for: o Tussock Skink (FFG Endangered) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	• Steepness of track creates potential for erosion within/adjacent to upgraded track • Shallow bedrock has the potential to limit erosion in some areas	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake detailed geological assessment to confirm features and determine their significance • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control
15	**Existing track**	Well-used narrow steep walking track along the Razorback between the foot of Mount Feathertop and the Mount Hotham Alpine Resort	Recorded within the study area: • 13 Victorian FFG Act listed species:	• 4 EVCs with a bioregional conservation status of Rare:	[redacted] • Potential habitat for:	• Steepness of the existing track creates potential for erosion within/adjacent to upgraded track	• Under the current project plan, there are no opportunities to avoid habitat destruction for flora and fauna

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
		sitting at around 1800 m ASL. The track is situated on a narrow ridgeline with steep slopes either side and shallow soils. Track widening would require significant construction works and resultant impacts on biodiversity. In a small section of the track midway along the Razorback, hikers have created a second trail that skirts around a small peak and we recommend this informal trail be decommissioned to minimise impacts on natural values in this area. There are some off-track deviations along the Razorback track that could be closed and walkers directed to a single track to reduce impacts on biodiversity.	8 Endangered 5 Vulnerable • Suitable habitat for additional threatened species	o Alpine Grassland o Alpine Grassy Heathland o Alpine Rocky Outcrop Heathland o Snowpatch Grassland	o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered), although less likely to occur here (N. Clemann pers. comm.) o Tussock Skink (FFG Endangered) o Mountain Skink (EPBC & FFG Endangered) o Dingo (FFG Vulnerable) • Potential non-breeding habitat for Alpine Tree Frog (EPBC Vulnerable, FFG Critically Endangered) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	• Shallow bedrock has the potential to limit erosion in some areas	• To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species • Undertake detailed geological assessment to identify features and determine their significance • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Decommission secondary trails • Undertake weed control
16	**Existing track**	Includes a well-used narrow walking track, management vehicle track and section of the Great Alpine Road in the Mount Hotham Alpine Resort. It sits at 1750 m ASL at the Great Alpine Road and ascends to 1850 m ASL near Mount Hotham before descending to around 1800 ASL at the Mount Loch car park. Includes steep slopes on either side.	Recorded within the study area: • 3 Victorian FFG Act listed species: 3 Endangered • Suitable habitat for additional threatened species	• 4 EVCs with a bioregional conservation status of Rare: o Alpine Grassland o Alpine Grassy Heathland o Alpine Dwarf Heathland o Alpine Rocky Outcrop Heathland/Alpine	• Suitable habitat for: o Tussock Skink (FFG Endangered) • Potential habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) o Mountain Skink (EPBC & FFG Endangered)	• Steepness of track creates potential for erosion within/adjacent to upgraded track • Shallow bedrock has the potential to limit erosion in some areas	• Under the current project plan, there are no opportunities to avoid habitat destruction for flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
				Dwarf Heathland Mosaic	o Dingo (FFG Vulnerable) • Potential non-breeding habitat for Alpine Tree Frog (EPBC Vulnerable, FFG Critically Endangered) • Potential atypical habitat for Alpine Bog Skink (EPBC & FFG Endangered) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over		• Recommend no track realignment or widening to avoid impacting threatened species • Undertake detailed geological assessment to identify features and determine their significance • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to the upgraded track • Undertake weed control
17	**Existing track**	A wide and well-used winding unmade vehicle maintenance track that is gated at Pretty Valley Dam and provides access to Tawonga Huts Campground. The track includes gentle to moderate slopes ranging from 1650 m ASL at Pretty Valley Dam to 1800 m ASL at the midpoint descending to 1720 m ASL at the western end. The alignment intersects multiple natural ground water expression drainage lines and peri glacial blockstreams. CaLP Act listed weeds in this section of track include *Grey Sallow	Recorded within the study area: • 33 Victorian FFG Act listed species: 1 Critically Endangered 27 Endangered 5 Vulnerable • Suitable habitat for additional threatened species	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • Alpine Conifer Shrubland Community (FFG listed) • Alpine Fen Community (FFG listed) • 6 EVCs with a bioregional conservation status of Endangered, Vulnerable or Rare: o Alpine Valley Peatland (Endangered) o Alpine Fen (Endangered) o Alpine Conifer Shrubland (Vulnerable)	• White-throated Needletail (EPBC & FFG Vulnerable) may fly over • Suitable habitat for: o Alpine Bog Skink (EPBC & FFG Endangered) o Alpine She-oak skink (EPBC Endangered, FFG Critically Endangered) o Mountain Pygmy Possum (EPBC & FFG Endangered) o Tussock Skink (FFG Endangered) o Alpine Stonefly (EPBC & FFG Endangered)	• Fainter Firetrail contains a large number and variety of periglacial blockstreams which are relict (fossil) periglacial features that are classified as EPBC listed values on the National Heritage List under 'Glacial and Periglacial Features' within the Australian Alps National Parks. Activities that disturb or cause the removal of vegetation and overlying soil may cause land instability and increased risk of erosion by water and wind that would impact and/or destroy these periglacial features • Waterways/ponds have the potential to be negatively impacted through the concentration of flows, track runoff and construction activities that lead to physical damage/erosion	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened communities, flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to avoid impacting threatened species and communities • Undertake survey of drainage lines and track run off and drainage requirements

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
				o Sub-alpine Shrubland (Rare) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare)	o Alpine Spiny Crayfish (FFG Endangered) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) o Alpine Darner Dragonfly (FFG Vulnerable) o Broad-toothed Rat (EPBC Endangered, FFG Vulnerable) o Alpine Water Skink (FFG Endangered) o Mountain Galaxias species complex (potential EPBC/FFG listed)		• Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control
18	**Existing track**	This is a well-used walking track. The western trailhead is located in the foothills at Harrietville at 550 m ASL. The track is winding and steep and intersects with the Razorback to the east at 1730 m ASL. CaLP Act listed weeds in this section of track include *St John's Wort, *Ox-eye Daisy, *Forest Blackberry and *Grey Sallow	Recorded within the study area: • 11 Victorian FFG Act listed species: 8 Endangered 3 Vulnerable • Suitable habitat for additional threatened species • Patches of long unburnt snow gums	• 3 EVCs with a bioregional conservation status of Rare: o Alpine Grassland o Alpine Grassy Heathland o Sub-alpine Shrubland	• Gang-gang Cockatoo (EPBC & FFG Endangered) known to occur • Suitable habitat for: o Mountain Galaxias species complex (potential EPBC/FFG listed) o Mountain Skink (EPBC & FFG Endangered) o Powerful Owl (FFG Vulnerable)	• The track occurs on the Pinnak Sandstone and features geologically interesting outcrops and ground water expression springs. • Minimal geological impact likely from proposed track works apart from the outcrops and springs that should not be disturbed, as the track was historically wider and used for access with packhorses and tractors.	• Under the current project plan, there are no opportunities to avoid habitat destruction for flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in these locations • Recommend no track realignment or widening to

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					o Southern Greater Glider (EPBC & FFG Endangered) o Yellow-bellied Glider (EPBC & FFG Vulnerable) o Pilotbird (EPBC & FFG Vulnerable) • Potential habitat for: o Dingo (FFG Vulnerable) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) o Spot-tailed Quoll (EPBC & FFG Endangered) o Murray Spiny Crayfish (FFG threatened) o Broad-toothed Rat (EPBC Endangered, FFG Vulnerable) o Platypus (FFG Vulnerable) o Long-footed Potoroo (EPBC & FFG Endangered) o Smoky Mouse (EPBC & FFG Endangered) o Alpine Spiny Crayfish (FFG Endangered) o Alpine Stonefly (FFG Endangered)		avoid impacting threatened species • Suitable waterway crossing arrangements should be designed to avoid physical damage to the waterways • Incorporate appropriate track runoff arrangements to avoid erosion within/adjacent to upgraded track • Undertake weed control

Track Section	Track type	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted>	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
					o Alpine Darner Dragonfly (FFG Vulnerable) o Sooty Owl (FFG Endangered) o White-throated Needletail (EPBC & FFG Vulnerable) may occur		

>Sensitive species location information have been redacted for their protection

7.2 Overnight node design and construction

7.2.1 Location

The extent of the OVs should be limited to minimise impacts on natural values.

One option PV could consider is upgrading existing camp and visitor infrastructure around the existing Cope Hut camping area, Tawonga Huts and Weston Hut.

At Cope Hut and Weston Hut existing camping areas there is evidence of disturbance by hikers, impacts include trampled vegetation, weeds and bare ground. At Cope Hut there the impacts are focused around existing facilities including a toilet, camping platforms and picnic table. Selection of these optional node areas rather than OVs with better quality vegetation, and habitat for threatened fauna species recorded may reduce overall project impacts on natural values.

The existing camping ground around Tawonga Huts is disturbed and flattened, with a high number of weeds, and damage from horses including pugging, bare ground, evidence of grazing and browsing, and piles of horse dung. Similar to the existing camping site at Cope Hut, this may be a suitable area to develop hiker camps or operated huts to minimise impacts on sensitive flora and fauna values. The impacts to sites of geological significance would need to be assessed.

It is not recommended to allow the extension of informal camping areas into habitat considered to be of better structural quality for threatened fauna at Cope Hut existing camping area, Weston Hut existing camping area or at Tawonga Huts, as threatened reptile species are resident at those locations, and significant geological features may also be impacted at Tawonga Huts.

7.2.2 Overnight accommodation structures

Sensitive building design, construction principles and techniques should be explored to minimise work footprints and the amount of construction equipment and material storage required. For example, air lifting prefabricated structures will minimise vehicle and foot traffic, and the need to store building equipment, fuel and construction materials, all of which can impact native vegetation and fauna habitat.

Unless it can be done in a sensitive/minimalist way involving only very minor earthworks and no impacts to geologically sensitive sites, construction should be avoided on slopes. This is recommended to reduce the risk of soil/substrate disturbance and vegetation removal which increases the risks of erosion and soil/substrate instability and impacts on significant geologic features at locations such as OV2.

The design should consider treatments to address runoff control requirements and minimise hillslope erosion and erosion around structures such as huts, camping platforms, toilets and water tanks.

7.2.3 Internal tracks

It is recommended that existing tracks are used where possible, to provide access to OVs, therefore minimising the need for vegetation removal and soil disturbance.

Off-track walking impacts on vegetation, fauna habitat, geologically significant features and waterways and should be minimised by ensuring new and existing paths are clearly defined between huts and/or tent platforms.

7.2.4 Track drainage and flooding risk management

Consider general track drainage and flooding risk management requirements as discussed under Section 7.1.

7.2.5 Interpretive signage

Potential ongoing impacts to native vegetation, fauna habitat, significant geologic features and waterways within the proposed OVs from increased future visitation need to be considered and addressed. For example, during the environmental assessment, rock-stacking and taking rocks for establishing fireplaces or modifying existing fireplaces (therefore removing habitat for threatened reptiles and other small terrestrial fauna and disturbing geoscience features) was observed. Logs and twigs (organic litter) had been cleared from areas surrounding informal and formal campsites (also removing habitat for small reptiles and invertebrates), likely used to fuel campfires. Interpretive signage explaining these impacts and the consequences if caught may encourage hikers not to carry out these activities.

7.2.6 Ongoing overnight node management

Ongoing management that is required to minimise impacts on natural values before, during and after construction includes:

- Undertaking weed control in proposed OVs and surrounding areas with a focus on WONS, declared noxious weeds and other very high to high risk environmental weeds as per The Advisory list of environmental weeds in Victoria (White et al. 2018), to prevent their further spread in the assessment area and beyond;
- Undertaking feral horse control to reduce impacts;
- Maintaining track surface integrity within OVs and remediating damage caused by horses at OV2, Tawonga Huts and hikers walking off-track;
- Remediating informal camping areas (e.g. informal fireplaces);
- Maintaining track runoff drainage controls; and
- Mitigating erosion.

7.2.7 Summary table – proposed overnight node impacts on natural values and recommendations for avoidance and minimisation

A summary of natural values and mitigation recommendations for each OV is provided in Table 21.

Table 21. Summary of environmental values likely to be impacted, potential waterway impacts and management recommendations to avoid or minimise impacts in FHAC proposed overnight nodes, December 2020/21 and 2022

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
Overnight node 1, Cope Hut, Bogong High Plains Overnight node 1 location options (preferred and alternate) are located on gentle slopes with northerly aspects, each option supports treeless alpine vegetation fringed by Sub-alpine Woodland. These two options are accessed by short walks from the Langford West Aqueduct Road which is an unmade gated management vehicle track.						
OV1 (Preferred)	This OV option is situated on the south-east side of the western end of Langford West Aqueduct Road and is located immediately adjacent to the road. The OV is an elongate shape that extends south east from the road up a moderate slope. It comprises a central area of open Alpine Grassland fringed by Sub-alpine Woodland. The underlying geology includes regional metamorphic migmatite gneiss of Silurian Omeo Metamorphic Complex and features some gneiss rock outcrops. The soil depth is shallow in places, possibly limiting tree cover. CaLP Act listed weeds include *Grey Sallow.	Recorded within the OV: • 33 Victorian FFG Act listed species including: 1 Critically Endangered 27 Endangered 5 Vulnerable • Suitable habitat identified for an additional 20 threatened FFG listed species	• 2 EVCs with a bioregional conservation status of Rare: o Alpine Grassland o Alpine Grassy Heathland	• Suitable habitat for: o Broad-tooth Rat (EPBC Endangered, FFG Vulnerable) o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) o Alpine Bog Skink (EPBC & FFG Endangered) o Tussock Skink (FFG Endangered) • Potential habitat for: o Dingo (FFG Vulnerable)	• None identified	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control and eradicate *Grey Sallow to prevent its spread elsewhere and control of herbaceous weeds to prevent further spread
OV1 (Alternate)	The alternate option is located a few hundred metres west of OV1 preferred and is also adjacent to the Langford West Aqueduct Road. This OV is located on a moderate slope which levels out to the south-east. Like OV1 preferred, it contains a central area of open Alpine Grassland fringed by Sub-alpine Woodland. The underlying geology is regional	Recorded within the OV: • 10 Victorian FFG Act listed species including: 9 Endangered 1 Vulnerable • Suitable habitat identified for 1	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 4 EVCs with a bioregional	• Suitable habitat for: o Broad-tooth Rat (EPBC Endangered, FFG Vulnerable) o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered)	• Sensitive waterways such as Alpine Bog Communities have the potential to be negatively impacted through the concentration of flows and construction activities that lead	• Under the current project plan, there are no opportunities to avoid habitat destruction of a threatened vegetation community, and flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control and eradicate *Grey Sallow to prevent its spread elsewhere and control of herbaceous weeds to prevent further spread

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
	metamorphic migmatite gneiss of Silurian Omeo Metamorphic Complex with unusually large gneiss outcrops (3+ m high). Weathered areas forming concave depressions with impeded lateral and vertical drainage may promote wetlands and limit tree growth within the OV. Tree growth may be further limited by the shallow depth of soil over rock. CaLP Act listed weeds include *Grey Sallow. NB: At OV1 alternate, there was research equipment established in the middle of the proposed OV (PV to confirm the purpose). Construction of OV structures are likely to impact any ongoing long term data collection and may require removal of the equipment which would impact the associated research project (Images 122 and 123).	EPBC listed species • Suitable habitat for an additional 37 threatened FFG listed species	conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassland (Rare) o Alpine Grassy Heathland (Rare) o Sub-Alpine Shrubland	o Alpine Water Skink (FFG Endangered) o Tussock Skink (FFG Endangered) o Alpine Bog Skink (EPBC & FFG Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) o Latham's Snipe (EPBC Vulnerable & Migratory)	to physical damage/erosion	
Overnight node 2, Tawonga Huts. Overnight node 2 location options are located in a sheltered valley which is intersected by Tawonga Hut Creek. The valley includes discrete areas of treeless alpine vegetation fringed by Sub-alpine Woodland. Tawonga Huts can be accessed on foot via Fainter Firetrail which a gated management vehicle dirt track.						
OV2 (Preferred) and associated tracks	This option is situated on a gentle to moderate slope west of Tawonga Huts. The construction of access tracks to this location would require the removal of areas of dense uncleared native vegetation. The access tracks are underlain by Jaithmathang Range Granodiorite outcropping as smooth rounded	Recorded within the OV: • 12 Victorian FFG Act listed species including: 10 Endangered 2 Vulnerable • Suitable habitat identified for 1	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered) • Alpine Bog Community (FFG listed) • 3 EVCs with a bioregional	• Suitable habitat for: o Broad-toothed rat (EPBC Endangered, FFG Vulnerable) o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered)	• Sensitive waterways, ponds, shallow streams and Alpine Bog Communities have the potential to be negatively impacted through the concentration of flows and construction	• Under the current project plan, there are no opportunities to avoid habitat destruction of a threatened vegetation community, threatened flora and fauna, and periglacial features • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control particularly of *Sheep Sorrel which has a high cover in this location to prevent further spread

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
	slopes and detached slabs on part of the northern access route. The proposed OV is located on relict periglacial debris, small cobble to coarse gravel of basalt origin derived from isolated capping of the upslope ridge with some slab blocks of granodiorites. Basalt blocks were formed by repeated freeze-thaw action of the last Glacial Maximum 23,000 to 17,000 years ago which have slid downslope and are now inactive, so blocks have become stabilised by soil and vegetation. These rocks are therefore relic (fossil) landforms of the late Pleistocene age and therefore of high geoscientific significance. Almost all of the main soil orders are present here and there are also likely to be extensive buried soils of more than one soil order. This OV contains extensive periglacial landforms and deposits of national (potentially international) geoheritage significance. There is high weed cover here, particularly *Sheep sorrel.	EPBC listed species • Suitable habitat for an additional 38 threatened FFG listed species	conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassy Heathland (Rare) o Sub-Alpine Shrubland (Rare)	o Alpine Water Skink (FFG Endangered) o Alpine Bog Skink (EPBC & FFG Endangered) o Tussock Skink (FFG Endangered) o Alpine Darner Dragonfly (FFG Vulnerable) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Alpine Stonefly (EPBC & FFG Endangered) o Latham's Snipe (EPBC Vulnerable & Migratory) • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	activities that lead to physical damage/erosion • A relict (fossil) periglacial feature covers the entire area of OV2 preferred so the entire area is classified as an EPBC listed value on the National Heritage List under 'Glacial and Periglacial Features' within the within the Australian Alps National Parks. Activities that disturb or cause the removal of vegetation and overlying soil may cause land instability and increased risk of erosion which would impact and/or destroy the periglacial feature	• Proposed OV design needs to consider runoff arrangements to avoid erosion • Track design needs to consider runoff arrangements to avoid erosion
OV2 (Alternate)	This option is situated north east of Tawonga Huts and is located on an alluvial flat on Tawonga Huts Creek and extends up a gentle to moderate slope. The OV contains granite outcrops in the north-eastern section. The	Recorded within the OV: • 13 Victorian FFG Act listed species including: Endangered	• Alpine Sphagnum Bogs and Associated Fens (EPBC Endangered)	• Suitable habitat for: o Broad-toothed rat (EPBC Endangered, FFG Vulnerable) o Latham's Snipe (EPBC Vulnerable & Migratory)	• Sensitive waterways such as Alpine Bog Communities have the potential to be negatively impacted through	• Under the current project plan, there are no opportunities to avoid habitat destruction of a threatened vegetation community and threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
	boulders in this location include weathering residuals of periglacial transported origin. Within the alluvium and lower slopes there is likely to be cryogenic transported basalt materials. Areas of the OV feature a hummocky and irregular surface resulting from seasonal shallow soil freezing (but may also be due to disturbance from cattle, horses and deer).	Vulnerable • Suitable habitat identified for 1 EPBC listed species • Suitable habitat for an additional 39 threatened FFG listed species	• Alpine Bog Community (FFG listed) • 3 EVCs with a bioregional conservation status of Endangered or Rare: o Alpine Valley Peatland (Endangered) o Alpine Grassy Heathland (Rare) o Sub-Alpine Shrubland (Rare)	o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) o Alpine Water Skink (FFG Endangered) o Alpine Bog Skink (EPBC & FFG Endangered) o Tussock Skink (FFG Endangered) o Alpine Darner Dragonfly (FFG Vulnerable) o freshwater isopod *Colubotelson joyneri* (FFG Critically Endangered) o Murray Spiny Crayfish (FFG threatened) o Alpine Spiny Crayfish (FFG Endangered) o stonefly *Riekoperla intermedia* (FFG Vulnerable) o Alpine Stonefly (EPBC & FFG Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC &	the concentration of flows and construction activities that lead to physical damage/erosion • Flooding could be an issue given the close proximity to the creek.	• Undertake weed control of herbaceous weeds to prevent further spread • Proposed OV design needs to consider runoff arrangements to avoid erosion • Track design needs to consider runoff arrangements to avoid erosion • A buffer will likely be required (e.g. 30 m wide) from all waterways

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
				FFG Vulnerable) may fly over		
Overnight node 3 — Blairs Hut Overnight node 3 location is in montane forest accessed via the West Kiewa Logging Road. It is located near Blairs Hut and situated close to the Kiewa River West Branch.						
OV3 Blairs Hut	This OV is located in close proximity to the Kiewa River West Branch. The OV occurs on an alluvial fan formed by an unusual slump/debris flow (~ 20,000 yrs. ago) consisting of poorly sorted sediment of mud and largely basalt pebbles around an old stream course. The stream alignment is now situated on the side of the OV. CaLP Act listed weeds include *Spear Thistle and *Forest Blackberry	Recorded within the OV: • 2 Victorian FFG Act listed species including: 1 Endangered 1 Vulnerable	• None identified	• Gang-gang Cockatoo known to occur (EPBC & FFG Endangered) • Suitable habitat for: o Greater Glider (EPBC & FFG Endangered) o Yellow-bellied Glider (EPBC & FFG Vulnerable) o Powerful Owl (FFG Vulnerable) o Sooty Owl (FFG Endangered) o Long-footed Potoroo (EPBC & FFG Endangered) • Potential habitat for: o Mountain Galaxias species complex (potential EPBC/FFG listed) o Dingo (FFG Vulnerable) o Broad-toothed rat (EPBC Endangered, FFG Vulnerable) o Alpine Stonefly (EPBC & FFG Endangered)	• Uphill slump in the future is a possibility but unlikely, however if it did occur, it would flow across the OV site. • Regular flooding is unlikely but a limited possibility given the close proximity to a river. • An exceptional flood event could realign the existing stream in line with one of several historical courses which intersect the proposed OV location	• Under the current project plan, there are no opportunities to avoid habitat destruction of threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control, including the eradication of *Rusty Sallow and *Forest Blackberry and control other herbaceous weeds to prevent further spread • Construction must take into account potential issues for camper safety and integrity of infrastructure due to tree fall and extreme flood events • Proposed OV design needs to consider runoff arrangements to avoid erosion • A buffer will likely be required (e.g. 30 m wide) from all waterways

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
				○ Alpine Darner Dragonfly (FFG Vulnerable) ○ Alpine Spiny Crayfish (FFG Endangered) ○ stonefly *Riekoperla intermedia* (FFG Vulnerable) ○ Spot-tailed Quoll (EPBC & FFG Endangered) ○ Murray Spiny Crayfish (FFG threatened) ○ Pilotbird (EPBC & FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may occur • Platypus (FFG Vulnerable) known to occur in the river nearby		
Overnight node 4 — High Knob Overnight node 4 is situated at the western end of the Diamantina Spur which is flanked by steep slopes. The OV is located in Sub-alpine Woodland. There are existing informal camping areas in this area which includes a number of well-defined informal fire pits made from rocks taken from the surrounding landscape. The OV is only accessed on foot via Diamantina Spur or the Razorback Track – there is no vehicle access.						
OV4 High Knob	The proposed OV straddles the Diamantina Spur Track. The area on the north side of the track includes partially cleared Sub-alpine Woodland with a variably high cover of weeds noted in the area in 2020. The area on the southern side of the track is situated in Sub-alpine Woodland	Recorded within the OV: • 7 Victorian FFG Act listed species including: 4 Endangered 3 Vulnerable	• None identified	• Potential habitat for: ○ Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered), although thought to be less likely to occur here (N.	• Loss of vegetation may contribute to erosion of the hillslope • Runoff from huts may contribute to erosion of the hillslope	• Under the current project plan, there are no opportunities to avoid habitat destruction of threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Avoid the removal of Eucalypts to the greatest extent possible (particularly any threatened Bogong Sally)

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
	and is located on a steep slope which descends into a gully and the headwaters of a drainage line. This area supports one of the few remaining long unburnt patches of snow gums which may include Bogong Sally which is state listed as Critically Endangered under the FFG Act.	• Suitable habitat for an additional 4 threatened FFG listed species • Patches of long unburnt snow gums		Clemann pers. comm.) o Tussock Skink (FFG Endangered) o Mountain Skink (EPBC & FFG Endangered) o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	• No geological values should be impacted by the proposed project work footprint	• Undertake weed control of herbaceous weeds to prevent further spread • Proposed OV design needs to consider runoff arrangements to avoid erosion • A buffer (e.g. 30 m wide) will likely be required from all waterways
Cope Hut existing camping area Cope Hut existing camping area is situated on a gentle northern slope near Cope Hut. The OV is located in disturbed Sub-alpine Woodland, Alpine Grassland and Alpine Grassy Heathland. There are existing camping platforms, a wooden picnic table and informal camping areas in this area which includes two well-defined illegal fire pits made from rocks taken from the surrounding landscape. The OV is accessed via a short walk from Cope Hut Track which is a management vehicle track.						
Cope Hut existing camping area	This OV is situated on the southern uphill side of Cope Hut Track. A hut and toilet is located nearby. The area extends across Alpine Grassland and into Sub-alpine Woodland which has been heavily trampled by hiker traffic and camping. Alpine Grassy Heathland has been crushed and destroyed by hikers creating tracks. The soil has been compacted by hikers and campers in the Sub-alpine Woodland and Alpine Grassland and along tracks through Alpine Grassy Heathland. There is some erosion evident around the picnic table. There are few logs and low covers of litter (presumably used to fuel illegal campfires) which impacts fauna habitat.	Recorded within the OV: • 2 FFG Act listed species including: 1 Endangered 1 Vulnerable Recorded immediately adjacent to the existing overnight node areas • 6 Victorian FFG Act listed species including: 5 Endangered 1 Vulnerable	• 2 EVCs with a bioregional conservation status of Rare: o Alpine Grassland o Alpine Grassy Heathland	• Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) known to occur • Tussock Skink (FFG Endangered) known to occur • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	Not yet assessed	• Under the current project plan, there are no opportunities to avoid habitat destruction for threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control of herbaceous weeds to prevent further spread • Construction must take into account potential issues for camper safety and integrity of infrastructure due to tree fall • Proposed OV design needs to consider runoff arrangements to avoid erosion

Overnight node locations	Description	Threatened flora species potentially impacted	Rare or threatened vegetation communities/EVCs potentially impacted	Threatened fauna species potentially impacted	Waterway and geology impacts	Opportunities to avoid or minimise impacts on environmental values
		• Suitable habitat for an additional 17 threatened FFG listed species • Patches of long unburnt snow gums				
Weston Hut existing camping area Westons Hut existing camping area is situated on Westons Spur Track on a westerly slope. The OV is located in disturbed Sub-alpine Woodland. There is an existing informal camping area in this area around a hut which includes a well-defined informal fire pits made from rocks taken from the surrounding landscape. The OV is only accessed on foot via Westons Spur Track – there is no vehicle access.						
Weston Hut existing camping area	This OV is located at the western edge of the Bogong High Plains in a cleared area immediately adjacent to Westons Spur Track. The cleared area is fringed by Sub-alpine Woodland which is likely to have extended across the site prior to the hut construction and use as an informal camping area. There is a ground water seepage area in the central section of this OV which supports some rushes and other plants adapted to moister habitats. It extends from Sub-alpine Woodland in the east to the western disturbed section just north of the hut. This OV occurs immediately north of a large historic land side identified in the LiDAR desktop geomorphological review (Rosengren 2024). CaLP Act listed weeds include *Forest Blackberry and *Rusty Sallow.	Recorded within the OV: • 1 FFG Act listed Endangered species Recorded immediately adjacent to the existing overnight node areas • 6 Victorian FFG Act listed species including: 6 Endangered • Suitable habitat for an additional 4 threatened FFG listed species	• None identified	• Tussock Skink (FFG Endangered) known to occur • Suitable habitat for: o Alpine She-oak Skink (EPBC Endangered, FFG Critically Endangered) • Potential habitat for: o Dingo (FFG Vulnerable) • White-throated Needletail (EPBC & FFG Vulnerable) may fly over	Not yet assessed	• Under the current project plan, there are no opportunities to avoid habitat destruction of threatened flora and fauna • To minimise impacts on threatened flora and fauna, undertake targeted surveys in the appropriate seasons to identify locations of these species and do not undertake construction in locations where threatened species are recorded or assumed present • Undertake weed control, including the eradication of *Rusty Sallow and *Forest Blackberry and control other herbaceous weeds to prevent further spread • Proposed OV design needs to consider runoff arrangements to avoid erosion. A buffer will likely be required (e.g. 30 m wide) from all waterways

Image 122. Research equipment at OV1 alternate (December 2022)
(Image credit: Louise Rodda)

Image 123. Research equipment at OV1 alternate (December 2022)
(Image credit: Louise Rodda)

7.3 Recommendations for detailed assessments for referrals and approvals

It is recommended that the following investigations be undertaken in the works area once the project scope has been confirmed to inform the final FHAC plan and prepare regulatory authority referral documents:

- Review the locations of sensitive species within the project footprint held within the VBA;
- Conduct the recommended targeted surveys for threatened flora and fauna in this report to identify locations and population size of threatened species likely to be impacted;[18]
- Undertake detailed geomorphological field assessments to map the location, type and extent of all geoscience areas of importance and significance that may be impacted; and
- Undertake detailed mapping of all waterways and drainage lines likely to be impacted by the proposed works.

[18] Targeted threatened flora surveys were undertaken at Cope Hut and Weston Hut in February 2025 (see Addendum)

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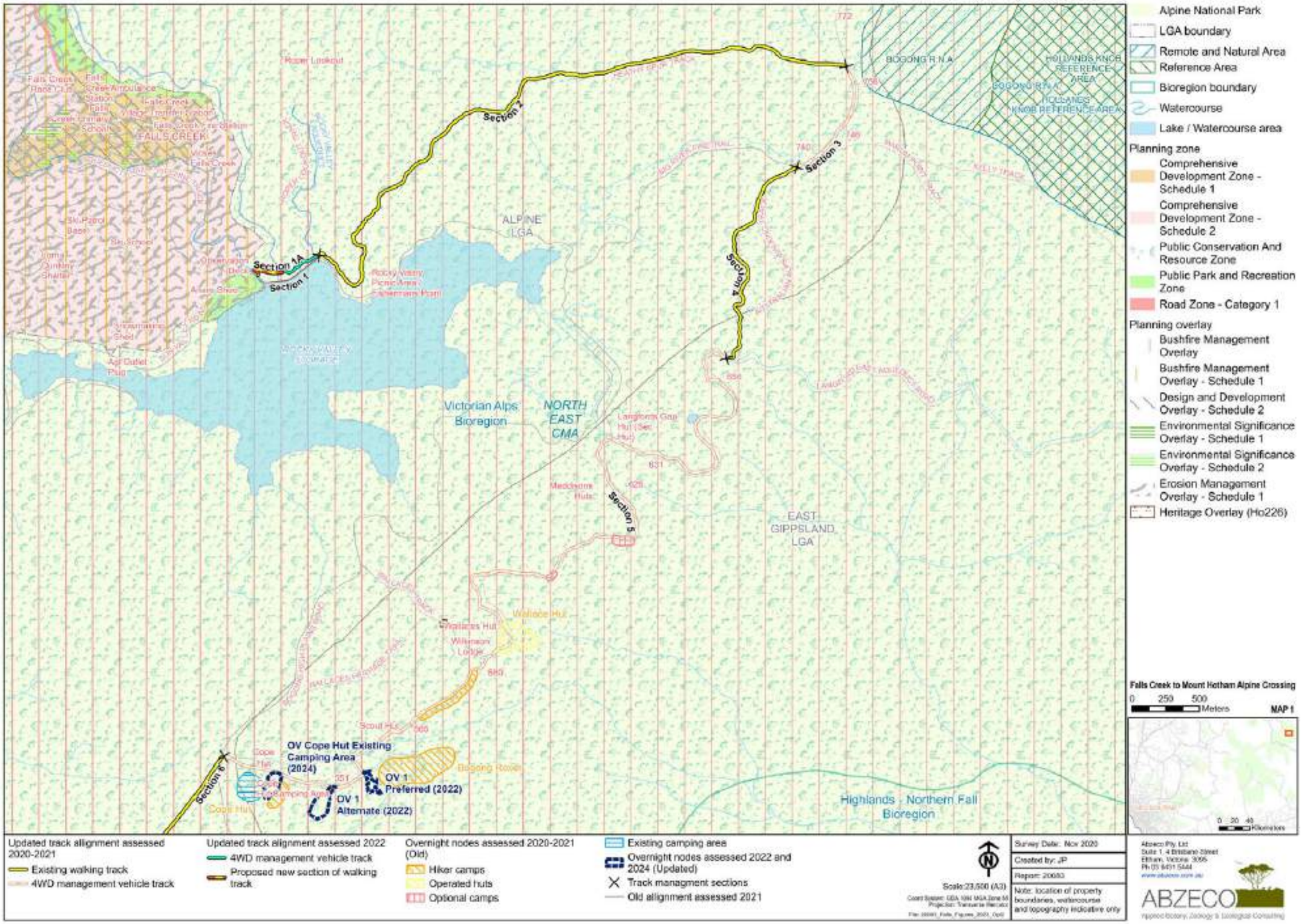
Appendix 1a. Overview (maps 1-4) of the proposed Falls to Hotham Alpine Crossing assessment area (as of February 2024)


Section 1
Section 1A
Section 2
Section 3
Section 4
Section 5
Section 6
OV Cope Hut Existing Camping Area (2024)
OV 1 Preferred (2022)
OV 1 Alternate (2022)
ALPINE LGA
EAST GIPPSLAND LGA
Victorian Alps Bioregion
NORTH EAST CMA
Highlands - Northern Fall Bioregion
BOGONG R.N.A
HOLLANDS KNOB REFERENCE AREA
FALLS CREEK
Alpine National Park
LGA boundary
Remote and Natural Area
Reference Area
Bioregion boundary
Watercourse
Lake / Watercourse area
Planning zone
Comprehensive Development Zone - Schedule 1
Comprehensive Development Zone - Schedule 2
Public Conservation And Resource Zone
Public Park and Recreation Zone
Road Zone - Category 1
Planning overlay
Bushfire Management Overlay
Bushfire Management Overlay - Schedule 1
Design and Development Overlay - Schedule 2
Environmental Significance Overlay - Schedule 1
Environmental Significance Overlay - Schedule 2
Erosion Management Overlay - Schedule 1
Heritage Overlay (Ho226)
Falls Creek to Mount Hotham Alpine Crossing
0 250 500 Meters
MAP 1
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2020-2021 (Old)
Hiker camps
Operated huts
Optional camps
Existing camping area
Overnight nodes assessed 2022 and 2024 (Updated)
Track managment sections
Old alignment assessed 2021
Scale:23,500 (A3)
Survey Date: Nov 2020
Created by: JP
Report: 20083
Note: location of property boundaries, watercourse and topography indicative only
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Eltham, Victoria 3095
Ph 03 9431 5444
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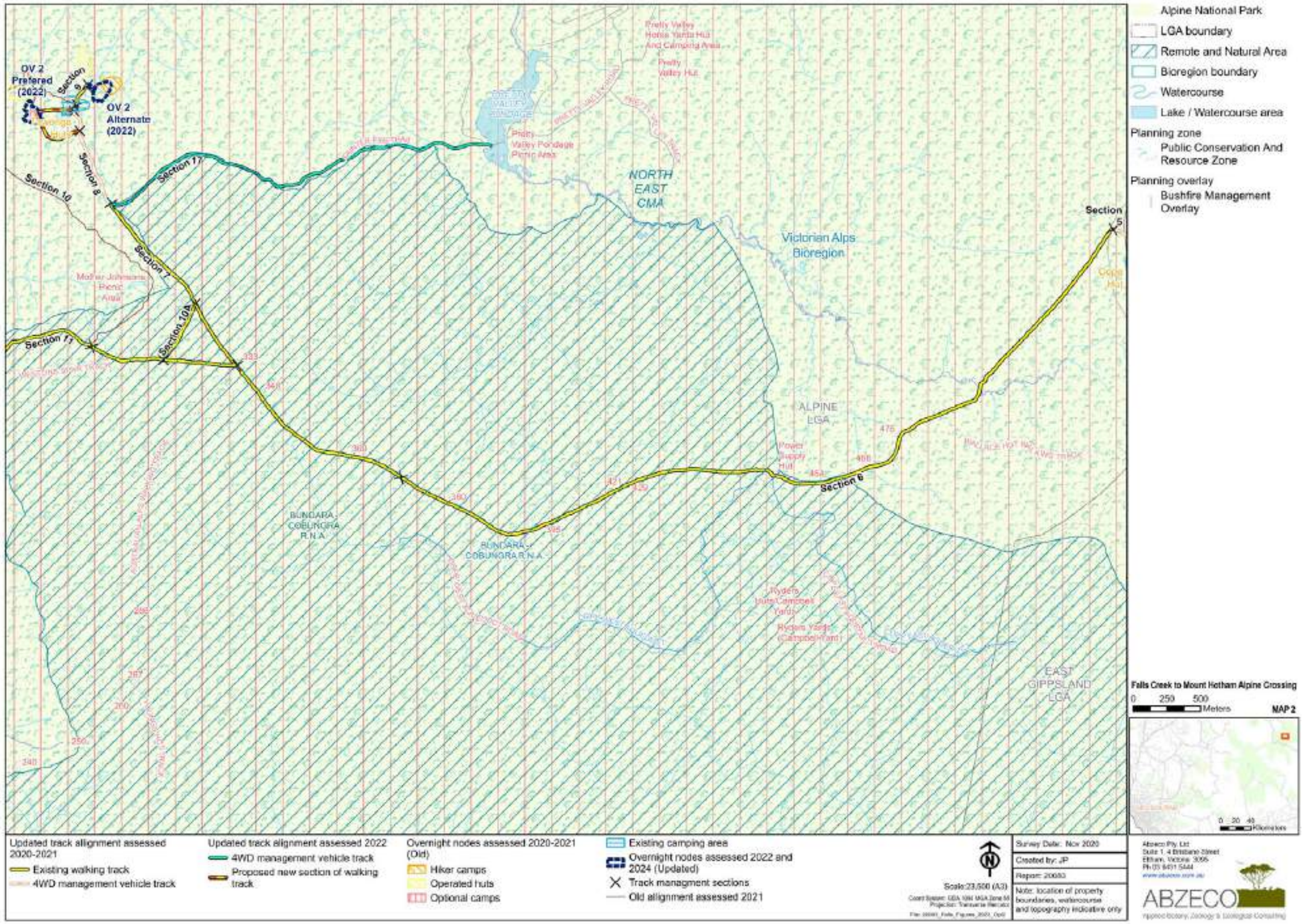
OV 2 Prefered (2022)
OV 2 Alternate (2022)
Section 9
Section 8
Section 10
Section 17
Section 7
Section 10A
Section 11
Section 6
Section 5
Pretty Valley Horse Yards Hut And Camping Area
Pretty Valley Hut
Pretty Valley Pondage Picnic Area
NORTH EAST CMA
Victorian Alps Bioregion
ALPINE LGA
EAST GIPPSLAND LGA
BUNDARA - COBUNGRA R.N.A
Ryders Huts/Campers Yards
Ryders Yards (Campers Yard)
Power Supply Hut
Mother Johnsons Picnic Area
Alpine National Park
LGA boundary
Remote and Natural Area
Bioregion boundary
Watercourse
Lake / Watercourse area
Planning zone
Public Conservation And Resource Zone
Planning overlay
Bushfire Management Overlay
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2020-2021 (Old)
Hiker camps
Operated huts
Optional camps
Existing camping area
Overnight nodes assessed 2022 and 2024 (Updated)
Track managment sections
Old alignment assessed 2021
Scale:23,500 (A3)
Survey Date: Nov 2020
Created by: JP
Report: 20083
Note: location of property boundaries, watercourse and topography indicative only
Falls Creek to Mount Hotham Alpine Crossing
0 250 500 Meters
MAP 2
0 20 40 Kilometers
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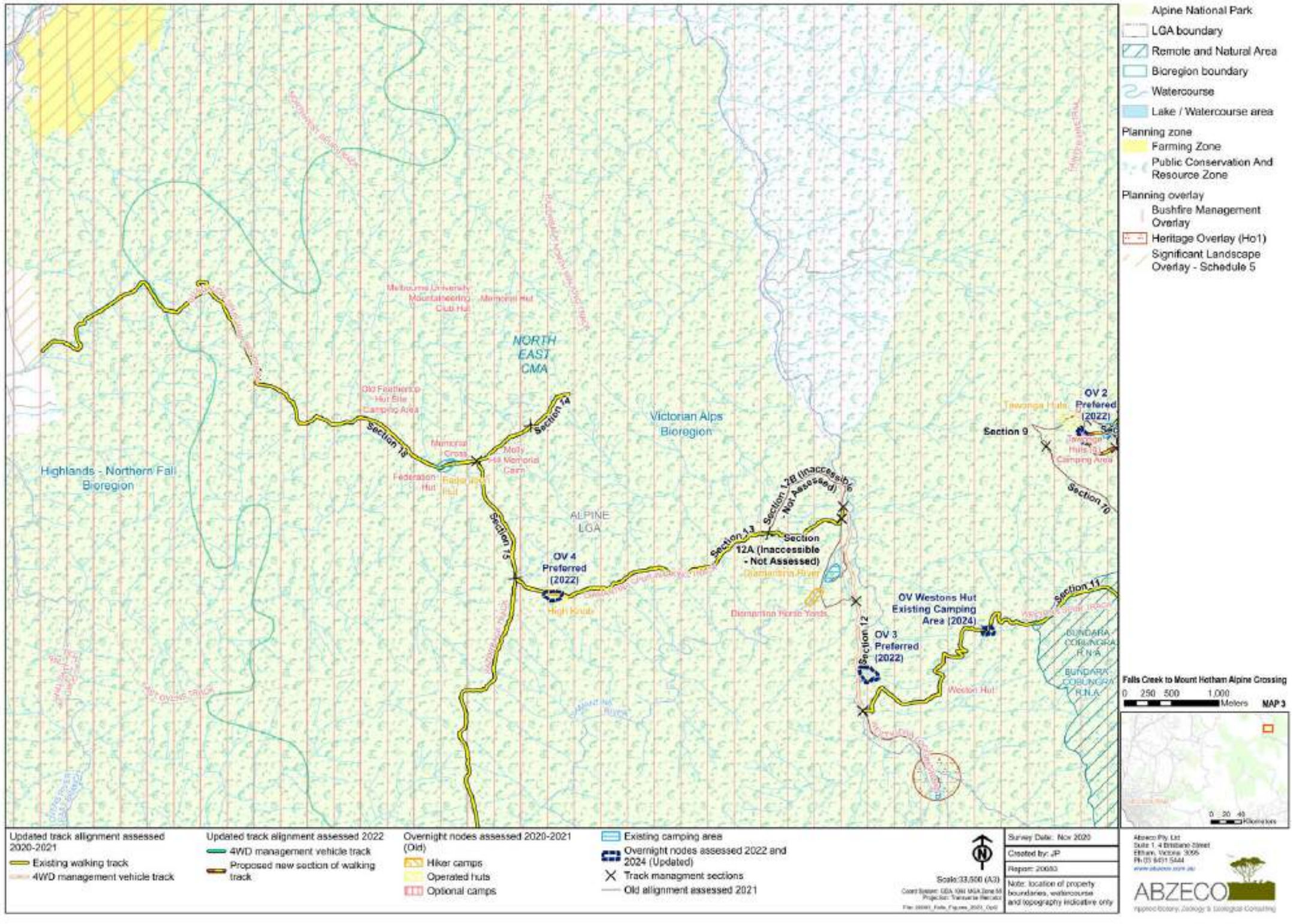
Alpine National Park
LGA boundary
Remote and Natural Area
Bioregion boundary
Watercourse
Lake / Watercourse area
Planning zone
Farming Zone
Public Conservation And Resource Zone
Planning overlay
Bushfire Management Overlay
Heritage Overlay (Ho1)
Significant Landscape Overlay - Schedule 5
Melbourne University Mountaineering Club Hut
Memorial Hut
NORTH EAST CMA
Old Feathertop Hut Site Camping Area
Section 14
Section 13
Memorial Cross
Mt Feathertop
Mt Feathertop Memorial Cairn
Federation Hut
Razorback Hut
Victorian Alps Bioregion
Highlands - Northern Fall Bioregion
ALPINE LGA
Section 15
OV 4 Preferred (2022)
High Knob
Section 1.3
Section 1.2B (Inaccessible - Not Assessed)
Section 12A (Inaccessible - Not Assessed)
Diamantina River
Diamantina Horse Yards
Section 12
OV 3 Preferred (2022)
OV Westons Hut Existing Camping Area (2024)
Section 11
Weston Hut
BUNDARA CORUNGRA R.N.A
OV 2 Preferred (2022)
Section 9
Section 10
Falls Creek to Mount Hotham Alpine Crossing
0 250 500 1,000 Meters
MAP 3
0 20 40 Kilometers
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2020-2021 (Old)
Hiker camps
Operated huts
Optional camps
Existing camping area
Overnight nodes assessed 2022 and 2024 (Updated)
Track managment sections
Old alignment assessed 2021
Scale:33,500 (A3)
Survey Date: Nov 2020
Created by: JP
Report: 20083
Note: location of property boundaries, watercourse and topography indicative only
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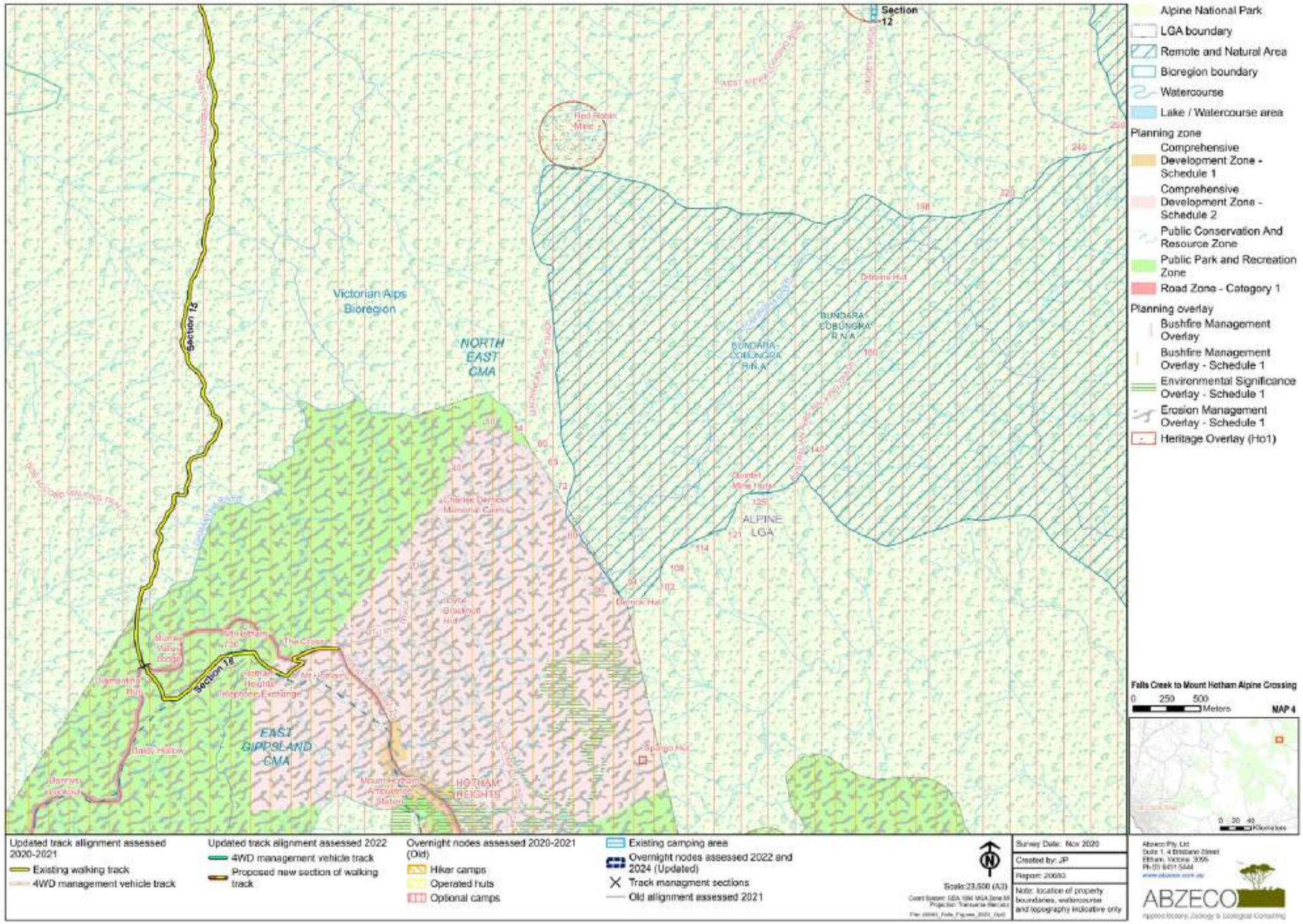
Section 12
Section 13
Section 14
Victorian Alps Bioregion
NORTH EAST CMA
EAST GIPPSLAND CMA
ALPINE LGA
HOTHAM HEIGHTS
BUNDARA-COBUNGRA R.N.A.
Red Robin Mine
Debneys Hut
Quartet Mine Huts
Derrick Hut
Spargo Hut
Diamantina Hut
Bailey Hollow
Barrys Hollow
Mount Hotham Automatic Station
Alpine National Park
LGA boundary
Remote and Natural Area
Bioregion boundary
Watercourse
Lake / Watercourse area
Planning zone
Comprehensive Development Zone - Schedule 1
Comprehensive Development Zone - Schedule 2
Public Conservation And Resource Zone
Public Park and Recreation Zone
Road Zone - Category 1
Planning overlay
Bushfire Management Overlay
Bushfire Management Overlay - Schedule 1
Environmental Significance Overlay - Schedule 1
Erosion Management Overlay - Schedule 1
Heritage Overlay (Ho1)
Falls Creek to Mount Hotham Alpine Crossing
0 250 500 Meters
MAP 4
0 20 40 Kilometers
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2020-2021 (Old)
Hiker camps
Operated huts
Optional camps
Existing camping area
Overnight nodes assessed 2022 and 2024 (Updated)
Track managment sections
Old alignment assessed 2021
Scale:23,500 (A3)
Survey Date: Nov 2020
Created by: JP
Report: 20083
Note: location of property boundaries, watercourse and topography indicative only
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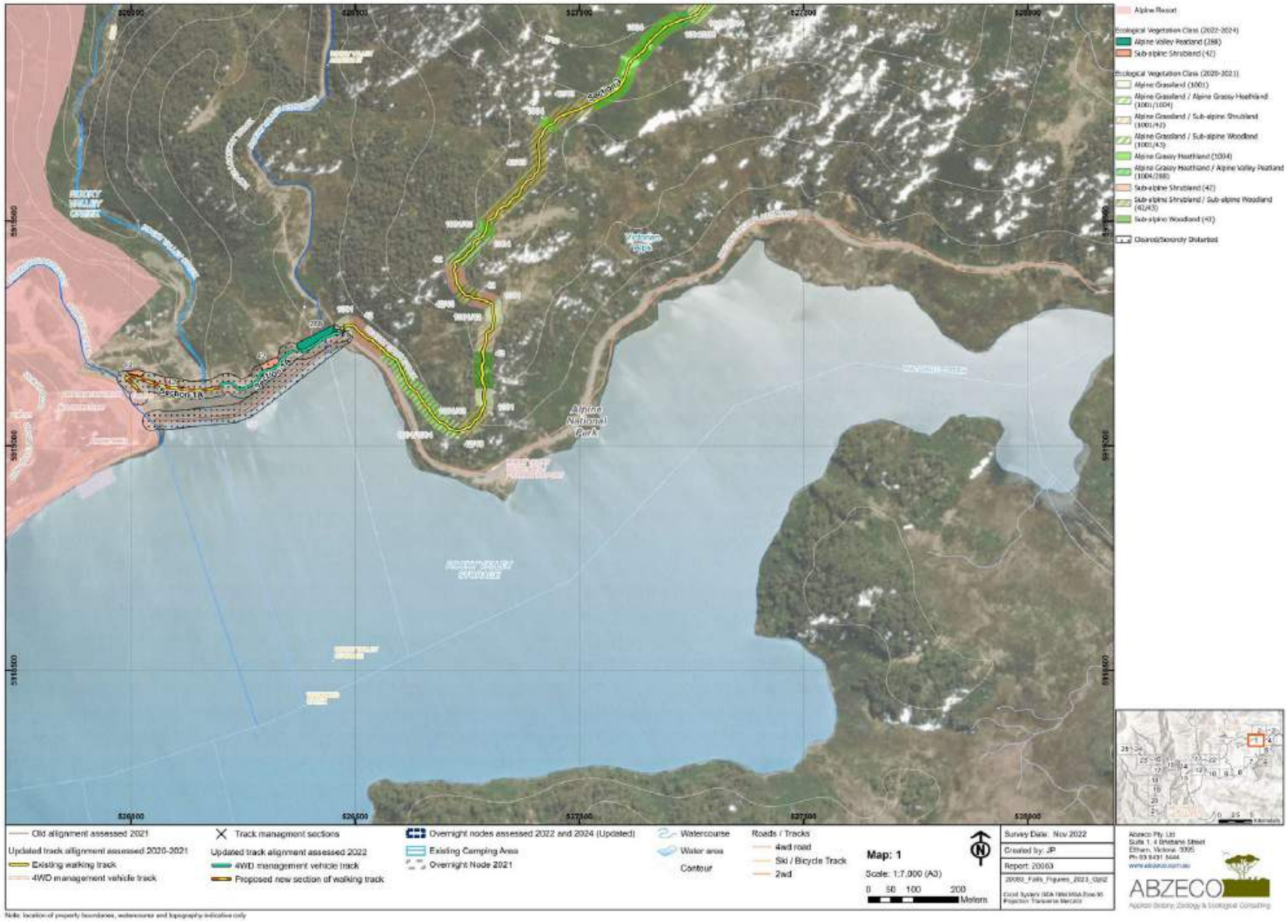
Appendix 1b. Ecological Vegetation Classes (EVC) (maps 1-25) recorded along the alignment of the updated proposed Falls to Hotham Alpine Crossing assessment area (recorded between November 2020 and February 2024)


Alpine Resort
Ecological Vegetation Class (2022-2024)
Alpine Valley Peatland (288)
Sub-alpine Shrubland (42)
Ecological Vegetation Class (2020-2021)
Alpine Grassland (1001)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassland / Sub-alpine Shrubland (1001/42)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Valley Peatland (1004/288)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Clearing/Severely Disturbed
Section 1A
Section 1B
Section 2
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 1
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgis2
Cord System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
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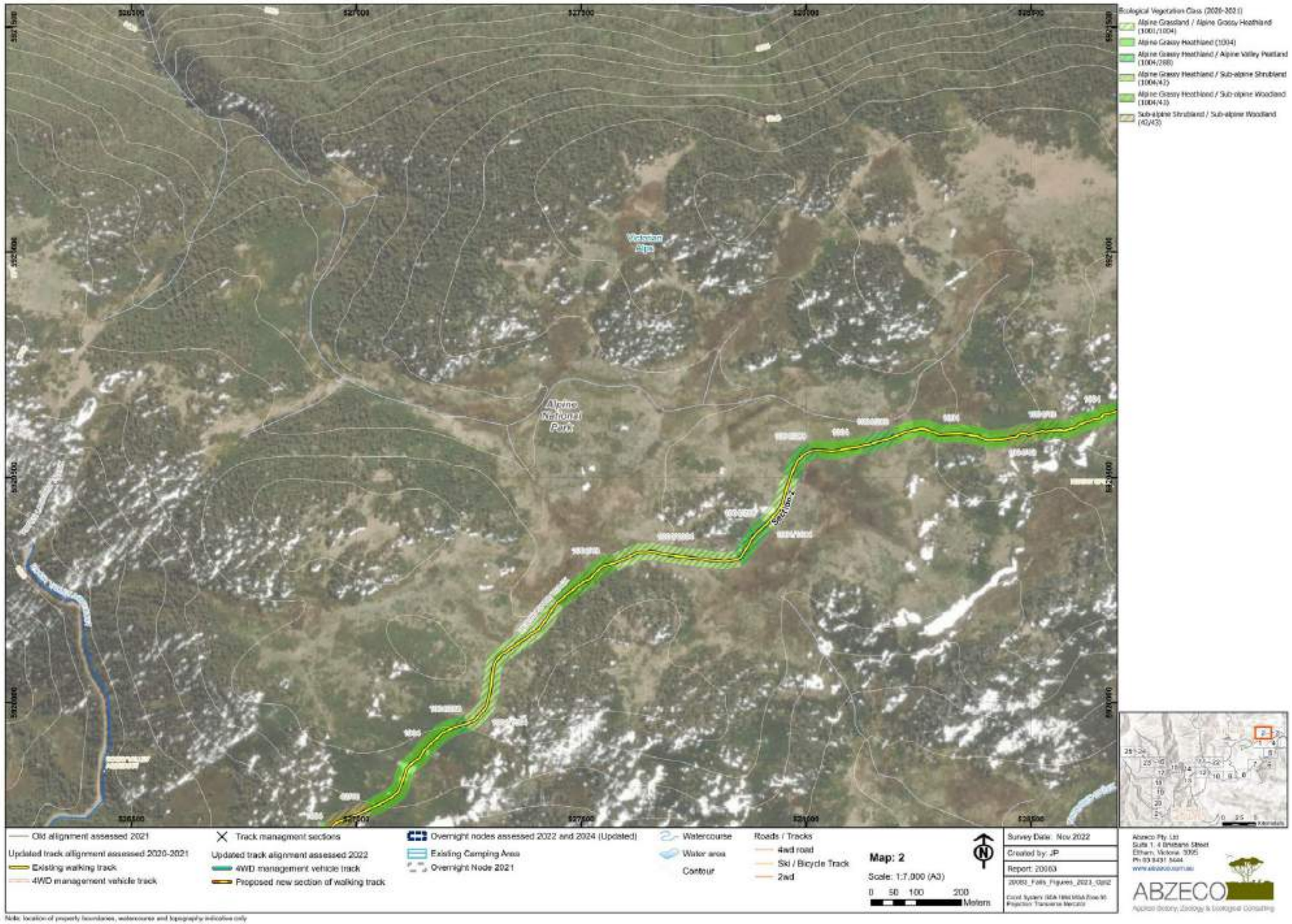
www.abzeco.com.au
ABZECO
Applied Botany, Zoology & Ecological Consulting
Note: location of property boundaries, watercourse and topography indicative only


Ecological Vegetation Class (2026-303 I)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Valley Peatland (1004/288)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Hotham Alps
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track management sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 2
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgis2
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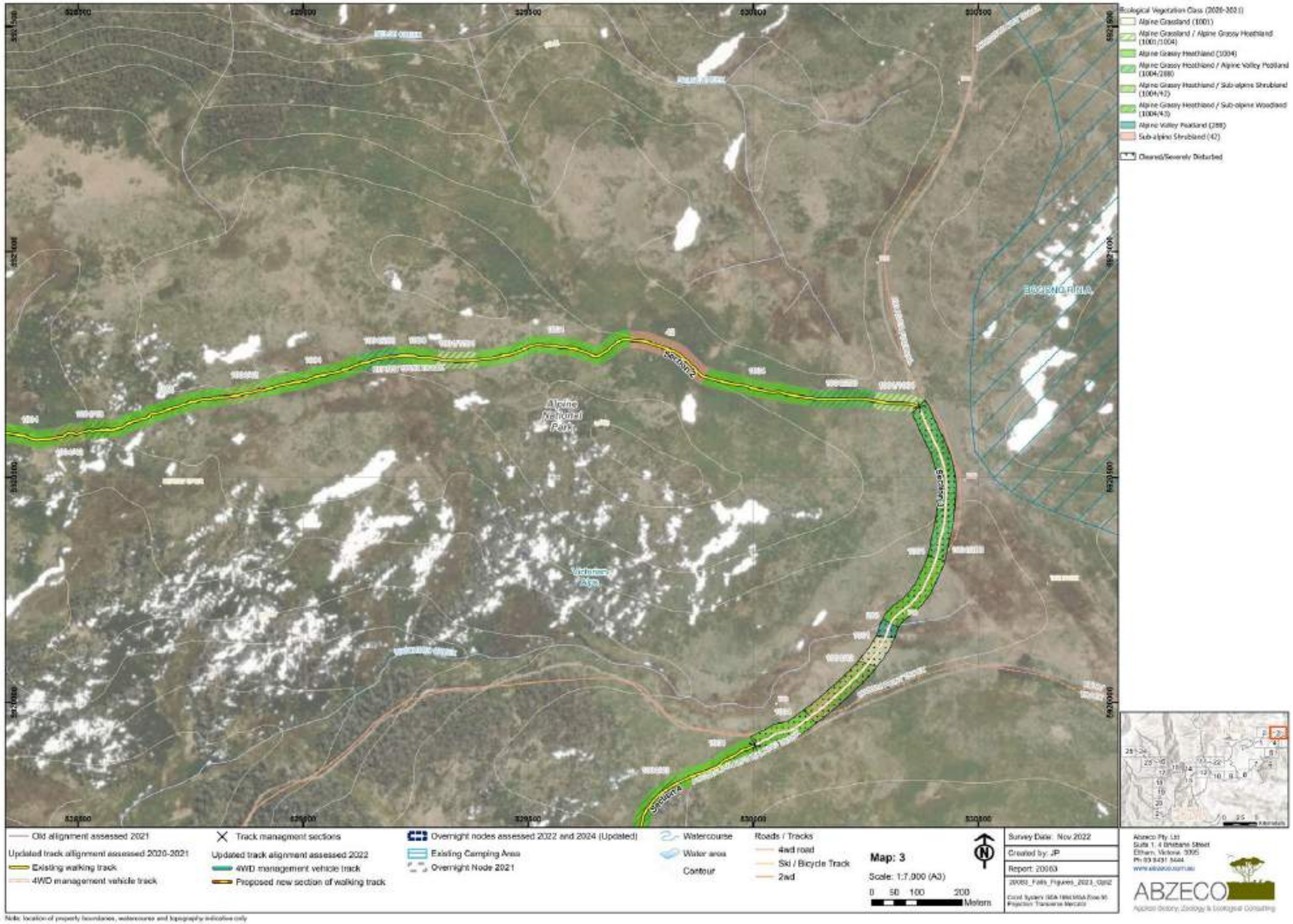
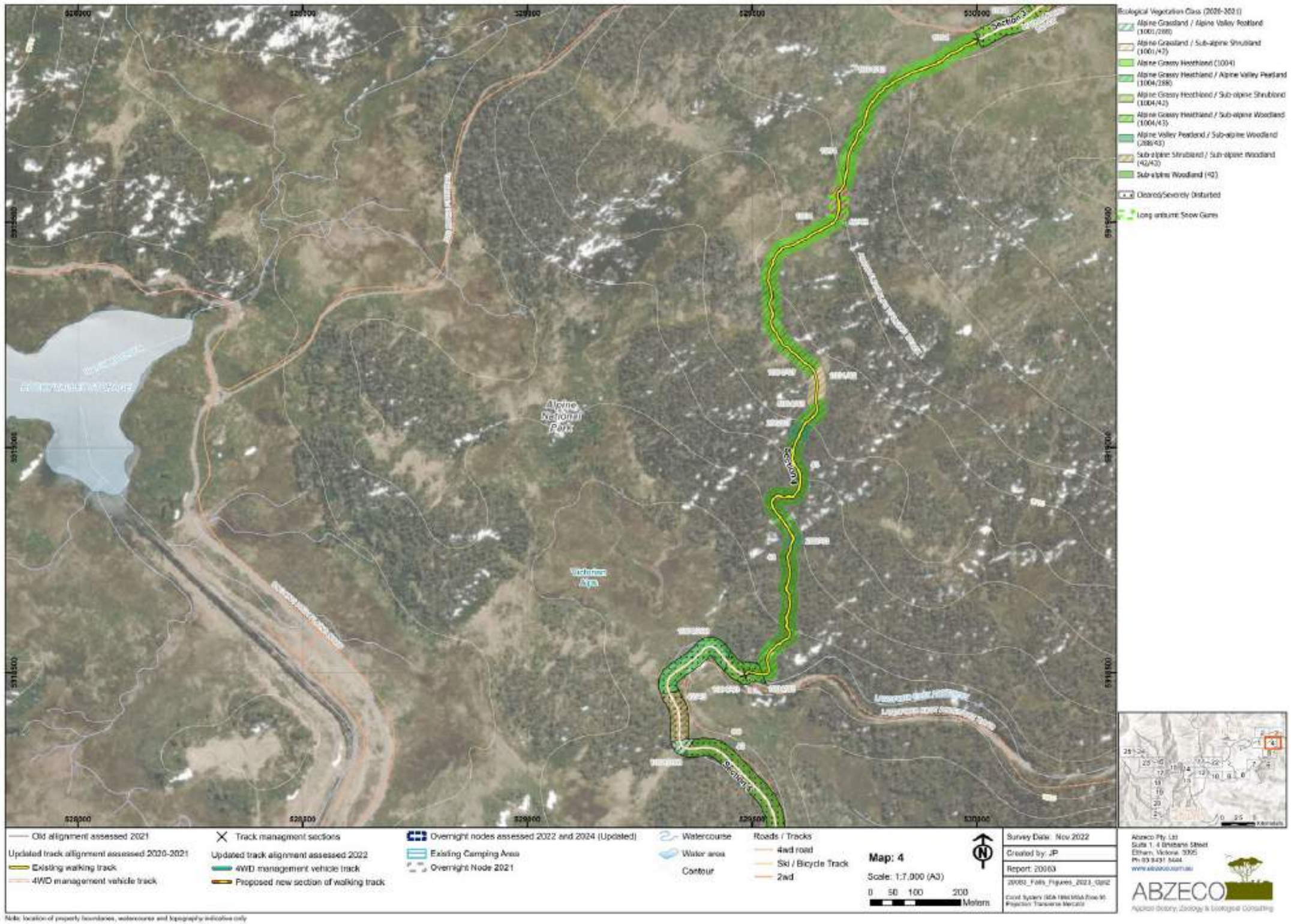
Note: location of property boundaries, watercourse and topography indicative only


Ecological Vegetation Class (2020-302 i)
Alpine Grassland (1001)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Valley Peatland (1004/288)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (288)
Sub-alpine Shrubland (42)
Cleared/Severely Disturbed
Section 2
Section 1
Section 3
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track management sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 3
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
ABZECO


Ecological Vegetation Class (2020-350 i)
Alpine Grassland / Alpine Valley Peatland (1001/288)
Alpine Grassland / Sub-alpine Shrubland (1001/42)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Valley Peatland (1004/288)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland / Sub-alpine Woodland (288/43)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Cleared/Severely Disturbed
Long unburnt Snow Gums
Alpine National Park
Victorian Alps
Section 3
Section 4
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 4
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgis2
Coord System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
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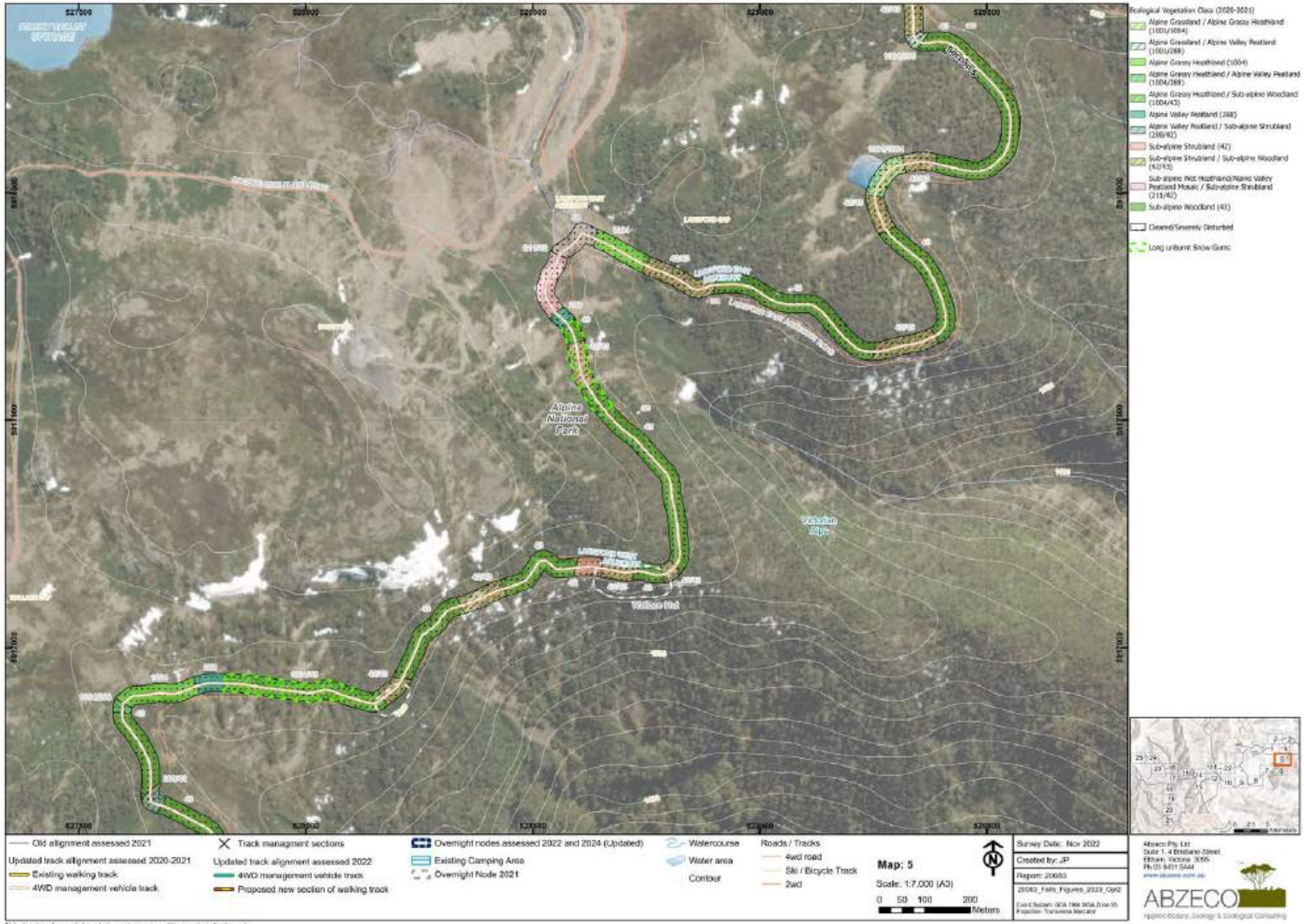
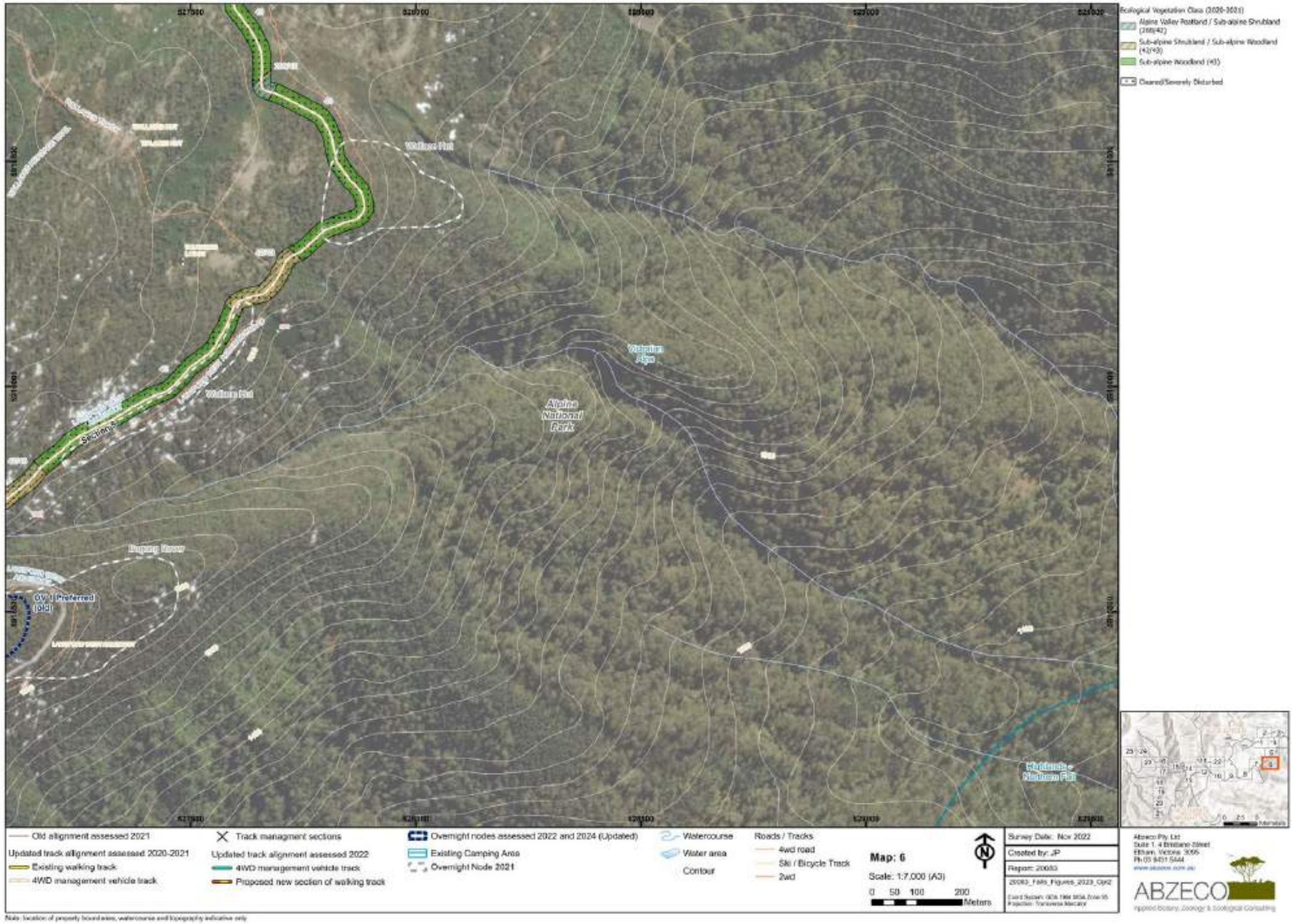
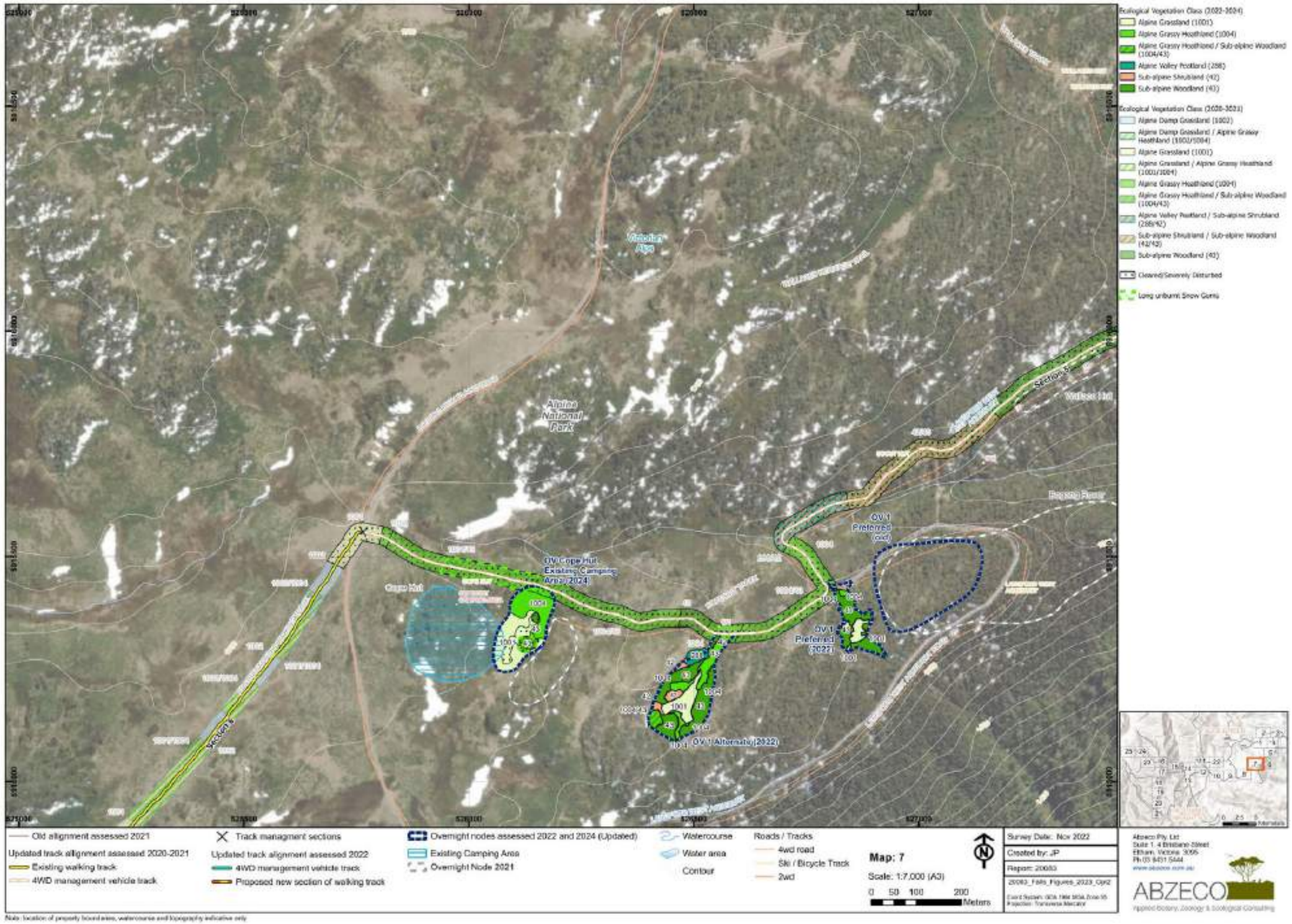
Note: location of property boundaries, watercourse and topography indicative only



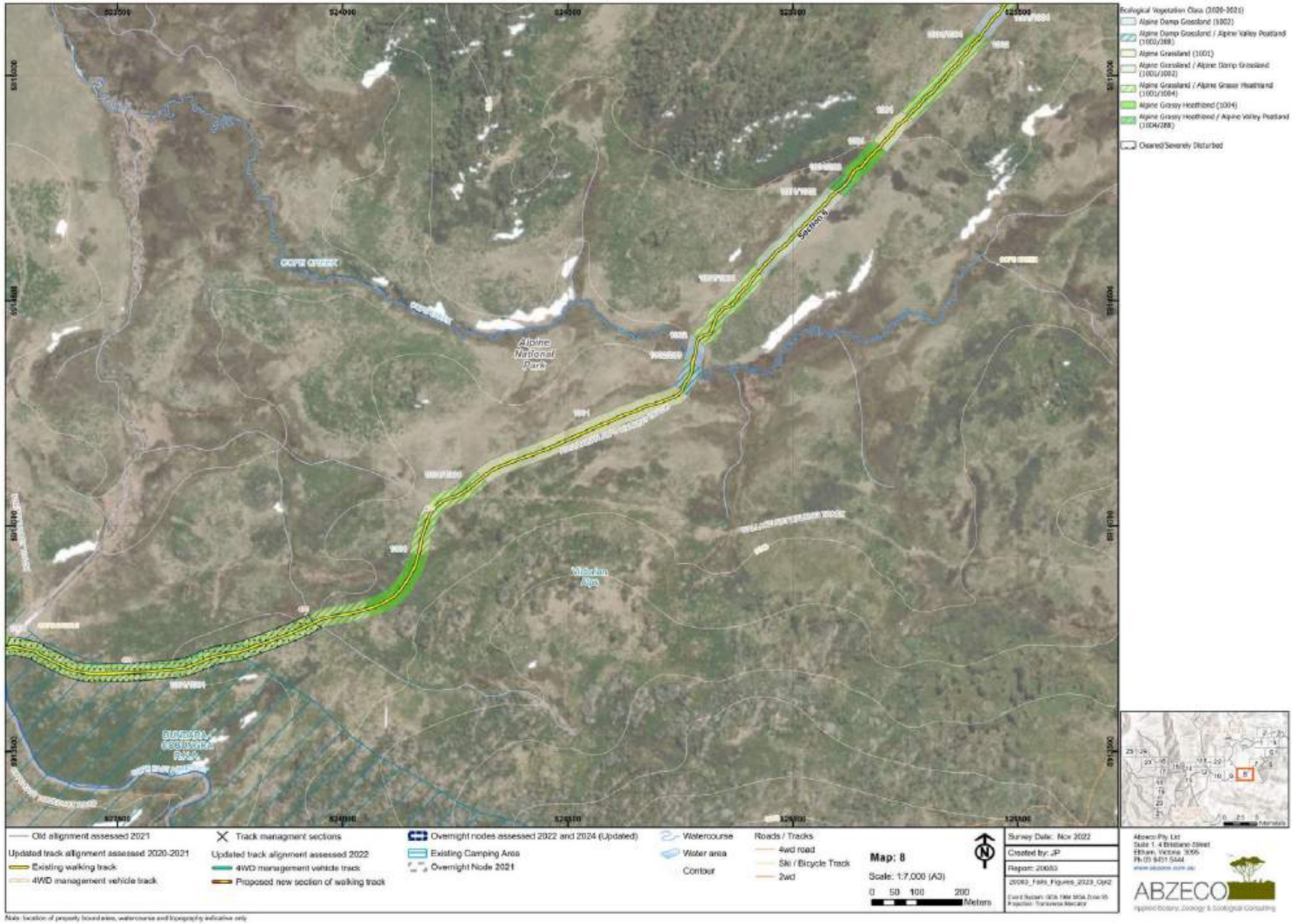
Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only


Ecological Vegetation Class (2020-2021)
Alpine Damp Grassland (1002)
Alpine Damp Grassland / Alpine Valley Peatland (1002/288)
Alpine Grassland (1001)
Alpine Grassland / Alpine Damp Grassland (1001/1002)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Valley Peatland (1004/288)
Cleared/Severely Disturbed
Section 9
COPE CREEK
Alpine National Park
BUNDARA CROSSING PICNIC
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 8
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgis2
Abzeco Pty Ltd
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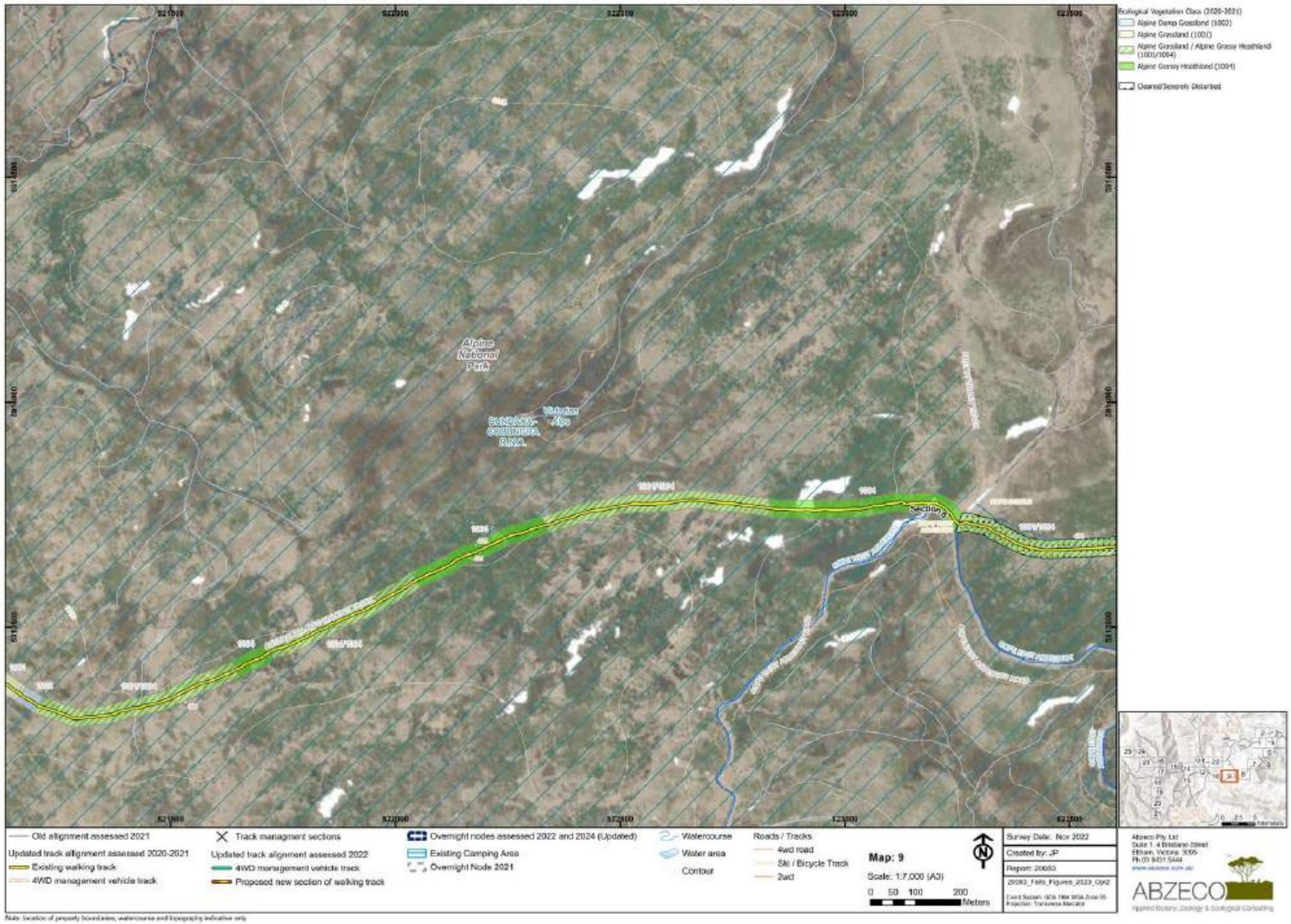
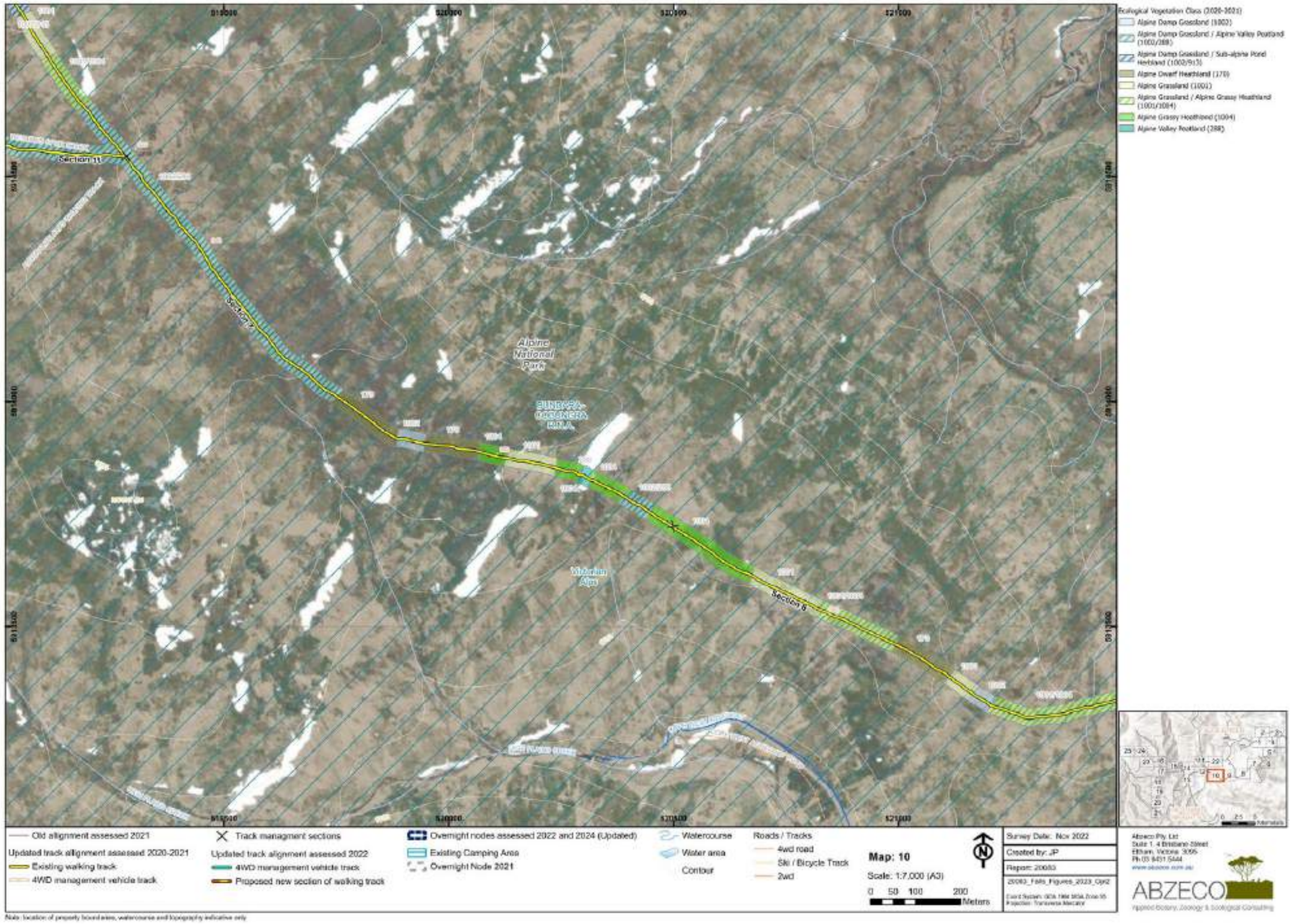
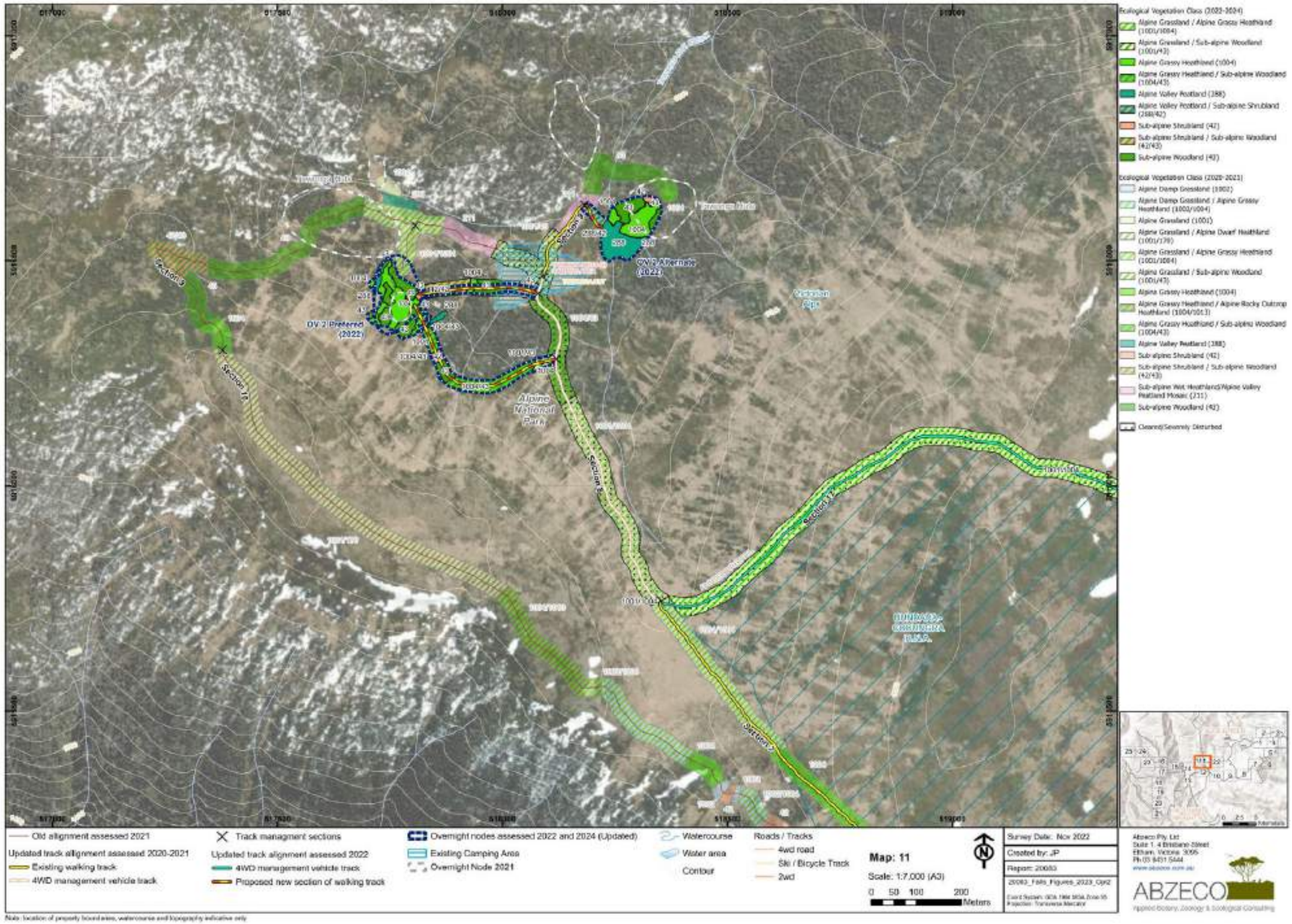
Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only


Ecological Vegetation Class (2022-2024)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (388)
Alpine Valley Peatland / Sub-alpine Shrubland (388/42)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2020-2021)
Alpine Damp Grassland (1002)
Alpine Damp Grassland / Alpine Grassy Heathland (1002/1004)
Alpine Grassland (1001)
Alpine Grassland / Alpine Dwarf Heathland (1001/178)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Rocky Outcrop Heathland (1004/1013)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (388)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (211)
Sub-alpine Woodland (42)
Cleared/Severely Disturbed
Section 1
Section 2
Section 3
Section 4
OV 2 Preferred (2022)
OV 2 Alternate (2022)
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 11
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qtr2
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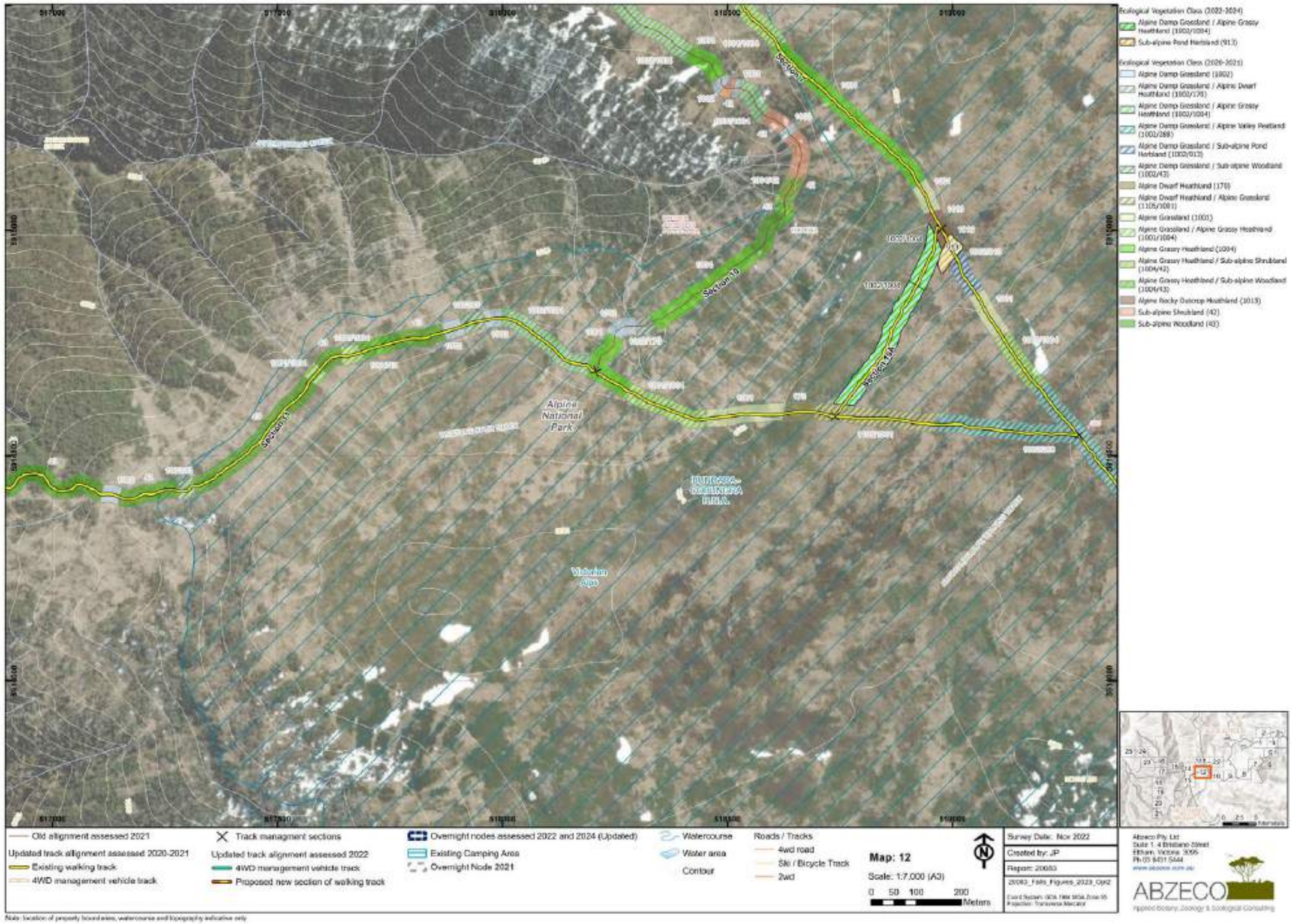
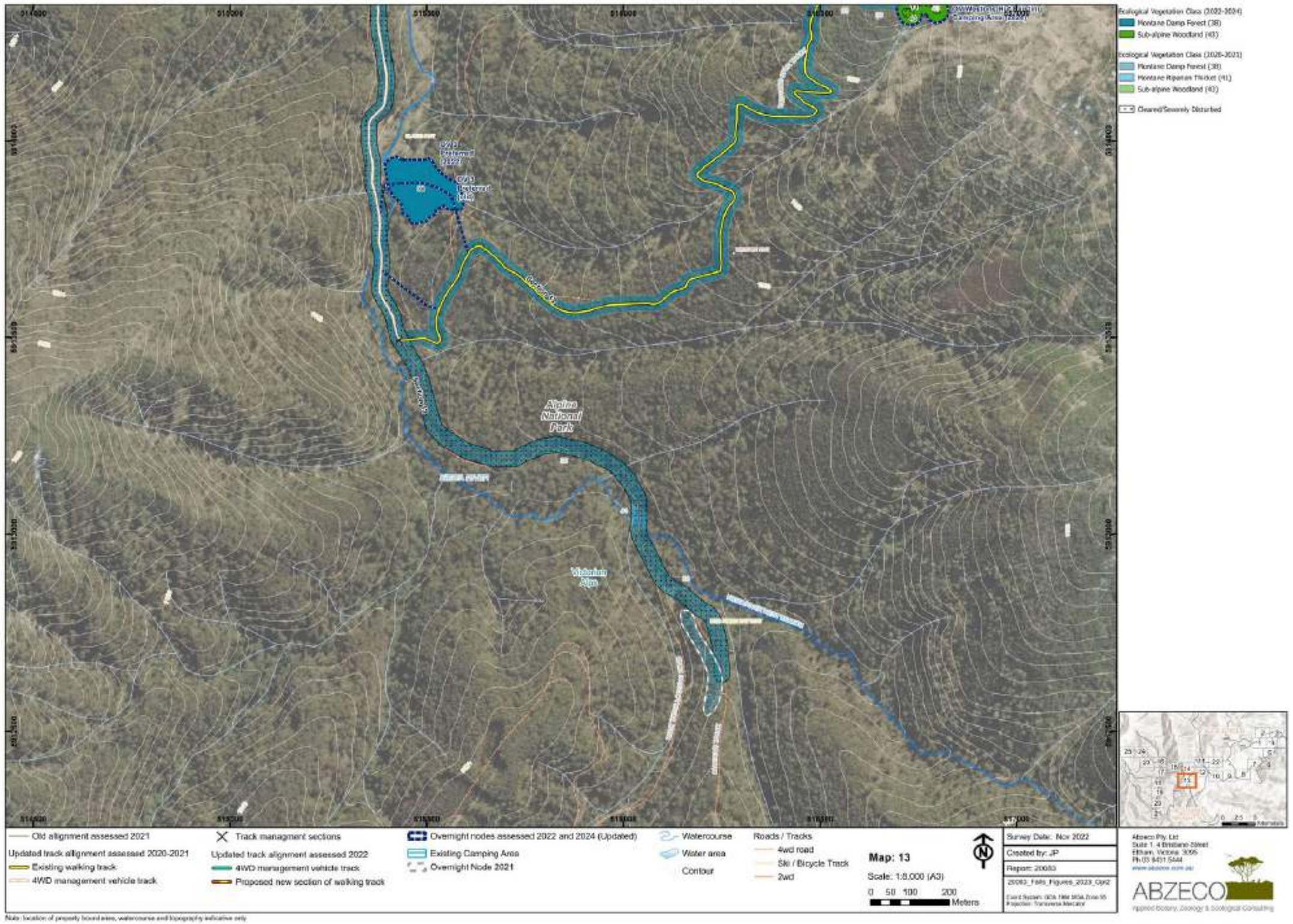
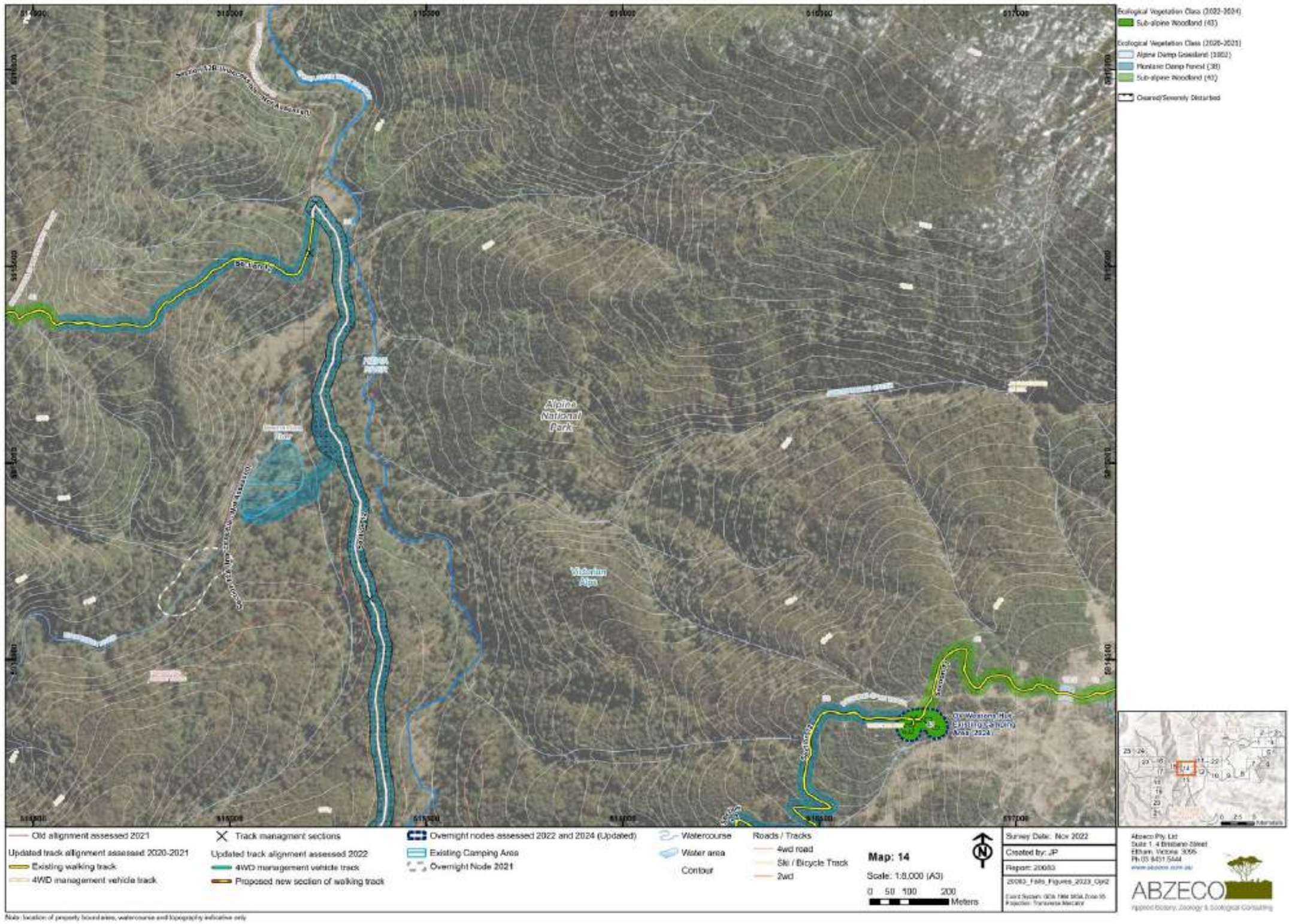


Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only


Ecological Vegetation Class (2002-3024)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2026-3023)
Alpine Damp Grassland (3002)
Montane Damp Forest (38)
Sub-alpine Woodland (43)
Cleared/Severely Disturbed
Alpine National Park
Victorian Alps
Old Westons Hut Falls to Hotham Area 2024
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 14
Scale: 1:8,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgs2
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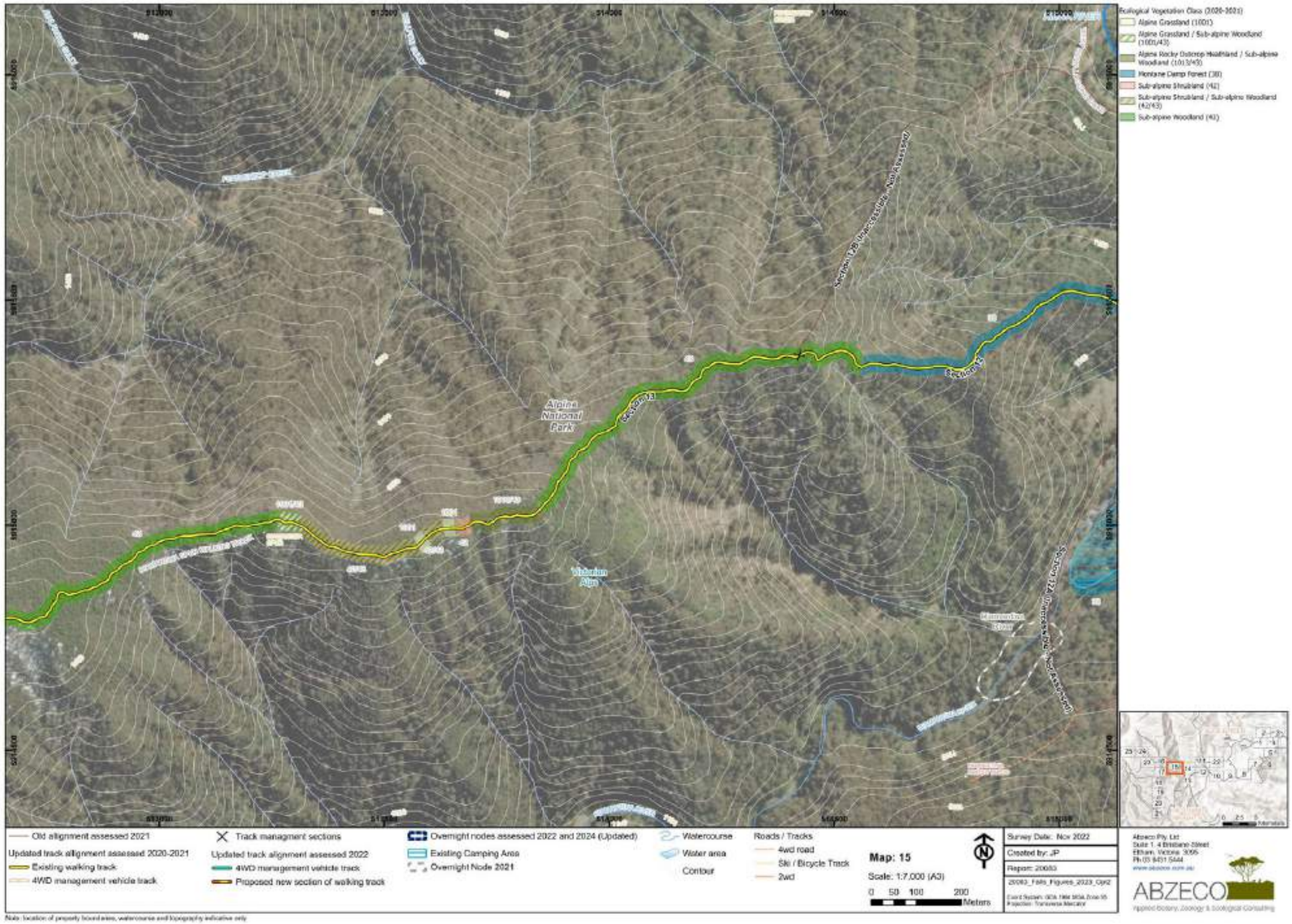
Ecological Vegetation Class (2020-3021)
Alpine Grassland (1001)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Rocky Outcrop Heathland / Sub-alpine Woodland (1013/43)
Montane Damp Forest (38)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Alpine National Park
Section 13
Section 12A (Upgrade to Track - Not Assessed)
Section 12B (Upgrade to Track - Not Assessed)
Section 12A (Upgrade to Track - Not Assessed)
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 15
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
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20083_Falls_Figures_2023_Qgis2
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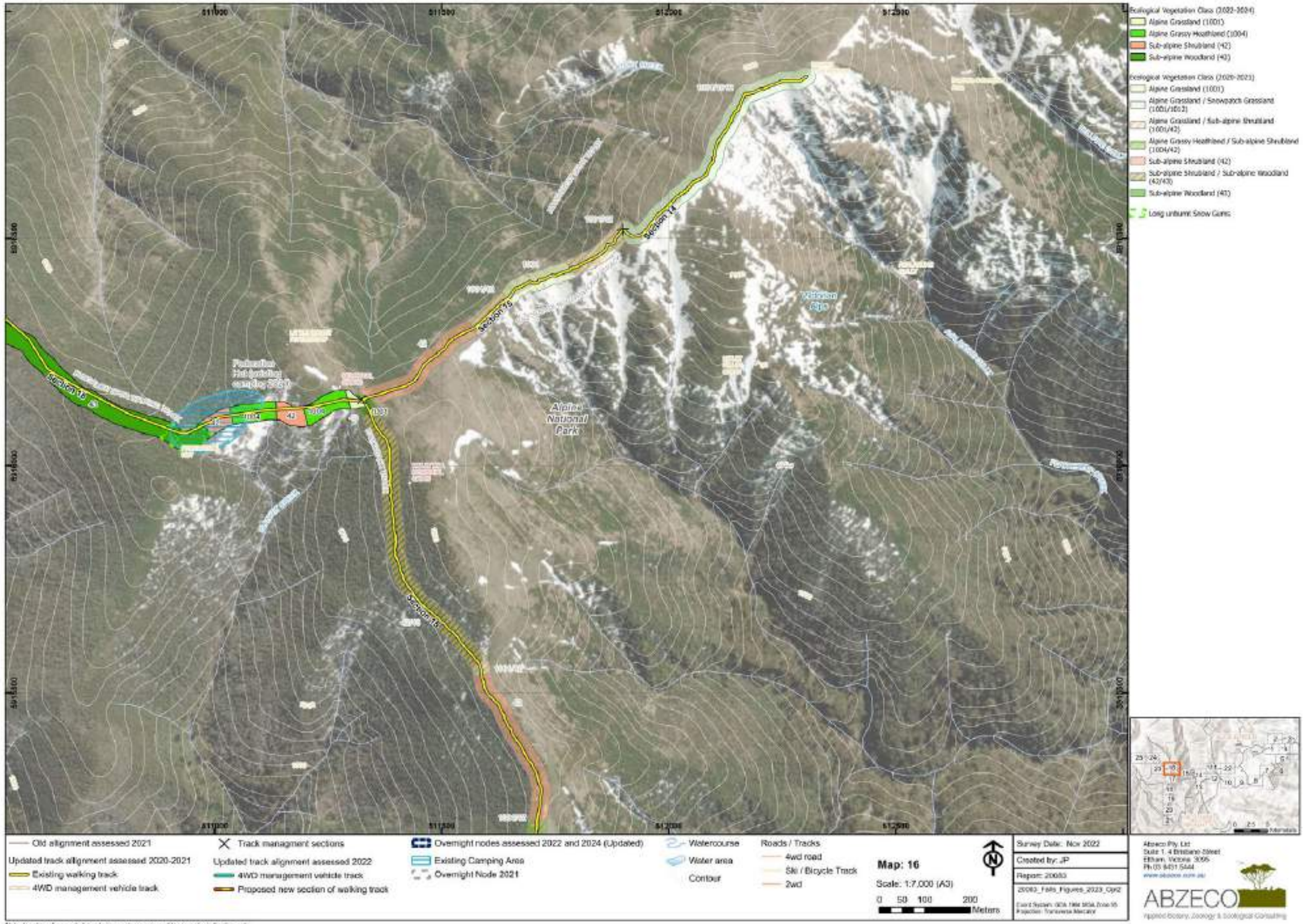
Ecological Vegetation Class (2022-2024)
Alpine Grassland (1001)
Alpine Grassy Heathland (1004)
Sub-alpine Shrubland (42)
Sub-alpine Woodland (40)
Ecological Vegetation Class (2020-2021)
Alpine Grassland (1001)
Alpine Grassland / Snowpatch Grassland (1001/1012)
Alpine Grassland / Sub-alpine Shrubland (1001/42)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/40)
Sub-alpine Woodland (40)
Long unburnt Snow Gums
Section 1A
Section 1B
Section 1C
Section 1D
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 16
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
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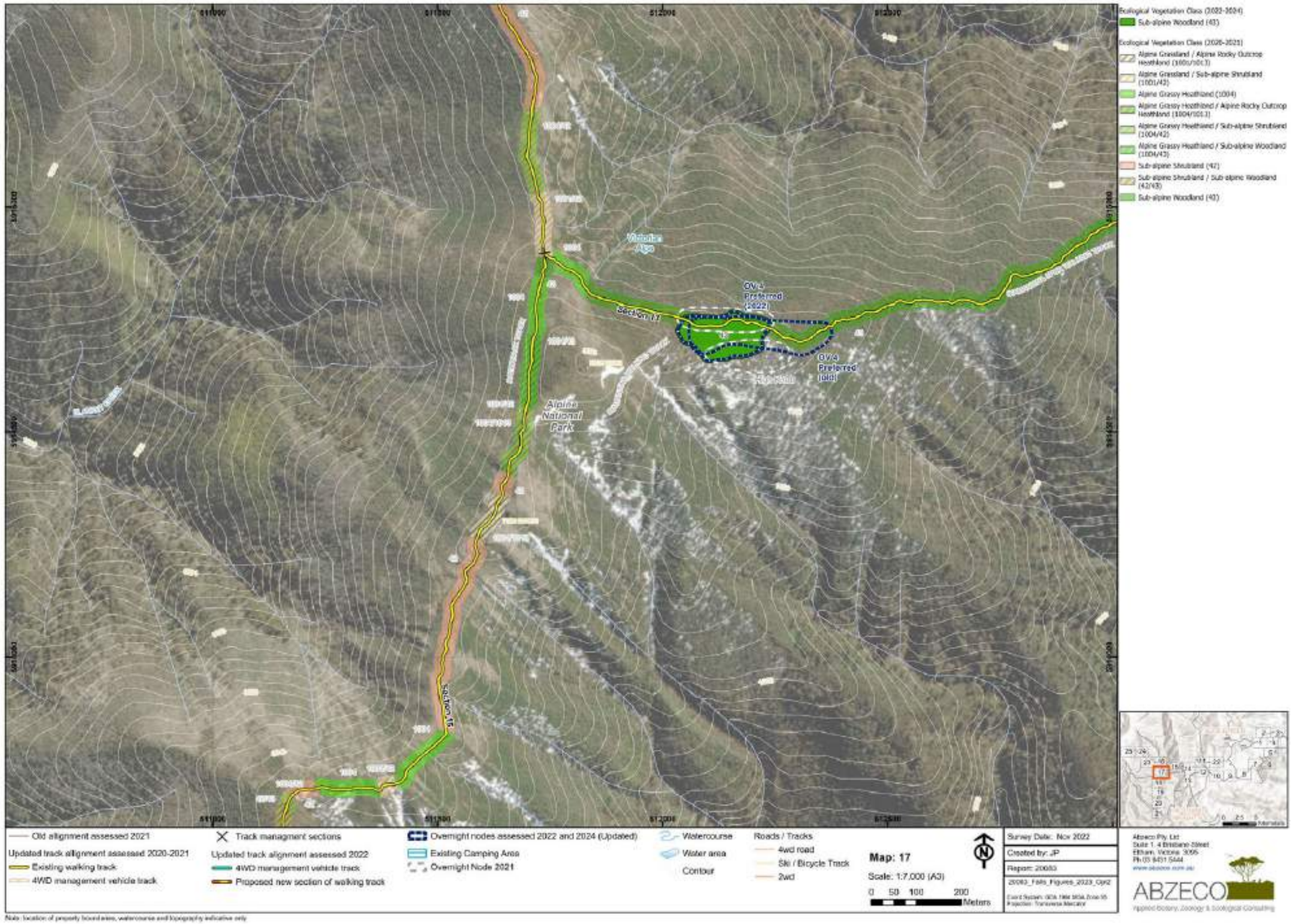
Ecological Vegetation Class (3002-3024)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2026-3023)
Alpine Grassland / Alpine Rocky Outcrop Heathland (3003/1003)
Alpine Grassland / Sub-alpine Shrubland (1003/42)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Rocky Outcrop Heathland (1004/1003)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Alpine National Park
Section 17
Section 16
OV 4 Preferred (1022)
OV 4 Preferred (old)
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 17
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
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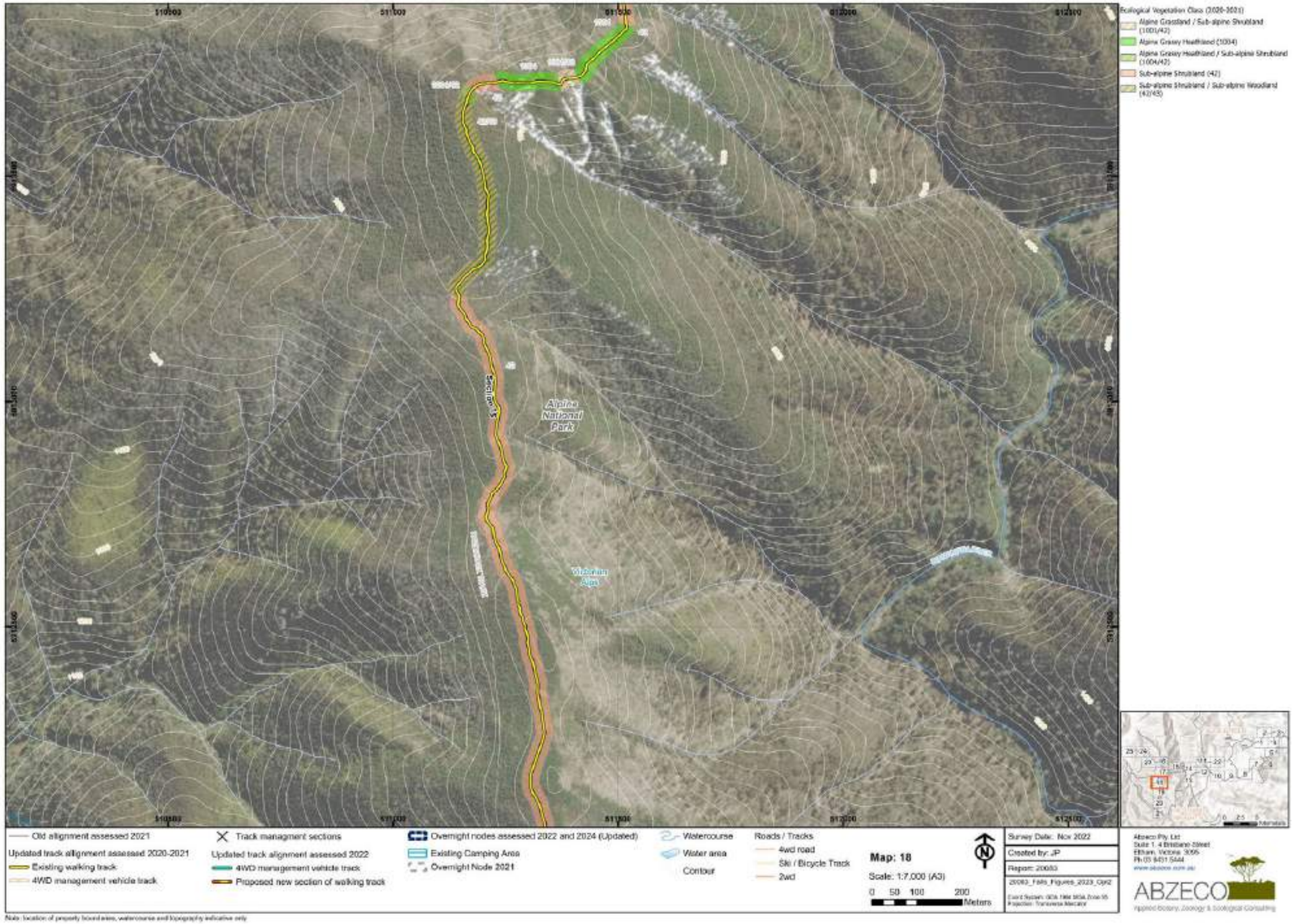
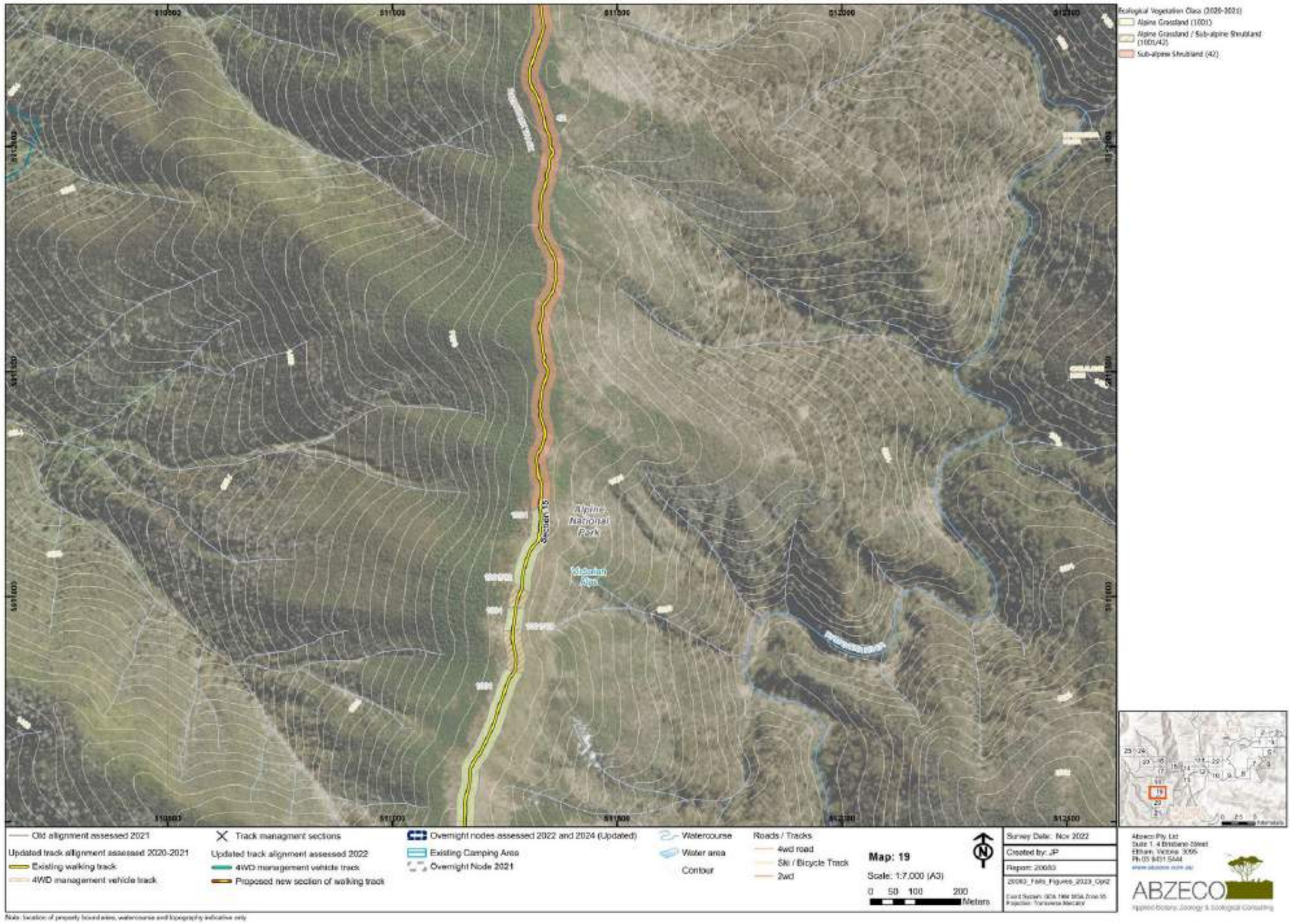
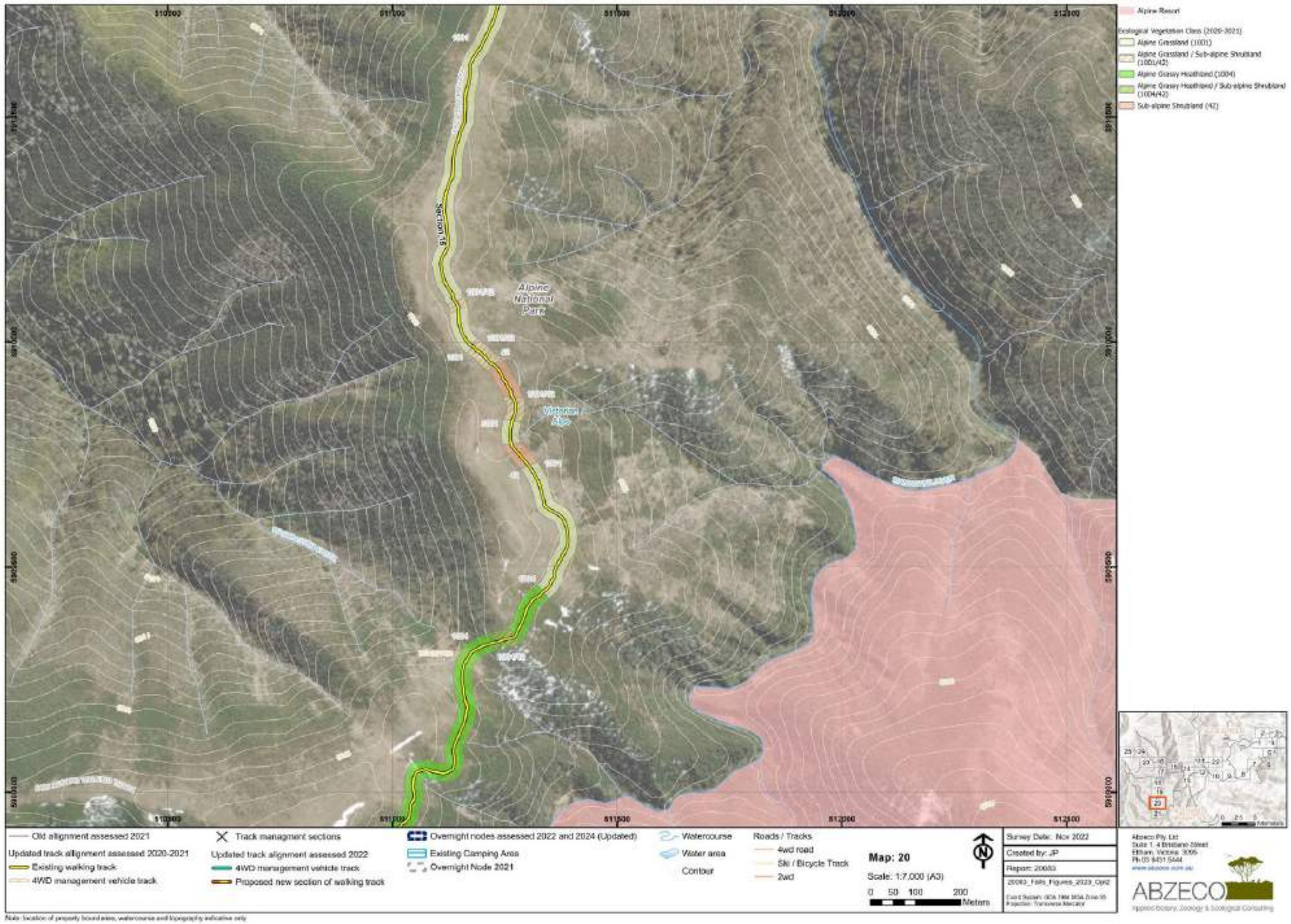
Note: location of property boundaries, watercourse and topography indicative only



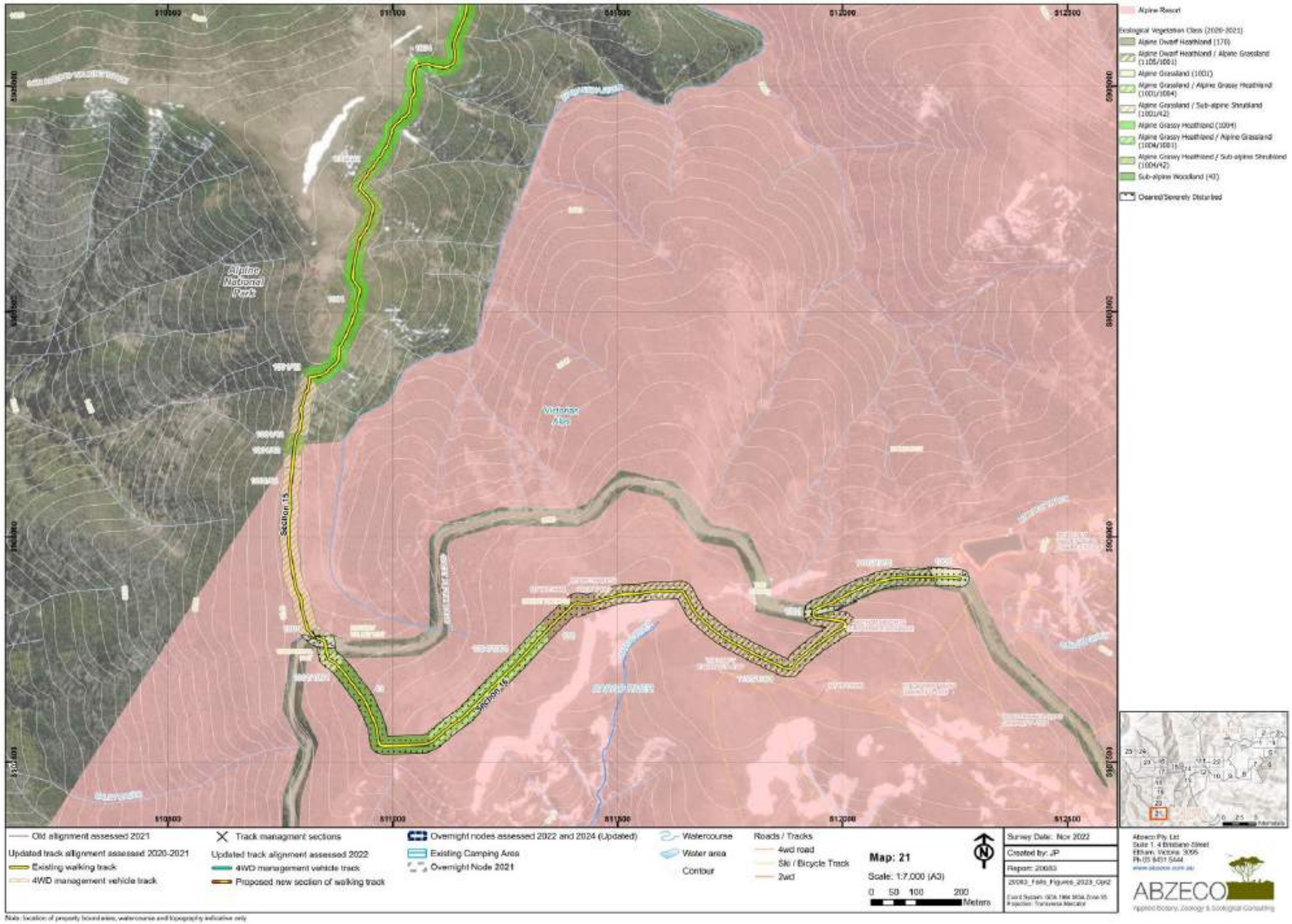
Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only



Note: location of property boundaries, watercourse and topography indicative only


Alpine Resort
Ecological Vegetation Class (2020-2021)
Alpine Dwarf Heathland (170)
Alpine Dwarf Heathland / Alpine Grassland (1105/1001)
Alpine Grassland (1001)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassland / Sub-alpine Shrubland (1001/42)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Grassland (1004/1001)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Sub-alpine Woodland (40)
Cleared/Severely Disturbed
Alpine National Park
Victoria Alps
Section 15
Section 16
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 21
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
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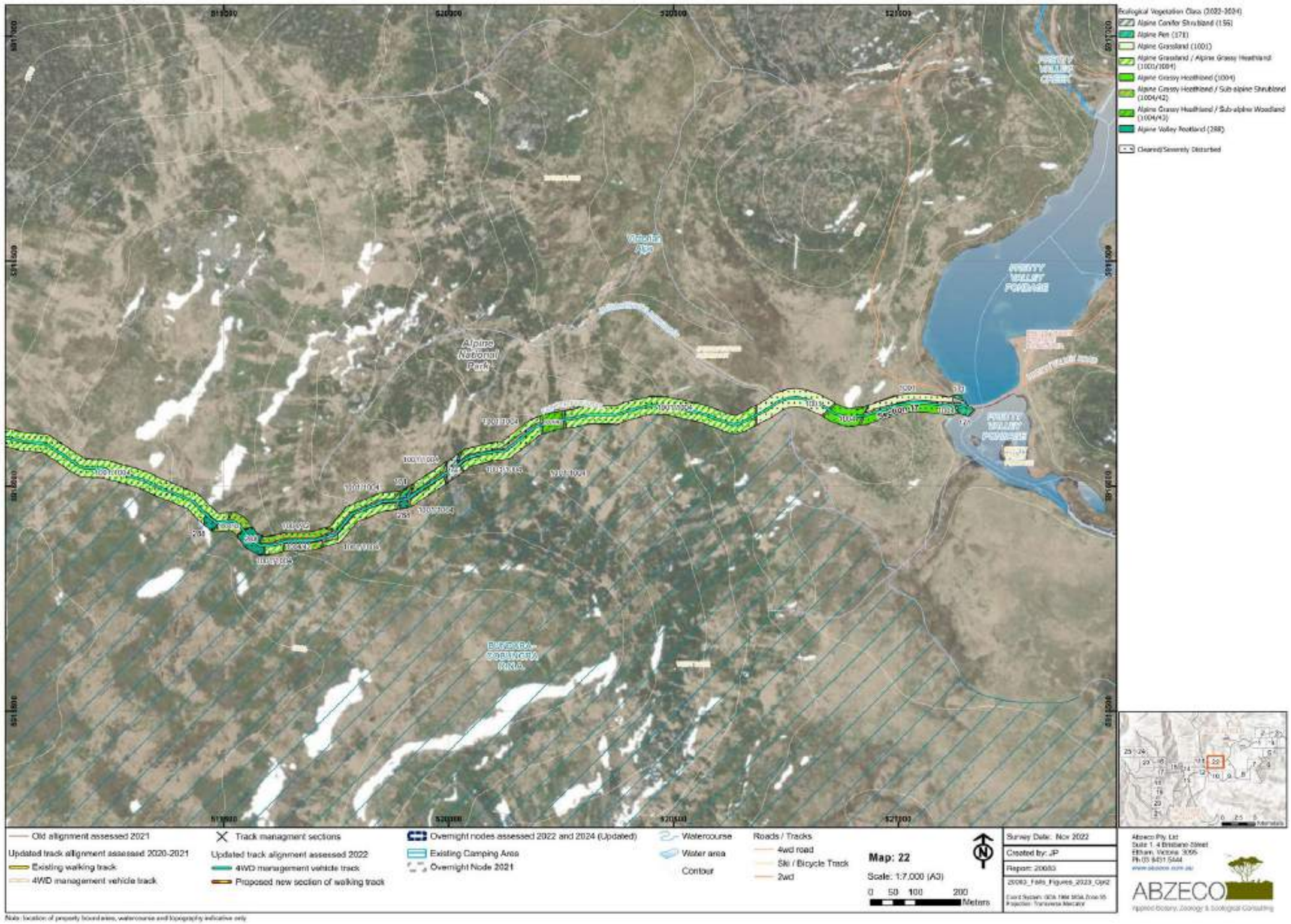
Ecological Vegetation Class (2022-2024)
Alpine Conifer Shrubland (155)
Alpine Fen (171)
Alpine Grassland (1001)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (288)
Cleared/Severely Disturbed
Alpine National Park
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 22
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
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20083_Falls_Figures_2023_Qgis2
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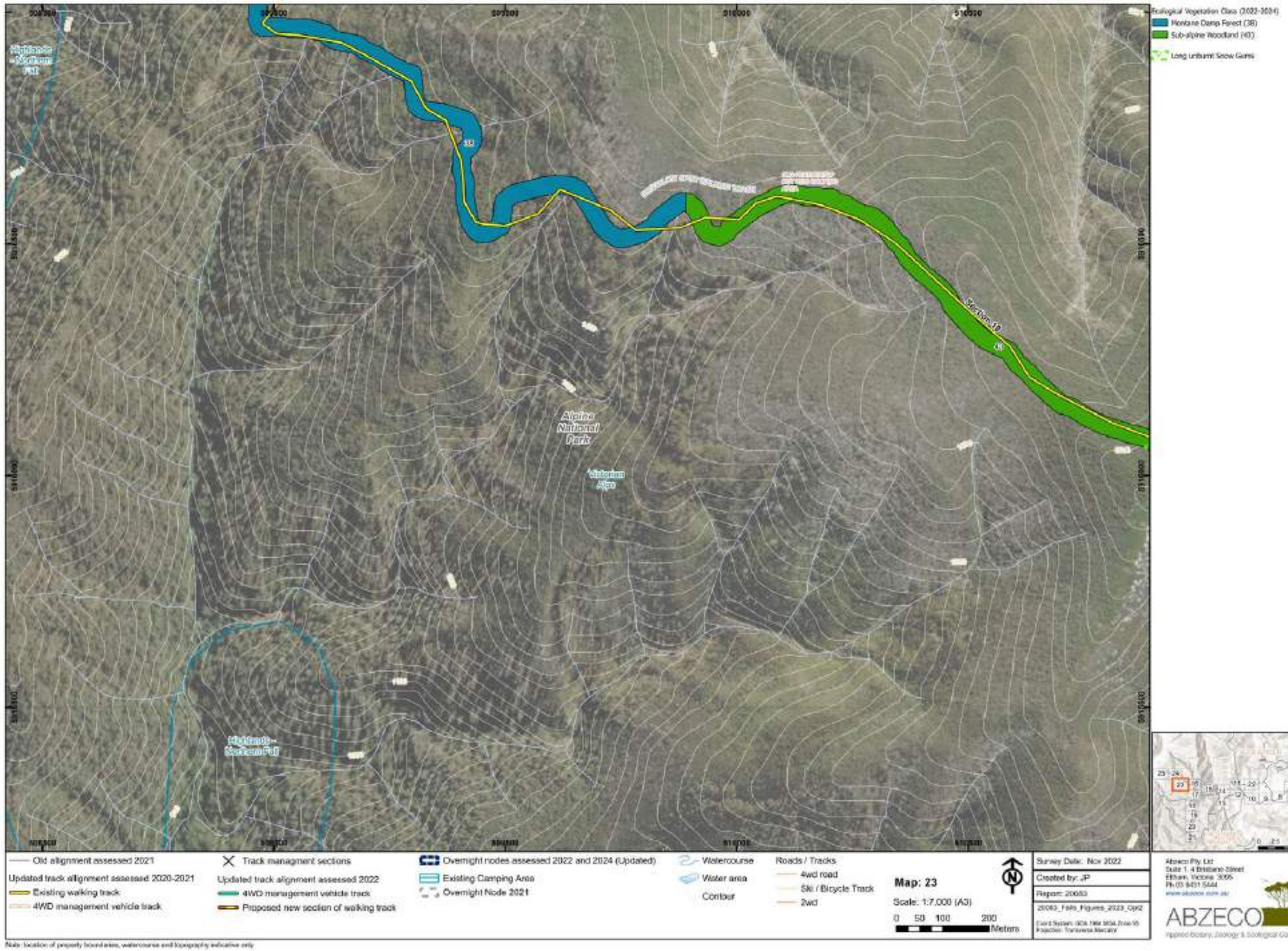
Ecological Vegetation Class (2002-2024)
Montane Damp Forest (38)
Sub-alpine Woodland (40)
Long unburnt Snow Gums
Section 19
Alpine National Park
Victorian Alps
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 23
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
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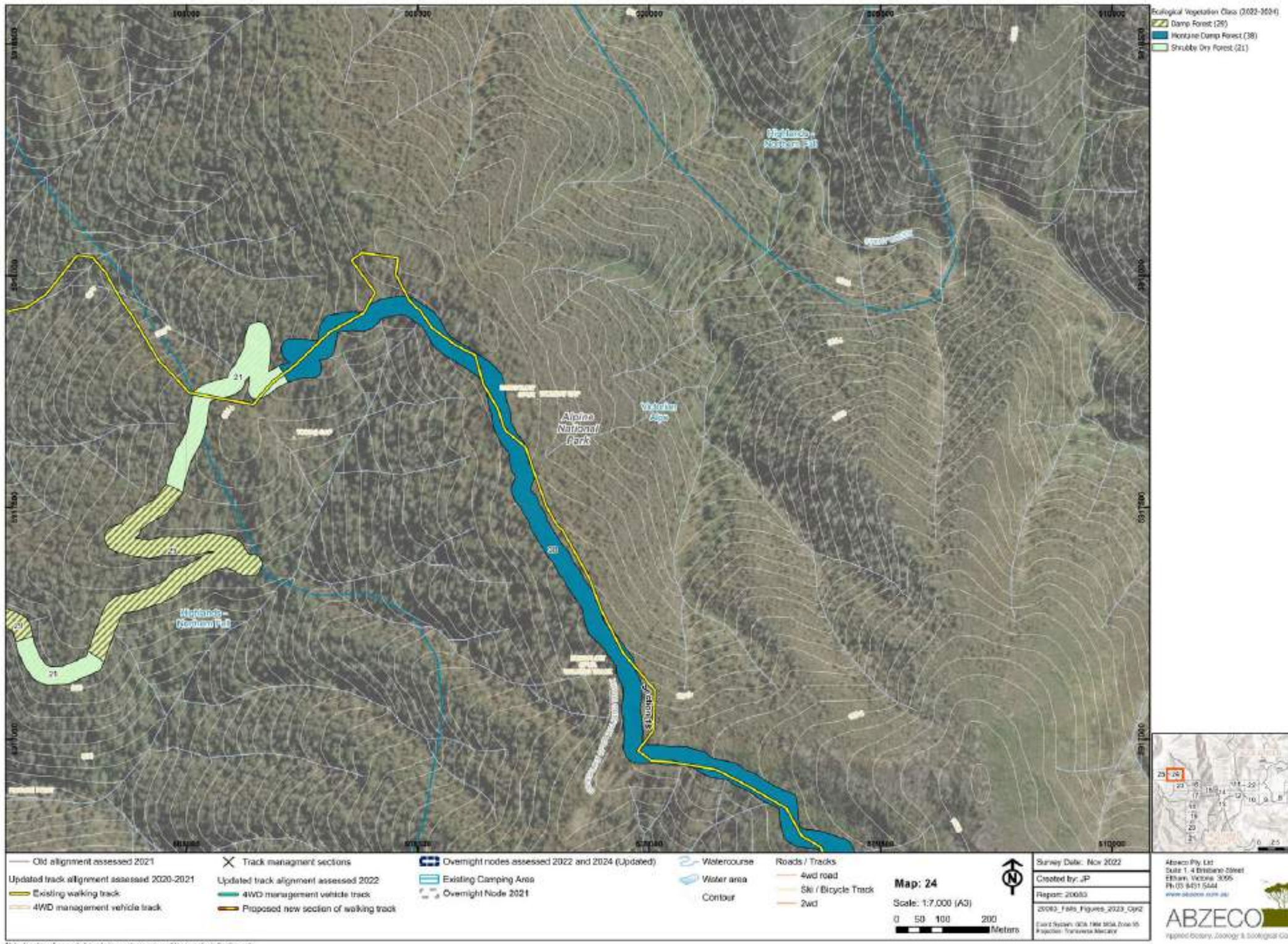
Ecological Vegetation Class (2022-2024)
Damp Forest (29)
Montane Damp Forest (38)
Shrubby Dry Forest (21)
Alpine National Park
Victorian Alps
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 24
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qtr2
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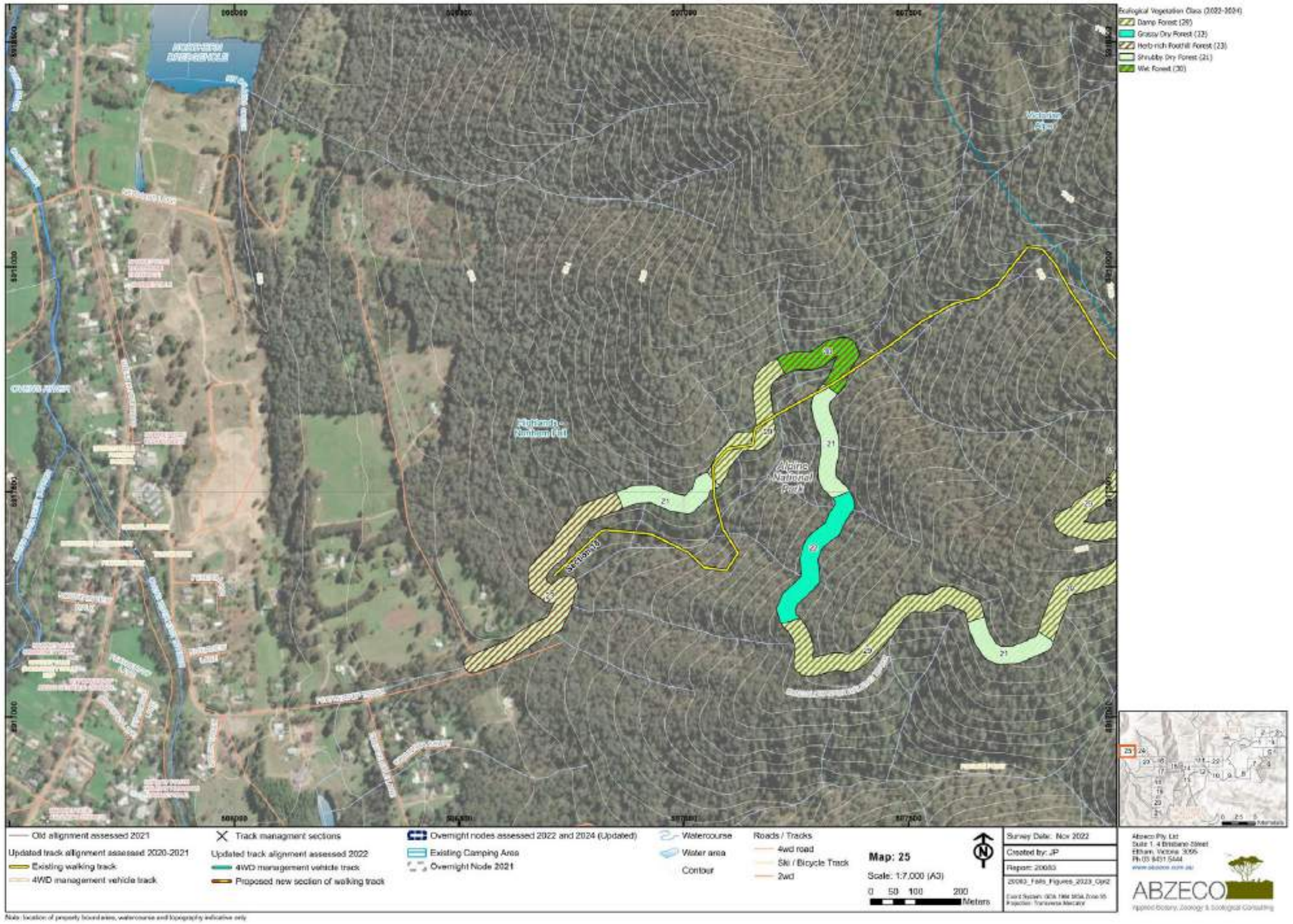
Ecological Vegetation Class (2002-2024)
Damp Forest (29)
Grassy Dry Forest (22)
Herb-rich Foothill Forest (23)
Shrubby Dry Forest (21)
Wet Forest (30)
Old alignment assessed 2021
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Track managment sections
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Overnight nodes assessed 2022 and 2024 (Updated)
Existing Camping Area
Overnight Node 2021
Watercourse
Water area
Contour
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Map: 25
Scale: 1:7,000 (A3)
0 50 100 200
Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Qgis2
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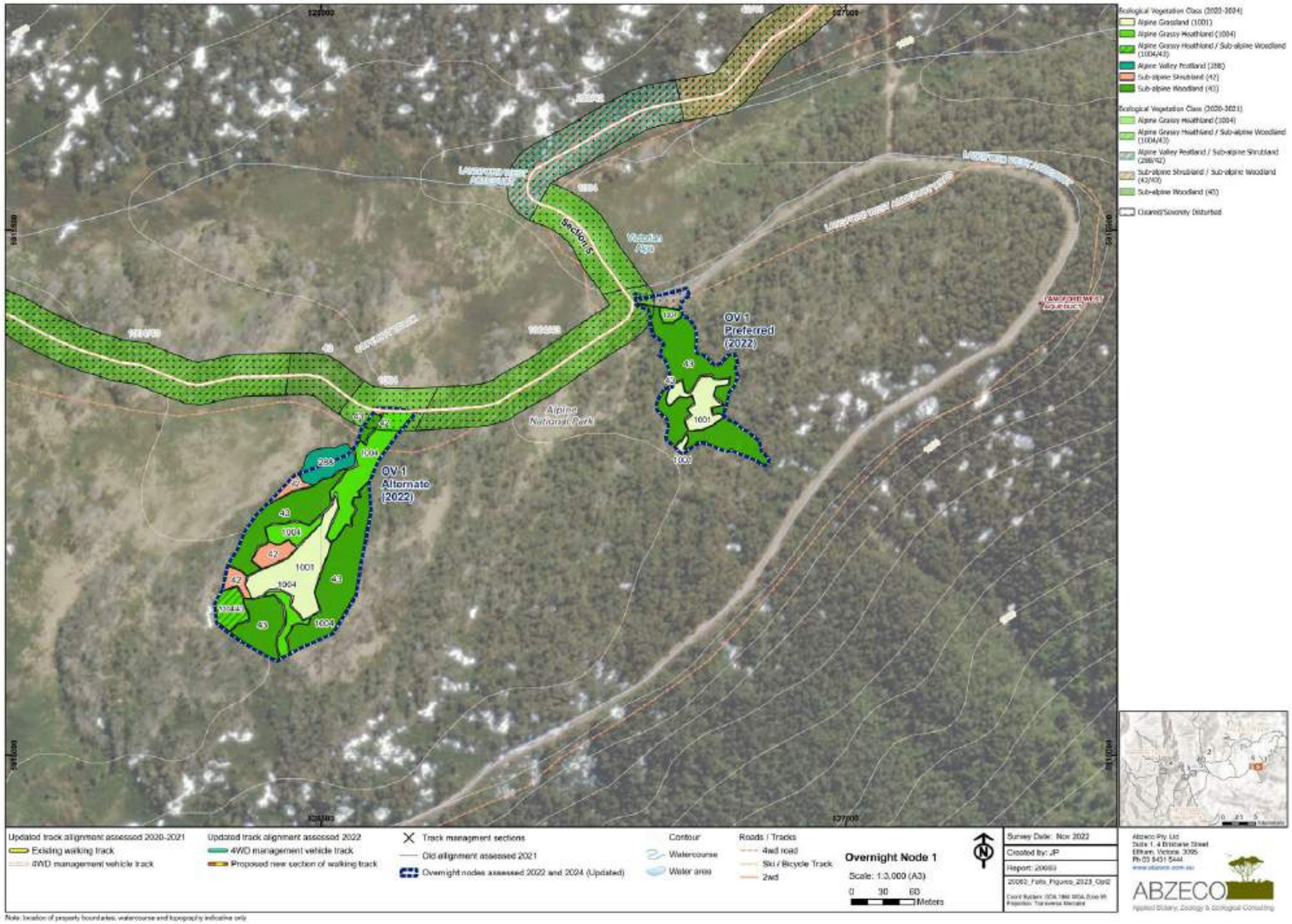
Appendix 1c. Overnight node locations (1-4 and Cope Hut and Weston Hut existing camping areas) Ecological Vegetation Class mapping, suitable habitat, and records of threatened species for the updated Falls to Hotham Alpine Crossing assessment area (assessed between December 2022 and February 2024)


Ecological Vegetation Class (2022-3024)
Alpine Grassland (1001)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (288)
Sub-alpine Shrubland (42)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2020-2021)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland / Sub-alpine Shrubland (288/42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Cleared/Severely Disturbed
OV 1 Preferred (2022)
OV 1 Alternate (2022)
Alpine National Park
Section 5
Section 6
Victoria Spur
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Track management sections
Old alignment assessed 2021
Overnight nodes assessed 2022 and 2024 (Updated)
Contour
Watercourse
Water area
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Overnight Node 1
Scale: 1:3,000 (A3)
0 30 60
Meters
Survey Date: Nov 2022
Created By: JP
Report: 20083
20083_Falls_Figures_2023_Op2
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Threatened flora OV1 preferred (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	EVCs in overnight nodes
Acrothamnus montanus		en		Yes	42, 43
Austrostipa nivicola		en		Yes	43, 1001, 42
Brachydontium intermedium		cr		Yes	43, 1001, 1004
Cardamine lilacina s.s.		en	Yes	Yes	1001, 288, 1004, 42, 43
Carex archeri		en		Yes	288
Celmisia costiniana		en	Yes	Yes	1001, 1004, waterways
Celmisia tomentella		vu	Yes	Yes	1001, 1004, 43, 42
Chenopodium erosum		en		Yes	1001, 1004, 43
Coprosma nivalis		en		Yes	1001, 288, 1004, 42, 43
Craspedia aurantia var. *aurantia*		en	Yes	Yes	1001
Erigeron conyzoides		en		Yes	1001, 288, 1004, 42, 43
Geranium brevicaule		en		Yes	1001
Geranium potentilloides var. *abditum*		en		Yes	43
Grevillea victoriae subsp. *victoriae*		en	Yes	Yes	43
Leptorhynchos squamatus subsp. *alpinus*		en	Yes	Yes	1001, 1004
Notogrammitis crassior		en		Yes	1001, 288, 1004, 42, 43
Olearia brevipedunculata		en	Yes	Yes	1004, 42
Olearia frostii		vu	Yes	Yes	42, 1004, 43
Olearia phlogopappa subsp. *flavescens*		en		Yes	42, 1004, 43
Phebalium squamulosum subsp. *alpinum*		en	Yes	Yes	43, 42
Pimelea axiflora subsp. *alpina*		vu		Yes	42, 1004, 43
Pimelea ligustrina subsp. *ciliata*		en	Yes	Yes	43
Podolepis laciniata		en		Yes	1001, 1004
Poranthera oreophila		en	Yes	Yes	1001, 43
Prasophyllum sphacelatum		en		Yes	1001, 1004, 43
Pterostylis crassicaulis		en		Yes	1001, 1004
Pultenaea capitellata		en		Yes	1004, 42
Pultenaea fasciculata		en		Yes	1004, 1001, 43, 288
Ranunculus victoriensis		en	Yes	Yes	1004
Schizeilema fragoseum		en		Yes	Waterways
Scleranthus singuliflorus		en	Yes	Yes	1001, 1004, 43
Trachymene humilis subsp. *breviscapa*		en	Yes	Yes	1001 and waterways
Utricularia monanthos		en		Yes	288 and waterways
Totals	**0**	**33**	**13**	**33**	

Threatened flora OV1 alternate (additional species may be recorded during targeted surveys)

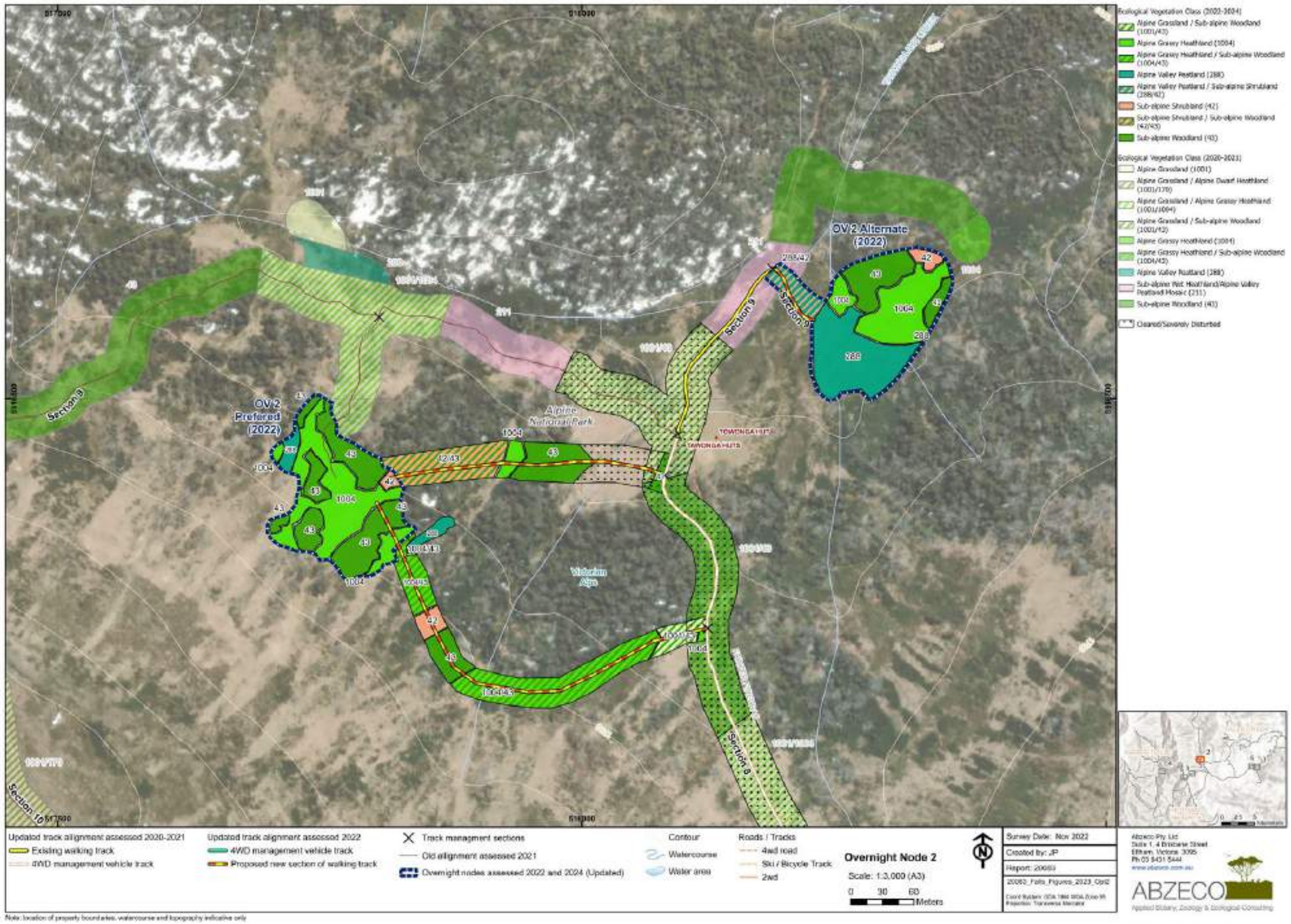
Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	EVCs in overnight nodes
Aciphylla glacialis		en		Yes	288
Acrothamnus montanus		en		Yes	42, 43
Agrostis australiensis		en		Yes	1001, 288
Argyrotegium poliochlorum		en		Yes	288
Australopyrum velutinum		vu		Yes	288
Austrostipa nivicola		en		Yes	43, 1001, 42
Barbarea grayi		vu		Yes	288 and waterways
Bartramia subsymmetrica		cr		Yes	288
Brachydontium intermedium		cr		Yes	43, 1001, 1004
Cardamine lilacina s.s.		en	Yes	Yes	1001, 288, 1004, 42, 43
Carex archeri		en		Yes	288
Carex capillacea		en		Yes	288
Carex hypandra		cr		Yes	288 and waterways
Carex jackiana		en		Yes	288
Celmisia costiniana		en	Yes	Yes	1001, 1004, waterways
Celmisia tomentella		vu	Yes	Yes	1001, 1004, 43, 42
Chenopodium erosum		en		Yes	1001, 1004, 43
Coprosma nivalis		en		Yes	1001, 288, 1004, 42, 43
Drepanocladus polygamus		vu		Yes	288
Drosera arcturi		en		Yes	288
Epacris celata		en		Yes	288
Epacris glacialis		en		Yes	288
Erigeron conyzoides		en		Yes	1001, 288, 1004, 42, 43
Eucalyptus perriniana		en		Yes	288
Euphrasia eichleri	VU	en		Yes	288
Geranium brevicaule		en		Yes	1001
Geranium potentilloides var. *abditum*		en		Yes	43
Grevillea victoriae subsp. *victoriae*		en	Yes	Yes	43
Huperzia australiana		en		Yes	288
Juncus antarcticus		en		Yes	288
Juncus falcatus subsp. *falcatus*		en		Yes	288
Leptorhynchos squamatus subsp. *alpinus*		en	Yes	Yes	1001, 1004
Notogrammitis crassior		en		Yes	1001, 288, 1004, 42, 43
Olearia brevipedunculata		en	Yes	Yes	1004, 42
Olearia frostii		vu	Yes	Yes	42, 1004, 43
Olearia phlogopappa subsp. *flavescens*		en		Yes	42, 1004, 43
Phebalium squamulosum subsp. *alpinum*		en	Yes	Yes	43, 42
Pimelea axiflora subsp. *alpina*		vu		Yes	42, 1004, 43
Pimelea ligustrina subsp. *ciliata*		en	Yes	Yes	43
Podolepis laciniata		en		Yes	1001, 1004
Poranthera oreophila		en	Yes	Yes	1001, 43
Prasophyllum sphacelatum		en		Yes	1001, 1004, 43
Pterostylis crassicaulis		en		Yes	1001, 1004
Pultenaea capitellata		en		Yes	1004, 42
Pultenaea fasciculata		en		Yes	1004, 1001, 43, 288
Ranunculus gunnianus		en	Yes	Yes	288
Ranunculus victoriensis		en	Yes	Yes	1004
Schizeilema fragoseum		en		Yes	Waterways
Scleranthus singuliflorus		en	Yes	Yes	1001, 1004, 43
Trachymene humilis subsp. *breviscapa*		en	Yes	Yes	1001 and waterways
Utricularia monanthos		en		Yes	288 and waterways
Totals	**1**	**51**	**14**	**51**	

Threatened fauna OV1 Prefered (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable th = threatened	Recorded in OV during FHAC PEVA assessments	Suitable Habitat Identified	Assumed present
Canis lupus dingo		vu		Yes	Yes
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Hirundapus caudacutus	VU	vu		Yes	Yes
Mastacomys fuscus mordicus	VU	vu		Yes	Yes
Pseudemoia cryodroma	EN	en		Yes	Yes
Pseudemoia pagenstecheri		en		Yes	Yes
Totals	**4**	**6**	**0**	**6**	

Threatened fauna OV1 Alternate (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable th = threatened	Recorded in OV during FHAC PEVA assessments	Suitable Habitat Identified	Assumed present
Canis lupus dingo		vu		Yes	Yes
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Eulamprus kosciuskoi		en		Yes	Yes
Gallinago hardwickii	Migratory			Yes	
Hirundapus caudacutus	VU	vu		Yes	Yes
Mastacomys fuscus mordicus	VU	vu		Yes	Yes
Pseudemoia cryodroma	EN	en		Yes	Yes
*Pseudemoia pagensteche*ri		en		Yes	Yes
Totals	**5**	**7**	**0**	**8**	


OV 2 Alternate (2022)
OV 2 Preferred (2022)
Section 9
Section 10
Alpine National Park
Victorian Alps
TOWONGA HUTS
Ecological Vegetation Class (2002-3604)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (288)
Alpine Valley Peatland / Sub-alpine Shrubland (288/42)
Sub-alpine Shrubland (42)
Sub-alpine Shrubland / Sub-alpine Woodland (42/43)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2020-3021)
Alpine Grassland (1001)
Alpine Grassland / Alpine Dwarf Heathland (1001/170)
Alpine Grassland / Alpine Grassy Heathland (1001/1004)
Alpine Grassland / Sub-alpine Woodland (1001/43)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Alpine Valley Peatland (288)
Sub-alpine Wet Heathland/Alpine Valley Peatland Mosaic (231)
Sub-alpine Woodland (43)
Cleared/Severely Disturbed
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Track management sections
Old alignment assessed 2021
Overnight nodes assessed 2022 and 2024 (Updated)
Contour
Watercourse
Water area
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Overnight Node 2
Scale: 1:3,000 (A3)
0 30 60
Meters
Survey Date: Nov 2022
Created By: JP
Report: 20083
20083_Falls_Figures_2023_Ops2
Abzeco Pty Ltd
Suite 1, 4 Brisbane Street
Eltham, Victoria 3095
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www.abzeco.com.au
ABZECO
Applied Botany, Zoology & Ecological Consulting
Note: location of property boundaries, watercourse and topography indicative only

Threatened flora OV2 preferred (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	EVCs in overnight nodes
Aciphylla glacialis		en		Yes	288
Acrothamnus montanus		en		Yes	42, 43
Agrostis australiensis		en		Yes	1001, 288
Argyrotegium poliochlorum		en		Yes	288
Australopyrum velutinum		vu		Yes	288
Austrostipa nivicola		en		Yes	43, 1001, 42
Barbarea grayi		vu		Yes	288 and waterways
Bartramia subsymmetrica		cr		Yes	288
Brachydontium intermedium		cr		Yes	43, 1001, 1004
Cardamine lilacina s.s.		en	Yes	Yes	1001, 288, 1004, 42, 43
Carex archeri		en		Yes	288
Carex capillacea		en		Yes	288
Carex hypandra		cr		Yes	288 and waterways
Carex jackiana		en		Yes	288
Celmisia costiniana		en	Yes	Yes	1001, 1004 and waterways
Celmisia sericophylla		cr		Yes	288
Celmisia tomentella		vu	Yes	Yes	1001, 1004, 43, 42
Chenopodium erosum		en		Yes	1001, 1004, 43
Coprosma nivalis		en		Yes	1001, 288, 1004, 42, 43
Craspedia aurantia var. *aurantia*		en	Yes	Yes	1001
Craspedia lamicola		en		Yes	288
Drepanocladus polygamus		vu		Yes	288
Drosera arcturi		en		Yes	288
Epacris celata		en	Yes	Yes	288
Epacris glacialis		en		Yes	288
Erigeron conyzoides		en		Yes	1001, 288, 1004, 42, 43
Eucalyptus perriniana		en		Yes	288
Euphrasia eichleri	VU	en		Yes	288
Geranium brevicaule		en		Yes	1001
Geranium potentilloides var. *abditum*		en		Yes	43
Huperzia australiana		en		Yes	288
Juncus antarcticus		en		Yes	288
Juncus falcatus subsp. *falcatus*		en		Yes	288
Lachnagrostis meionectes		en		Yes	1001, 1004, 288
Leptorhynchos squamatus subsp. *alpinus*		en	Yes	Yes	1001, 1004
Notogrammitis crassior		en		Yes	1001, 288, 1004, 42, 43
Olearia brevipedunculata		en	Yes	Yes	1004, 42
Olearia frostii		vu	Yes	Yes	42, 1004, 43
Olearia phlogopappa subsp. *flavescens*		en	Yes	Yes	42, 1004, 43
Pappochroma nitidum		vu		Yes	1001, 1004
Phebalium squamulosum subsp. *alpinum*		en	Yes	Yes	43, 42
Pimelea axiflora subsp. *alpina*		vu	Yes	Yes	42, 1004, 43
Pimelea ligustrina subsp. *ciliata*		en	Yes	Yes	43
Plantago alpestris		vu		Yes	288, 1001 and waterways
Prasophyllum sphacelatum		en		Yes	1001, 1004, 43
Pterostylis crassicaulis		en		Yes	1001, 1004
Pultenaea capitellata		en		Yes	1004, 42
Pultenaea fasciculata		en		Yes	1004, 1001, 43, 288
Ranunculus eichlerianus		en	Yes	Yes	1001, 1004, 43
Ranunculus victoriensis		en	Yes	Yes	1004
Schizeilema fragoseum		en		Yes	Waterways
Scleranthus diander		en		Yes	1001, 1004, 42
Scleranthus singuliflorus		en	Yes	Yes	1001, 1004, 43
Senecio pinnatifolius var. *alpinus*		en	Yes	Yes	43
Trachymene humilis subsp. *breviscapa*		en	Yes	Yes	1001 and waterways
Utricularia monanthos		en		Yes	288 and waterways
Totals	**1**	**55**	**17**	**55**	

Threatened flora OV2 alternate (additional species may be recorded during targeted surveys)

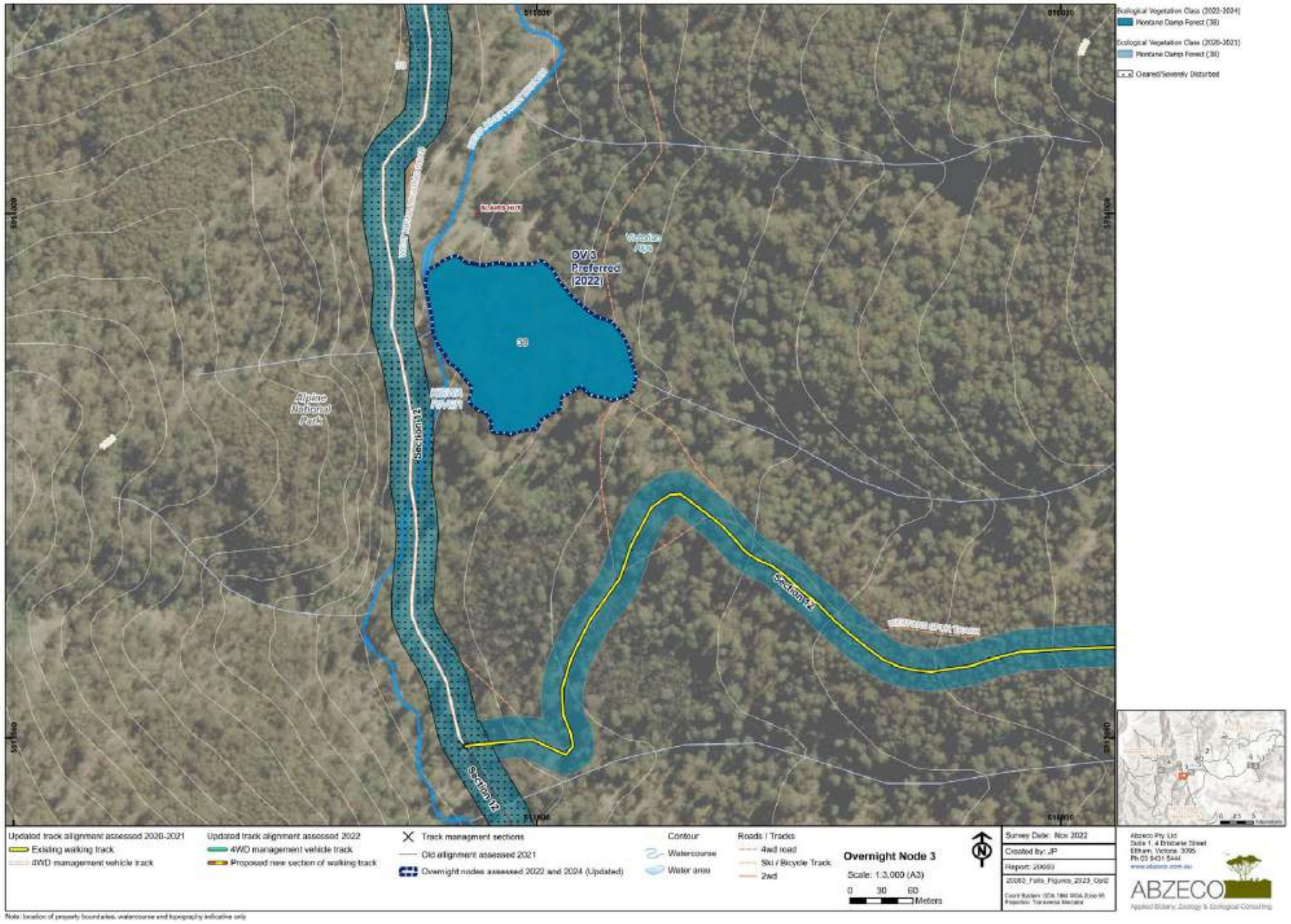
Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	EVCs in overnight nodes
Aciphylla glacialis		en		Yes	288
Acrothamnus montanus		en		Yes	42, 43
Agrostis australiensis		en		Yes	1001, 288
Argyrotegium poliochlorum		en		Yes	288
Australopyrum velutinum		vu		Yes	288
Austrostipa nivicola		en		Yes	43, 1001, 42
Barbarea grayi		vu		Yes	288 and waterways
Bartramia subsymmetrica		cr		Yes	288
Brachydontium intermedium		cr		Yes	43, 1001, 1004
Cardamine lilacina s.s.		en	Yes	Yes	1001, 288, 1004, 42, 43
Carex archeri		en		Yes	288
Carex capillacea		en		Yes	288
Carex hypandra		cr		Yes	288 and waterways
Carex jackiana		en		Yes	288
Celmisia costiniana		en	Yes	Yes	1001, 1004 and waterways
Celmisia sericophylla		cr		Yes	288
Celmisia tomentella		vu	Yes	Yes	1001, 1004, 43, 42
Chenopodium erosum		en		Yes	1001, 1004, 43
Coprosma nivalis		en		Yes	1001, 288, 1004, 42, 43
Craspedia aurantia var. *aurantia*		en	Yes	Yes	1001
Craspedia lamicola		en		Yes	288
Drepanocladus polygamus		vu		Yes	288
Drosera arcturi		en		Yes	288
Epacris celata		en	Yes	Yes	288
Epacris glacialis		en		Yes	288
Erigeron conyzoides		en		Yes	1001, 288, 1004, 42, 43
Eucalyptus perriniana		en		Yes	288
Euphrasia eichleri	VU	en		Yes	288
Geranium brevicaule		en		Yes	1001
Geranium potentilloides var. *abditum*		en		Yes	43
Huperzia australiana		en		Yes	288
Juncus antarcticus		en		Yes	288
Juncus falcatus subsp. *falcatus*		en		Yes	288
Lachnagrostis meionectes		en		Yes	1001, 1004, 288
Leptorhynchos squamatus subsp. *alpinus*		en	Yes	Yes	1001, 1004
Luzula acutifolia subsp. *acutifolia*		en	Yes	Yes	1001
Myriophyllum alpinum		en		Yes	Waterways
Notogrammitis crassior		en		Yes	1001, 288, 1004, 42, 43
Olearia brevipedunculata		en	Yes	Yes	1004, 42
Olearia frostii		vu	Yes	Yes	42, 1004, 43
Olearia phlogopappa subsp. *flavescens*		en	Yes	Yes	42, 1004, 43
Phebalium squamulosum subsp. *alpinum*		en	Yes	Yes	43, 42
Pimelea axiflora subsp. *alpina*		vu	Yes	Yes	42, 1004, 43
Pimelea ligustrina subsp. *ciliata*		en	Yes	Y	43
Plantago alpestris		vu		Y	288, 1001 and waterways
Prasophyllum sphacelatum		en		Y	1001, 1004, 43
Pterostylis crassicaulis		en		Y	1001, 1004
Pultenaea capitellata		en		Y	1004, 42
Pultenaea fasciculata		en		Y	1004, 1001, 43, 288
Ranunculus eichlerianus		en	Yes	Y	1001, 1004, 43
Ranunculus victoriensis		en	Yes	Y	1004
Schizeilema fragoseum		en		Y	Waterways
Scleranthus diander		en		Y	1001, 1004, 42
Scleranthus singuliflorus		en	Yes	Y	1001, 1004, 43
Senecio pinnatifolius var. *alpinus*		en	Yes	Y	43
Trachymene humilis subsp. *breviscapa*		en	Yes	Y	1001 and waterways
Utricularia monanthos		en		Y	288 and waterways
Totals	**1**	**57**	**18**	**57**	

Threatened fauna OV2 Prefered (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable th = threatened	Recorded in OV during FHAC PEVA assessments	Suitable Habitat Identified	Assumed present
Austroaeshna flavomaculata		vu		Yes	
Canis lupus dingo		vu		Yes	Yes
Colubotelson joyneri		cr		Yes	
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Euastacus crassus		en		Yes	
Eulamprus kosciuskoi		en		Yes	Yes
Gallinago hardwickii	Migratory			Yes	
Hirundapus caudacutus	VU	vu		Yes	Yes
Mastacomys fuscus mordicus	VU	vu		Yes	Yes
Pseudemoia cryodroma	EN	en		Yes	Yes
Pseudemoia pagenstecheri		en		Yes	Yes
Riekoperla intermedia		vu		Yes	
Thaumatoperla alpina	EN	en		Yes	Yes
Totals	**6**	**12**	**0**	**13**	

Threatened fauna OV2 Alternate (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable th = threatened	Recorded in OV during FHAC PEVA assessments	Suitable Habitat Identified	Assumed present
Austroaeshna flavomaculata		vu		Yes	
Canis lupus dingo		vu		Yes	Yes
Colubotelson joyneri		cr		Yes	
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Euastacus crassus		en		Yes	
Eulamprus kosciuskoi		en		Yes	Yes
Gallinago hardwickii	Migratory			Yes	
Hirundapus caudacutus	VU	vu		Yes	Yes
Mastacomys fuscus mordicus	VU	vu		Yes	Yes
Pseudemoia cryodroma	EN	en		Yes	Yes
Pseudemoia pagenstecheri		en		Yes	Yes
Riekoperla intermedia		vu		Yes	
Thaumatoperla alpina	EN	en		Yes	Yes
Totals	**6**	**13**	**1**	**14**	



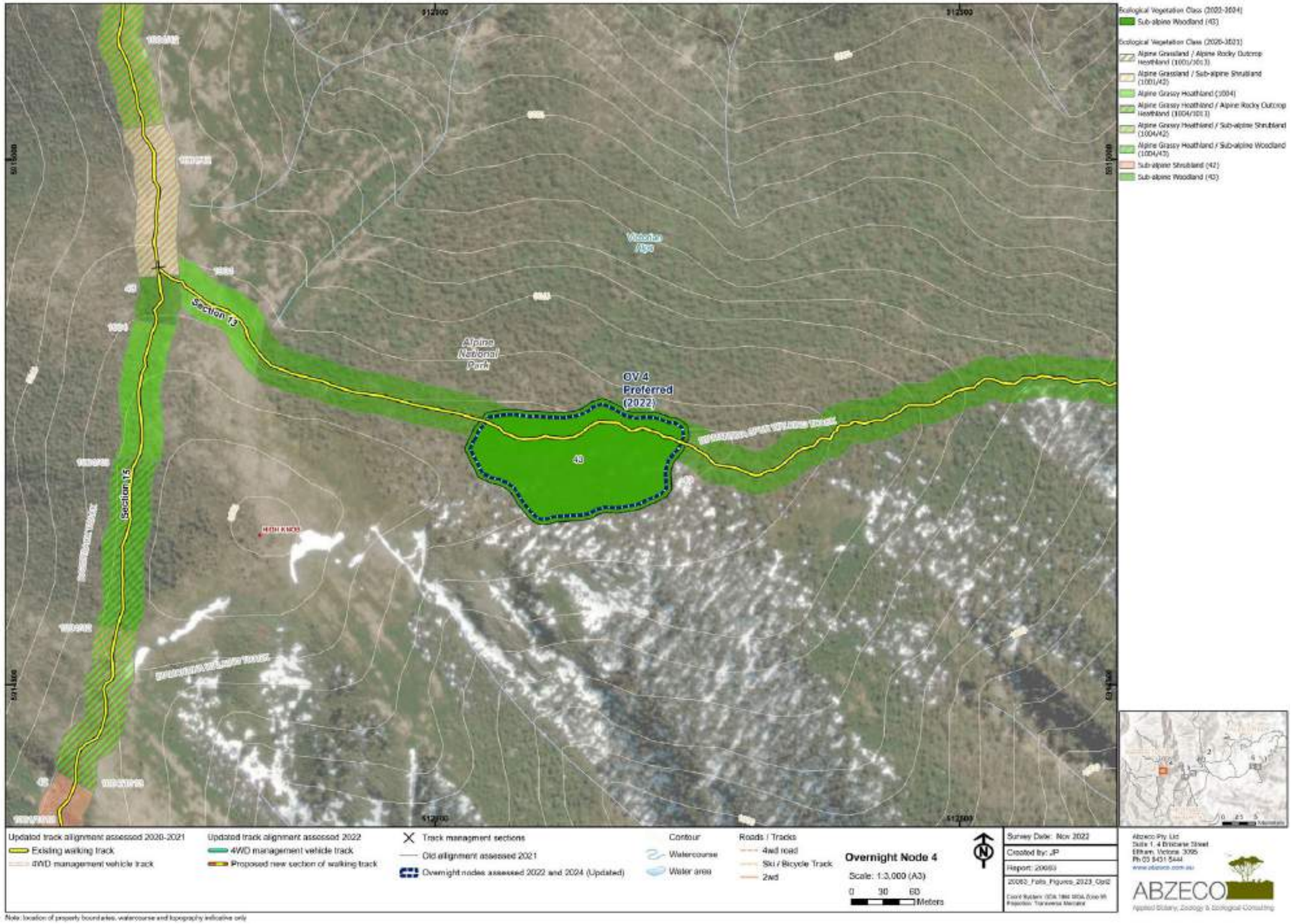
Note: location of property boundaries, watercourse and topography indicative only

Threatened flora OV3 (additional species may be recorded during targeted surveys)

Scientific name	**EPBC conservation status** CE = critically endangered EN = endangered VU = vulnerable	**FFG conservation status** cr = critically endangered en = endangered vu = vulnerable	**Recorded in OV during FHAC PEVA assessments**	**Suitable habitat identified**	**EVCs in overnight nodes**
Acacia dallachiana		vu	Yes	Yes	38
Arthropodium sp. 1 (robust glaucous)		en	Yes	Yes	43
Totals	**0**	**2**	**2**	**2**	

Threatened fauna OV3 (additional species may be recorded during targeted surveys)

Scientific name	**EPBC conservation status** CE = critically endangered EN = endangered VU = vulnerable	**FFG conservation status** cr = critically endangered en = endangered vu = vulnerable th = threatened	**Recorded in OV during FHAC PEVA assessments**	**Suitable Habitat Identified**	**Assumed present**
Austroaeshna flavomaculata		vu		Yes	
Calocephalon fimbriatum	EN		Yes	Yes	
Canis lupus dingo		vu		Yes	Yes
Dasyurus maculatus maculatus	EN	en		Yes	
Euastacus armatus		th		Yes	
Euastacus crassus		en		Yes	
Galaxias olidus complex	TBA	TBA	Yes	Yes	
Hirundapus caudacutus	VU	vu		Yes	Yes
Mastacomys fuscus mordicus	VU	vu		Yes	Yes
Ninox strenua		vu		Yes	
Petauroides volans	EN	vu		Yes	
Petaurus australis	VU			Yes	
Potorous longipes	EN	en		Yes	
Pycnoptilus floccosus	VU			Yes	
Riekoperla intermedia		vu		Yes	
Thaumatoperla alpina	EN	en		Yes	Yes
Tyto tenebricosa		en		Yes	
Totals	**9**	**14**	**2**	**17**	

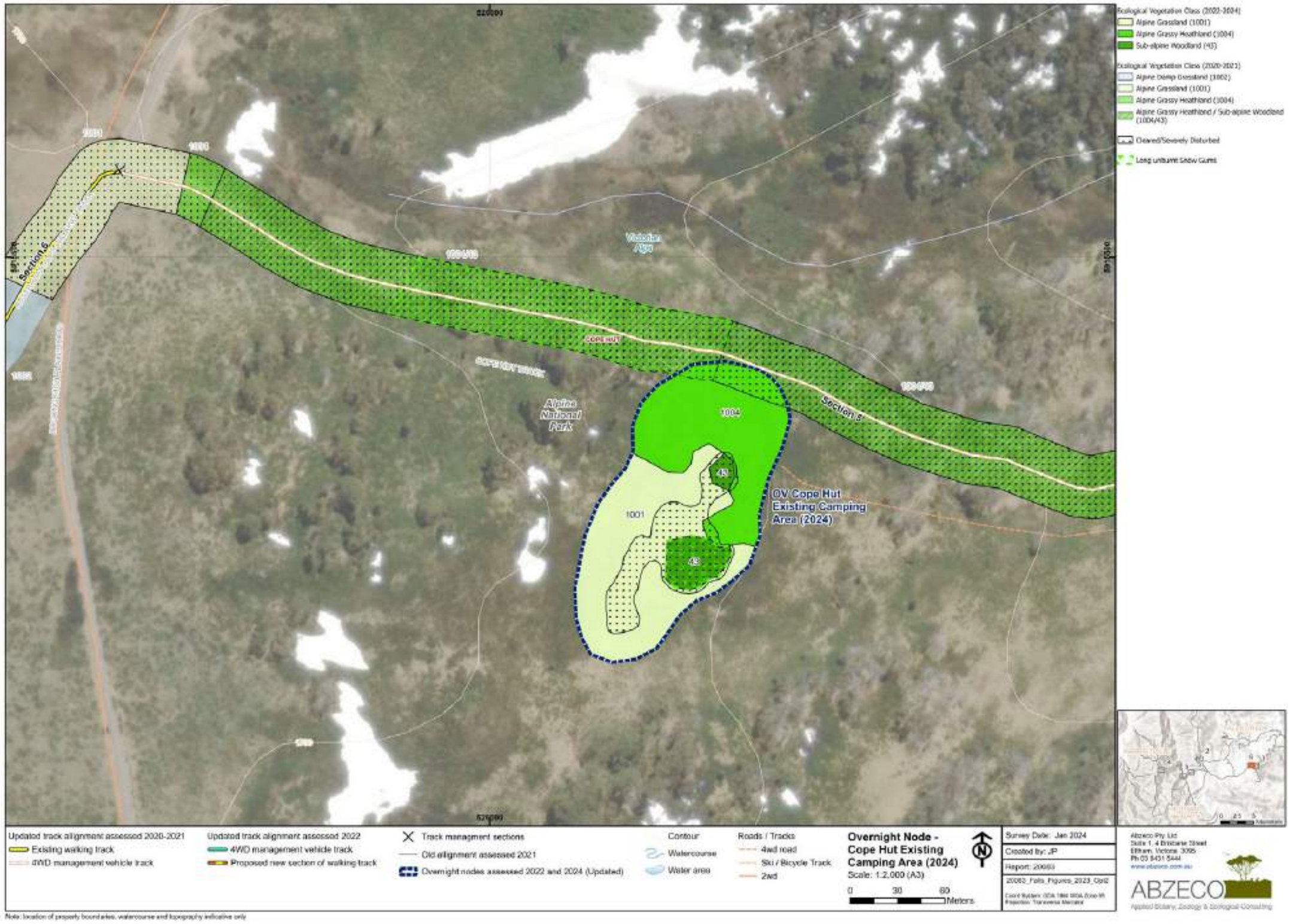

512500
5815000
Section 13
Section 15
Alpine National Park
OV 4 Preferred (2022)
49
Ecological Vegetation Class (2002-3604)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2005-3823)
Alpine Grassland / Alpine Rocky Outcrop Heathland (1001/3013)
Alpine Grassland / Sub-alpine Shrubland (1001/42)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Alpine Rocky Outcrop Heathland (1004/3013)
Alpine Grassy Heathland / Sub-alpine Shrubland (1004/42)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Sub-alpine Shrubland (42)
Sub-alpine Woodland (43)
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Track management sections
Old alignment assessed 2021
Overnight nodes assessed 2022 and 2024 (Updated)
Contour
Watercourse
Water area
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Overnight Node 4
Scale: 1:3,000 (A3)
0 30 60 Meters
Survey Date: Nov 2022
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Ch02
Abzeco Pty Ltd
Suite 1, 4 Brisbane Street
Eltham, Victoria 3095
Ph 03 9431 5444
ABZECO
Applied Botany, Zoology & Biological Consulting
Note: location of property boundaries, watercourse and topography indicative only

Threatened flora OV4 (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	EVCs in overnight nodes
Acrothamnus montanus		en		Yes	42, 43
Austrostipa nivicola		en		Yes	43, 1001, 42
Boronia algida		vu	Yes	Yes	43
Celmisia costiniana		en	Yes	Yes	1001, 1004 and waterways
Celmisia tomentella		vu	Yes	Yes	1001, 1004, 43, 42
Craspedia adenophora		en	Yes	Yes	43
Eucalyptus pauciflora subsp. *hedraia*		cr		Yes	43
Geranium potentilloides var. *abditum*		en		Yes	43
Olearia frostii		vu	Yes	Yes	42, 1004, 43
Olearia phlogopappa subsp. *flavescens*		en	Yes	Yes	42, 1004, 43
Pimelea axiflora subsp. *alpina*		vu	Yes	Yes	42, 1004, 43
Ranunculus victoriensis		en	Yes	Yes	1004
Totals	**0**	**12**	**8**	**12**	

Threatened fauna OV4 (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable th = threatened	Recorded in OV during FHAC PEVA assessments	Suitable Habitat Identified	Assumed present
Canis lupus dingo		vu		Yes	Yes
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Liopholis montana	EN			Yes	
Pseudemoia cryodroma	EN	en		Yes	Yes
Pseudemoia pagenstecheri		en		Yes	Yes
Totals	**3**	**4**	**0**	**5**	

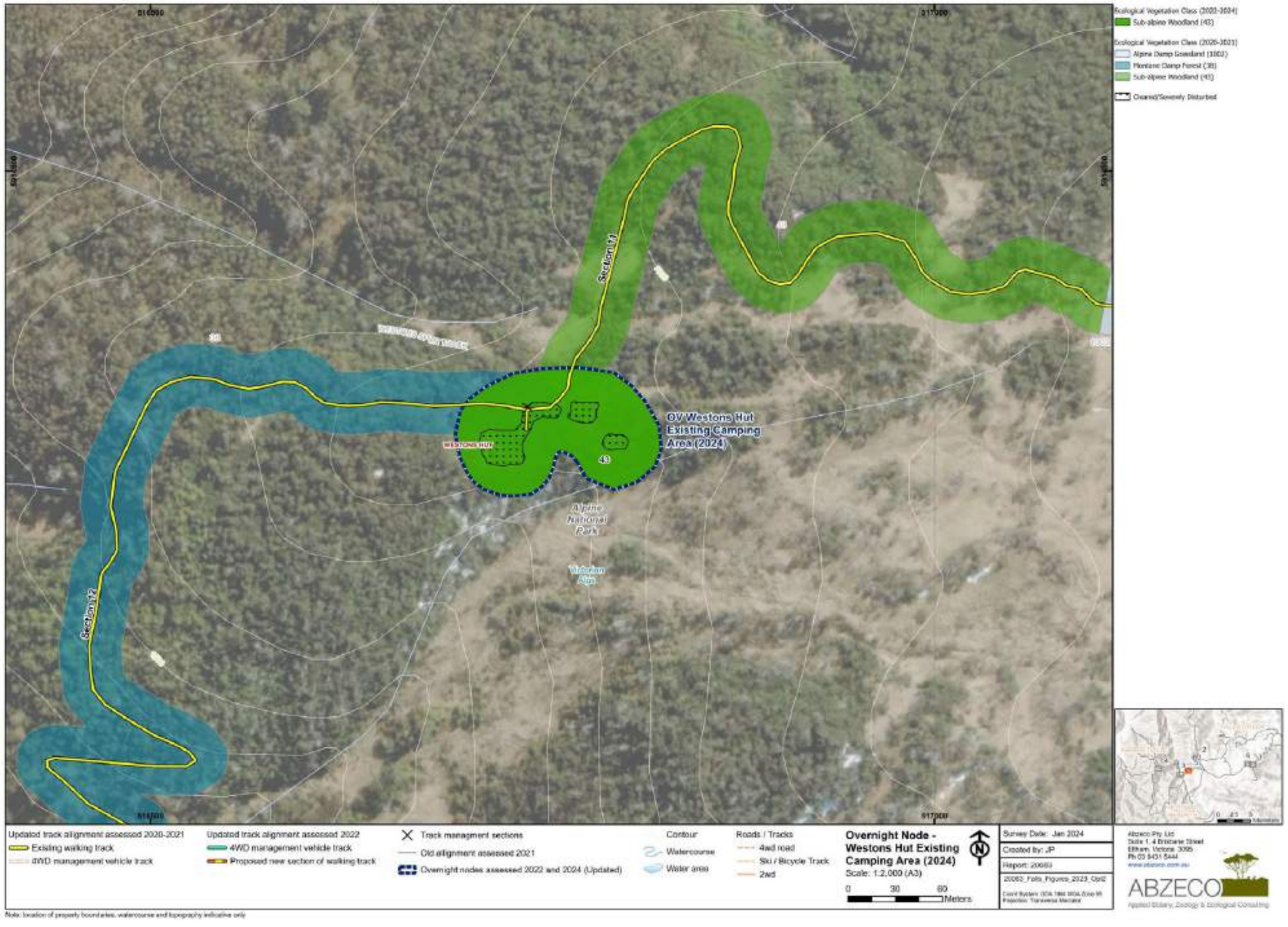

Ecological Vegetation Class (2022-3024)
Alpine Grassland (1001)
Alpine Grassy Heathland (1004)
Sub-alpine Woodland (43)
Ecological Vegetation Class (2020-2021)
Alpine Damp Grassland (1002)
Alpine Grassland (1001)
Alpine Grassy Heathland (1004)
Alpine Grassy Heathland / Sub-alpine Woodland (1004/43)
Cleared/Severely Disturbed
Long unburnt Snow Gums
Section 6
Section 5
COPE HUT
Alpine National Park
1004
1001
43
OV Cope Hut Existing Camping Area (2024)
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Track management sections
Old alignment assessed 2021
Overnight nodes assessed 2022 and 2024 (Updated)
Contour
Watercourse
Water area
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Overnight Node - Cope Hut Existing Camping Area (2024)
Scale: 1:2,000 (A3)
0 30 60 Meters
Survey Date: Jan 2024
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Ops2
Abzeco Pty Ltd
Suite 1, 4 Brisbane Street
Eltham, Victoria 3095
Ph 03 9431 5444
www.abzeco.com.au
ABZECO
Applied Botany, Zoology & Biological Consulting
Note: location of property boundaries, watercourse and topography indicative only

Threatened flora Cope Hut existing camping area (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in and around OV during FHAC PEVA assessments IA = immediately adjacent	Suitable habitat identified	EVCs in overnight nodes
Acrothamnus montanus		en		Yes	43
Austrostipa nivicola		en		Yes	43, 1001
Cardamine lilacina s.s.		en		Yes	43, 1001, 1004
Celmisia costiniana		en	IA	Yes	1001, 1004
Celmisia tomentella		vu	IA	Yes	1001, 1004, 43
Chenopodium erosum		en		Yes	1001, 1004, 43
Coprosma nivalis		en		Yes	1001, 1004, 43
Coronidium waddelliae		vu		Yes	1001, 1004, 43
Craspedia aurantia var. *aurantia*		en	IA	Yes	1001
Geranium brevicaule		en		Yes	1001
Geranium potentilloides var. *abditum*		en		Yes	43
Leptorhynchos squamatus subsp. alpinus		en		Yes	1001, 1004
Olearia brevipedunculata		en		Yes	1004
Olearia frostii		**vu**	**Yes**	**Yes**	**1004, 43**
Olearia phlogopappa subsp. *flavescens*		en	IA	Yes	1004, 43
Phebalium squamulosum subsp. *alpinum*		en	IA	Yes	43
Pimelea axiflora subsp. *alpina*		vu		Yes	1004, 43
Pimelea ligustrina subsp. ciliata		en		Yes	43
Podolepis laciniata		en		Yes	1001, 1004
Poranthera oreophila		en		Yes	1001, 43
Pterostylis crassicaulis		en		Yes	1001, 1004
Pultenaea capitellata		en		Yes	1004
Pultenaea fasciculata		en		Yes	1001, 1004, 43
Ranunculus victoriensis		en	IA	Yes	1004
Scleranthus singuliflorus		**en**	**Yes**	**Yes**	**1001, 1004, 43**
Totals	**0**	**25**	**8**	**25**	

Threatened fauna Cope Hut existing camping area (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	Assumed present
Canis lupus dingo		vu		Yes	Yes
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Hirundapus caudacutus	VU	vu		Yes	Yes
Pseudemoia pagenstecheri		en	Yes	Yes	
Totals	**2**	**4**	**1**	**4**	**3**


Ecological Vegetation Class (2002-3604)
Sub-alpine Woodland (40)
Ecological Vegetation Class (2020-3021)
Alpine Damp Grassland (3002)
Montane Damp Forest (38)
Sub-alpine Woodland (40)
Cleared/Severely Disturbed
Section 13
Section 12
OV Westons Hut Existing Camping Area (2024)
WESTONS HUT
49
Alpine National Park
Victorian Alps
Updated track alignment assessed 2020-2021
Existing walking track
4WD management vehicle track
Updated track alignment assessed 2022
4WD management vehicle track
Proposed new section of walking track
Track management sections
Old alignment assessed 2021
Overnight nodes assessed 2022 and 2024 (Updated)
Contour
Watercourse
Water area
Roads / Tracks
4wd road
Ski / Bicycle Track
2wd
Overnight Node - Westons Hut Existing Camping Area (2024)
Scale: 1:2,000 (A3)
0 30 60 Meters
Survey Date: Jan 2024
Created by: JP
Report: 20083
20083_Falls_Figures_2023_Ops2
Abzeco Pty Ltd
Suite 1, 4 Brisbane Street
Eltham, Victoria 3095
Ph 03 9431 5444
www.abzeco.com.au
ABZECO
Applied Botany, Zoology & Biological Consulting
Note: location of property boundaries, watercourse and topography indicative only

Threatened flora Westons Hut existing camping area (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in and around OV during FHAC PEVA assessments IA = immediately adjacent	Suitable habitat identified	EVCs in overnight nodes
Alchemilla xanthochlora		en	IA	Yes	43
Celmisia latifolia		en		Yes	43
Celmisia tomentella		vu		Yes	43
Coronidium waddelliae		vu		Yes	43
Craspedia aurantia var. *jamesii*		en	IA	Yes	43
Grevillea victoriae* subsp. *victoriae		**en**	**Yes**	**Yes**	**43**
Huperzia australiana		en	IA	Yes	43
Olearia phlogopappa subsp. *flavescens*		en	IA	Yes	43
Pimelea ligustrina subsp. *ciliata*		en		Yes	43
Ranunculus gunnianus		en	IA	Yes	43
Ranunculus victoriensis		en	IA	Yes	43
Totals	**0**	**11**	**7**	**11**	**43**

Threatened fauna Westons Hut existing camping area (additional species may be recorded during targeted surveys)

Scientific name	EPBC conservation status CE = critically endangered EN = endangered VU = vulnerable	FFG conservation status cr = critically endangered en = endangered vu = vulnerable	Recorded in OV during FHAC PEVA assessments	Suitable habitat identified	Assumed present
Canis lupus dingo		vu		Yes	Yes
Cyclodomorphus praealtus	EN	cr		Yes	Yes
Hirundapus caudacutus	VU	vu		Yes	Yes
Pseudemoia pagenstecheri		en	Yes	Yes	
Totals	**2**	**4**	**1**	**4**	**3**

Appendix 2. Combined flora species list for the Falls to Hotham Alpine Crossing Project area

(Flora species recorded across the entire updated project assessment area(track and overnight nodes combined) between November 2020 and February 2024)

Legend:

S = status

***** = Species introduced to Victoria

CaLP = *Conservation and Land Protection Act 1994*

SP = State Prohibited

P = Regionally Prohibited Weeds

C = Regionally Controlled Weeds

R = Restricted Weeds

W = Weeds of National Significance

EPBC = *Environment Protection and Biodiversity Conservation* ***Act 1999***

CR = Critically Endangered

E = Endangered

V = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

Origin	Scientific name	Common name	EPBC	FFG
	Acacia alpina	Alpine Wattle		e
	Acacia dallachiana	Catkin Wattle		v
	Acacia dealbata subsp. *dealbata*	Silver Wattle		
	Acacia melanoxylon	Blackwood		
	Acacia obliquinervia	Mountain Hickory Wattle		
	Acacia stricta	Hop Wattle		
	Acaena echinata	Sheep's Burr		
	Acaena novae-zelandiae	Bidgee-widgee		
	Acaena spp.	Sheep's Burr		
*	*Acetosella vulgaris*	Sheep Sorrel		
*	*Achillea millefolium*	Milfoil		
	Acianthus spp.	Mosquito Orchid		
	Aciphylla glacialis	Snow Aciphyll		e
	Acrothamnus hookeri	Mountain Beard-heath		
	Acrothamnus montanus	Snow Beard-heath		e
	Acrothamnus spp.	Mountain Beard-heath		
*	*Agrostis capillaris*	Brown-top Bent		
*	*Agrostis capillaris* var. *capillaris*	Brown-top Bent		
	Agrostis s.l. spp.	Bent/Blown Grass		
*	*Agrostis stolonifera*	Creeping Bent		
*	*Aira caryophyllea* subsp. *caryophyllea*	Silvery Hair-grass		
*	*Aira caryophyllea/elegantissima*	Silvery/Delicate Hair-grass		
	Ajuga australis	Austral Bugle		
	Alchemilla xanthochlora	Lady's Mantle		e
	Amyema pendula subsp. *pendula* (s.s.)	Drooping Mistletoe		
*	*Anthoxanthum odoratum*	Sweet Vernal-grass		
*	*Aphanes arvensis*	Parsley Piert		
	Argyrotegium fordianum	Alpine Cudweed		
	Argyrotegium mackayi	Silver Cudweed		e

Origin	Scientific name	Common name	EPBC	FFG
	Argyrotegium nitidulum	Shining Cudweed	V	
	Arthropodium milleflorum s.s.	Pale Vanilla-lily		
	Arthropodium sp. 1 (robust glaucous)	Tall Vanilla-lily		e
	Asperula conferta	Common Woodruff		
	Asperula gunnii	Mountain Woodruff		
	Asperula minima	Mossy Woodruff		
	Asperula pusilla	Alpine Woodruff		
	Asplenium flabellifolium	Necklace Fern		
	Astelia alpina var. *novae-hollandiae*	Silver Astelia		
	Asterolasia trymalioides subsp. *trymalioides*	Alpine Star-bush		
	Australina pusilla subsp. *muelleri*	Shade Nettle		
	Baeckea gunniana	Alpine Baeckea		
	Baloskion australe	Blanket Leaf		
	Baloskion australe	Mountain Cord-rush		
*	*Barbarea intermedia*	Wintercress		
	Bartramia robusta	Common Apple-moss		
	Bertya tasmanica subsp. *vestita* (fine-haired variant)	Mitchell Bertya (fine-haired variant)		
	Blechnum minus	Soft Water-fern		
	Blechnum nudum	Fishbone Water-fern		
	Blechnum penna-marina subsp. *alpina*	Alpine Water-fern		
	Blechnum wattsii	Hard Water-fern		
	Boronia algida	Alpine Boronia		v
	Bossiaea foliosa s.s.	Leafy Bossiaea		
	Bossiaea sericea	Silky Bossiaea		
	Brachyscome decipiens	Field Daisy		
	Brachyscome foliosa	Mountain Daisy		e
	Brachyscome nivalis	Snow Daisy		
	Brachyscome rigidula	Leafy Daisy		
	Brachyscome scapigera	Tufted Daisy		
	Brachyscome spathulata	Spoon Daisy		
	Brachyscome tadgellii	Tadgell's Daisy		e
*	*Bromus catharticus* var. *catharticus*	Prairie Grass		
	Caesia alpina	Alpine Grass-lily		
	Caladenia alpina	Mountain Hood-orchid		
	Caladenia moschata	Musk Hood-orchid		
	Callistemon pityoides	Alpine Bottlebrush		
	Calochlaena dubia	Common Ground-fern		
	Cardamine lilacina s.s.	Lilac Bitter-cress		e
	Carex appressa	Tall Sedge		
	Carex breviculmis	Common Grass-sedge		
	Carex canescens	Short Sedge		e
	Carex gaudichaudiana	Fen Sedge		
	Carex hebes	Mountain Sedge		
	Carex inversa	Knob Sedge		
	Carex jackiana	Carpet Sedge		e

Origin	Scientific name	Common name	EPBC	FFG
	Carex spp.	Sedge		
	Cassinia aculeata subsp. *aculeata*	Common Cassinia		
	Cassinia longifolia	Shiny Cassinia		
	Celmisia costiniana	Carpet Snow-daisy		e
	Celmisia latifolia	Victorian Snow-daisy		e
	Celmisia pugioniformis	Slender Snow-daisy		
	Celmisia sericophylla	Silky Snow-daisy		ce
	Celmisia tomentella	Silver Snow-daisy		v
*	*Centaurium erythraea*	Common Centaury		
*	*Cerastium glomeratum* s.s.	Sticky Mouse-ear Chickweed		
*	*Cerastium glomeratum* s.s.	Sticky Mouse-ear Chickweed		
*	*Cerastium vulgare*	Common Mouse-ear Chickweed		
	Cheilanthes austrotenuifolia	Green Rock-fern		
	Chiloglottis cornuta	Green Bird-orchid		
	Chiloglottis valida	Common Bird-orchid		
	Chrysocephalum apiculatum s.s.	Common Everlasting		
	Chrysocephalum semipapposum	Clustered Everlasting		
	Chrysocephalum semipapposum subsp. *semipapposum*	Clustered Everlasting		
*C	*Cirsium vulgare*	Spear Thistle		
	Clematis aristata	Mountain Clematis		
	Colobanthus affinis	Alpine Colobanth		e
	Comesperma ericinum	Heath Milkwort		
	Coprosma hirtella	Rough Coprosma		
	Coprosma quadrifida	Prickly Currant-bush		
	Coronidium monticola	Mountain Everlasting		
	Coronidium scorpioides s.s.	Button Everlasting		
	Coronidium waddelliae	Snowy Everlasting		v
	Corybas spp.	Helmet Orchid		
	Cotula alpina	Alpine Cotula		
Uncertain (VicFlora 2023)	*Cotula australis*	Common Cotula		
	Craspedia adenophora	Sticky Billy-buttons		e
	Craspedia aurantia s.l.	Orange/Green Billy-buttons		
	Craspedia aurantia var. *aurantia*	Orange Billy-buttons		e
	Craspedia aurantia var. *jamesii*	Green Billy-buttons		e
	Craspedia crocata	Crimson Billy-buttons		e
	Craspedia gracilis	Ashen Billy-buttons		
	Craspedia lamicola	Bog Billy-buttons		e
	Craspedia maxgrayi s.s.	Woolly Billy-buttons		ce
	Craspedia spp.	Billy Buttons		
	Crassula sieberiana s.s.	Sieber Crassula		
*	*Crataegus monogyna* subsp. *monogyna*	Hawthorn		
*	*Dactylis glomerata*	Cocksfoot		
	Daviesia latifolia	Hop Bitter-pea		
	Daviesia ulicifolia	Gorse Bitter-pea		

Origin	Scientific name	Common name	EPBC	FFG
	Daviesia ulicifolia subsp. *ulicifolia*	Gorse Bitter-pea		
	Desmodium gunnii	Southern Tick-trefoil		
	Deyeuxia monticola	Mountain Bent-grass		
	Deyeuxia spp.	Bent Grass		
	Dianella revoluta s.l.	Black-anther Flax-lily		
	Dianella tasmanica	Tasman Flax-lily		
	Dichondra repens	Kidney-weed		
	Dicksonia antarctica	Soft Tree-fern		
*	*Digitalis purpurea*	Foxglove		
	Diuris sulphurea	Tiger Orchid		
	Drosera auriculata	Tall Sundew		
	Empodisma minus	Spreading Rope-rush		
	Epacris celata	Cryptic Heath		e
	Epacris glacialis	Reddish Bog-heath		e
	Epacris gunnii	Ace of Spades		
	Epacris paludosa	Swamp Heath		
	Epacris spp.	Heath		
	Epilobium billardiereanum	Variable Willow-herb		
	Epilobium curtisiae	Bald-seeded Willow-herb		e
	Epilobium gunnianum	Gunn's Willow-herb		
	Epilobium spp.	Willow Herb		
*	*Erigeron bonariensis*	Flaxleaf Fleabane		
*	*Erythranthe moschata*	Musk Monkey-flower		
	Eucalyptus dalrympleana subsp. *dalrympleana*	Mountain Gum		
	Eucalyptus delegatensis subsp *delegatensis*	Alpine Ash		
	Eucalyptus dives	Broad-leaf Peppermint		
	Eucalyptus mannifera subsp. *mannifera*	Brittle Gum		
	Eucalyptus pauciflora	Snow Gum		
	Eucalyptus pauciflora subsp. *hedraia*	Bogong Sally		ce
	Eucalyptus pauciflora subsp. *niphophila*	Alpine Sally		
	Eucalyptus pauciflora subsp. *pauciflora*	White Sallee		
	Eucalyptus radiata subsp. *radiata*	Narrow-leaf Peppermint		
	Eucalyptus viminalis subsp. *viminalis*	Manna Gum		
	Euchiton involucratus s.s.	Star Cudweed		
	Euchiton japonicus s.s.	Creeping Cudweed		
	Euchiton sphaericus	Annual Cudweed		
	Euchiton umbricola	Cliff Cudweed		e
	Euphrasia crassiuscula subsp. *crassiuscula*	Thick Eyebright		v
	Euphrasia crassiuscula subsp. *eglandulosa*	Thick Eyebright		v
	Ewartia nubigena	Silver Ewartia		e
	Exocarpos cupressiformis	Cherry Ballart		
	Exocarpos strictus	Pale-fruit Ballart		
*	*Festuca pratensis*	Meadow Fescue		
*	*Festuca rubra* s.s.	Creeping Fescue		
*	*Galium aparine*	Cleavers		

Origin	Scientific name	Common name	EPBC	FFG
	Galium binifolium	Reflexed Bedstraw		
	Gaultheria appressa	Wax-berry		
	Geranium antrorsum	Rosetted Crane's-bill		
	Geranium potentilloides	Soft Crane's-bill		
	Geranium potentilloides var. 1	Soft Crane's-bill		
	Geranium potentilloides var. *potentilloides*	Soft Crane's-bill		
	Geranium sp. 2	Variable Crane's-bill		
	Geranium spp.	Crane's Bill		
	Glycine clandestina	Twining Glycine		
	Gonocarpus micranthus	Creeping Raspwort		
	Gonocarpus micranthus subsp. *micranthus*	Creeping Raspwort		
	Gonocarpus montanus	Mat Raspwort		
	Gonocarpus tetragynus	Common Raspwort		
	Goodenia hederacea subsp. *alpestris*	Ivy Goodenia		
	Goodenia hederacea subsp. *hederacea*	Ivy Goodenia		
	Grevillea australis	Alpine Grevillea		
	Grevillea victoriae subsp. *victoriae*	Royal Grevillea		e
	Hardenbergia violacea	Purple Coral-pea		
	Hedycarya angustifolia	Austral Mulberry		
	Herpolirion novae-zelandiae	Sky Lily		e
*	*Holcus lanatus*	Yorkshire Fog		
	Hovea montana	Alpine Rusty-pods		
	Hydrocotyle algida	Mountain Pennywort		
	Hydrocotyle hirta	Hairy Pennywort		
	Hydrocotyle sibthorpioides	Shining Pennywort		
	Hypericum japonicum	Matted St John's Wort		
*C	*Hypericum perforatum* subsp. *veronense*	St John's Wort		
*	*Hypochaeris glabra*	Smooth Cat's-ear		
*	*Hypochaeris radicata*	Flatweed		
	Hypolepis rugosula	Ruddy Ground-fern		
	Indigofera australis subsp. australis	Austral Indigo		
	Isolepis crassiuscula	Alpine Club-sedge		
	Isolepis spp.	Club Sedge		
	Juncus alexandri subsp. *alexandri*	Mountain Rush		
*	*Juncus articulatus* subsp. *articulatus*	Jointed Rush		
*	*Juncus effusus* subsp. *effusus*	Soft Rush		
	Juncus spp.	Rush		
*	*Juncus tenuis*	Slender Rush		
	Kunzea muelleri	Yellow Kunzea		
	Kunzea sp. (Upright form)	Forest Burgan		
	Lagenophora montana	Mountain Bottle-daisy		
	Lagenophora stipitata s.s.	Blue Bottle-daisy		
	Leionema phylicifolium	Alpine Leionema		
*	*Leontodon saxatilis* subsp. *saxatilis*	Hairy Hawkbit		
	Leptinella filicula	Mountain Cotula		

Origin	Scientific name	Common name	EPBC	FFG
	Leptorhynchos squamatus subsp. *alpinus*	Alpine Buttons		e
*R	*Leucanthemum vulgare*	Ox-eye Daisy		
	Leucochrysum albicans subsp. *albicans*	Hoary Sunray		
	Leucochrysum alpinum	Alpine Sunray		e
	Leucopogon gelidus	Drooping Beard-heath		
	Lobelia surrepens	Mud Pratia		
*	*Lolium perenne* var. *perenne*	Perennial Rye-grass		
	Lomandra longifolia subsp. *exilis*	Cluster-headed Mat-rush		
	Lomatia fraseri	Tree Lomatia		
	Lomatia myricoides	River Lomatia		
*	*Lotus corniculatus* var. *corniculatus*	Bird's-foot Trefoil		
*	*Lotus subbiflorus*	Hairy Bird's-foot Trefoil		
*	*Lotus uliginosus*	Greater Bird's-foot Trefoil		
*	*Lupinus arboreus*	Tree Lupin		
	Luzula acutifolia subsp. *acutifolia*	Sharp-leaf Woodrush		e
	Luzula alpestris	Tussock Woodrush		v
	Luzula meridionalis var. *flaccida*	Common Woodrush		
	Luzula meridionalis var. *meridionalis*	Common Woodrush		
	Luzula modesta	Southern Woodrush		
	Luzula novae-cambriae	Coarse Woodrush		
	Luzula spp.	Woodrush		
	Lycopodium fastigiatum	Mountain Clubmoss		
*	*Malus pumila*	Apple		
	Melicytus angustifolius subsp. *divaricatus*	Tangled Shrub-violet		
	Melicytus dentatus s.l.	Tree Violet		
	Melicytus sp. aff. *dentatus* (Snowfields variant)	Alpine Shrub-violet		
	Microlaena stipoides var. *stipoides*	Weeping Grass		
	Microseris lanceolata	Alpine Yam-daisy		
	Monotoca scoparia	Prickly Broom-heath		
	Montia australasica	White Purslane		
*	*Myosotis discolor*	Yellow-and-blue Forget-me-not		
	Myriophyllum pedunculatum subsp. *pedunculatum*	Mat Water-milfoil		
	Olearia algida	Mountain Daisy-bush		
	Olearia alpicola	Alpine Daisy-bush		
	Olearia argophylla	Musk Daisy-bush		
	Olearia brevipedunculata	Rusty Daisy-bush		e
	Olearia erubescens	Moth Daisy-bush		
	Olearia frostii	Bogong Daisy-bush		v
	Olearia megalophylla	Large-leaf Daisy-bush		
	Olearia phlogopappa	Dusty Daisy-bush		
	Olearia phlogopappa subsp. *flavescens*	Dusty Daisy-bush		e
	Oreobolus distichus	Fan Tuft-rush		
	Oreomyrrhis brevipes	Branched Caraway		e
	Oreomyrrhis ciliata	Fringed Caraway		
	Oreomyrrhis eriopoda	Australian Caraway		

Origin	Scientific name	Common name	EPBC	FFG
	Oreomyrrhis pulvinifica	Cushion Caraway		e
	Orites lancifolius	Alpine Orites		
	Oxylobium arborescens	Tall Oxylobium		
	Oxylobium ellipticum	Common Oxylobium		
	Ozothamnus alpinus	Alpine Everlasting		e
	Ozothamnus cupressoides	Kerosene Bush		
	Ozothamnus secundiflorus	Cascade Everlasting		
	Ozothamnus thyrsoideus	Sticky Everlasting		
	Pappochroma bellidioides	Violet Fleabane		
	Pappochroma nitidum	Sticky Fleabane		v
	Pappochroma paludicola	Bog Fleabane		
	Pentachondra pumila	Carpet Heath		e
	Persoonia confertiflora	Cluster-flower Geebung		
	Persoonia juniperina	Prickly Geebung		
	Phebalium squamulosum subsp. *alpinum*	Alpine Phebalium		e
	Philotheca myoporoides subsp. *myoporoides*	Long-leaf Wax-flower		
*	*Phleum pratense*	Timothy Grass		
	Picris angustifolia subsp. *merxmuelleri*	Highland Picris		
	Pimelea alpina	Alpine Rice-flower		
	Pimelea axiflora subsp. *alpina*	Alpine Bootlace Bush		v
	Pimelea axiflora subsp. *axiflora*	Bootlace Bush		
	Pimelea ligustrina subsp. *ciliata*	Fringed Rice-flower		e
	Pimelea ligustrina subsp. *ligustrina*	Tall Rice-flower		
	Pimelea linifolia subsp. *linifolia*	Slender Rice-flower		
	Plantago antarctica	Mountain Plantain		
*	*Plantago coronopus*	Buck's-horn Plantain		
	Plantago euryphylla	Broad Plantain		
*	*Plantago lanceolata*	Ribwort		
	Plantago spp.	Plantain		
	Platylobium montanum subsp. *montanum*	Mountain Flat-pea		
*	*Poa annua* s.s.	Annual Meadow-grass		
	Poa costiniana	Bog Snow-grass		
	Poa ensiformis	Sword Tussock-grass		
	Poa fawcettiae	Horny Snow-grass		
	Poa helmsii	Tall Mountain Tussock-grass		
	Poa hiemata	Soft Snow-grass		
	Poa hothamensis	Ledge Grass		
	Poa hothamensis var. *hothamensis*	Ledge Grass		
	Poa hothamensis var. *parviflora*	Soft Ledge-grass		
	Poa labillardierei	Common Tussock-grass		
	Poa phillipsiana	Blue Snow-grass		
*	*Poa pratensis*	Kentucky Blue-grass		
	Poa sieberiana	Grey Tussock-grass		
	Poa sieberiana var. *sieberiana*	Grey Tussock-grass		
	Poa tenera	Slender Tussock-grass		

Origin	Scientific name	Common name	EPBC	FFG
	Podocarpus lawrencei	Mountain Plum-pine		
	Podolepis laciniata	High-plain Podolepis		e
	Podolepis robusta	Alpine Podolepis		
	Podolobium alpestre	Alpine Podolobium		
	Polyscias sambucifolia subsp. 1	Broad-leaf Panax		
	Polyscias sambucifolia subsp. 2	Ferny Panax		
	Polyscias sambucifolia subsp. 3	Mountain Panax		
	Polystichum proliferum	Mother Shield-fern		
	Pomaderris aspera	Hazel Pomaderris		
	Poranthera microphylla s.s.	Small Poranthera		
	Poranthera oreophila	Mountain Poranthera		e
	Prasophyllum spp.	Leek Orchid		
	Prostanthera cuneata	Alpine Mint-bush		
*	*Prunella vulgaris*	Self-heal		
*	*Prunus cerasifera*	Cherry Plum		
	Psychrophila introloba	Alpine Marsh-marigold		e
	Pteridium esculentum subsp. *esculentum*	Austral Bracken		
	Pterostylis parviflora s.l.	Tiny Greenhood		
	Pultenaea forsythiana	Prickly Bush-pea		
	Ranunculus eichlerianus	Eichler's Buttercup		e
	Ranunculus graniticola	Granite Buttercup		
	Ranunculus gunnianus	Gunn's Alpine Buttercup		e
	Ranunculus lappaceus	Australian Buttercup		
	Ranunculus millanii	Dwarf Buttercup		e
	Ranunculus muelleri	Felted Buttercup		e
	Ranunculus pimpinellifolius	Bog Buttercup		
*	*Ranunculus repens*	Creeping Buttercup		
	Ranunculus scapiger	Hairy Buttercup		
	Ranunculus spp.	Buttercup		
	Ranunculus victoriensis	Victorian Buttercup		e
*R	*Reseda luteola*	Weld		
	Rhodanthe anthemoides	Chamomile Sunray		
	Richea continentis	Candle Heath		
*C	*Rosa rubiginosa*	Sweet Briar		
*W, C	*Rubus anglocandicans*	Common Blackberry		
	Rubus parvifolius	Small-leaf Bramble		
*W, C	*Rubus polyanthemus*	Forest Blackberry		
*	*Rumex crispus*	Curled Dock		
*	*Rumex obtusifolius* subsp. *obtusifolius*	Broad-leaf Dock		
	Rumex spp.	Dock		
	Rytidosperma alpicola	Crag Wallaby-grass		v
	Rytidosperma nivicola	Snow Wallaby-grass		e
	Rytidosperma nudiflorum	Alpine Wallaby-grass		
	Rytidosperma pallidum	Silvertop Wallaby-grass		
	Rytidosperma penicillatum	Weeping Wallaby-grass		

Origin	Scientific name	Common name	EPBC	FFG
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass		
	Rytidosperma spp.	Wallaby Grass		
*W, R	*Salix cinerea* subsp. *cinerea*	Grey Sallow		
*W, R	*Salix cinerea* subsp. *oleifolia*	Rusty Sallow		
	Sambucus gaudichaudiana	White Elderberry		
	Scaevola hookeri	Creeping Fan-flower		
	Schoenus apogon	Common Bog-sedge		
	Scleranthus biflorus s.s.	Twin-flower Knawel		
	Scleranthus diander	Tufted Knawel		e
	Scleranthus singuliflorus	Mossy Knawel		e
	Senecio gunnii	Mountain Fireweed		
	Senecio linearifolius var. *latifolius*	Fireweed Groundsel (montane variant)		
	Senecio minimus	Shrubby Fireweed		
	Senecio pinnatifolius var. *alpinus*	Snowfield Groundsel		e
	Senecio prenanthoides	Beaked Fireweed		
	Senecio spp.	Groundsel		
*	*Spergularia rubra* s.s.	Red Sand-spurrey		
	Sphagnum spp.	Peat Moss		
	Stackhousia monogyna s.s.	Creamy Candles		
	Stackhousia pulvinaris	Alpine Stackhousia		e
	Stackhousia viminea	Slender Stackhousia		
	Stellaria flaccida	Forest Starwort		
*	*Stellaria media*	Chickweed		
	Stellaria pungens	Prickly Starwort		
	Stylidium armeria	Common Triggerplant		
	Stylidium armeria subsp. *armeria*	Common Triggerplant		
	Styphelia nesophila	Sharp Beard-heath		
*	*Symphyotrichum lanceolatum*	Narrow-leaf Michaelmas Daisy		
*	*Taraxacum officinale* spp. agg.	Garden Dandelion		
*	*Taraxacum* spp.	Dandelion		
	Tasmannia lanceolata	Mountain Pepper		
	Tasmannia xerophila	Alpine Pepper		
	Tasmannia xerophila subsp. *xerophila*	Alpine Pepper		
	Tetratheca ciliata	Pink-bells		
	Themeda triandra	Kangaroo Grass		
	Trachymene humilis subsp. *breviscapa*	Alpine Trachymene		e
*	*Trifolium dubium*	Suckling Clover		
*	*Trifolium repens* var. *repens*	White Clover		
	Trisetum spicatum subsp. *australiense*	Bristle Grass		
	Urtica incisa	Scrub Nettle		
*	*Verbascum virgatum*	Twiggy Mullein		
*	*Veronica arvensis*	Wall Speedwell		
	Veronica calycina	Hairy Speedwell		
	Veronica derwentiana subsp. *derwentiana*	Derwent Speedwell		
	Veronica derwentiana subsp. *maideniana*	Derwent Speedwell		

Origin	Scientific name	Common name	EPBC	FFG
Uncertain (VicFlora 2023)	*Veronica serpyllifolia*	Thyme Speedwell		
	Veronica subtilis	Thread Speedwell		
	Viola betonicifolia subsp. *betonicifolia*	Showy Violet		
	Viola hederacea sensu Thiele & Prober	Ivy-leaf Violet		
*	*Vulpia bromoides*	Squirrel-tail Fescue		
	Wahlenbergia gloriosa	Royal Bluebell		
	Wahlenbergia gracilis	Sprawling Bluebell		
	Wahlenbergia spp.	Bluebell		
	Xerochrysum subundulatum	Orange Everlasting		

Appendix 3. Flora list for the updated Falls to Hotham Alpine Crossing updated proposed track alignment

(Flora species recorded across the updated project assessment area between November 2020 and December 2022)

Legend:

1 = recorded in the relevant track or overnight node section of the study area

S = status

***** = Species introduced to Victoria

CaLP = *Conservation and Land Protection Act 1994*

SP = State Prohibited

P = Regionally Prohibited Weeds

C = Regionally Controlled Weeds

R = Restricted Weeds

W = Weeds of National Significance

EPBC = *Environment Protection and Biodiversity Conservation **Act 1999***

CR = Critically Endangered

E = Endangered

V = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

Native species						**Track sections**																
	Origin	**Scientific name**	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
		Acacia alpina	Alpine Wattle		e													1		1			
		Acacia dallachiana	Catkin Wattle		v												1						
		Acacia dealbata subsp. *dealbata*	Silver Wattle														1						1
		Acacia melanoxylon	Blackwood																				1
		Acacia obliquinervia	Mountain Hickory Wattle													1	1						1
		Acacia stricta	Hop Wattle																				1
		Acaena echinata	Sheep's Burr			1																	
		Acaena novae-zelandiae	Bidgee-widgee			1	1	1	1	1	1	1		1	1	1			1	1	1	1	1
		Acianthus spp.	Mosquito Orchid																				1
		Aciphylla glacialis	Snow Aciphyll		e					1	1	1			1	1			1				1
		Acrothamnus hookeri	Mountain Beard-heath			1	1									1	1	1				1	1
		Acrothamnus montanus	Snow Beard-heath		e	1	1	1	1	1	1	1		1	1					1			
		Acrothamnus spp.	Mountain Beard-heath							1													
		Agrostis s.l. spp.	Bent/Blown Grass														1						
		Ajuga australis	Austral Bugle				1			1													
		Alchemilla xanthochlora	Lady's Mantle		e											1							
		Amyema pendula subsp. pendula (s.s.)	Drooping Mistletoe																				1
		Argyrotegium fordianum	Alpine Cudweed			1	1	1	1	1	1	1			1							1	1
		Argyrotegium mackayi	Silver Cudweed		e																	1	
		Argyrotegium nitidulum	Shining Cudweed	V		1	1	1			1												
		Arthropodium milleflorum s.s.	Pale Vanilla-lily													1	1	1	1	1			1
		Asperula conferta	Common Woodruff													1	1						1
		Asperula gunnii	Mountain Woodruff				1	1	1	1	1	1	1	1		1				1		1	
		Asperula pusilla	Alpine Woodruff				1			1		1						1	1	1		1	
		Asplenium flabellifolium	Necklace Fern																				1
		Astelia alpina var. *novae-hollandiae*	Silver Astelia			1	1																
		Asterolasia trymalioides subsp. *trymalioides*	Alpine Star-bush			1	1	1	1	1	1	1			1							1	

Native species						Track sections																	
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Australina pusilla subsp. muelleri	Shade Nettle																				1
		Baeckea gunniana	Alpine Baeckea			1	1		1		1	1	1			1						1	
		Baloskion australe	Mountain Cord-rush							1													
		Bedfordia arborescens	Blanket Leaf																				1
		Bertya tasmanica subsp. *vestita* (fine-haired variant)	Mitchell Bertya (fine-haired variant)						1														
		Blechnum minus	Soft Water-fern																				1
		Blechnum nudum	Fishbone Water-fern																				1
		Blechnum penna-marina subsp. *alpina*	Alpine Water-fern			1	1		1	1		1				1						1	1
		Blechnum wattsii	Hard Water-fern														1						
		Boronia algida	Alpine Boronia		v													1		1			
		Bossiaea foliosa s.s.	Leafy Bossiaea					1								1							
		Bossiaea sericea	Silky Bossiaea			1	1		1	1			1									1	
		Brachyscome decipiens	Field Daisy			1	1	1	1	1	1	1	1			1			1			1	
		Brachyscome foliosa	Mountain Daisy		e						1								1			1	
		Brachyscome nivalis	Snow Daisy															1	1	1		1	
		Brachyscome rigidula	Leafy Daisy									1				1		1	1	1		1	
		Brachyscome scapigera	Tufted Daisy									1				1			1				
		Brachyscome spathulata	Spoon Daisy				1				1							1		1	1		1
		Brachyscome tadgellii	Tadgell's Daisy		e						1	1				1			1				
		Caesia alpina	Alpine Grass-lily				1									1							
		Caladenia alpina	Mountain Hood-orchid			1												1		1			1
		Caladenia moschata	Musk Hood-orchid																				1
		Callistemon pityoides	Alpine Bottlebrush						1	1													
		Calochlaena dubia	Common Ground-fern																				1
		Cardamine lilacina s.s.	Lilac Bitter-cress		e		1	1	1		1	1										1	
		Carex appressa	Tall Sedge				1		1	1		1	1	1		1						1	1
		Carex breviculmis	Common Grass-sedge			1	1	1	1	1	1	1						1	1	1		1	1
		Carex canescens	Short Sedge		e	1	1		1														
		Carex gaudichaudiana	Fen Sedge			1	1			1	1	1			1							1	
		Carex hebes	Mountain Sedge				1																
		Carex inversa	Knob Sedge					1												1			1
		Carex jackiana	Carpet Sedge		e						1												
		Carex spp.	Sedge				1		1			1											
		Cassinia aculeata subsp. *aculeata*	Common Cassinia														1						1
		Cassinia longifolia	Shiny Cassinia																				1
		Celmisia costiniana	Carpet Snow-daisy		e	1	1	1	1	1					1							1	1
		Celmisia latifolia	Victorian Snow-daisy		e											1							
		Celmisia pugioniformis	Slender Snow-daisy								1	1			1	1		1	1	1	1	1	
		Celmisia sericophylla	Silky Snow-daisy		cr					1												1	
		Celmisia tomentella	Silver Snow-daisy		v	1	1	1	1	1	1	1			1				1	1		1	1
		Cheilanthes austrotenuifolia	Green Rock-fern																				1
		Chiloglottis valida	Common Bird-orchid														1						1
		Chrysocephalum apiculatum s.s.	Common Everlasting													1	1	1					
		Chrysocephalum semipapposum	Clustered Everlasting															1					
		Chrysocephalum semipapposum subsp. *semipapposum*	Clustered Everlasting																				1
		Clematis aristata	Mountain Clematis																				1
		Colobanthus affinis	Alpine Colobanth		e																	1	
		Comesperma ericinum	Heath Milkwort																				1
		Coprosma hirtella	Rough Coprosma														1						1

Native species						Track sections																	
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Coprosma quadrifida	Prickly Currant-bush																				1
		Coronidium monticola	Mountain Everlasting			1	1	1	1	1		1	1			1						1	
		Coronidium scorpioides s.s.	Button Everlasting																	1			1
		Coronidium waddelliae	Snowy Everlasting		v												1						
		Corybas spp.	Helmet Orchid																				1
		Cotula alpina	Alpine Cotula				1		1	1	1	1						1				1	1
		Craspedia adenophora	Sticky Billy-buttons		e			1															1
		Craspedia aurantia s.l.	Orange/Green Billy-buttons				1	1	1	1	1					1							
		Craspedia aurantia var. *aurantia*	Orange Billy-buttons		e	1									1	1			1	1	1	1	
		Craspedia aurantia var. *jamesii*	Green Billy-buttons		e														1			1	
		Craspedia crocata	Crimson Billy-buttons		e																	1	
		Craspedia gracilis	Ashen Billy-buttons			1	1	1	1		1	1	1		1							1	
		Craspedia lamicola	Bog Billy-buttons		e		1	1	1			1										1	
		Craspedia maxgrayi s.s.	Woolly Billy-buttons		cr	1	1	1								1		1					
		Craspedia spp.	Billy Buttons				1	1	1		1	1		1		1							
		Crassula sieberiana s.s.	Sieber Crassula													1							
		Daviesia latifolia	Hop Bitter-pea																				1
		Daviesia ulicifolia	Gorse Bitter-pea														1						1
		Desmodium gunnii	Southern Tick-trefoil														1						
		Deyeuxia monticola	Mountain Bent-grass																1	1			
		Deyeuxia spp.	Bent Grass				1	1	1		1	1						1					1
		Dianella revoluta s.l.	Black-anther Flax-lily																				1
		Dianella tasmanica	Tasman Flax-lily							1							1	1		1			1
		Dichondra repens	Kidney-weed											1		1							1
		Dicksonia antarctica	Soft Tree-fern																				1
		Diuris sulphurea	Tiger Orchid																				1
		Drosera auriculata	Tall Sundew																				1
		Empodisma minus	Spreading Rope-rush			1	1	1	1	1	1	1										1	
		Epacris celata	Cryptic Heath		e	1	1	1		1	1	1			1							1	
		Epacris glacialis	Reddish Bog-heath		e										1								
		Epacris gunnii	Ace of Spades			1	1		1	1	1	1		1		1						1	
		Epacris paludosa	Swamp Heath			1	1		1	1												1	
		Epacris spp.	Heath													1							
		Epilobium billardiereanum	Variable Willow-herb											1		1							1
		Epilobium curtisiae	Bald-seeded Willow-herb		e	1					1	1											
		Epilobium gunnianum	Gunn's Willow-herb			1	1															1	
		Epilobium spp.	Willow Herb					1	1	1	1	1				1							1
		Eucalyptus dalrympleana subsp. *dalrympleana*	Mountain Gum														1						1
		Eucalyptus delegatensis subsp. *delegatensis*	Alpine Ash														1						1
		Eucalyptus dives	Broad-leaf Peppermint														1						1
		Eucalyptus mannifera subsp. *mannifera*	Brittle Gum																				1
		Eucalyptus pauciflora subsp. *hedraia*	Bogong Sally		cr																		1
		Eucalyptus pauciflora subsp. *niphophila*	Alpine Sally				1		1	1		1	1	1		1	1	1		1	1		1
		Eucalyptus pauciflora subsp. *pauciflora*	White Sallee			1																1	1
		Eucalyptus radiata subsp. *radiata*	Narrow-leaf Peppermint																				1
		Eucalyptus viminalis subsp. *viminalis*	Manna Gum																				1
		Euchiton involucratus s.s.	Star Cudweed																				1
		Euchiton japonicus s.s.	Creeping Cudweed			1																	
		Euchiton sphaericus	Annual Cudweed															1					

Native species						Track sections																
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Euchiton umbricola	Cliff Cudweed		e												1						
		Euphrasia crassiuscula subsp. *crassiuscula*	Thick Eyebright		v						1					1		1					
		Euphrasia crassiuscula subsp. *eglandulosa*	Thick Eyebright		v														1	1			
		Ewartia nubigena	Silver Ewartia		e							1			1	1			1		1	1	
		Exocarpos cupressiformis	Cherry Ballart																				1
		Exocarpos strictus	Pale-fruit Ballart																				1
		Galium binifolium	Reflexed Bedstraw																				1
		Gaultheria appressa	Wax-berry														1	1					
		Geranium antrorsum	Rosetted Crane's-bill																			1	
		Geranium potentilloides	Soft Crane's-bill									1				1				1			
		Geranium potentilloides var. 1	Soft Crane's-bill																			1	
		Geranium sp. 2	Variable Crane's-bill																				1
		Geranium spp.	Crane's Bill													1	1						1
		Glycine clandestina	Twining Glycine																				1
		Gonocarpus micranthus	Creeping Raspwort				1		1	1	1												
		Gonocarpus micranthus subsp. *micranthus*	Creeping Raspwort																			1	
		Gonocarpus montanus	Mat Raspwort			1	1			1										1		1	
		Gonocarpus tetragynus	Common Raspwort																				1
		Goodenia hederacea subsp. *alpestris*	Ivy Goodenia				1	1	1	1				1				1		1			
		Goodenia hederacea subsp. *hederacea*	Ivy Goodenia																				1
		Grevillea australis	Alpine Grevillea			1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1
		Grevillea victoriae subsp. *victoriae*	Royal Grevillea		e	1				1						1	1			1			1
		Hardenbergia violacea	Purple Coral-pea																				1
		Hedycarya angustifolia	Austral Mulberry																				1
		Herpolirion novae-zelandiae	Sky Lily		e																	1	
		Hovea montana	Alpine Rusty-pods			1	1	1	1	1	1	1		1		1		1		1	1	1	1
		Hydrocotyle algida	Mountain Pennywort															1					1
		Hydrocotyle hirta	Hairy Pennywort																				1
		Hydrocotyle sibthorpioides	Shining Pennywort								1											1	
		Hypericum japonicum	Matted St John's Wort								1	1				1							1
		Hypolepis rugosula	Ruddy Ground-fern																				1
		Indigofera australis subsp. *australis*	Austral Indigo																				1
		Isolepis crassiuscula	Alpine Club-sedge			1						1			1							1	
		Isolepis spp.	Club Sedge				1		1		1	1											
		Juncus alexandri subsp. *alexandri*	Mountain Rush																				1
		Juncus spp.	Rush							1						1							
		Kunzea muelleri	Yellow Kunzea			1		1	1	1	1	1			1	1		1		1	1		1
		Kunzea sp. (Upright form)	Forest Burgan														1						
		Lagenophora montana	Mountain Bottle-daisy													1							
		Lagenophora stipitata s.s.	Blue Bottle-daisy																				1
		Leionema phylicifolium	Alpine Leionema																				1
		Leptinella filicula	Mountain Cotula													1							1
		Leptorhynchos squamatus subsp. *alpinus*	Alpine Buttons		e		1	1	1		1					1		1	1	1		1	
		Leucochrysum albicans subsp. *albicans*	Hoary Sunray															1	1	1			1
		Leucochrysum alpinum	Alpine Sunray		e											1			1				
		Lobelia surrepens	Mud Pratia				1				1	1			1							1	
		Lomandra longifolia subsp. *exilis*	Cluster-headed Mat-rush																				1
		Lomatia fraseri	Tree Lomatia													1							1
		Luzula acutifolia subsp. *acutifolia*	Sharp-leaf Woodrush		e											1			1				

Native species						Track sections																	
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Luzula alpestris	Tussock Woodrush		v						1	1			1							1	
		Luzula meridionalis var. *flaccida*	Common Woodrush				1		1								1	1					
		Luzula meridionalis var. *meridionalis*	Common Woodrush															1	1	1	1		1
		Luzula modesta	Southern Woodrush			1	1	1	1	1	1	1			1	1				1		1	
		Luzula novae-cambriae	Coarse Woodrush								1											1	1
		Luzula spp.	Woodrush								1												
		Lycopodium fastigiatum	Mountain Clubmoss			1				1												1	1
		Melicytus angustifolius subsp. *divaricatus*	Tangled Shrub-violet				1	1	1	1		1										1	
		Melicytus dentatus s.l.	Tree Violet															1					
		Melicytus sp. aff. *dentatus* (Snowfields variant)	Alpine Shrub-violet													1							
		Microlaena stipoides var. *stipoides*	Weeping Grass														1						1
		Microseris lanceolata	Alpine Yam-daisy			1	1	1	1		1	1			1	1		1		1		1	
		Monotoca scoparia	Prickly Broom-heath																				1
		Montia australasica	White Purslane									1				1							
		Myriophyllum pedunculatum subsp. *pedunculatum*	Mat Water-milfoil				1					1											
		Olearia algida	Mountain Daisy-bush								1											1	1
		Olearia alpicola	Alpine Daisy-bush																				1
		Olearia argophylla	Musk Daisy-bush																				1
		Olearia brevipedunculata	Rusty Daisy-bush		e	1	1	1	1	1	1	1	1	1		1		1		1		1	
		Olearia erubescens	Moth Daisy-bush														1						1
		Olearia frostii	Bogong Daisy-bush		v	1	1	1	1	1					1	1		1		1		1	1
		Olearia phlogopappa	Dusty Daisy-bush																				1
		Olearia phlogopappa subsp. *flavescens*	Dusty Daisy-bush		e		1		1	1					1	1	1					1	
		Oreobolus distichus	Fan Tuft-rush				1				1	1										1	
		Oreomyrrhis brevipes	Branched Caraway		e																	1	
		Oreomyrrhis ciliata	Fringed Caraway																			1	
		Oreomyrrhis eriopoda	Australian Caraway				1	1		1	1	1			1							1	1
		Oreomyrrhis pulvinifica	Cushion Caraway		e						1												
		Orites lancifolius	Alpine Orites			1	1	1	1	1		1				1		1		1	1	1	1
		Oxylobium arborescens	Tall Oxylobium														1						
		Oxylobium ellipticum	Common Oxylobium							1							1	1					
		Ozothamnus alpinus	Alpine Everlasting		e		1	1	1		1									1			1
		Ozothamnus cupressoides	Kerosene Bush			1		1	1	1										1		1	
		Ozothamnus secundiflorus	Cascade Everlasting							1								1					1
		Ozothamnus thyrsoideus	Sticky Everlasting			1			1	1						1	1					1	
		Pappochroma bellidioides	Violet Fleabane				1	1	1	1	1					1			1				
		Pappochroma nitidum	Sticky Fleabane		v										1				1			1	
		Pappochroma paludicola	Bog Fleabane				1																
		Pentachondra pumila	Carpet Heath		e			1			1	1			1							1	
		Persoonia confertiflora	Cluster-flower Geebung																				1
		Persoonia juniperina	Prickly Geebung																				1
		Phebalium squamulosum subsp. *alpinum*	Alpine Phebalium		e	1	1	1	1	1	1	1			1	1				1	1	1	
		Philotheca myoporoides subsp. *myoporoides*	Long-leaf Wax-flower														1						
		Picris angustifolia subsp. *merxmuelleri*	Highland Picris							1													
		Pimelea alpina	Alpine Rice-flower			1	1	1	1	1	1	1				1		1		1	1	1	1
		Pimelea axiflora subsp. *alpina*	Alpine Bootlace Bush		v	1	1	1	1	1	1	1	1				1			1		1	1
		Pimelea axiflora subsp. *axiflora*	Bootlace Bush																				1
		Pimelea ligustrina subsp. *ciliata*	Fringed Rice-flower		e		1		1	1			1			1						1	1
		Pimelea ligustrina subsp. *ligustrina*	Tall Rice-flower																	1			

Native species						Track sections																
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Pimelea linifolia subsp. *linifolia*	Slender Rice-flower																				1
		Plantago antarctica	Mountain Plantain				1									1							
		Plantago euryphylla	Broad Plantain				1								1							1	
		Plantago spp.	Plantain				1	1	1		1	1											
		Platylobium montanum subsp. *montanum*	Mountain Flat-pea																				1
		Poa costiniana	Bog Snow-grass			1	1	1	1	1	1	1	1	1	1	1		1			1	1	
		Poa ensiformis	Sword Tussock-grass														1						1
		Poa fawcettiae	Horny Snow-grass				1	1		1	1	1			1	1		1	1		1	1	
		Poa helmsii	Tall Mountain Tussock-grass							1			1	1								1	1
		Poa hiemata	Soft Snow-grass			1	1	1	1	1	1	1	1			1		1	1	1	1	1	1
		Poa hothamensis	Ledge Grass																				1
		Poa hothamensis var. *hothamensis*	Ledge Grass			1	1	1	1	1	1	1	1		1			1			1	1	
		Poa hothamensis var. *parviflora*	Soft Ledge-grass							1													
		Poa labillardierei	Common Tussock-grass																				1
		Poa phillipsiana	Blue Snow-grass					1	1							1							
		Poa sieberiana	Grey Tussock-grass													1							
		Poa sieberiana var. *sieberiana*	Grey Tussock-grass														1	1					1
		Poa tenera	Slender Tussock-grass														1						1
		Podocarpus lawrencei	Mountain Plum-pine			1				1												1	
		Podolepis laciniata	High-plain Podolepis		e		1	1		1	1												
		Podolepis robusta	Alpine Podolepis				1	1	1		1	1				1						1	
		Podolobium alpestre	Alpine Podolobium				1		1	1								1		1	1	1	1
		Polyscias sambucifolia subsp. 1	Broad-leaf Panax														1						
		Polyscias sambucifolia subsp. 2	Ferny Panax														1						1
		Polyscias sambucifolia subsp. 3	Mountain Panax													1							1
		Polystichum proliferum	Mother Shield-fern			1	1			1			1			1						1	1
		Pomaderris aspera	Hazel Pomaderris																				1
		Poranthera microphylla s.s.	Small Poranthera																				1
		Poranthera oreophila	Mountain Poranthera		e		1	1	1		1												
		Prasophyllum spp.	Leek Orchid				1	1			1				1							1	
		Prostanthera cuneata	Alpine Mint-bush			1	1	1		1	1		1		1	1						1	
		Psychrophila introloba	Alpine Marsh-marigold		e						1	1										1	
		Pteridium esculentum subsp. *esculentum*	Austral Bracken														1						1
		Pterostylis parviflora s.l.	Tiny Greenhood																				1
		Pultenaea forsythiana	Prickly Bush-pea																				1
		Ranunculus eichlerianus	Eichler's Buttercup		e						1	1	1					1				1	1
		Ranunculus graniticola	Granite Buttercup																			1	
		Ranunculus gunnianus	Gunn's Alpine Buttercup		e		1				1												
		Ranunculus lappaceus	Australian Buttercup																				1
		Ranunculus millanii	Dwarf Buttercup		e		1			1		1			1							1	
		Ranunculus muelleri	Felted Buttercup		e							1			1								
		Ranunculus pimpinellifolius	Bog Buttercup								1					1						1	
		Ranunculus spp.	Buttercup													1							
		Ranunculus victoriensis	Victorian Buttercup		e	1	1	1	1	1	1	1			1	1			1			1	1
		Rhodanthe anthemoides	Chamomile Sunray																1				
		Richea continentis	Candle Heath			1	1	1		1	1	1		1								1	
		Rubus parvifolius	Small-leaf Bramble														1						1
		Rumex spp.	Dock			1																	
		Rytidosperma alpicola	Crag Wallaby-grass		v														1				

Native species						Track sections																	
	Origin	Scientific name	Common name	EPBC	FFG	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
		Rytidosperma nivicola	Snow Wallaby-grass		e											1							
		Rytidosperma nudiflorum	Alpine Wallaby-grass						1	1					1	1			1	1		1	1
		Rytidosperma pallidum	Silvertop Wallaby-grass														1						1
		Rytidosperma penicillatum	Weeping Wallaby-grass																				1
		Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass																				1
		Rytidosperma spp.	Wallaby Grass								1			1		1							1
		Sambucus gaudichaudiana	White Elderberry																				1
		Schoenus apogon	Common Bog-sedge																				1
		Scleranthus biflorus s.s.	Twin-flower Knawel			1	1	1	1	1	1	1			1				1	1		1	
		Scleranthus diander	Tufted Knawel		e											1			1				
		Scleranthus singuliflorus	Mossy Knawel		e			1	1	1	1	1			1							1	
		Senecio gunnii	Mountain Fireweed			1	1	1	1	1				1		1		1		1		1	1
		Senecio linearifolius var. *latifolius*	Fireweed Groundsel (montane variant)											1		1	1						1
		Senecio minimus	Shrubby Fireweed														1						1
		Senecio pinnatifolius var. *alpinus*	Snowfield Groundsel		e		1	1	1	1	1	1	1									1	
		Senecio prenanthoides	Beaked Fireweed																				1
		Senecio spp.	Groundsel													1							
		Sphagnum spp.	Peat Moss			1	1		1	1	1	1										1	
		Stackhousia monogyna s.s.	Creamy Candles				1	1	1	1	1									1			1
		Stackhousia pulvinaris	Alpine Stackhousia		e		1	1			1	1			1	1						1	
		Stackhousia viminea	Slender Stackhousia																				1
		Stellaria flaccida	Forest Starwort																				1
		Stellaria pungens	Prickly Starwort			1	1		1	1				1		1	1	1		1		1	1
		Stylidium armeria	Common Triggerplant																				1
		Stylidium armeria subsp. *armeria*	Common Triggerplant			1	1	1	1	1						1	1	1	1	1			
		Styphelia nesophila	Sharp Beard-heath													1							
		Tasmannia lanceolata	Mountain Pepper						1					1			1						
		Tasmannia xerophila	Alpine Pepper																				1
		Tasmannia xerophila subsp. *xerophila*	Alpine Pepper			1	1			1			1			1		1		1		1	
		Tetratheca ciliata	Pink-bells																				1
		Themeda triandra	Kangaroo Grass																				1
		Trachymene humilis subsp. *breviscapa*	Alpine Trachymene		e	1	1	1	1	1	1	1			1							1	
		Trisetum spicatum subsp. *australiense*	Bristle Grass				1		1		1	1		1								1	
		Urtica incisa	Scrub Nettle																				1
		Veronica calycina	Hairy Speedwell																				1
		Veronica derwentiana subsp. *derwentiana*	Derwent Speedwell				1	1	1	1		1	1			1	1	1					1
		Veronica derwentiana subsp. *maideniana*	Derwent Speedwell																			1	
		Veronica subtilis	Thread Speedwell							1													
		Viola betonicifolia subsp. *betonicifolia*	Showy Violet			1	1	1	1	1	1	1		1		1	1	1	1	1			1
		Viola hederacea sensu Thiele & Prober	Ivy-leaf Violet																				1
		Wahlenbergia gloriosa	Royal Bluebell															1					1
		Wahlenbergia gracilis	Sprawling Bluebell																				1
		Wahlenbergia spp.	Bluebell																				1
		Xerochrysum subundulatum	Orange Everlasting			1	1	1	1		1	1				1			1				
Total		**316**				**65**	**97**	**67**	**77**	**84**	**81**	**77**	**22**	**23**	**41**	**89**	**49**	**52**	**36**	**52**	**18**	**102**	**157**

Introduced species						Track sections																
	Origin	Scientific name	Common name	EPBC Act listed	FFG Act listed	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
	*	*Acetosella vulgaris*	Sheep Sorrel			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	*	*Achillea millefolium*	Milfoil			1	1													1	1	1	
	*	*Agrostis capillaris* var. *capillaris*	Brown-top Bent			1	1	1	1	1	1			1								1	
	*	*Agrostis stolonifera*	Creeping Bent																	1			
	*	*Aira caryophyllea* subsp. *caryophyllea*	Silvery Hair-grass																				1
	*	*Aira caryophyllea/elegantissima*	Silvery/Delicate Hair-grass			1				1													
	*	*Anthoxanthum odoratum*	Sweet Vernal-grass			1	1			1		1			1	1	1	1				1	1
	*	*Aphanes arvensis*	Parsley Piert														1						
	*	*Bromus catharticus* var. *catharticus*	Prairie Grass																				1
	*	*Centaurium erythraea*	Common Centaury																				1
	*	*Cerastium glomeratum* s.s.	Sticky Mouse-ear Chickweed			1	1							1		1				1			
	*	*Cerastium vulgare*	Common Mouse-ear Chickweed			1		1		1		1										1	
	* C	*Cirsium vulgare*	Spear Thistle			1																	
	*	*Dactylis glomerata*	Cocksfoot			1																	
	*	*Digitalis purpurea*	Foxglove			1																	
	*	*Erigeron bonariensis*	Flaxleaf Fleabane																				1
	*	*Festuca pratensis*	Meadow Fescue			1																	
	*	*Festuca rubra* s.s.	Creeping Fescue			1	1			1	1											1	
	*	*Galium aparine*	Cleavers											1									1
	*	*Holcus lanatus*	Yorkshire Fog			1				1							1	1		1		1	1
	*C	*Hypericum perforatum* subsp. *veronense*	St John's Wort			1											1						1
	*	*Hypochaeris glabra*	Smooth Cat's-ear																				1
	*	*Hypochaeris radicata*	Flatweed			1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	
	*	*Juncus articulatus* subsp. *articulatus*	Jointed Rush			1	1			1													
	*	*Juncus effusus* subsp. *effusus*	Soft Rush			1	1		1	1													
	*	*Juncus tenuis*	Slender Rush			1	1			1	1	1										1	
	*	*Leontodon saxatilis* subsp. *saxatilis*	Hairy Hawkbit															1					
	*R	*Leucanthemum vulgare*	Ox-eye Daisy																				1
	*	*Lotus corniculatus*	Bird's-foot Trefoil																				1
	*	*Lotus uliginosus*	Greater Bird's-foot Trefoil			1										1							1
	*	*Lupinus arboreus*	Tree Lupin			1																	
	*	*Malus pumila*	Apple			1											1						1
	*	*Myosotis discolor*	Yellow-and-blue Forget-me-not													1							
	*	*Phleum pratense*	Timothy Grass			1			1	1												1	
	*	*Plantago coronopus*	Buck's-horn Plantain																	1	1		
	*	*Plantago lanceolata*	Ribwort			1																	1
	*	*Poa annua* s.s.	Annual Meadow-grass			1															1	1	
	*	*Poa pratensis*	Kentucky Blue-grass			1				1												1	
	*	*Prunella vulgaris*	Self-heal																				1
	*	*Prunus cerasifera*	Cherry Plum																				1
	*	*Ranunculus repens*	Creeping Buttercup																				1
	*R	*Reseda luteola*	Weld			1																	
	*C	*Rosa rubiginosa*	Sweet Briar													1							
	*W, C	*Rubus anglocandicans*	Common Blackberry													1	1	1					
	*W, C	*Rubus polyanthemus*	Forest Blackberry														1	1					1
	*	*Rumex crispus*	Curled Dock														1						1
	* W, R	*Salix cinerea* subsp. *cinerea*	Grey Sallow				1															1	1
	* W, R	*Salix cinerea* subsp. *oleifolia*	Rusty Sallow													1	1						
	*	*Spergularia rubra* s.s.	Red Sand-spurrey			1																	
	*	*Stellaria media*	Chickweed																				1

Introduced species						Track sections																	
	Origin	Scientific name	Common name	EPBC Act listed	FFG Act listed	1a	2	3	4	5	6	7	8	9	10a	11	12	13	14	15	16	17	18
	*	*Symphyotrichum lanceolatum*	Narrow-leaf Michaelmas Daisy			1																	
	*	*Taraxacum officinale* spp. agg.	Garden Dandelion																				1
	*	*Taraxacum* spp.	Dandelion			1	1	1	1	1	1	1	1		1	1						1	
	*	*Trifolium dubium*	Suckling Clover			1																	
	*	*Trifolium repens* var. *repens*	White Clover			1	1	1	1	1	1	1	1		1	1			1	1	1	1	1
	*	*Verbascum virgatum*	Twiggy Mullein			1																	
	*	*Veronica arvensis*	Wall Speedwell			1																	
	*	*Vulpia bromoides*	Squirrel-tail Fescue							1													
	Uncertain (Vic Flora 2023)	*Cotula australis*	Common Cotula																				1
	Uncertain (Vic Flora 2023)	*Veronica serpyllifolia*	Thyme Speedwell			1	1	1														1	
Total		**60**				**32**	**14**	**7**	**7**	**16**	**7**	**7**	**3**	**5**	**5**	**11**	**11**	**7**	**3**	**8**	**6**	**16**	**25**

Appendix 4. Flora list for the updated Falls to Hotham Alpine Crossing proposed overnight nodes

(Flora species recorded across the updated project assessment area between December 2022 and February 2024)

Legend

OV = overnight node

1 = recorded in the relevant track or overnight node section of the study area

S = status

* = Species introduced to Victoria

CaLP = *Conservation and Land Protection Act 1994*

SP = State Prohibited

P = Regionally Prohibited Weeds

C = Regionally Controlled Weeds

R = Restricted Weeds

W = Weeds of National Significance

EPBC = *Environment Protection and Biodiversity Conservation **Act 1999***

CR = Critically Endangered

E = Endangered

V = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

Native plants				OV assessed in 2022			OV assessed in 2024				
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1 Preferred**	**OV1 alternate**	**OV2 preferred (including linked access tracks)**	**OV2 alternate (including access track from track section 9)**	**OV3**	**OV4**	**Cope Hut (existing camping area)**	**Weston Hut (existing camping area)**
Acacia dallachiana	Catkin Wattle		v					1			
Acacia dealbata subsp. *dealbata*	Silver Wattle							1			
Acacia obliquinervia	Mountain Hickory Wattle										1
Acaena echinata	Sheep's Burr					1					
Acaena novae-zelandiae	Bidgee-widgee			1		1	1	1			1
Acaena spp.	Sheep's Burr							1		1	
Acrothamnus hookeri	Mountain Beard-heath				1	1	1	1	1	1	
Ajuga australis	Austral Bugal										1
Alchemilla xanthochlora	Lady's Mantle		e								1
Argyrotegium fordianum	Alpine Cudweed				1						
Arthropodium milleflorum s.s.	Pale Vanilla-lily										1
Arthropodium sp. 1 (robust glaucous)	Tall Vanilla-lily		e					1			
Asperula conferta	Common Woodruff				1	1		1			
Asperula gunnii	Mountain Woodruff			1	1	1			1		1
Asperula minima	Mossy Woodruff										1
Asperula pusilla	Alpine Woodruff			1			1				
Astelia alpina var. *novae-hollandiae*	Silver Astelia				1					1	
Asterolasia trymalioides subsp. *trymalioides*	Alpine Star-bush				1					1	
Baeckea gunniana	Alpine Baeckea				1	1	1				
Bartramia robusta	Common Apple-moss										1
Blechnum penna-marina subsp. *alpina*	Alpine Water-fern					1		1			
Boronia algida	Alpine Boronia		v						1		
Bossiaea foliosa s.s.	Leafy Bossiaea										1
Bossiaea sericea	Silky Bossiaea				1	1	1				1
Brachyscome decipiens	Field Daisy			1	1	1	1				
Brachyscome nivalis	Snow Daisy										1
Brachyscome spathulata	Spoon Daisy			1					1	1	
Brachyscome tadgellii	Tadgell's Daisy		e			1					
Callistemon pityoides	Alpine Bottlebrush									1	

Native plants				OV assessed in 2022			OV assessed in 2024				
Scientific name	Common name	EPBC	FFG	OV1 Preferred	OV1 alternate	OV2 preferred (including linked access tracks)	OV2 alternate (including access track from track section 9)	OV3	OV4	Cope Hut (existing camping area)	Weston Hut (existing camping area)
Cardamine lilacina s.s.	Lilac Bitter-cress		e	1		1	1				
Carex appressa	Tall Sedge					1	1	1			1
Carex breviculmis	Common Grass-sedge			1	1	1	1	1	1	1	1
Carex gaudichaudiana	Fen Sedge				1	1	1				
Carex hebes	Mountain Sedge					1				1	
Carex inversa	Knob Sedge							1	1		
Celmisia costiniana	Carpet Snow-daisy		e	1	1				1	1	
Celmisia pugioniformis	Slender Snow-daisy								1		
Celmisia tomentella	Silver Snow-daisy		v	1		1	1		1	1	
Chiloglottis cornuta	Green Bird-orchid				1						
Chrysocephalum apiculatum s.s.	Common Everlasting								1		
Coprosma hirtella	Rough Coprosma							1			
Coronidium monticola	Mountain Everlasting			1	1	1	1			1	1
Cotula alpina	Alpine Cotula				1				1		
Craspedia adenophora	Sticky Billy-buttons		e						1		
Craspedia aurantia var. *aurantia*	Orange Billy-buttons		e	1			1			1	
Craspedia aurantia var. *jamesii*	Green Billy-buttons		e								1
Craspedia gracilis	Ashen Billy-buttons			1		1	1				
Craspedia lamicola	Bog Billy-buttons		e								
Daviesia ulicifolia subsp. *ulicifolia*	Gorse Bitter-pea							1			
Deyeuxia monticola	Mountain Bent-grass								1		
Dianella tasmanica	Tasman Flax-lily			1				1	1		
Empodisma minus	Spreading Rope-rush					1	1				
Epacris celata	Cryptic Heath		e				1				
Epacris paludosa	Swamp Heath				1	1	1				
Epilobium billardiereanum subsp. *hydrophilum*	Robust Willow-herb										1
Epilobium gunnianum	Gunn's Willow-herb					1	1				1
Eucalyptus dalrympleana subsp. *dalrympleana*	Mountain Gum							1			
Eucalyptus pauciflora	Snow Gum								1		
Eucalyptus pauciflora subsp. *niphophila*	Alpine Sally								1	1	
Eucalyptus pauciflora subsp. *pauciflora*	White Sallee			1	1	1	1	1	1		1
Euchiton japonicus s.s.	Creeping Cudweed					1					
Gaultheria appressa	Wax-berry							1			
Geranium potentilloides	Soft Crane's-bill								1		
Geranium potentilloides var. 1	Soft Crane's-bill			1		1					1
Geranium potentilloides var. *potentilloides*	Soft Crane's-bill							1			
Gonocarpus micranthus subsp. *micranthus*	Creeping Raspwort					1					
Gonocarpus montanus	Mat Raspwort			1		1	1				
Goodenia hederacea subsp. *alpestris*	Ivy Goodenia				1						
Grevillea australis	Alpine Grevillea			1	1	1	1		1	1	
Grevillea victoriae subsp. *victoriae*	Royal Grevillea		e	1							1
Hovea montana	Alpine Rusty-pods			1	1	1	1		1	1	
Huperzia australiana	Fir Clubmoss		e								1
Hydrocotyle algida	Mountain Pennywort					1					
Hydrocotyle sibthorpioides	Shining Pennywort			1		1	1				
Isolepis crassiuscula	Alpine Club-sedge						1				
Kunzea muelleri	Yellow Kunzea									1	
Lagenophora stipitata s.s.	Blue Bottle-daisy								1		

Native plants				OV assessed in 2022			OV assessed in 2024				
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1 Preferred**	**OV1 alternate**	**OV2 preferred (including linked access tracks)**	**OV2 alternate (including access track from track section 9)**	**OV3**	**OV4**	**Cope Hut (existing camping area)**	**Weston Hut (existing camping area)**
Leptinella filicula	Mountain Cotula					1	1				
Leptorhynchos squamatus subsp. *alpinus*	Alpine Buttons		e		1		1				
Leucopogon gelidus	Drooping Beard-heath							1			
Lomatia myricoides	River Lomatia							1			
Luzula acutifolia subsp. *acutifolia*	Sharp-leaf Woodrush		e				1				
Luzula alpestris	Tussock Woodrush		v								
Luzula meridionalis var. *flaccida*	Common Woodrush				1			1		1	
Luzula modesta	Southern Woodrush			1	1		1				
Luzula novae-cambriae	Coarse Woodrush								1		
Lycopodium fastigiatum	Mountain Clubmoss					1	1		1		1
Melicytus angustifolius subsp. *divaricatus*	Tangled Shrub-violet				1	1	1				
Microlaena stipoides var. *stipoides*	Weeping Grass							1			
Microseris lanceolata	Alpine Yam-daisy				1	1	1		1		
Olearia brevipedunculata	Rusty Daisy-bush		e	1	1	1	1				
Olearia erubescens	Moth Daisy-bush							1			
Olearia frostii	Bogong Daisy-bush		v	1	1	1	1		1	1	
Olearia megalophylla	Large-leaf Daisy-bush							1			
Olearia phlogopappa subsp. *flavescens*	Dusty Daisy-bush		e			1			1	1	1
Oreomyrrhis ciliata	Fringed Caraway						1				
Oreomyrrhis eriopoda	Australian Caraway			1	1	1	1		1	1	1
Orites lancifolius	Alpine Orites					1	1			1	
Oxylobium ellipticum	Common Oxylobium			1	1			1			
Ozothamnus cupressoides	Kerosene Bush			1	1						
Ozothamnus secundiflorus	Cascade Everlasting			1					1		
Pappochroma bellidioides	Violet Fleabane									1	
Phebalium squamulosum subsp. *alpinum*	Alpine Phebalium		e	1	1	1	1			1	
Pimelea alpina	Alpine Rice-flower			1	1		1		1	1	1
Pimelea axiflora subsp. *alpina*	Alpine Bootlace Bush		v				1				
Pimelea ligustrina subsp. *ciliata*	Fringed Rice-flower		e	1		1	1				
Plantago euryphylla	Broad Plantain				1		1			1	
Poa costiniana	Bog Snow-grass			1	1	1	1				1
Poa ensiformis	Sword Tussock-grass							1			
Poa fawcettiae	Horny Snow-grass									1	1
Poa helmsii	Tall Mountain Tussock-grass					1	1				
Poa hiemata	Soft Snow-grass			1	1	1	1		1	1	
Poa hothamensis var. *hothamensis*	Ledge Grass			1	1	1	1				
Poa tenera	Slender Tussock-grass							1			
Podocarpus lawrencei	Mountain Plum-pine					1	1			1	
Podolepis robusta	Alpine Podolepis									1	
Podolobium alpestre	Alpine Podolobium					1	1		1	1	
Polyscias sambucifolia subsp. 3	Mountain Panax			1		1		1			
Polystichum proliferum	Mother Shield-fern			1				1			1
Poranthera oreophila	Mountain Poranthera		e	1	1						
Prasophyllum spp.	Leek Orchid				1						
Prostanthera cuneata	Alpine Mint-bush					1	1				
Ranunculus eichlerianus	Eichler's Buttercup		e			1	1				
Ranunculus graniticola	Granite Buttercup					1					
Ranunculus gunnianus	Gunn's Alpine Buttercup		e		1						1
Ranunculus pimpinellifolius	Bog Buttercup						1				
Ranunculus scapiger	Hairy Buttercup							1			

Native plants				OV assessed in 2022			OV assessed in 2024				
Scientific name	**Common name**	**EPBC**	**FFG**	**OV1 Preferred**	**OV1 alternate**	**OV2 preferred (including linked access tracks)**	**OV2 alternate (including access track from track section 9)**	**OV3**	**OV4**	**Cope Hut (existing camping area)**	**Weston Hut (existing camping area)**
Ranunculus victoriensis	Victorian Buttercup		e	1	1	1	1		1	1	1
Richea continentis	Candle Heath			1		1	1				
Rubus parvifolius	Small-leaf Bramble										1
Rytidosperma nudiflorum	Alpine Wallaby-grass				1		1		1	1	
Rytidosperma spp.	Wallaby Grass								1		
Scaevola hookeri	Creeping Fan-flower				1						
Schoenus apogon	Common Bog-sedge							1			1
Scleranthus biflorus s.s.	Twin-flower Knawel			1		1	1			1	
Scleranthus singuliflorus	Mossy Knawel		e	1	1	1	1			1	
Senecio gunnii	Mountain Fireweed					1	1		1		1
Senecio pinnatifolius var. *alpinus*	Snowfield Groundsel		e			1	1				
Senecio spp.	Groundsel										1
Sphagnum spp.	Peat Moss				1	1	1				
Stellaria pungens	Prickly Starwort			1	1	1	1	1	1	1	
Stylidium armeria	Common Triggerplant								1		
Tasmannia xerophila subsp. *xerophila*	Alpine Pepper			1	1	1		1	1	1	1
Trachymene humilis subsp. *breviscapa*	Alpine Trachymene		e	1	1		1				
Trisetum spicatum subsp. *australiense*	Bristle Grass			1	1						
Veronica derwentiana subsp. *derwentiana*	Derwent Speedwell							1			
Veronica derwentiana subsp. *maideniana*	Derwent Speedwell					1					
Viola betonicifolia subsp. *betonicifolia*	Showy Violet			1	1	1	1	1		1	1
Xerochrysum subundulatum	Orange Everlasting				1						1
Totals 149				**45**	**50**	**62**	**61**	**35**	**38**	**37**	**37**

Introduced plants			OV assessed in 2022						OV assessed in 2024	
Status	**Scientific name**	**Common name**	**OV1 Preferred**	**OV1 alternate**	**OV2 preferred (including linked access tracks)**	**OV2 alternate (including access track from track section 9)**	**OV3**	**OV4**	**Cope Hut (existing camping area)**	**Weston Hut (existing camping area)**
*	*Acetosella vulgaris*	Sheep Sorrel	1	1	1	1	1	1	1	1
*	*Agrostis capillaris*	Brown-top Bent					1	1		
*	*Agrostis capillaris* var. *capillaris*	Brown-top Bent	1							
*	*Anthoxanthum odoratum*	Sweet Vernal-grass	1	1	1	1	1			1
*	*Barbarea intermedia*	Wintercress								1
*	*Bromus catharticus* var. *catharticus*	Prairie Grass					1			
*	*Cerastium glomeratum* s.s.	Sticky Mouse-ear Chickweed							1	1
*	*Cerastium vulgare*	Common Mouse-ear Chickweed			1	1			1	1
*C	*Cirsium vulgare*	Spear Thistle					1			
*	*Crataegus monogyna* subsp. *monogyna*	Hawthorn					1			
*	*Dactylis glomerata*	Cocksfoot						1		
*	*Erythranthe moschata*	Musk Monkey-flower			1					
*	*Festuca rubra* s.s.	Creeping Fescue			1					
*	*Holcus lanatus*	Yorkshire Fog			1		1			
*	*Hypochaeris radicata*	Flatweed	1	1	1	1	1	1	1	1
*	*Juncus effusus* subsp. *effusus*	Soft Rush								1
*	*Juncus tenuis*	Slender Rush			1					
*	*Lolium perenne* var. *perenne*	Perennial Rye-grass					1			
*	*Lotus corniculatus* var. *corniculatus*	Bird's-foot Trefoil								1
*	*Lotus subbiflorus*	Hairy Bird's-foot Trefoil					1			
*	*Lotus uliginosus*	Greater Bird's-foot Trefoil					1			

Introduced plants			OV assessed in 2022						OV assessed in 2024	
Status	Scientific name	Common name	OV1 Preferred	OV1 alternate	OV2 preferred (including linked access tracks)	OV2 alternate (including access track from track section 9)	OV3	OV4	Cope Hut (existing camping area)	Weston Hut (existing camping area)
*	*Malus pumila*	Apple					1			1
*	*Plantago lanceolata*	Ribwort					1			
*	*Poa annua* s.s.	Annual Meadow-grass					1			
*	*Poa pratensis*	Kentucky Blue-grass			1					
*	*Prunella vulgaris*	Self-heal					1			
*	*Ranunculus repens*	Creeping Buttercup					1			1
*W, C	*Rubus polyanthemus*	Forest Blackberry					1			1
*	*Rumex obtusifolius* subsp. *obtusifolius*	Broad-leaf Dock								1
* W, R	*Salix cinerea* subsp. *cinerea*	Grey Sallow	1		1	1				
* W, R	*Salix cinerea subsp. oleifolia*	Rusty Sallow								1
*	*Stellaria media*	Chickweed					1			
*	*Taraxacum officinale* spp. agg.	Garden Dandelion						1		
*	*Taraxacum* spp.	Dandelion	1	1	1	1				
*	*Trifolium repens* var. *repens*	White Clover	1	1	1	1	1	1		1
Uncertain (VicFlora 2023)	*Veronica serpyllifolia*	Thyme Speedwell			1	1				
Totals	**36**		**7**	**5**	**13**	**8**	**19**	**6**	**4**	**14**

Appendix 5. Fauna species list for the updated Falls to Hotham Alpine Crossing project area

(Fauna species recorded across the updated project assessment area between November 2020 and February 2024 – sensitive species records have been redacted for their protection).

Legend:

1 = recorded in the relevant track or overnight node section of the study area

***** = introduced to Australia

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

V = Vulnerable

E = Endangered

FFG = *Flora and Fauna Guarantee Act 1988*

vu = Vulnerable

en = Endangered

cr = Critically Endangered

Origin	Scientific name	Common name	EPBC	FFG	Track sections																		Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area								
					1A	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18	OV1 (preferred)	OV1 (alternate)	OV2 (preferred)	Track to OV2 (preferred)	OV2 (alternate)	OV3	OV 4	CH	WH
	Mammals																														
	Antechinus sp.	antechinus																				1									
	Austronomus australis	White-striped Freetail Bat											1				1														
*	*Cervus unicolor*	Sambar				1			1								1															
*	*Equus caballus*	Horse (feral)				1					1	1	1	1																	
*	*Lepus europaeus*	European Hare				1																									
	Mastacomys fuscus mordicus	Broad-toothed Rat	E	vu	1					1																					
	Ornithorhynchus anatinus	Platypus		vu													1														
*	*Oryctolagus cuniculus*	European Rabbit				1			1																						
	Petauroides volans	Southern Greater Glider	E	en													1														
	Petaurus australis	Yellow-bellied Glider	V	vu													1														
	Suborder Microchiroptera	microbat species											1				1														
	Trichosurus cunninghami	Mountain Brushtail Possum											1				1														
	Birds																														
	Acanthiza sp.	thornbill																				1									
	Anthochaera carunculata	Red Wattlebird															1					1									
	Anthus novaeseelandiae	Australasian Pipit					1																								
	Cacomantis flabelliformis	Fan-tailed Cuckoo															1					1									
	Callocephalon fimbriatum	Gang - Gang Cockatoo	E	en	[redacted]																										
	Colluricincla harmonica	Grey Shrike-thrush															1					1									
	Cormobates leucophaea	White-throated Treecreeper															1														
	Corvus mellori	Little Raven															1					1									
	Cracticus tibicen	Australian Magpie				1											1					1									
	Dacelo novaeguineae	Laughing Kookaburra															1														
	Eopsaltria australis	Eastern Yellow Robin																				1									
	Falco berigora	Brown Falcon							1																						
	Falco cenchroides	Nankeen Kestrel																		1		1									
	Lichenostomus chrysops	Yellow-faced Honeyeater															1														
	Melithreptus lunatus	White-naped Honeyeater															1														
	Nino1 novaeseelandiae	Southern Boobook Owl															1														

Origin	Scientific name	Common name	EPBC	FFG	Track sections																		Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area								
					1A	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18	OV1 (preferred)	OV1 (alternate)	OV2 (preferred)	Track to OV2 (preferred)	OV2 (alternate)	OV3	OV 4	CH	WH
	Pachycephala pectoralis	Golden Whistler															1															
	Pachycephala rufiventris	Rufous Whistler															1															
	Pardalotus punctatus	Spotted Pardalote															1						1									
	Pardalotus striatus	Striated Pardalote															1						1									
	Petroica phoenicea	Flame Robin				1							1							1			1									
	Platycercus elegans	Crimson Rosella															1						1									
	Psophodes olivaceus	Eastern Whipbird															1						1									
	Rhipidura albiscapa	Grey Fantail															1						1									
	Rhipidura leucophrys	Willie Wagtail																		1			1									
	Sericornis frontalis	White-browed Scrubwren															1						1									
	Strepera graculina	Pied Currawong															1															
	Strepera versicolor	Grey Currawong																					1									
	Zanda funerea	Yellow-Tailed Black Cockatoo																					1									
	Zosterops lateralis	Silvereye															1						1									
	Reptiles																															
	Austrelaps ramsayi	Highland Copperhead														1		1					1									
	Cyclodomorphys praealtus	Alpine She-oak Skink	E	cr																												
	Drysdalia coronoides	White-lipped Snake																		1												
	Eulamprus kosciuskoi	Alpine Water Skink		en																												
	Eulaprus tympanum tympanum	Southern Water Skink			1	1			1				1										1									
	Lampropholis guichenoti	Garden Skink															1	1					1									
	Liopholis guthega	Guthega Skink	E	cr																												
	Notechis scutatus	Tiger Snake															1															
	Pseudemoia cryodroma	Alpine Bog Skink	E	en																												
	Pseudemoia pagenstecheri	Tussock Skink		en		1				1	1																				1	1
	Pseudemoia entrecasteau1ii	Southern Grass Skink																1		1			1									
	Pseudemoia spenceri	Spencer's Skink																					1									
	Rankinia diamensis	Mountain Dragon																1					1									
	Tiliqua nigrolutea	Blotched Blue-tongued Lizard															1															
	Frogs																															
	Crinia signifera	Common Froglet				1			1			1	1																			
	Litoria ewingii species group	Brown tree frog species group																														
	Fish																															
	Gala1ias olidus	Mountain Gala1ias											1																			
	Gala1ias cf. *olidus*	galaxias (Bogong High Plains)	TBA	TBA																												
*	*Salmo trutta*	Brown Trout							1	1							1															
	Invertebrates																															
	Amphibolia sp.	fly																					1									
	Apricia jovialis	Jovial Jumping Spider																					1									
	Argynnina cyrilla	Cyril's Brown Butterfly																					1									
	Chrysolarentia nephodes	High-country Carpet Moth																				1										
	Chrysolarentia correlata	Yellow Carpet Moth																					1									
	Diphucephala spp.	Green Scarab Beetle												1																		

Origin	Scientific name	Common name	EPBC	FFG	Track sections																	Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area								
					1A	2	3	4	5	6	7	8	9	10	10a	11	12	13	14	15	16	17	18	OV1 (preferred)	OV1 (alternate)	OV2 (preferred)	Track to OV2 (preferred)	OV2 (alternate)	OV3	OV 4	CH	WH
	Eusthenia venosa	stonefly											1																		
	Graphium macleayanum	Macleay's Swallowtail																1													
	Leptotarsus imperatorias	Cranefly																				1									
	Monistria concinna	Spotted Mountain Grasshopper												1		1															
	Order Amphipoda	amphipod																				1									
	Order Ephemeroptera	mayflies											1				1														
	Order Plecoptera	stoneflies											1				1														
	Order Trichoptera	caddisflies				1				1			1																		
	Phaos aglaophora	Alpine Tiger Moth																				1									
	Vanessa itea	Australian Admiral															1														
	Vanessa kershawi	Australian Painted Lady																					1								

Appendix 6. Waterway processes

Bed level lowering

Bed level lowering is a process by which the bed level is lowered through erosion. This can occur for many reasons (including catchment clearing, riparian vegetation clearing, poor waterway crossing design and construction, artificial channelisation, etc.), and can have a number of effects on bank stability, in-stream geomorphic diversity and floodplain hydrology. It is almost always accompanied by channel widening as the steepening banks collapse.

Commonly, bed level lowering (incision) occurs through a process called head-cut migration (or knickpoint regression). Head-cut migration presents as an abrupt change in channel slope, similar to small waterfalls or cascades within the channel (Schumm 1977) (Figure 15). A small plunge pool may be present at the base of the head-cut due to the higher energy of falling water. This is particularly common in steeper channels.

Head-cut erosion occurs in an upstream direction. In general, after a head-cut forms, it will continue to migrate upstream until it reaches either the head of the catchment or a solid barrier (e.g. a rock bar or road crossing). That is, without physical intervention within the creek, the head-cut will continue to migrate, and the channel will continue to deepen and subsequently cause channel widening (Booth 1990). This has the potential to impact on infrastructure that is aligned with the current bed elevation. Alpine Bog Communities are particularly vulnerable to this form of erosion. Minor head-cuts were also observed within the aqueduct network. Conversely, bedrock-controlled streams have limited to no capacity to incise further.

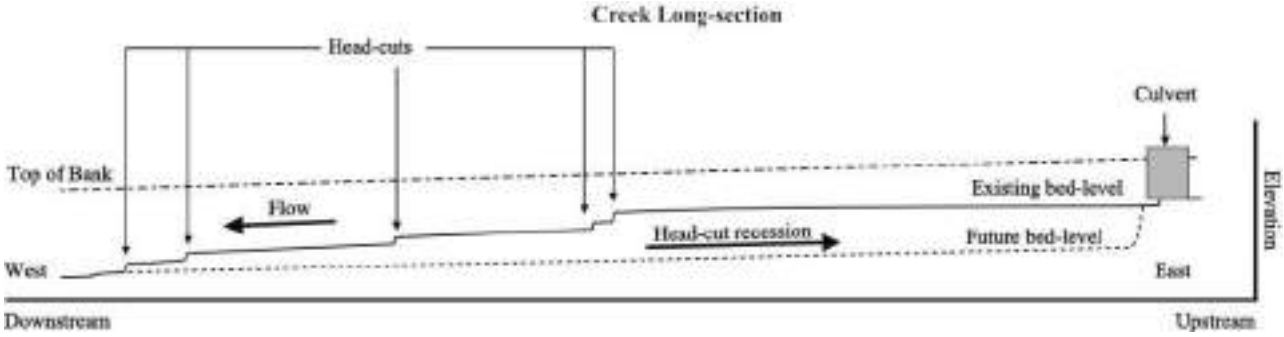


Figure 15. Conceptual diagram of knickpoint recession showing head-cuts moving upstream

Channel widening

Bank collapse will occur in response to channel deepening, resulting in widening of the channel (Leopold et al. 1964). Increased channel capacity results in larger flows being contained within the channel, which leads to increased erosive power. This is a significant problem when combined with disturbed or unvegetated bank substrates.

Bank erosion

Bank erosion can occur in response to several different processes and can present in a variety of forms. Toe erosion of banks, particularly on the outside of meander bends (lateral migration) was observed in the form of bank erosion. Erosion of this sort is often associated with a lack of riparian vegetation functioning to stabilise the bank. The toe of the bank is gradually (or episodically) eroded until the bank is vertical or undercut, and the bank subsequently collapses under its own weight. Erosion on the outside of meander bends is a natural process of gradual channel planform change called lateral migration (lengthening). Erosion is expected at the

outside of bends as these are areas of increased flow velocity. Likewise, deposition is expected on the inside of the bend, as it is an area of reduced flow velocity.

Slumping or mass failure of the bank can also be initiated through geotechnical instabilities within the bank and saturation of the sediments, rather than being directly associated with channel flow. This can also occur through drawdown, where the bank becomes unstable through the transfer of ground water through the saturated bank to the channel. Once a bank fails, erosion can occur rapidly due to the exposed unconsolidated sediment behaving as a slurry.

Sediment supply

Sediment supply is a major influence for geomorphic change in river systems. Sediment is supplied to the river system through a variety of mechanisms such as the erosion of bedrock, catchment denudation, runoff, and bed and bank erosion. As such, sediment delivery volumes to a river system are dependent on a myriad of factors including, but not limited to, regional geology, regional hydrology, valley size, valley slope, anthropogenic disturbance and vegetation cover.

The sediment transport capacity of a channel is determined by its morphology (channel cross-section, planform and slope), hydraulic characteristics (discharge) and sediment particle size. In general, higher discharge results in a higher sediment transport capacity, however, a higher channel width:depth ratio will reduce the sediment transport capacity due to a reduced depth of flow.

Geomorphic change in a river system occurs when sediment supply and sediment transport capacity relationships vary. Deposition will occur if sediment supply exceeds sediment transport capacity, and erosion will occur when sediment transport capacity exceeds sediment supply.

Sediment starvation

Sediment starvation is the process where the downstream transfer of sediment is limited. Sediment transfer may be limited by natural and anthropogenic factors such as log jams or artificial instream structures (e.g. waterway crossings such as pipe culverts or weirs) during both low flow and flood conditions due to the structure preventing the passage of sediment. The process involves sediment being eroded from the downstream side of a structure and not being replenished by sediment from upstream, as it would be if there was no structure. Bed deepening can also occur through sediment starvation (e.g. downstream of dams and crossings).

Excess sediment

Excess sediment can result in sand slugs or sediment pulses that are unable to move under low flow conditions but are transported downstream during floods. This results in episodic movement and storage of large sand deposits downstream. These features can often occur as a result of major channel degradation (widespread bank erosion and/or channel deepening) associated with large floods or significant land disturbances such as bushfires.

Appendix 7. Waterway crossings and potential waterway impacts

A summary of potential crossing types and their implications for management within the project area is provided in Table 22.

Table 22. Waterway crossing types and their implications (December 2020)

Crossing type	Key design considerations	Advantages	Disadvantages
Bridge	Surrounding channel dimensions, site characteristics and geomorphic processes. The height of bridge relative to flood levels. Floodplain flow restriction brought about by the bridge approaches constructed above the floodplain surface. Bridge abutment protection (rock beaching requirements) to prevent bank erosion where flows are concentrated beneath the bridge. Bridge span width. Single span bridges are preferred to minimise waterway disturbance and potential for debris capture. To reduce costs, bridges are generally placed where the floodplain width is naturally narrow. Impacts to surrounding riparian vegetation and habitat for native fauna. Trackside drainage arrangements.	Bridges are generally the preferred structure from a waterway health perspective as they generally cause the least disturbance to the surrounding stream dynamics and hydrologic and hydraulic conditions. However, particular care must be taken to prevent sediment flows entering the waterway from works on the banks. Bridges provide unrestricted fish passage and sediment transport. Bridges are likely to provide the most reliable crossing type as they are usually constructed above the 1% AEP flood level.	Bridges are generally the most expensive crossing structure. The concentration of flow beneath the bridge deck may increase the hydraulic forces and contribute to bank erosion beneath and surrounding the bridge. Bridge approaches are generally constructed above the floodplain surface. This has the potential to reduce the hydraulic capacity through the structure creating an increased afflux upstream of the bridge and increasing hydraulic forces (and therefore erosion potential) surrounding the structure. Impacts to soil and vegetation along the banks may result in sediment entering the waterway if controls are not strictly enforced, and the direct (albeit limited) removal of habitat for several threatened fauna species.

Crossing type	Key design considerations	Advantages	Disadvantages
Box culvert	Surrounding channel dimensions, site characteristics and geomorphic processes. Hydraulic capacity. Culvert crossing height. Culvert invert level. Provision for fish passage. Provision for sediment transport through the structure. Bed and bank erosion mitigation requirements. Impacts to surrounding riparian vegetation and habitat for native fauna. Trackside drainage arrangements. Maintenance requirements (e.g. blockage risk).	Appropriately designed and constructed box culverts are an effective crossing type. Box culvert crossings are generally constructed to facilitate greater flow capacity through the crossing. If appropriate bed and bank protection works are undertaken, the box culvert crossing can be overtopped without threatening the integrity of the structure. They can be designed to allow fish passage through the crossing. If constructed at or just below the surrounding waterway bed level, box culverts allow sufficient sediment transport through the crossing.	Box culverts have the potential to catch debris and therefore exacerbate impacts associated with an increased afflux upstream of the crossing. Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing. Box culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure.

Crossing type	Key design considerations	Advantages	Disadvantages
Pipe culvert	Surrounding channel dimensions, site characteristics and geomorphic processes. Hydraulic capacity. Culvert crossing height. Culvert invert level. Provision for fish passage. Provision for sediment transport through the structure. Bed and bank erosion mitigation requirements. Impacts to surrounding riparian vegetation and habitat for native fauna. Trackside drainage arrangements. Maintenance requirements (e.g., blockage risk).	If appropriate bed and bank protection works are undertaken, the pipe culvert crossing can be overtopped without threatening the integrity of the structure. If designed and constructed appropriately, pipe culverts can be a cost-effective method of facilitating access across a watercourse.	Pipe culverts are susceptible to catching debris, becoming blocked and therefore exacerbating impacts associated with increased afflux upstream of the crossing. They are therefore also maintenance intensive. Poor construction methods have the potential to initiate bed deepening in the waterway upstream of the crossing. Pipe culvert crossings generally result in the greatest reduction in cross sectional area (depending upon the track surface height). Hence, they typically have a significant influence on the surrounding hydraulic conditions. Pipe culverts concentrate flows through the structure, increasing hydraulic forces (and therefore erosion potential) surrounding the structure. Pipe culverts can inhibit fish passage through the crossing if not constructed appropriately. Pipe culverts typically restrict bed load sediment transport through the structure.

Crossing type	Key design considerations	Advantages	Disadvantages
Causeway (i.e. low-profile ford crossings that do not incorporate a culvert)	Surrounding channel dimensions, site characteristics and geomorphic processes. Crossing height. Provision for fish passage at low flows. Provision for sediment transport through the structure. Bed and bank erosion mitigation requirements. Impacts to surrounding riparian vegetation and habitat for native fauna. Trackside drainage arrangements.	Causeways are generally set at or near the bed level of the waterway. As such, they can have a reduced impact upon the hydraulic conditions surrounding the waterway. Causeways are generally the least expensive crossing option. Causeways may facilitate fish passage during moderate to high flow events (when inundated).	Without appropriate bed and bank protection, causeways are prone to failure through undermining and outflanking. Being low profile, causeways are regularly inundated and therefore provide the least reliable crossing type. Causeways do not facilitate flow passage through the crossing during low flow events. Consequently, the structure has its greatest hydraulic influence during low events. Causeways will not facilitate fish passage during low flow events. Causeways can prevent bed load sediment from being transported past the crossing.

Appendix 8. Protected flora listed under the FFG Act recorded within the updated FHAC assessment area (as of February 2024)

Legend:

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

FFG = *Flora and Fauna Guarantee Act 1988*

cr = Critically Endangered

e = Endangered

v = Vulnerable

				Track sections																	Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area							
Scientific name	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**OV1 Preferred**	**OV1 Alternate**	**OV2 Preferred (including access track)**	**OV2 Alternate (including access track)**	**OV3**	**OV4**	**CH**	**WH**
Acacia alpina	Alpine Wattle		e													1		1											
Acacia dallachiana	Catkin Wattle		v												1											1			
Acacia obliquinervia	Mountain Hickory Wattle													1	1						1								1
Acacia stricta	Hop Wattle																				1								
Aciphylla glacialis	Snow Aciphyll							1	1	1			1	1			1				1								
Acrothamnus hookeri	Mountain Beard-heath			1	1									1	1	1				1	1		1	1	1	1	1	1	
Acrothamnus montanus	Snow Beard-heath			1	1	1	1	1	1	1		1	1					1											
Acrothamnus spp.	Mountain Beard-heath							1																					
Argyrotegium fordianum	Alpine Cudweed			1	1	1	1	1	1	1			1							1	1		1						1
Argyrotegium mackayi	Silver Cudweed																			1									
Argyrotegium nitidulum	Shining Cudweed	V		1	1	1			1																				
Asplenium flabellifolium	Necklace Fern																				1								
Baeckea gunniana	Alpine Baeckea			1	1		1		1	1	1			1						1			1	1	1				
Bedfordia arborescens	Blanket Leaf																				1								
Blechnum minus	Soft Water-fern																				1								
Blechnum nudum	Fishbone Water-fern																				1								
Blechnum penna-marina subsp. alpina	Alpine Water-fern			1	1		1	1		1				1						1	1			1		1			
Blechnum wattsii	Hard Water-fern														1														
Boronia algida	Alpine Boronia															1		1										1	
Brachyscome decipiens	Field Daisy			1	1	1	1	1	1	1	1			1			1			1		1	1	1	1				1
Brachyscome foliosa	Mountain Daisy		L						1								1			1									
Brachyscome nivalis	Snow Daisy															1	1	1		1									1
Brachyscome rigidula	Leafy Daisy									1				1		1	1	1		1									
Brachyscome scapigera	Tufted Daisy									1				1			1												
Brachyscome spathulata	Spoon Daisy				1				1							1		1	1		1	1					1	1	
Brachyscome tadgellii	Tadgell's Daisy								1	1				1			1							1					
Caladenia alpina	Mountain Hood-orchid			1												1		1			1								

				Track sections																	Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area							
Scientific name	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**OV1 Preferred**	**OV1 Alternate**	**OV2 Preferred (including access track)**	**OV2 Alternate (including access track)**	**OV3**	**OV4**	**CH**	**WH**
Caladenia moschata	Musk-hook Orchid																				1								
Calochlaena dubia	Common Ground-fern																				1								
Cassinia aculeata subsp. *aculeata*	Common Cassinia														1						1								
Cassinia longifolia	Shiny Cassinia																				1								
Celmisia costiniana	Carpet Snow-daisy			1	1	1	1	1					1							1	1	1	1				1	1	
Celmisia latifolia	Victorian Snow-daisy													1			1	1											
Celmisia pugioniformis	Slender Snow-daisy								1	1			1	1		1	1	1	1	1							1		
Celmisia sericophylla	Silky Snow-daisy		L					1												1									
Celmisia tomentella	Silver Snow-daisy			1	1	1	1	1	1	1			1							1	1	1		1	1		1	1	
Cheilanthes austrotenuifolia	Green Rock-fern																				1								
Chiloglottis cornuta	Green Bired-orchid														1						1		1						
Chiloglottis valida	Common Bird-orchid														1						1								
Chrysocephalum apiculatum s.s.	Common Everlasting													1	1	1											1		
Chrysocephalum semipapposum	Clustered Everlasting															1													
Chrysocephalum semipapposum subsp. *semipaposum*	Clustered Everlasting																				1								
Coronidium monticola	Mountain Everlasting			1	1	1	1	1		1	1			1						1		1	1	1	1			1	1
Coronidium scorpioides s.s.	Button Everlasting																	1			1								
Coronidium waddelliae	Snowy Everlasting														1														
Corybas spp.	Helmet Orchid																				1								
Cotula alpina	Alpine Cotula				1		1	1	1	1						1				1	1		1				1		
Cotula australia	Common Cotula																				1								
Craspedia adenophora	Sticky Billy-buttons					1															1						1		
Craspedia aurantia s.l.	Orange/Green Billy-buttons				1	1	1	1	1					1															
Craspedia aurantia var. *aurantia*	Orange Billy-buttons			1									1	1			1	1	1	1		1			1				
Craspedia aurantia var. *jamesii*	Green Billy-buttons																1			1									
Craspedia crocata	Crimson Billy-buttons																			1									
Craspedia gracilis	Ashen Billy-buttons			1	1	1	1		1	1	1		1							1									
Craspedia lamicola	Bog Billy-buttons				1	1	1			1										1									
Craspedia ma1grayi s.s.	Woolly Billy-buttons			1	1	1								1		1													
Craspedia spp.	Billy Buttons				1	1	1		1	1		1		1															
Dicksonia antarctica	Soft Tree-fern																				1								
Diuris supphurea	Tiger Orchid																				1								
Epacris celata	Cryptic Heath			1	1	1		1	1	1			1							1					1				
Epacris glacialis	Reddish Bog-heath												1																
Epacris gunnii	Ace of Spades			1	1		1	1	1	1		1		1						1									
Epacris paludosa	Swamp Heath			1	1		1	1												1				1	1	1			
Epacris spp.	Heath													1															
Euchiton involucratis s.s.	Star Cudweed																				1								

				Track sections																	Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area							
Scientific name	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**OV1 Preferred**	**OV1 Alternate**	**OV2 Preferred (including access track)**	**OV2 Alternate (including access track)**	**OV3**	**OV4**	**CH**	**WH**
Euchiton japonicus s.s.	Creeping Cudweed			1																				1					
Euchiton sphaericus	Annual Cudweed															1													
Euchiton umbricola	Cliff Cudweed														1														
Ewartia nubigena	Silver Ewartia									1			1	1			1		1	1									
Gaultheria appressa	Wa1-berry														1	1										1			
Grevillea australis	Alpine Grevillea			1	1	1	1	1	1	1	1	1	1	1		1		1	1	1		1	1	1	1		1	1	
Grevillea victoriae s.l.	Royal Grevillea			1				1						1	1			1			1	1							1
Hypolepis rugosula	Ruddy Ground-fern																				1								
Lagenophora montana	Mountain Bottle-daisy													1															
Lagenophora stipitata	Common Bottle-daisy																				1			1	1		1		
Leptinella filicula	Mountain Cotula													1							1			1	1				
Leptorhynchos squamatus subsp. *alpinus*	Alpine Buttons				1	1	1		1					1		1	1	1		1			1		1				
Leucochrysum albicans subsp. *albicans*	Hoary Sunray															1	1	1			1								
Leucochrysum alpinum	Alpine Sunray													1			1												
Leucopogon gelidus	Drooping Beard-heath																									1			
Lycopodium fastigiatum	Mountain Clubmoss			1				1												1	1			1	1		1		1
Microseris lanceolata	Alpine Yam-daisy				1	1	1		1	1			1	1		1		1		1			1	1	1		1		
Olearia algida	Mountain Daisy-bush								1											1	1								
Olearia brevipedunculata	Rusty Daisy-bush			1	1	1	1	1	1	1	1	1		1		1		1		1		1	1	1	1				
Olearia erubescens	Moth Daisy-bush														1						1					1			
Olearia frostii	Bogong Daisy-bush			1	1	1	1	1					1	1		1		1		1	1	1	1	1	1		1	1	
Olearia megalophylla	Large-leaf Daisy-bush																									1			
Olearia phlogopappa	Dusty Daisy-bush																				1								
Olearia phlogopappa subsp. *flavescens*	Dusty Daisy-bush				1		1	1					1	1	1					1				1			1	1	1
Ozothamnus alpinus	Alpine Everlasting				1	1	1		1									1			1								
Ozothamnus cupressoides	Kerosene Bush			1		1	1	1										1		1		1	1						
Ozothamnus secundiflorus	Cascade Everlasting							1								1					1	1					1		
Ozothamnus thyrsoideus	Sticky Everlasting			1			1	1						1	1					1									
Pappochroma bellidioides	Violet Fleabane				1	1	1	1	1					1			1											1	
Pappochroma nitidum	Sticky Fleabane												1				1			1									
Pappochroma paludicola	Bog Fleabane				1																								
Pentachondra pumila	Carpet Heath					1			1	1			1							1									
Picris angustifolia subsp. *mer1muelleri*	Highland Picris							1																					
Podolepis laciniata	High-plain Podolepis				1	1		1	1																				
Podolepis robusta	Alpine Podolepis				1	1	1		1	1				1						1								1	
Polystichum proliferum	Mother Shield-fern			1	1			1			1			1					1	1		1				1			1
Prasophyllum spp.	Leek Orchid				1	1			1				1							1			1						
Prostanthera cuneata	Alpine Mint-bush			1	1	1		1	1		1		1	1						1				1	1				

				Track sections																	Overnight node (OV = overnight node) CH = Cope Hut existing camping area WH = Weston Hut existing camping area							
Scientific name	**Common name**	**EPBC**	**FFG**	**1a**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10a**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**OV1 Preferred**	**OV1 Alternate**	**OV2 Preferred (including access track)**	**OV2 Alternate (including access track)**	**OV3**	**OV4**	**CH**	**WH**
Pterostylis parviflora s.l.	Tiny Greenhood																			1									
Rhodanthe anthemoides	Chamomile Sunray																1												
Richea continentis	Candle Heath			1	1	1		1	1	1		1								1					1				
Senecio gunnii	Mountain Fireweed			1	1	1	1	1				1		1		1		1		1	1			1	1		1		1
Senecio hispidulus s.l.	Rough Fireweed																												
Senecio linearifolius var. *latifolius*	Fireweed Groundsel (montane variant)											1		1	1						1								
Senecio minimus	Shrubby Fireweed														1						1								
Senecio pinnatifolius var. *alpinus*	Snowfield Groundsel				1	1	1	1	1	1	1									1				1	1				
Senecio spp.	Groundsel													1															1
Sphagnum spp.	Peat Moss			1	1		1	1	1	1										1			1	1	1				
Stylidium armeria	Common Triggerplant																				1						1		
Stylidium armeria subsp. *armeria*	Common Triggerplant			1	1	1	1							1	1	1	1	1											
Styphelia nesophila	Sharp Beard-heath													1															
Xerochrysum subundulatum	Orange Everlasting			1	1	1	1		1	1				1			1						1						1
Totals				**32**	**40**	**32**	**31**	**33**	**33**	**28**	**9**	**8**	**19**	**41**	**18**	**23**	**20**	**22**	**6**	**45**	**46**	**13**	**18**	**21**	**21**	**8**	**18**	**10**	**12**

Attachment 1. Recommended targeted surveys for threatened flora species for the 2022 updated FHAC project

(Excel spreadsheet provided separately)

Attachment 2. Recommended targeted surveys for threatened fauna species for the 2022 updated FHAC project

(Excel spreadsheet provided separately)

Attachment 3a. Proposed Falls to Hotham Alpine Crossing, Alpine National Park, Geomorphological assessment of proposed overnight nodes (1 and 2) and walking tracks (below the Rocky Valley Dam wall, Fainter Firetrail, short track south of Tawonga Huts), Bogong High Plains (Rosengren 2023)

(Standalone report provided separately)

Attachment 3b. Geomorphological Assessment of Bungalow Spur Track and overnight nodes 3 and 4 (Webb 2023)

(Standalone report provided separately)

Attachment 3c. Proposed Falls – Hotham Alpine Crossing Geomorphology: LiDAR Interpretation, Version 2, February 2024 (Rosengren 2024)

(Standalone report provided separately)

Addendum: FHAC threatened flora species targeted survey report, Cope Hut and Weston Hut proposed overnight nodes, Alpine National Park, Victoria.

(Standalone report provided separately)