



Warburton Mountain Bike Destination Technical Report: Biodiversity assessment for the Environment Effects Statement

FINAL REPORT

Prepared for AECOM and Yarra Ranges Council

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Contents

Executive summary	ix
1. Introduction	1
2. Scoping requirements	2
2.1 EES evaluation objectives	2
2.2 EES scoping requirements	2
2.2.1 Approach to significant species and communities survey and assessments	6
2.3 Linkages to other technical reports.....	9
3. Project description	10
3.1 Project overview.....	10
3.2 Project development.....	13
3.3 Main project components.....	13
3.4 Alternative to Trail 1	14
3.5 Project timing	15
3.6 Project staging.....	15
3.7 Location of the project area.....	15
4. Legislation, policy and guidelines.....	17
5. Consultation	21
6. Methods	25
6.1 Overview of method.....	25
6.1.1 Key information sources	26
6.2 Existing conditions approach	33
6.2.1 Database review	33
6.2.2 Flora and native vegetation assessment.....	33
6.2.3 Defining, assessing and mapping native vegetation	34
6.2.4 Native vegetation impacts	36
6.2.5 Arboricultural assessment.....	37
6.2.6 General fauna assessment.....	37
6.2.7 Targeted surveys for threatened flora and fauna	38
6.2.8 Aquatic habitat assessment	42
6.2.9 Mapping.....	43
6.2.10 Large tree mapping.....	44
6.2.11 Definitions of significant species and ecological communities.....	44
6.2.12 Determining likelihood of occurrence of significant species.....	45
6.2.13 Biosis permits.....	45
6.2.14 Summary of trail assessment effort	46
6.3 Avoidance and design.....	50
6.4 Risk assessment.....	53
6.4.1 Risk overview and purpose	53

6.4.2	Risk assessment process	53
6.4.3	Assigning a consequence level	54
6.4.4	Assigning a likelihood level	55
6.4.5	Assigning a level of risk.....	55
6.5	Impact assessment methods	56
6.6	Assessment of alternatives to Trail 1	56
6.7	Limitations, uncertainties, assumptions.....	57
6.8	Inputs from other EES technical reports	58
7.	Existing conditions.....	59
7.1	Landscape context.....	59
7.2	Public land use history.....	59
7.3	Flora and vegetation	63
7.3.1	Ecological vegetation classes.....	63
7.3.2	Vegetation condition.....	69
7.3.3	Large trees.....	70
7.3.4	Significant flora species	71
7.3.5	DELWP Habitat importance modelling - flora	79
7.3.6	Noxious and high threat weeds.....	81
7.3.7	Weed invasion pathways assessment.....	82
7.3.8	Pathogens.....	89
7.3.9	Arboricultural assessment results.....	91
7.4	Fauna and habitat.....	166
7.4.1	Fauna species.....	166
7.4.2	Terrestrial fauna habitat types.....	166
7.4.3	Aquatic habitat types.....	169
7.4.4	Aquatic habitat condition assessment	170
7.4.5	Significant fauna	174
7.4.6	DELWP Habitat importance modelling - fauna	185
7.4.7	Migratory species	186
7.4.8	Introduced species.....	187
7.5	Significant ecological communities	278
7.5.1	EPBC Act listed ecological communities.....	278
7.5.2	FFG Act listed ecological communities	278
7.6	Groundwater dependent ecosystems.....	280
7.7	Potentially threatening processes	280
7.8	Summary.....	281
8.	Risk assessment.....	283
9.	Construction impact assessment.....	298
9.1	Defining trail construction impacts	298
9.1.1	Partial clearing, large tree and canopy tree impacts rationale	301
9.2	Leadbeater's Possum.....	304

9.2.1	Construction phase disturbance	306
9.3	Cool Temperate Rainforest (CTR) / Cool Temperate Mixed Forest (CTMF).....	307
9.4	Mount Donna Buang Wingless Stonefly	308
9.5	Significant flora.....	309
9.5.1	Large trees	310
9.5.2	Understorey (sub-canopy) trees and large shrubs	310
9.5.3	Medium and small shrubs.....	311
9.5.4	Herbs and graminoids, including orchids.....	312
9.5.5	Ferns	313
9.5.6	Cryptogams (except ferns).....	314
9.6	Other significant fauna, including canopy and ground-dwelling species.....	315
9.6.1	EPBC Act listed species	315
9.6.2	FFG Act listed species.....	316
9.6.3	Construction phase disturbance	317
9.7	Aquatic ecosystems, including other significant fauna.....	322
9.7.1	EPBC Act listed fish species	322
9.7.2	FFG Act listed fauna	322
9.8	Groundwater dependent ecosystems	324
9.9	Native vegetation and habitat removal	325
9.9.1	Habitat fragmentation and edge effects.....	329
9.10	Migratory species.....	332
9.11	Impacts on modelled habitat for rare and threatened species	332
9.12	Cumulative impacts and effects.....	334
9.12.1	Other nearby projects	334
9.12.2	Cumulative biodiversity effects related to existing activities and threats.....	335
10.	Operation impact assessment.....	483
10.1	Leadbeater's Possum.....	483
10.2	Cool Temperate Rainforest (CTR) / Cool Temperate Mixed Forest (CTMF).....	484
10.3	Mount Donna Buang Wingless Stonefly	484
10.4	Significant flora.....	485
10.5	Other significant fauna	486
10.6	Aquatic ecosystems, including other significant aquatic fauna	486
10.7	Groundwater dependent ecosystems	487
10.8	Native vegetation removal and habitat impacts.....	487
10.9	Cumulative operational impacts.....	487
10.10	Migratory species.....	488
11.	Assessment of alternatives to Trail 1.....	489
12.	Summary of mitigation and contingency measures	492
12.1	Mitigation and contingency measures for construction and operation.....	492
12.2	Monitoring and contingency measures.....	492

12.3	Offset requirements.....	502
12.3.1	State offsets.....	502
12.3.2	Commonwealth offsets.....	502
12.4	Proposed offset strategy.....	505
12.4.1	Biodiversity offset requirements.....	505
12.4.2	Offset options investigated.....	507
12.4.3	Credit register and broker searches.....	508
12.4.4	Crown land and alternative offsets.....	508
13.	Conclusion	509
13.1	Existing conditions.....	509
13.2	Risk assessment.....	509
13.3	Residual risks and impacts.....	509
13.3.1	Commonwealth matters.....	509
13.3.2	State significant species and communities.....	510
13.3.3	Groundwater dependent ecosystems.....	510
13.3.4	Native vegetation.....	510
13.3.5	Migratory species.....	511
13.3.6	Cumulative impacts and effects.....	511
13.4	Mitigation and contingency.....	511
14.	References	513
	Appendices.....	522
Appendix 1	Risk register (construction & operation)	523
Appendix 2	Flora and threatened communities	549
Appendix 3	Fauna	587
Appendix 4	Photos of the project area	608
Appendix 5	Vegetation quality assessment results (Practical Ecology and Biosis).....	618
Appendix 6	Named waterways.....	629
Appendix 7	EPBC Significant Impact Criteria assessments	634
Appendix 8	Arborists assessment method statement.....	680
Appendix 9	Arborist report on tree conditions and impacts.....	703
Appendix 10	Mount Donna Buang Wingless Stonefly surveys (2019 & 2021).....	788
Appendix 11	Native Vegetation Removal Reports for two project scenarios.....	797

Tables

Table 1	Scoping requirements relevant to biodiversity.....	3
Table 2	Rationale for survey and assessment effort	6
Table 3	Legislation, policies and guidelines relevant to the assessment.....	17
Table 4	Community and stakeholder engagement undertaken for biodiversity	21
Table 5	Response to community feedback	23
Table 6	Ecology related reports and publications relevant to the Project.....	26
Table 7	Spatial datasets relevant to the Project.....	30
Table 8	Criteria for assigning aquatic habitat condition rating to waterways.....	43
Table 9	Trail survey timing and effort (note - PE dates derived from their spatial data).....	46
Table 10	Guide to consequence levels.....	54
Table 11	Guide to likelihood levels.....	55
Table 12	Risk matrix	55
Table 13	Summary of EVCs recorded within the assessment corridor	64
Table 14	Description of vegetation types within the assessment corridor and project area	65
Table 15	Summary statistics of Vegetation Quality Assessments for habitat zones in the assessment corridor (VAQ score out of 100)	70
Table 16	Average large tree density per bioregional EVC within the assessment corridor where large trees have been recorded in a habitat zone	71
Table 17	Significant flora species recorded or predicted to have a likelihood of occurrence of medium or higher within the project area (the Table contains DELWP Advisory List status used for the Guidelines and new FFG Act Status).....	72
Table 18	Round-leaf Pomaderris EVC affinities - VBA records in the Yarra Ranges intersected DELWP mapped EVC (DELWP 2014a).....	76
Table 19	EVCs known to support Round-leaf Pomaderris (Patykowski, Gibson & Dell 2014).....	77
Table 20	Summary of rare or threatened flora species' habitats modelled in the project area	80
Table 21	Noxious weeds recorded within the project area during field assessments	82
Table 22	Weed risk and invasions pathway assessment for species recorded in the project area or assessment corridor	84
Table 23	Aquatic habitat condition assessment results for waterways in the assessment corridor (desktop)	170
Table 24	Significant fauna species recorded or predicted to have a likelihood of occurrence of medium or higher within the project area	174
Table 25	Summary of fauna species' habitats modelled in the project area	186
Table 26	EVCs that correspond to Alpine <i>Sphagnum</i> Bogs and Associated Fens TEC (TSSC 2009).....	278
Table 27	Biodiversity values	284
Table 28	Summary of risk assessment results – CONSTRUCTION phase.....	285
Table 29	Summary of risk assessment results –OPERATIONAL phase	292
Table 30	Variable width impact footprint widths used for native vegetation removal.....	300
Table 31	Rationale for applying partial clearing based on VQA scores	303
Table 32	Summary of sensitivity of threatened species.....	318
Table 33	Summary of native vegetation impacts (understorey)	326

Table 34	Bioregional analysis of project impacts on EVCs.....	328
Table 35	Summary of threatened fauna sensitivity to fragmentation	330
Table 36	Proportional impacts on modelled habitat for rare and threatened species	333
Table 37	Overview of potential cumulative effects of the project on existing threatening processes	337
Table 38	Comparison of impacts between trail 1 and alternatives to trail 1.....	490
Table 39	Mitigation measures relevant to biodiversity	494
Table 40	Relevant mitigation measures for other disciplines	500
Table 41	State offset requirements for native vegetation removal based on variable trail width impact footprint.....	503
Table 42	Summary of staged species habitat offsets	506
Table 43	Summary of species offset characteristics.....	507
Table 44	Round-leaf Pomaderris: self-assessment against Significant Impact Criteria (CoA 2013).....	635
Table 45	Tall Astelia: self-assessment against Significant Impact Criteria (CoA 2013).....	640
Table 46	Swift Parrot: self-assessment against Significant Impact Criteria (CoA 2013).....	644
Table 47	Leadbeater’s Possum: self-assessment against Significant Impact Criteria (CoA 2013)	646
Table 48	Spot-tailed Quoll: self-assessment against Significant Impact Criteria (CoA 2013)	651
Table 49	Smoky Mouse: self-assessment against Significant Impact Criteria (CoA 2013).....	655
Table 50	Southern Brown Bandicoot: self-assessment against Significant Impact Criteria (CoA 2013).....	659
Table 51	Macquarie Perch: self-assessment against Significant Impact Criteria (CoA 2013).....	662
Table 52	White-throated Needletail: self-assessment against Significant Impact Criteria (CoA 2013).....	664
Table 53	Southern Greater Glider: self-assessment against Significant Impact Criteria (CoA 2013)	666
Table 54	Broad-toothed Rat: self-assessment against Significant Impact Criteria (CoA 2013).....	669
Table 55	Grey-headed Flying-fox: self-assessment against Significant Impact Criteria (CoA 2013).....	672
Table 56	Australian Grayling: self-assessment against Significant Impact Criteria (CoA 2013)	674
Table 57	Murray Cod: self-assessment against Significant Impact Criteria (CoA 2013).....	676
Table 58	Migratory species: self-assessment against Significant Impact Criteria (CoA 2013).....	678

Figures

Figure 1	Warburton Mountain Bike Destination in relation to Melbourne CBD (AECOM supplied).....	11
Figure 2	Project overview (AECOM supplied)	12
Figure 3	Mitigation hierarchy	13
Figure 4	Overview of EES assessment framework	25
Figure 5	Public land use, fire and logging history.....	61
Figure 6	Ecological features of the project area, Victoria	92
Figure 7	Waterways and vegetation cover in the project area, Victoria	172
Figure 8	Significant flora species records from the project search area, Victoria.....	188
Figure 9	Significant fauna species records from the project search area, Victoria.....	190
Figure 10	Leadbeater’s Possum habitat values the project search area, Victoria.....	192
Figure 11	Arborist survey locations in each EVC.....	197

Figure 12	CaLP Act noxious weed records (VBA)	199
Figure 13	Mount Donna Buang Wingless Stonefly survey results.....	201
Figure 14	Combined HIMs and VBA records for significant species (medium/high likelihood or recorded).....	202
Figure 15	Native vegetation proposed for removal within the project area, Victoria	347
Figure 16	Existing linear fragmentation and movement pathways in the project area	481

Photos

Plate 1	EVC 16 Lowland Forest, VQA 202, HZ 216, Lower section of trail 44	608
Plate 2	EVC 18 Riparian Forest near the proposed Yarra River bridge crossing	608
Plate 3	EVC 23 Herb-rich Foothill Forest	609
Plate 4	EVC 29 Damp Forest- VQA 204, HZ4, Trail 44 below Mount Bride Road	609
Plate 5	EVC 30 Wet Forest, HZ 9, Trail 41 Mount Bride Track	610
Plate 6	EVC 31 Cool Temperate Rainforest (pure CTR) along the upper drainage lines of Mount Donna Buang.....	611
Plate 7	Cool Temperate Mixed Forest (CTMF) on the upper slopes of Mount Donna Buang	612
Plate 8	EVC 39 Montane Wet Forest on the eastern slopes of Mount Donna Buang.....	613
Plate 9	EVC 45 Shrubby Foothill Forest - WHZ 34, Trail 40 Mount Bride track.....	614
Plate 10	EVC 127 Valley Heathy Forest - Trail 44, VQA 203.....	615
Plate 11	Modified area	616
Plate 12	Rocky outcrops.....	616
Plate 13	Typical waterway in a forested gully below Mount Bride.....	617
Plate 14	High quality Leadbeater’s Possum montane thicket habitat near Mount Donna Buang, with high stem density and lateral stems to facilitate movement. Such areas are to be avoided.....	617

Executive summary

Project overview

The Warburton Mountain Bike Destination ('the project') is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres north-east of Melbourne. It consists of up to approximately 177 kilometres of mountain bike trails providing a variety of mountain bike experiences to suit all levels of riding. The proponent for the project is Yarra Ranges Council.

Under the *Environment Effects Act 1978* (EE Act), the project requires an Environment Effects Statement (EES) to be prepared to allow stakeholders to understand the likely environmental impacts of the project and how they are proposed to be managed. The project is also a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This report addresses matters of national and state environmental significance and the Project is being assessed under the bilateral agreement between the State of Victoria and the Commonwealth.

The biodiversity evaluation objective of the EES scoping requirements is "*Avoid, and where avoidance is not possible, minimise potential adverse effects on native vegetation and animals (particularly listed threatened species and their habitat and listed ecological communities), as well as address offset requirements consistent with state and Commonwealth policies*". Through responding to the EES scoping requirements, this report also addresses Yarra Ranges Council's *Flora and Fauna Guarantee Act 1988* public authority duty to consider the potential biodiversity impacts of the project.

Biosis was commissioned to prepare the biodiversity technical report (existing conditions and impact assessment) to inform the EES. This technical report presents the findings of existing conditions investigations, risk assessments and impact assessments proportionate to the project's likely impacts and is an attachment to the EES.

Project alternatives and staging

Two trail network design scenarios have been assessed in the impact assessment chapters of this report. The rationale for investigation of alternative trail network scenarios was driven by the EES requirement to document the proponent's process that led to the preferred alternative(s) and designs. These alternatives respond directly to the EES biodiversity evaluation objective of avoiding and minimising impacts.

The two scenarios differ in the proposed trail connection between Mount Donna Buang summit and Warburton township. The first scenario includes trail 1 from the Mount Donna Buang summit to the Warburton Golf Course via Ben Cairn. The second scenario introduces trails 45, 46 and 47 as an alternative to trail 1, these three trails link Mount Donna Buang summit and Warburton via Mount Victoria. The remaining trails remain consistent between the two scenarios.

In addition to project alternatives, it is also proposed to implement trail development across two stages. The two stages have been determined for the purpose of biodiversity impact assessment. Stage 1 includes all trails south of Warburton including those in the Yarra State Forest. Stage 2 includes all trails to the north of Warburton including those in the Yarra Ranges National Park. Therefore, native vegetation impacts and biodiversity offsets have been presented in a staged manner for the two scenarios.

Existing conditions

Methods

The existing conditions assessment involved a range of methods including background and desktop investigation using standard sources of publicly-available biodiversity information, review and interrogation of natural resource and biodiversity spatial datasets, review and collation of field data and findings from previous project-specific technical studies between 2017 and 2019, additional field studies between May 2020 and July 2021, commissioning of arboricultural investigations and consultation with species experts and government agency representatives.

Landscape context

The project area consists mainly of forested public land on moderate to steep slopes in the Yarra Ranges National Park and Yarra State Forest with other small areas of private and public land. Small areas of cleared and modified land occur close to Warburton and along the Yarra River. This forested landscape has been subject to various forestry, mining, recreation and agricultural land uses over the last 150 years. The disturbance history of Yarra Ranges National Park and the Melbourne Water catchment areas in the northern part of the project area has been less intensive but the influence of recreational land uses is ongoing in these areas including roads, trails, snow play areas, resource extraction (spring water removal) and illegal firewood collection. Pest animal proliferation (particularly Sambar Deer) is also apparent in the National Park and catchment areas. The State Forest areas to the south of Warburton have been subject to more recent and intensive forestry, regular planned burning, firewood removal, farming activities and un-regulated recreational activities such as four-wheel driving.

An extensive track and trail network and other linear disturbances already exist across public land throughout the project area. More extensive existing roads, tracks and trails occur in the southern part of the project area (State Forest) compared to the northern part of the project area (Yarra Ranges National Park and the Melbourne Water catchment). Based on an analysis of topographic information and existing trail mapping, there is approximately 340 kilometres of existing roads, streets, forest tracks, walking trails and mountain bike trails in the project area.

Vegetation type, extent, condition and threatened communities

The assessment corridor where trail construction and operation will occur supports nine forest Ecological Vegetation Classes (EVCs) across the Highlands Southern Fall and Victorian Alps bioregions. The most common EVCs in the assessment corridor are Wet Forest, Damp Forest and Shrubby Foothill Forest, which combined equate to 86.3% of the vegetation recorded in the assessment corridor across both bioregions. Montane Wet Forest in the Yarra Ranges National Park occurs in 5% of the assessment corridor. Another 2.5% of the assessment corridor is made up of Lowland Forest, Riparian Forest and Herb-rich Foothill Forest in the southern part of the project area. These seven EVCs all have a Bioregional Conservation Status of Least Concern, this status means that greater than 50% of pre-European extent remains and is subject to little to no degradation over a majority of the two bioregions. The bioregionally vulnerable Valley Heathy Forest makes up 0.3% of the assessment corridor.

The remaining 5.9% of the assessment corridor supports forest vegetation that has been assigned to the Cool Temperate Rainforest EVC. This vegetation is primarily the *Flora and Fauna Guarantee Act 1988* (FFG Act) listed threatened ecological community Cool Temperate Mixed Forest, an early successional form of Cool Temperate Rainforest. Cool Temperate Rainforest EVC has a Bioregional Conservation Status of Endangered. Of the areas assigned to Cool Temperate Rainforest, 4.96 hectares is considered the pure Cool Temperate Rainforest FFG Act threatened community and 14.05 hectares is considered the Cool Temperate Mixed Forest

FFG Act threatened community. No EPBC Act threatened ecological communities were recorded or are likely to occur in the assessment corridor.

Native vegetation within the project area is mostly of high quality with a very low cover of weeds observed along the majority of the assessment corridor. The impacts of past disturbance, particularly timber harvesting and fire (planned fire and bushfire), on native vegetation is still evident with some areas displaying low numbers of large trees relative to other areas of the same EVC. The impact of fire is most notable in Lowland Forest and Shrubby Foothill Forest EVCs in Yarra State Forest which are variously dominated by fire tolerant woody species. The average habitat score across all EVCs in the assessment corridor is 74 out of 100. The average minimum score for habitat zones is 65 out of 100 and the average maximum score is 78 out of 100. The lowest score recorded was 33 out of 100 for disturbed Riparian Forest along the Yarra River in Warburton township and the highest score was 95 out of 100 for very high quality Wet Forest in the Yarra Ranges National Park.

The majority of the assessment corridor supports medium to tall forest types with a typical eucalypt forest structure and varying densities of large trees primarily as a result of disturbance history (fire and logging). Large tree health is generally moderate to high throughout the project area. Areas of Wet Forest and Montane Wet Forest, present on the upper slopes of Mount Donna Buang, have not been burnt since 1939 and have remained unlogged for over 50 years. Average large tree density across all forest types in the assessment corridor is 23 large trees per hectares, which is reflective of benchmark conditions for forest EVCs. Herb-rich Foothill Forest and Lowland Forest have the lowest densities of large trees. Cool Temperate Rainforest and Montane Wet Forest have the highest densities of large trees.

Flora, including significant species

Ecological surveys have recorded 288 indigenous plant species in the assessment corridor including 50 introduced plant species, seven of which are listed noxious weeds and 11 that are ranked as very high risk environmental weeds. Seven FFG Act or Advisory listed rare or threatened plant species were recorded in the assessment corridor and another 42 rare or threatened plants have a medium or high likelihood of occurring either in the assessment corridor or in the broader project area. Two of the significant flora species likely to occur are EPBC Act listed (Round-leaf Pomaderris *Pomaderris vacciniifolia* and Tall Astelia *Astelia australiana*) and the remaining 40 are FFG Act or Advisory listed, noting that Advisory lists are still used in native vegetation impact assessment under the *Guidelines for the removal, destruction or lopping of native vegetation*. Ninety-three (93) FFG Act Protected flora species have been recorded in the assessment corridor.

Trees

The arboricultural investigation commissioned for the project used sample-based tree condition assessments to investigate forest tree conditions and potential impacts on tree protection zones (TPZs) and structural root zones (SRZs) from trail construction and operation. In summary, there were 675 trees assessed in 30 representative sample locations across the assessment corridor. All assessed trees were of indigenous species. The majority of the assessed trees were considered to be in the fair condition category. The arborist's report findings provide a range of sensitive trail construction recommendations that if implemented indicate that encroachment in TPZs and SRZs as a result of trail construction is unlikely to lead to the long term decline of forest trees.

Fauna and habitat types (terrestrial and aquatic)

Terrestrial fauna habitat types include wet and damp forests, rainforests, dry forest, disturbed areas and planted vegetation. These habitat types include important habitat components for terrestrial fauna including tree canopies, and trees with small and large hollows, including dead stags, dense understorey vegetation including shrubs and grasses, vegetation (foliage, fruit and grasses) that provide food resources, leaf litter and

rocks, moist depressions and wet areas along gully lines and large fallen logs that are hollow or concave. Aquatic and riparian habitats consist of numerous creeks, rivers, drainage lines, seasonal gullies, damp depressions and riparian vegetation. Spatial analysis identified approximately 64 named waterways in the project area, of which 18 are crossed by the assessment corridor. Terrestrial and aquatic habitat types are generally of high to moderate quality given the forested nature of the project area. A total of 61 terrestrial fauna species (56 native and five introduced) were recorded from the project area during field assessments undertaken by Biosis between November 2020 and July 2021. This includes 50 bird species (two introduced), seven mammal species (three introduced), two reptile species and two frog species. Based on desktop investigations, a total of 153 aquatic fauna species have been recorded within the Yarra River basin, including 35 fish species, 13 frog species, 80 aquatic invertebrates, 17 crustacea and eight molluscs.

Of the significant terrestrial and aquatic fauna species recorded or predicted to occur within the project search area, 30 species are considered to have a medium or higher likelihood of occurrence within the project area or assessment corridor. Eight nationally significant terrestrial fauna species are likely to occur including Leadbeater's Possum *Gymnobelideus leadbeateri*, Southern Greater Glider *Petauroides volans*, Southern Brown Bandicoot *Isodon obesulus*, Smoky Mouse *Pseudomys fumeus*, Spot-tailed Quoll *Dasyurus maculatus*, Grey-headed Flying-fox *Pteropus poliocephalus*, Swift Parrot *Lathamus discolor* and White-throated Needletail *Hirundapus caudacutus*. The remaining state significant terrestrial fauna species include a range of forest owls, arboreal mammals, semi-aquatic mammals, microbats, reptiles and wetland birds. Six threatened aquatic species, or species that have an aquatic larval stage, have previously been recorded or are predicted to occur (i.e. medium or higher likelihood of occurrence) with the project area or assessment corridor including Australian Grayling *Prototroctes maraena*, Murray Cod *Maccullochella peelii* (translocated population), Macquarie Perch *Macquaria australasica* (translocated population), Curve-tailed Burrowing Crayfish *Engaeus curvisuturus*, Tubercle Burrowing Crayfish *Engaeus tuberculatus* and Mount Donna Buang Wingless Stonefly *Riekoperla darlingtoni*.

Thirteen migratory fauna species, all birds, have been recorded or are predicted to occur within the project search area. Of these 13 species, six have been previously recorded within the project search area and seven are predicted to occur based on distribution, but have not been previously recorded. Two of these migratory species are considered to have a medium or higher likelihood of occurrence within the project area; White-throated Needletail and Fork-tailed Swift *Apus pacificus*. Two other were recorded in forest habitat; Rufous Fantail *Rhipidura rufifrons* and Satin Flycatcher *Myiagra cyanoleuca*. Although migratory species are not considered a controlling provision under the EPBC Act controlled action decision, they have been included in this technical report as some migratory species are also threatened species and it was deemed appropriate to assess all migratory species for completeness of this technical study.

Introduced fauna species are likely to be widespread across the project area and the impacts of these species through competition and predation are already operating in forested and aquatic habitats. The Yarra Ranges National Park management plan acknowledged back in 2002 that deer were already a significant problem in the park and were impacting water quality and vegetation condition through tramping, wallows and browsing. The 2002 management plan also acknowledges that pest animal trapping had indicated introduced predators, particularly foxes, cats and dogs, were present in the park in large numbers. During field assessments feral cats have been observed in the Mount Donna Buang area and deer scats and signs were recorded across the project area. The project area contains many existing movement and invasion corridors for introduced animals (e.g. roads, tracks and easements) and species such as deer, cats and foxes are likely to be ubiquitous across the forested landscape. The interface between forest, farmland and urban areas along the Warburton valley floor also provides extensive opportunities for pest animal invasion and spread into forested areas.

Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are limited to montane thickets embedded within wet forest and rainforest vegetation communities dominated by Lemon Bottlebrush *Callistemon pallidus* and / or Mountain Tea-tree *Leptospermum grandifolium*. Given this thicket vegetation thrives in damp soil conditions and is away from surface water sources, it is likely this vegetation is partially dependent on shallow aquifer groundwater sources but is also sustained by the high rainfall conditions and high soil moisture content in the project area during winter and spring months.

Threatening processes

Nineteen FFG Act listed and six EPBC Act potentially threatening processes have been identified as likely to be already operating in the project area and along the assessment corridor. The most relevant threatening processes relate to pest plant and animal invasion and habitat impacts, and plant and animal pathogen infection and spread. These threatening processes have been used as a basis for assessing the cumulative effects of the project on the Yarra Ranges National Park and other forested habitats.

Pathogens

Myrtle Wilt *Chalara australis*, Cinnamon Fungus *Phytophthora cinnamomi* and Chytrid Fungus *Batrachochytrium dendrobatidis* are three plant or animal pathogen that occur, or have potential to occur or infect, sensitive species within the project area.

The Yarra Ranges National Park Management Plan states that Myrtle Wilt is present in the Park but does not specify where infected Myrtle Beech *Nothofagus cunninghamii* trees occur. The plan also identifies that road and track construction or maintenance activities can exacerbate spread of the disease. In addition to this, the plan states that existing recreation activities along walking tracks may also cause Myrtle Beech tree wounding resulting in diseases spread. The National Park management plan outlines actions such as encouraging survey and monitoring of Myrtle Wilt and other actions such as minimising the potential for Myrtle Wilt to spread by preparing a special prescription for the planning, construction and maintenance of roads, tracks and structures.

Chytrid Fungus is likely to be already present in the project area given nearby observations of this amphibian disease in the northern part of Yarra Ranges National Park near Lake Mountain and the widespread nature of this fungal pathogen in Australian frog populations, especially in disturbed landscapes. No susceptible threatened frog populations have been recorded from the project area.

Cinnamon Fungus has not been officially recorded in the Yarra Ranges National Park based on a review of available data sources, however multiple species of *Phytophthora* have been recorded between Sugarloaf Dam and Glenburn to the north of the project area. Based on available information, 6% of the plant species present in the national park are likely to be susceptible to this plant disease and 31% of the park is in the high risk class for predicted distribution, 24% is in the medium risk class and 45% is in the low risk class.

Risk assessment

A risk assessment of project activities was performed in accordance with the standard project-wide assessment method. The risk assessment has been used as a screening tool to prioritise the focus of the impact assessments and development of mitigation measures. The risk assessment was also used to inform consultation with relevant experts, alternative trail alignments and trail design responses. Risks were assessed for the construction and operation phases of the project against a set of predefined ecological values identified in the existing conditions investigations. A total of 54 risk pathways were identified (27 for each project phase) and these pathways link project activities (causes) to their potential effects on the ecological values and environmental assets or uses.

The results of the risk assessment after application of initial and additional mitigation measures indicate the following levels of residual risk:

- Two risk pathways retain a Very High residual risk.
- Four risk pathways retain a High residual risk.
- 21 risk pathways retain a Medium residual risk.
- 26 risk pathways retain a Low residual risk.
- One risk pathway retains a Very Low residual risk.

The highest residual risks relate to the removal of native vegetation, including FFG Act listed rainforest and mixed forest communities, and disturbance of other natural materials such as fallen timber, organic litter and rocks which contribute to ecosystem function. These can be minimised but cannot be completely avoided due to the nature of the project in a forested landscape.

Avoid and minimise design principles

Considerable effort was applied to avoiding and minimising the likely magnitude, extent and duration of trail construction and operation impacts. The use of existing tracks and trails, existing disturbance footprints, avoidance of large trees and proposed elevated structures at all waterway crossings have been important impact avoidance and minimisation strategies applied during project design. A particular focus was placed on trail alignments and design responses that would avoid a significant impact on EPBC Act listed threatened plants, mammals and birds, and also reduce the potential significant effects on state significant biota. Consequently, the principles of avoiding and minimising impacts on threatened biota have translated into minimising impacts on general biodiversity values including native vegetation, trees, non-threatened wildlife and aquatic habitats. Avoidance and minimisation principles have underpinned the project alternatives screening process mandated by the EES scoping requirements. In practice this has required additional field investigations to find trail alignments that have avoided and/or minimised impacts and to arrive at feasible sensitive construction methods. These avoid and minimise strategies are coupled with a range of standard and highly project-specific construction and operation mitigation measures.

Impact assessment

The project will involve creating an extensive narrow trail network through a mountainous forested landscape that will result in soil disturbance, waterway and watercourse crossings and removal of native understorey vegetation. Locations for vehicle access and large congregations of trail users will be restricted to sites that are already highly disturbed and already experience significant visitation and human presence (e.g. Mount Donna Buang summit, Warburton Golf Course and Wesburn Park). There will also be discrete trailhead and access areas where minor works and vegetation removal will be required (e.g. Mount Tugwell trailhead and Yarra River bridge crossing). Existing access roads will be used for all access to the trail network by shuttle services or private vehicles. These include regularly used main roads and forest tracks such as Donna Buang Road, Dee Road, Mount Bride Road, Old Warburton Road and Edwardstown Road. In this context regular human presence and activities are already apparent across significant parts of the project area.

The impact assessment process assisted to clearly define the likely construction and operational footprints of the project. The impact assessment used the risk assessment as a basis for describing and quantifying the impacts related to the highest rated risk pathways in terms of magnitude, extent and duration. The key ecological values identified that are subject to residual construction and operational impacts are Leadbeater's Possum, Cool Temperate Rainforest and Cool Temperate Mixed Forest threatened communities, Mount

Donna Buang Wingless Stonefly, significant flora and fauna, aquatic ecosystems, GDEs, native vegetation and migratory species.

Leadbeater's Possum

The project area supports known colonies of Leadbeater's Possum. Key habitat features within the project area for the species include hollow-bearing trees, artificial nest boxes and areas with high stem densities of mid-storey species, such as Mountain Tea-tree, Lemon Bottlebrush, Myrtle Beech and associated occurrences of emergent eucalypts. These areas of high stem density typically occur over wet substrates in dense montane thickets in the Yarra Ranges National Park, and trails have been realigned in consultation with species experts to avoid impacts to these thickets around Mount Donna Buang and Ben Cairn. Structural fragmentation of dense montane thickets and the sub-canopy layer in wet forests and rainforests has been avoided through these realignments. Avoiding structural habitat fragmentation and maintaining key habitat connectivity was considered particularly important due to potential impacts associated with disturbance, increased predation and energetic costs to animals in the area. The project will also avoid removal of hollow-bearing trees, artificial nest boxes and removal of dense stands of sub-canopy stems that provide movement opportunities for this species and these considerations have guided trail alignments. If any treatment of large or hollow-bearing trees that are deemed hazardous is required during construction, this will be done in consultation with the land manager, an ecologist and arboricultural specialist. Noise, vibration and disturbance generated from trail construction and operation are considered manageable through standard construction environmental controls and due to the dispersed nature of trail use. With these important avoidance and impact minimisation measures applied to trail design and appropriate mitigation, the project is considered unlikely to result in significant impacts or effects to the Leadbeater's Possum population in the project area.

Cool Temperate Rainforest and Cool Temperate Mixed Forest

Impacts on Cool Temperate Mixed Forest and Cool Temperate Rainforest are largely confined to an area between the summit of Mount Donna Buang, Mount Victoria and Ben Cairn in the Yarra Ranges National Park. There is one small area of Cool Temperate Mixed Forest likely to be impacted in the Yarra State Forest. It is proposed to hand build all trails that intersect these communities to minimise the construction footprint as hand built trails have been demonstrated to require less disturbance than machine built trails. This design response will reduce soil disturbance, reduce understorey vegetation removal and minimise the risk of Myrtle Beech wounding that could result in Myrtle Wilt infection and spread. The alternative alignments (i.e. trails 45, 46 and 47) have less impacts on these communities than the project development scenario that includes trail 1. An assessment of bioregion scale impacts on Cool Temperate Rainforest has been undertaken using DELWP's ecological vegetation class mapping. This analysis indicates that for scenario 1, the proportional bioregional impact on the remaining mapped rainforest areas would be 0.001% in the Highlands Southern Fall bioregion and 0.02% in the Victorian Alps. For scenario 2, the proportional bioregional impact on the remaining mapped areas of rainforest would be 0.003% in the Highlands Southern Fall bioregion and 0.007% in the Victorian Alps.

Mount Donna Buang Wingless Stonefly

Targeted investigations of Mount Donna Buang Wingless Stonefly habitat indicate this species is present in the headwaters of several streams that flow from the ridges and slopes between Mount Donna Buang, Mount Victoria and Ben Cairn. Specific areas of potential impacts on this species' habitat or sources of indirect impacts to habitat through soil compaction and sedimentation include sections of trail 1 between Mount Donna Buang and Ben Cairn, sections of alternative trail 45 in the catchment of Ythan Creek and sections of alternative trail 46 in the catchment of Cement Creek. Trail alignments do not cross any well-defined headwater streams in the species' habitat but there is a risk that minor hydrological change in the upper

catchment and soil disturbance caused by trail construction and operation could generate sediment into soaks and trickles that provide stonefly habitat immediately downstream. There is potential for residual construction (and operational) impacts to Mount Donna Buang Wingless Stonefly and its habitat due the sensitivity of this species to soil and hydrological disturbance. Micro-siting trail works between Mount Donna Buang, Mount Victoria and Ben Cairn and installing elevated structures in headwater habitats will minimise but not eliminate the potential residual risks to this species. Micro-siting and defining exact locations for elevated structures will involve engaging experts at the pre-construction stage to specifically indicate where trails should be elevated and how soils and hydrological conditions can be maintained. Targeted surveys for this project have located new populations of Mount Donna Buang Wingless Stonefly between Mount Donna Buang and Mount Victoria. There is potential that this species is more widespread in the vicinity of Mount Donna Buang and the project and/or land managers could support ongoing eDNA-based monitoring and detection of more new populations in the Yarra Ranges National Park and Melbourne Water catchment.

Significant flora

The project is considered unlikely to result in a significant impact on the nationally significant Round-leaf Pomaderris based on an assessment against the EPBC significant impact criteria for this critically endangered species. This conclusion has been reached on the basis that no populations of this readily detectable species were recorded in lower slopes forest habitat where the species is most likely to occur. The project is also considered unlikely to result in a significant impact on the nationally significant Tall Astelia based on an assessment against the EPBC Act significant impact criteria for this vulnerable species. This conclusion has been reached on the basis that no populations of this large and obvious species were detected in rainforest habitat within the assessment corridor that will be impacted by the project.

Residual impacts on state significant (i.e. FFG Act and Advisory listed) tree species are considered to be negligible if they do occur in the assessment corridor and have remained undetected during field surveys. This conclusion has been reached on the basis that no tree removal is required for trail construction and if present these species are likely to be restricted to lower slopes forested areas and can be readily detected and avoided during pre-construction trail micro-siting. Furthermore, arboricultural investigations of potential impacts on tree health, as a result of TPZ and SRZ encroachment, have concluded that long term tree decline is unlikely to occur as a result by trail construction provided sensitive construction techniques are implemented.

It is likely direct impacts to the state significant shrub species Forest Phebalium *Phebalium squamulosum* subsp. *squamulosum* and Long Pink-bells *Tetratheca stenocarpa* can be avoided through trail micro-siting given the discrete locations where these species have been recorded. However, the state significant Victorian Flat-pea *Platylobium reflexum* is very widespread and a dominant understorey shrub in the Yarra State Forest. Approximately 12 hectares of Shrubby Foothill Forest understorey will be disturbed by the project but not all of this area is dominated by Victorian Flat-pea. The state significant Toothed Leionema *Leionema bilobum* subsp. *serrulatum* is also widespread in Wet Forest near Mount Bride and some pruning and removal of this species will be required along trails 49 and 50. To ensure residual impacts are avoided and minimised for all nationally and state significant shrub species that have been recorded or potentially occur in the assessment corridor, these species will be included in trail construction micro-siting protocols to be implemented under the guidance of a project ecologist. Trail construction crews will also be educated by a project ecologist in the potential presence of these species and steps to avoid and minimise impacts.

One state significant orchid species, Mountain Bird-orchid *Chiloglottis jeansii*, has been recorded during field surveys between 2017 and 2021. It is likely direct impacts to Mountain Bird-orchid can be avoided through trail micro-siting given the discrete locations where this species has been recorded.

For the remaining state significant herbs, graminoids and orchids, residual impacts remain a risk as most of these species are small, cryptic or transient in nature. There is some probability these species occur in the

assessment corridor and were not detected by field surveys between 2017 and 2021. To manage this risk of residual impacts trail micro-siting will be used and impacts in key habitats, such as wet gullies for Fairy Lanterns *Thismia rodwayi*, will be minimised during trail construction.

One state significant fern species, Oval Fork-fern *Tmesipteris ovata*, was recorded in one location during field surveys in 2021. It is likely direct impacts to this occurrence of Oval Fork-fern can be avoided through trail micro-siting given the discrete location where these species has been recorded. The same principle of trail micro-siting can be applied to other potential populations of Oval Fork-fern in Wet Forest habitats. Three other state significant fern species not recorded but with some potential to occur are large and obvious species. Residual impacts on these obvious species are considered to be low to negligible if they do occur in the assessment corridor and have remained undetected. This conclusion has been reached on the basis that these fern species are readily identifiable and would have been detected if reasonable populations were present in the assessment corridor. To ensure residual impacts are avoided for these obvious fern species they will be included in trail construction micro-siting protocols to be implemented under the guidance of a project ecologist. Trail construction crews will also be educated by the project ecologist to avoid removal of tree ferns and in the potential presence and steps to avoid and minimise impacts on ground ferns. Other state significant fern species with some potential to occur are small epiphytic species that grow on the trunks of tree ferns and on rocks in rainforest or wet forest vegetation communities. Residual impacts remain a risk as these small epiphytic ferns may occur in the assessment corridor and were not detected by field surveys between 2017 and 2021. To manage this risk of residual construction impacts protocols that avoid tree fern removal and impacts (i.e. host plants) and trail micro-siting with guidance by a project ecologist will be used in key fern habitats (such as rainforest).

No targeted surveys were conducted for cryptogam species (mosses, liverworts, fungi or lichens) and it is the intention of the project to minimise impacts on habitat for these species by retaining and sensitivity relocating supporting habitat features and host substrates such as rock and logs or vascular plant species in key rainforest and wet forest habitats. This approach is considered sufficient to address potential residual impacts on significant cryptogams in rainforest and deep wet forest habitats. Trail construction crews will also be educated by a project ecologist in careful relocation of cryptogam habitat substrates and awareness of host plants.

Significant fauna

For the seven other nationally significant terrestrial fauna species considered to have a medium or high likelihood of occurrence in the project area and potentially in the assessment corridor, the project is considered unlikely to result in significant impacts or residual effect. The eucalypt canopy within the project area will largely be unaffected by avoiding the removal of large trees and canopy trees during trail construction and operation. This will avoid impacts for arboreal and canopy dwelling species such as Southern Greater Glider, Grey-headed Flying-fox and Swift Parrot. Impacts to White-throated Needletail will similarly be avoided, however they are far less likely to be present in the canopy.

Depending on the trail design scenario, the project proposes to permanently remove / disturb up to 37 hectares of understorey vegetation across a range of forest types. The habitat to be removed is within a large contiguous area of high quality native forest within the broader area and region. The resultant understorey disturbance will be a permeable narrow track network in discrete locations. This level of disturbance is unlikely to affect foraging, dispersal or gene flow of Spot-tailed Quoll, Smoky Mouse or Southern Brown Bandicoot. Given the relatively small linear construction footprint in the context of available habitat in the broader area and region, the proposed trails are considered unlikely to lead to a significant impact on these three species. For these FFG Act listed species, Little Egret *Egretta garzetta* and Eastern Great Egret *Ardea alba modesta* are likely to utilise wetlands and flooded areas in and around the township of Warburton, on the

Yarra River floodplain and there is unlikely to be any level of residual impact to these habitats at these locations from the proposed trail development.

For state significant fauna, Grey Goshawk *Accipiter novaehollandiae* is likely to forage in forested environments and while it may do so occasionally it is unlikely to be impacted by the project. The large forest owls Barking Owl *Ninox connivens*, Powerful Owl *Ninox strenua*, Masked Owl *Tyto novaehollandiae* and Sooty Owl *Tyto tenebricosa* may all occur within the project area. Habitat elements such as large old trees with hollows for roosting and breeding, and hollows/canopy/adjacent cleared area that support their prey are important for these species. By avoiding impacts to large old trees and minimising impacts on understorey habitats, significant residual effects on these species are unlikely. Grey Goshawk and these owl species are also likely to forage and range across large areas and the amount of ground disturbance from the project is unlikely to impact them or their prey adversely. Brush-tailed Phascogale *Phascogale tapoatafa* is only likely to be present in lower elevation drier woodland in the project area. The avoidance of large hollow-bearing trees and implementation of predator control measures will avoid and minimise any significant residual effect to this species. Platypus *Ornithorhynchus anatinus* is known to occur in and around Warburton, and could potentially occupy additional streams and tributaries supporting suitable habitat features further upstream within forested sections of the project area. Impacts to this species will be avoided by having a qualified zoologist micro-site any bridge crossings and structures in areas of potential burrowing habitat (e.g. adjacent to larger permanent and semi-permanent waterways or watercourses) and by applying appropriate mitigation measures at higher order stream crossings that avoid sedimentation and sediment mobilisation in accordance with the Australian Platypus Conservancy - Platypus Contingency Plans for Capital Works Programs. Eastern Horseshoe Bat *Rhinolopus megaphyllus megaphyllus* and Common Bent-wing Bat (eastern ssp.) *Miniopterus orianae oceanensis* are both cave roosting species, however the assessment corridor it is not considered likely to support any breeding habitat with only one capped mineshaft known to be present along an existing 4WD track on Mineshaft Hill Track near Trails 62 and 63. The minimisation of impacts to forest habitats and abundant local habitat will avoid impacts to these bat species. Lace Monitor *Varanus varius* is considered most likely to occur in drier vegetation located in the lower north and west facing foothills and ridges of the southern section of the project area, such as around Wesburn. The minimisation of impacts to forest and woodland habitats and abundant local habitat will avoid impacts to this species.

Residual construction and operational impacts on threatened fish species are considered low to negligible and can be readily managed through proven and effective soil erosion and sedimentation control measures in the catchment of the Yarra River and its tributaries. The project is unlikely to result in a significant impact on national significant fish species.

Residual risks to state significant burrowing crayfish species will be managed through implementation of construction and operational phase measures that minimise damage to burrows, minimise chemical use, minimise soil compaction, retain forest organic matter and where required allow for salvage and relocation of any animals from excavated burrows.

Noise, vibration and disturbance generated from trail construction and operation are considered manageable for terrestrial and aquatic fauna through standard construction environmental controls and due to the dispersed nature of trail use.

Groundwater dependent ecosystems

Potential impacts to GDEs are considered in terms of native vegetation removal within GDEs as well as impacts to existing groundwater flow pathways e.g. exposure of new seeps / springs which negatively impact ecosystem health. The groundwater impact assessment conducted for the EES has concluded that all residual risks to groundwater were Very Low and that the trails are not likely to significantly change the flow of the springs or to alter the groundwater quality, prior to its discharge and expression at the surface. Alterations to groundwater flow could occur through the exposure of new springs or the expansion of existing springs

which could negatively impact the health of GDEs. Although construction activities, primarily shallow excavation using a mini-excavator, are considered unlikely to cause major groundwater disruptions GHD (2021) include measure GWM01 which establishes a procedure for identifying springs and establishing appropriate treatments to protect groundwater and down-gradient discharging environments including GDEs. In the event that an existing spring is exposed, changes in the flow are likely to be short lived, as groundwater storage is locally depleted, and groundwater levels re-equilibrate and the effects on GDEs are likely to be highly localised (GHD 2021). Potential impacts to GDEs are expected to be minimal in magnitude, highly localised and short in duration.

Native vegetation removal

Native vegetation removal will be concentrated on understorey impacts only in a variable width trail construction and operational footprint. In general, the steeper the underlying slope the wider the trail construction impact footprint will be as a result of additional cut and fill works required to create the trail benches. Some areas of the trail network will not have native vegetation impacts where existing informal MTB trails are being incorporated into the project and where the proposed trail alignments utilised existing forest roads, tracks or cleared areas (e.g. Warburton Golf Course). Native vegetation removal is not anticipated in these existing disturbed areas.

Removal of understorey native vegetation is planned to occur in a staged manner for trail construction and is therefore assessed as 'almost certain' with a major consequence so has a very high residual risk. The residual impacts on native vegetation will equate to up to 37 hectares of understorey vegetation removal depending on the preferred trail development scenario. These impacts have been calculated using a slope and construction method driven variable width trail construction corridor. Construction impacts across part of this impact footprint will be temporary and short term in nature (several years) as after construction is complete the corridor will only be maintained to support the trail bench, typically 1.2 metres wide or less, and an overhead height clearance of 2.5 metres. The remaining areas disturbed during construction will be rehabilitated and allowed to regenerate with native vegetation.

When viewed in wider geographic contexts, the reduction in understorey vegetation from nine EVCs across the project area is relatively minor at a bioregional scale. In summary, impacts to EVCs in the project area equate to less than 0.03% of bioregional extant distribution of these vegetation types.

The majority of native vegetation to be impacted is from EVCs that have a bioregional conservation status of Least Concern. The vast majority (around 90%) of native vegetation impacts will occur in three Least Concern EVCs; Damp Forest, Wet Forest and Shrubby Foothill Forest. EnSym Native Vegetation Removal Reports have been produced for the two trail development scenarios for the project (i.e. trail 1 scenario and the alternative alignments scenario). Both scenarios impact understorey vegetation in a range of forest types across the project area according to the variable width trail construction footprint. In summary, scenario 1 with trail 1 will impact up to 37.047 hectares of understorey vegetation. Scenario 2 with the alternative trail alignments 45, 46 and 47 will impact 35.754 hectares of understorey vegetation. Both scenarios are on the detailed assessment pathway according to the *Guidelines for the removal, destruction or lopping of native vegetation*. Based on advice and recommendations from the project arborist no large trees have been included in patch vegetation removal as sensitive construction measures are considered unlikely to cause tree decline where TPZ and SRZ encroachment occurs.

Migratory species

Although migratory species are not considered a controlling provision under the EPBC Act controlled action decision, an EPBC significant impact assessment has been undertaken collectively for the four migratory species that occur or have potential to occur in the project area (Rufous Fantail, Satin Flycatcher, Fork-tailed Swift and White-throated Needle-tail) for technical study completeness and to ensure that species that also

have a threatened status (such as White-throated Needletail) were addressed appropriately. This assessment indicates that removal of small areas of wet forest vegetation is unlikely to result in significant impacts to migratory species. Residual effects on migratory species from the project area considered to be low to negligible.

Cumulative impacts and effects

The potential for cumulative impacts is typically addressed through the impact assessment undertaken for each technical assessment where relevant. The Warburton Water World, which opened in 2020 has been identified as a project with the potential for cumulative impacts because it is an attractor of traffic to Warburton. Accordingly, the cumulative traffic impacts have been assessed and the findings are presented in Technical Report F – Transport. Cumulative biodiversity impacts from that project are considered negligible. No other major projects that fit the criteria used for biodiversity values have been identified where there is potential for impacts to overlap temporally and spatially with the Warburton Mountain Bike Destination. Accordingly, no other cumulative impacts with other projects are anticipated.

Consequential cumulative effects of the project relate to increased disturbance and human presence in the Yarra Ranges National Park, adjacent Melbourne Water catchment and more remote sections of the Yarra State Forest during the construction and operational phase of the project. The trail network will cause disturbance to the forest soil and understorey vegetation but this is considered unlikely to pose a significant physical or functional barrier to important threatened forest fauna or to the lifecycle of understorey vegetation (e.g. pollination, seed dispersal, recruitment). A comparison of how threatening processes currently operate, how the project may result in an increase in these processes and the mitigation options available has been undertaken. The most notable potential cumulative effects and exacerbation of threatening processes are associated with introducing or facilitating the spread of pests and pathogens (weeds, deer and Myrtle Wilt impacts on rainforest communities), increased disturbance and mortality to wildlife (e.g. noise and vehicle collisions), localised changes to sedimentation of forest vegetation and waterways/watercourses and increased waste and litter. The cumulative effects of the 2019-20 bushfires across south-eastern Australia on key nationally threatened species has been considered as part of significant impact assessments for these species.

Mitigation and contingency

The recommended biodiversity mitigation and contingency measures combine the initial and additional measures applied during the risk assessment to arrive at the final recommended measures for the construction and operation of the project. In the course of finalising this report, consultation was undertaken with AECOM, YRC and other members of the project team (designers, contractors and other specialists) to ensure that the recommended mitigation and contingency measures would be achievable and compatible with those proposed by other specialists. These recommended biodiversity mitigation and contingency measures have been refined as a result of those discussions and will be incorporated into the Environmental Management Framework (EMF), which will be implemented through the project approvals to effectively manage the environmental performance of the project. The EMF will ultimately inform the development of a project Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) to manage potential impacts to biodiversity.

Significant impact assessments have been undertaken for all relevant EPBC Act listed threatened species according to Commonwealth guidelines. These assessments have concluded that either of the project development scenarios is unlikely to result in a significant impact on nationally threatened mammals, birds or plants. On this basis, Commonwealth offsets are not considered necessary for the project and have not been calculated.

State offsets arise through the removal of native vegetation, which sometimes corresponds with modelled habitat for rare or threatened flora and fauna under the DELWP Advisory lists. State biodiversity offsets have

been calculated in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*, which is an incorporated document within the Victoria Planning Provisions under Clause 52.17. Native Vegetation Removal Reports were obtained for two separate clearing scenarios. Scenario 1 includes trail 1 and scenario 2 is the alternative trail alignments 45, 46 and 47. The project is also proposed to be constructed across two stages and a staged offset scenario has also been calculated for the two different trail development scenarios. The results of the species-general offset test indicate that species offsets will be required for both development scenarios and evidence that these can be secured will need to be provided as part of project approvals. No general offsets or large tree offsets have been triggered. Large tree offsets are not required on the basis of the advice from the project arborist that trail construction that encroaches TPZs and SRZs is unlikely to lead to the long term decline of large trees provided sensitive construction techniques are implemented.

In order to ensure the 'no net loss' objective of the *Guidelines for the removal, destruction or lopping of native vegetation* can be achieved for the project, the project (encompassing the two stages) must secure the following offsets.

- For project scenario 1 with trail 1, 263.637 species habitat units are required for 13 species:
 - 21.107 Leadbeater's Possum
 - 20.684 Smoky Mouse
 - 19.073 Tall Astelia
 - 25.214 Brickmaker's Sedge *Gahnia grandis*
 - 26.076 Nunniong Everlasting *Ozothamnus rogersianus*
 - 20.620 Jungle Bristle-fern *Cephalomanes caudatum*
 - 19.885 Tree Geebung *Persoonia arborea*
 - 26.023 Long Pink-bells
 - 15.210 Fairy Lanterns
 - 9.342 Mountain Bird-orchid
 - 25.858 Powelltown Correa
 - 23.128 Toothed Leionema
 - 11.417 White Star-bush *Asterolasia asteriscophora* subsp. *albiflora*.
- For project scenario 2 with alternative trail alignments, 240.087 species habitat units are required for 13 species:
 - 19.410 Smoky Mouse
 - 18.027 Tall Astelia
 - 24.584 Brickmaker's Sedge
 - 25.342 Nunniong Everlasting
 - 19.387 Jungle Bristle-fern
 - 19.182 Tree Geebung
 - 25.345 Long Pink-bells

- 13.528 Fairy Lanterns
- 8.830 Mountain Bird-orchid
- 25.125 Powelltown Correa
- 22.394 Toothed Leionema
- 10.430 White Star-bush
- 8.503 Wavy Fork-moss *Dicranoloma platycaulon*.

The Native Vegetation Credit Register (NVCR) was searched using DELWP's online tool (<https://nvcr.delwp.vic.gov.au>) and a broker has been contacted to investigate the availability of the required species habitat units on the credit market. The NVCR search revealed that not all the offsets could be satisfied on one site, however there are sites across Victoria which have offsets for five species including Nunniong Everlasting, Tall Astelia, Mountain Bird-orchid, White Star-bush and Toothed Leionema. An offset broker has also been contacted and this broker has explored a range of species matching matrices to maximise the overlap of quantities of species habitat units for different species drawn from different existing and potential offset sites. Based on that analysis, there are insufficient available credits for Leadbeater's Possum, Smoky Mouse, Fairy Lanterns and Wavy Fork-moss on the credit market. The remaining species are available at sites that have expressed interest in offset registration. On the basis that the four species not available on the credit market (i.e. Leadbeater's Possum, Smoky Mouse, Fairy Lanterns and Wavy Fork-moss) have modelled habitat mostly restricted to public land, the project is pursuing establishment of a Crown land offset site. The *Guidelines for the removal, destruction or lopping of native vegetation* also has a mechanism for proposing alternative offset arrangements. Alternative arrangements for species offsets are considered for approval on a case by case basis by DELWP and must be to the satisfaction of the Secretary to DELWP. The alternative offset must generate direct habitat improvements for the species that provide equivalent compensation for the removal of its habitat.

The final offset strategy for the project will be developed as a stand-alone technical document in consultation with public land managers and project stakeholders. This final strategy will demonstrate how biodiversity offsets for the project can be secured and the strategy will be finalised prior to planning approval being granted.

Abbreviations

Abbreviation	Definition
AECOM	AECOM Australia Pty Ltd
ARI	Arthur Rylah Institute
BCS	Bioregional Conservation Status
CaLP Act	<i>Catchment and Land Protection Act 1994</i>
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CTMF	Cool Temperate Mixed Forest
CTR	Cool Temperate Rainforest
DAWE	Department of Agriculture, Water and the Environment
DELWP	Department of Environment, Land, Water and Planning
EE Act	<i>Environmental Effects Act 1978</i>
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
FFG Act	<i>Flora and Fauna Guarantee Act 1988</i>
HIM	Habitat importance maps
HZ	Habitat zone
LOT	Large Tree
MM	Mitigation Measure
NVIM	Native Vegetation Information Management
OWMP	Operations Weed and Maintenance Plan
OEMP	Operational Environmental Management Plan
PMST	Protected Matter Search Tool
ST	Scattered Tree
TRG	Technical Reference Group
TSSC	Threatened Species Scientific Committee
VQA	Vegetation Quality Assessment
YRC	Yarra Ranges Council

Glossary

Term	Definition
Assessment corridor	A 20 metre wide assessment corridor along all trails (i.e. 10 metres either side of the trail centreline) where biodiversity data was collected (e.g. vegetation and large tree mapping). The use of an assessment corridor provides for the informed re-alignment of the trail to avoid or minimise impacts to biodiversity as required.
Impact footprint	A variable width construction corridor along the entire indicative trail alignment where understorey vegetation removal and soil disturbance will occur to construct trails and trailheads or access points (e.g. bridges). Impact width for trails is driven by underlying slope and proposed construction method (hand versus machine construction).
Indicative trail alignment	A centreline representing the proposed alignment of the mountain bike trail as surveyed with a differential GPS by the trail designers. The indicative trail alignment is used as a basis for existing conditions surveys and impact assessment but does not necessarily represent the exact alignment of the trail once constructed. In areas of high environmental significance micro-siting will be used to avoid or minimise impacts to biodiversity along the trail alignment.
Local area	The project area more broadly than the 'search area'. This area is used to assess potential impacts to biodiversity values where information from the search area is considered insufficient.
Project area	All indicative trail alignments buffered outwards by 2 kilometres.
Search area	The project area buffered outwards by 10 kilometres. This area is used to conduct the database review of biodiversity values.
Waterway	Waterways according to the definition of the <i>Water Act 1989</i> and the <i>Waterway Determination Guidelines</i> .
Watercourse	Other gullies, headwater systems and tributaries not defined as Waterways.

1. Introduction

The Warburton Mountain Bike Destination ('the project') is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres north-east of Melbourne. It consists of up to approximately 177 kilometres of mountain bike trails and associated trailheads and access points providing a variety of mountain bike experiences to suit all levels of riding.

Yarra Ranges Council has identified mountain biking as an opportunity for tourism growth within this region as well as an opportunity to support the economy of the Warburton township and the health and well-being of its residents. It seeks to create iconic trails eligible for International Mountain Bike Association Gold Ride Centre status in an attempt to position Warburton as an internationally significant mountain bike destination.

On 21 May 2020, The Victorian Minister for Planning issued his decision that an Environment Effects Statement (EES) is required under the *Environment Effects Act 1978* (EE Act). On 16 June 2020 the Commonwealth Department for Agriculture, Water and Environment (DAWE) issued a decision that the project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and that the project will be assessed under the assessment bilateral agreement with the State of Victoria.

This technical report accompanies the EES for the project and its purpose is to specifically address the EES scoping requirements and evaluation objectives relating to biodiversity. It describes the existing environmental condition based on recent site assessments by Biosis, Eddie Tsyrlin and Tree Logic in late 2020 and 2021 and draws on previous assessments by other consultants (Practical Ecology and Eddie Tsyrlin) between 2017 and 2019. This report also outlines the likely biodiversity impacts arising from the project, the level of risk associated with various biodiversity impacts and how these impacts have been avoided and minimised and can be effectively mitigated to reduce their magnitude, extent and duration.

Two trail network design scenarios have been assessed in the impact assessment chapters of this report. The rationale for investigating alternative trail network scenarios was driven by the EES requirement to document the proponent's process that led to the preferred alternative(s) and designs. These two scenarios respond directly to the EES biodiversity evaluation objective of avoiding and minimising impacts on biodiversity values, especially for threatened species habitat and threatened ecological communities. The two scenarios differ in the proposed trail connection between Mount Donna Buang summit and the Warburton township. The first scenario includes trail 1, which is approximately 23 kilometres long, from the summit of Mount Donna Buang to the Warburton Golf Course via Ben Cairn. The second scenario introduces trails 45, 46 and 47 as an alternative to trail 1. These three trails have a combined length of approximately 15 kilometres. The second scenario links the Mount Donna Buang summit to Warburton via Mount Victoria. All other trails remain consistent between the two scenarios. In addition to project alternatives, it is also proposed to implement trail development across two stages. Therefore, native vegetation impacts and biodiversity offsets have been presented in a staged manner for the two scenarios in this technical investigation.

2. Scoping requirements

2.1 EES evaluation objectives

The Scoping Requirements for the Warburton Mountain Bike Destination EES (November 2020 'scoping requirements') issued by the Minister for Planning set out the specific environmental matters that need to be addressed by Yarra Ranges Council in order to satisfy the Commonwealth and Victorian assessment and approval requirements.

The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the project in accordance with the Ministerial guidelines for assessment of environmental effects under the EE Act.

The biodiversity evaluation objective is central to the biodiversity existing conditions and impact assessment:

- **Biodiversity** - Avoid, and where avoidance is not possible, minimise potential adverse effects on native vegetation and animals (particularly listed threatened species and their habitat and listed ecological communities), as well as address offset requirements consistent with state and Commonwealth policies.

A secondary evaluation objective relevant to biodiversity is:

- **Water and Catchments** - Maintain the functions and values of groundwater, surface water and floodplain environments and minimise effects on water quality and beneficial uses.

The water and catchments aspects are not addressed in detail in this report except where they relate to aquatic habitats and fauna. GHD (2020) addresses water and catchment issues for the project.

2.2 EES scoping requirements

The aspects from the scoping requirements relevant to the biodiversity evaluation objective are shown in Table 1, which indicates the location where these items have been addressed in this report.

Table 1 Scoping requirements relevant to biodiversity

Aspect	Scoping requirement	Section addressed
<p>Key issues</p>	<ul style="list-style-type: none"> • Direct loss of native vegetation (including large old trees) and any associated listed threatened flora and fauna species and communities known or likely to occur in or adjacent to the project works. • Direct loss of, or degradation to, habitat for flora and fauna species listed as threatened under the EPBC Act, FFG Act and/or DELWP advisory lists, including aquatic species. • Indirect loss of vegetation or decline in habitat quality, that may support any listed species or other protected fauna, resulting from hydrological or hydrogeological change, edge effects, habitat fragmentation, loss of connectivity, or other disturbance impacts arising from construction or operation, including noise, movement, vibration and lighting. • Potential for indirect effects on biodiversity values including but not limited to those effects associated with changes in hydrology (including surface and groundwater changes), water quality (i.e. on water dependent ecosystems), contaminants and pollutants, environmental weeds, pathogens and pest animals including, but not limited to declared weeds, pathogens and pest animals under the <i>Catchment and Land Protection Act 1994</i>. • Disruption to the movement of fauna between areas of habitat across the broader landscape. • Cumulative impacts on biodiversity and habitat both within and outside Yarra Ranges National Park. • The availability of suitable offsets in accordance with guidelines for the loss of native vegetation and habitat for threatened species and ecological communities which are listed under the EPBC Act and/or the FFG Act. 	<p>Section 8 (risk assessment)</p> <p>Section 9 and 10 (construction and operational impacts)</p> <p>Section 12 (mitigation and offset strategy)</p>
<p>Existing environment</p>	<ul style="list-style-type: none"> • Describe the conservation areas/reserves in the vicinity of the project, including the biodiversity values of the Yarra Ranges National Park. • Characterise the type, distribution and condition of native vegetation (including large old trees), terrestrial and aquatic habitat and habitat corridors or linkages that could be impacted by the project. This must include the quality and type of habitat impacted and quantification of the total direct and indirect impact areas from the proposed action and must be informed as appropriate by targeted surveys undertaken in accordance with the appropriate Commonwealth and/or DELWP survey guidelines. • Identify the existence or likely presence of species listed under the EPBC Act, FFG Act and DELWP advisory lists, as well as environmental weeds, pathogens and pest animals. • Characterise the listed threatened species, ecological communities and potentially threatening processes that are likely to be present. This characterisation is to be supported by seasonal or 	<p>Section 7 (existing conditions)</p>

Aspect	Scoping requirement	Section addressed
	<p>targeted surveys where necessary. Details of the scope, timing and method for studies or surveys used to provide information on the ecological values of the project area (and in other areas that may be impacted by the project) should be identified in consultation with DELWP. Records and other data from local sources should also be gathered and considered as appropriate.</p> <ul style="list-style-type: none"> • As appropriate, identify the different uses which EPBC Act, FFG Act and/or DELWP advisory lists species may make of different habitat areas that could be affected by the project at different times or life-cycle stages. • Consider the potential for the project to impact on groundwater dependant ecosystems. Where there is potential for impacts, groundwater dependant ecosystems are to be characterised based on data, literature and appropriate surveys where required. • Identify flora and fauna that could be affected by the project's potential effects on air quality, noise or vibration, or could be disoriented or otherwise impacted by project lighting. • Describe the existing threats present to biodiversity values, including: <ul style="list-style-type: none"> ○ removal of individuals or destruction of habitat; ○ historical or ongoing disturbance or alteration of habitat conditions (e.g. habitat fragmentation, severance of wildlife corridors or habitat linkages, changes to water quantity or quality, fire hazards, etc.); ○ threats of mortality of listed threatened fauna; ○ presence of or risk of introduction of any high threat weeds, pathogens and pest animals within and near the project area; and ○ initiating or exacerbating potentially threatening processes listed under the EPBC Act and/or FFG Act. 	
<p>Mitigation measures</p>	<ul style="list-style-type: none"> • Identify potential and proposed design options and measures that could avoid, minimise, mitigate or manage significant direct and indirect effects on native vegetation (including large trees and hollow bearing trees) and other biodiversity values including any listed ecological communities or flora and fauna species and their habitat within or adjacent to the project area. • Develop hygiene controls for bicycle, vehicle and machinery movement to minimise the spread of pathogens and weeds. • Evaluate the feasibility and limitations of implementing mitigation measures proposed and describe and justify the level of uncertainty associated with whether they are expected to achieve their desired outcomes. 	<p>Section 12 (mitigation and offset strategy)</p>

Aspect	Scoping requirement	Section addressed
Likely effects	<ul style="list-style-type: none"> Assess likely direct and indirect effects of the project and feasible alternatives on native vegetation (including large old trees), ecological communities as well as fauna and flora species listed under the EPBC Act, FFG Act and/or DELWP advisory lists. Assessment of potential effects on species should take into account the likelihood of occurrence (habitat presence and condition) and the effectiveness of proposed avoidance and mitigation measures and should also consider relevant conservation or listing advices, action statements, recovery plans and threat abatement plans. Where surveys do not identify a listed species, but past records and/or habitat analysis suggest that it may occur locally, justification will need to be provided if further investigations or further mitigation measures are not proposed. Assess potential impacts on the conservation values of Yarra Ranges National Park. Assess likely cumulative effects on biodiversity-related values that might result from the project in conjunction with other projects or actions taking place or proposed nearby, as well as with threatening processes in the broader region (e.g. bushfire impacts). Provide an assessment of residual effects of the project (assuming proposed mitigation measures have been implemented), including for all protected matters under the EPBC Act impacted by the project. 	<p>Section 8 (risk assessment) – to be completed</p> <p>Section 9 and 10 (construction and operational impacts)</p>
Performance objectives	<ul style="list-style-type: none"> Describe and evaluate proposed measures to manage the residual effects of the project on biodiversity values (including MNES) and prepare an offset strategy and offset management plan that sets out and includes evidence of the offsets that can be secured or are proposed to satisfy Commonwealth and Victorian offset policy or guideline requirements. Describe how the offset/s will be secured, managed and monitored, including management actions, responsibility, timing, performance measures and the specific environmental outcomes to be achieved. Proposed EPBC Act offsets must meet the requirements of the EPBC Act Environmental Offsets Policy (October 2012). Describe and evaluate the approach to monitoring and the proposed contingency measures to be implemented in the event of adverse residual effects on flora, fauna and ecological community values requiring further management. Describe any further measures that are proposed to enhance biodiversity outcomes, to form part of the EMF (see Section 3.7 of the Scoping Requirements). 	<p>Section 12 (mitigation and offset strategy)</p>

2.2.1 Approach to significant species and communities survey and assessments

Table 2 below provides a rationale for survey and assessment effort related to particular ecological values (e.g. a threatened species or particular fauna groups). The primary driver of survey effort for this project was aligning the anticipated magnitude, extent and duration of impacts with a commensurate level of survey and assessment effort. Survey and assessment effort was not expended where:

- Impacts are likely to be minimal or indirect in nature on a particular value(s) (e.g. hollow-bearing trees to be avoided and forest canopies will remain intact).
- There is a reasonable body of knowledge for a particular species' habitat preferences and this information can be used to characterise existing conditions and conduct an appropriate level of impact assessment.
- Where proposed mitigation actions (such as pre-construction micro-siting) can be demonstrated to be effective measures for avoiding and minimising impacts on particular values.
- For highly cryptic species where survey effort is considered highly intensive and impractical, and where mitigation measures can be applied to minimise habitat impacts for these cryptic species.

Table 2 Rationale for survey and assessment effort

Value	Approach to survey and information used for impact assessment	Impact and mitigation rationale to justify survey effort
Forest owls	Threatened forest owl species were assumed present and no targeted surveys were undertaken as database records indicate local presence and suitable habitat is widespread and extensive in the forested landscape.	It is not proposed to remove any hollow-bearing trees for trail construction and if any trees are deemed hazardous and require treatment, these trees will be inspected by an ecologist, land manager and arborist prior to any pruning/treatment. The use of pre-construction micro-siting will allow potential owl nest or roost sites to be identified from ground-based observations only (e.g. whitewash on trees and the ground), and if present, documented and avoided.
Arboreal fauna	Threatened and non-threatened arboreal fauna were assumed present and no targeted surveys were undertaken as database records indicate local presence and suitable habitat is present in the forested landscape. The large body of scientific literature on Leadbeater's Possum and expert consultation was used to assess existing conditions and impacts for this species. Southern Greater Glider was assumed to be present based on VBA records in the project area and presence of habitat components such as large hollow-bearing trees in mature forest stands.	It is not proposed to remove any hollow-bearing trees for trail construction and key areas of montane thicket habitat and translocation/confirmed sites for Leadbeater's Possum have been avoided through trail realignments. If any hollow-bearing trees are deemed hazardous and require treatment, or if any tree species associated with thicket habitat require minor pruning, these trees will be inspected by an ecologist, land manager and arborist prior to any pruning/treatment. The use of pre-construction micro-siting will ensure any thicket habitat is clearly identified and avoided.

Value	Approach to survey and information used for impact assessment	Impact and mitigation rationale to justify survey effort
Terrestrial fauna (non-arboreal)	An approach of assuming presence of threatened non-arboreal terrestrial fauna species with a medium or higher likelihood of occurrence has been adopted for all areas of suitable habitat within the project area. Targeted surveys across such a long, linear project area were considered unlikely to prove absence of species for this fauna group, and carried a high risk of false negative results. Detailed assessment was only considered for those non-arboreal species which were likely to be impacted by the project, such as Broad-toothed Rat, as this species was considered most at risk from the impacts of trail construction in or adjacent to potential habitat	Presence assumed and impact assessments undertaken using existing information sources on habitat use and sensitivity of each species to minor local fragmentation likely to result from trail construction.
Threatened vascular plants	Flora and vegetation survey efforts were conducted within the 20 m wide trail assessment corridor effectively creating extensive transect surveys through the landscape. These surveys would increase the likely detection of threatened flora, if present. Reference populations for the EPBC Act listed Round-leaf Pomaderris <i>Pomaderris vacciniifolia</i> were visited near Warburton and its habitat preferences on the valley floor are not represented in the trail assessment corridor where impacts will occur. Other threatened flora were incidentally recorded between 2017 and 2021 during various vegetation surveys for the project.	As the key threatened flora species are distinctive, have specific habitat requirements or are highly cryptic it was considered unnecessary to undertake extensive targeted flora surveys across the entire trail network (including alternatives) as the return on effort of these surveys was likely to be low especially for cryptic species (e.g. orchids, Fairy Lantern <i>Thismia rodwayi</i>). Any populations of obvious species not detected or incidentally recorded during vegetation surveys are likely to be detected during pre-construction micro-siting in specific locations where there is suitable habitat for these species. For cryptic species, presence has been assumed and micro-siting will be applied in specific habitat types or high-risk areas (e.g. rainforest vegetation and wet gullies). It should also be noted that DELWP Habitat Importance Models will not be contested using the alternative arrangements for site-based information regardless of pre-construction micro-siting survey findings and records.
Cryptogams	Suitable habitat for threatened mosses, liverworts, lichen and fungi occurs within the most mesic parts of the project area namely, EVC 30 Wet Forest, EVC 31 CTR	Impact avoidance and mitigation measures, such as retention of host surfaces like larger tree trunks and tree ferns and procedures to minimise disturbance to

Value	Approach to survey and information used for impact assessment	Impact and mitigation rationale to justify survey effort
	<p>(including CTMF) and EVC 39 Montane Wet Forest. These species are also primarily epiphytic or lithophytic. While these species are likely to be present, they are unlikely to be detected without an extensive survey effort within these sections of the assessment corridor. Given the nature of the project, including opportunities to minimise disturbance to and / or retain growing surfaces and habitat features for cryptogamic flora, extensive surveys were considered unlikely to be commensurate with potential impacts from the project.</p>	<p>other suitable habitat (rocks/logs etc) for threatened cryptogams and developing contractor awareness regarding threatened cryptogams. It is not intended to train construction crews in cryptogam identification but they will be trained by the project ecologist in the avoidance of host substrates in rainforest and wet forest habitats, and the careful relocation of these substrates (e.g. rocks and logs) where impacts are unavoidable.</p>
Aquatic habitats	<p>A desktop assessment of aquatic habitats was undertaken and was informed by field observations by botanists and zoologists while walking the trails and inspecting the assessment corridor (e.g. ground photos, descriptions of waterway/watercourses physical features and riparian vegetation). This was deemed appropriate to meet the EES scoping requirements as the forested landscape is relatively uniform in terms of gullies and headwater systems and these can be readily described and their condition characterised from available information. Furthermore, the surface water, groundwater and geotechnical assessment for the project (GHD 2021) provides relevant information on catchment and stream physical conditions and potential impacts.</p>	<p>Impact avoidance and mitigation measures, such as elevated structures across all waterways and pre-construction micro-siting of these structures, also justifies undertaking a desktop level assessments of aquatic habitats.</p>
Aquatic fauna	<p>Targeted surveys were conducted for the threatened Mount Donna Buang Wingless Stonefly (Appendix 10) given the limited habitat available for this species and the need for expert guidance on avoiding and minimising impacts. Presence was assumed for a range of other threatened and non-threatened vertebrate aquatic fauna and crustaceans based on database records and suitable habitat (e.g. waterway/watercourse and forest type, habitat condition/quality). Targeted surveys were considered unlikely to increase the</p>	<p>Impact avoidance and mitigation measures, such as elevated structures across all waterways and pre-construction micro-siting of these structures, also justifies undertaking desktop level assessments for most aquatic fauna species.</p>

Value	Approach to survey and information used for impact assessment	Impact and mitigation rationale to justify survey effort
	local understanding of cryptic crayfish species and are not considered commensurate with the level of likely impact on these species.	

2.3 Linkages to other technical reports

This report has interdependencies with the following reports which were published as part of the EES referral (and are therefore available on the DELWP planning website) in relation to the assessment of existing conditions and impacts:

- *Biodiversity Impact Assessment – Proposed Warburton Mountain Bike Trail* (Practical Ecology 2019).
- *Warburton Mountain Bike Destination Project – Preliminary Surface Water & Geotechnical Assessment* (GHD 2019a).
- *Warburton Mountain Bike Destination Project – Desktop Hydrogeological Assessment* (GHD 2019b).

The ecology and water specialists undertaking these assessments have worked collaboratively to evaluate surface water and groundwater dependent ecosystem impacts and design suitable mitigation measures to be adopted by the project. This biodiversity assessment should be read in conjunction with other relevant technical reports of the EES:

- EES Technical Report: *Surface water, groundwater and geotechnical hazard assessment* (GHD 2021)
- EES Technical Report: *Warburton Mountain Bike Destination Noise technical report* (AECOM 2021a).
- EES Technical Report: *Warburton Mountain Bike Destination Air Quality technical report* (AECOM 2021b).

3. Project description

3.1 Project overview

The project is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres north-east of Melbourne as shown in Figure 1. A significant informal network of mountain bike trails exists within the region and there is evidence of increasing use of these trails by local and visiting riders. Mountain biking in this locality started around 15 years ago and was concentrated in the Yarra State Forest in the vicinity of Mount Tugwell.

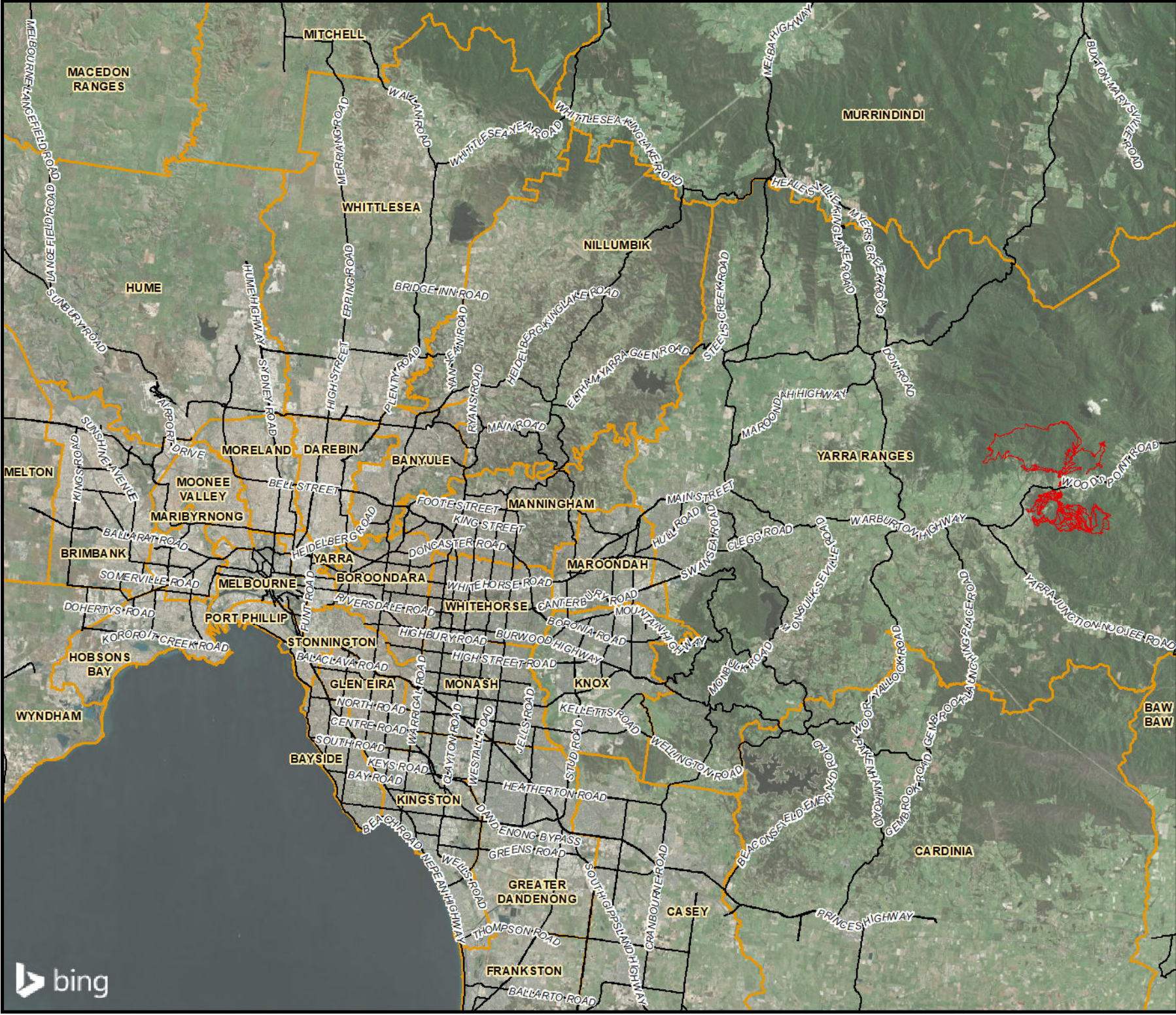
Yarra Ranges Council has identified mountain biking as an opportunity for tourism growth within the region as well as an opportunity to support the region and the health and well-being of its residents. The project would create iconic trails eligible for International Mountain Bike Association Gold Level Ride Centre status which would position Warburton as an internationally significant mountain biking destination.

The project objectives are to:

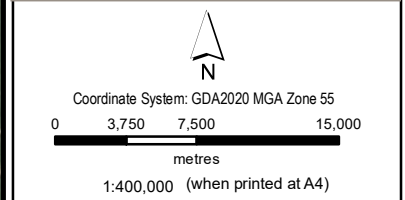
- Facilitate tourism growth and associated positive economic and jobs growth in the Yarra Valley region.
- Create iconic mountain bike trails eligible for International Mountain Bike Association Gold Ride Centre status.
- Create spectacular riding experiences that have a competitive advantage over existing mountain bike destinations and leverage Warburton's beautiful township, rural valley and surrounding forested slopes.
- Enhance the health and well-being of the community.
- Maintain the significant biodiversity and heritage values within the project area and provide opportunities for the community to connect with and appreciate their importance.

The project consists of up to approximately 177 kilometres of mountain bike trails providing a range of mountain bike experience to suit all levels of riding as shown in Figure 2. The project also includes a new Visitor's Hub and main trail head at the Warburton Golf Course and other trail heads at Mount Tugwell, Mount Donna Buang and Wesburn Park.

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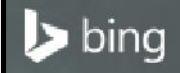
LEGEND
▭ Project Tracks and Trails
▭ LGA Boundaries



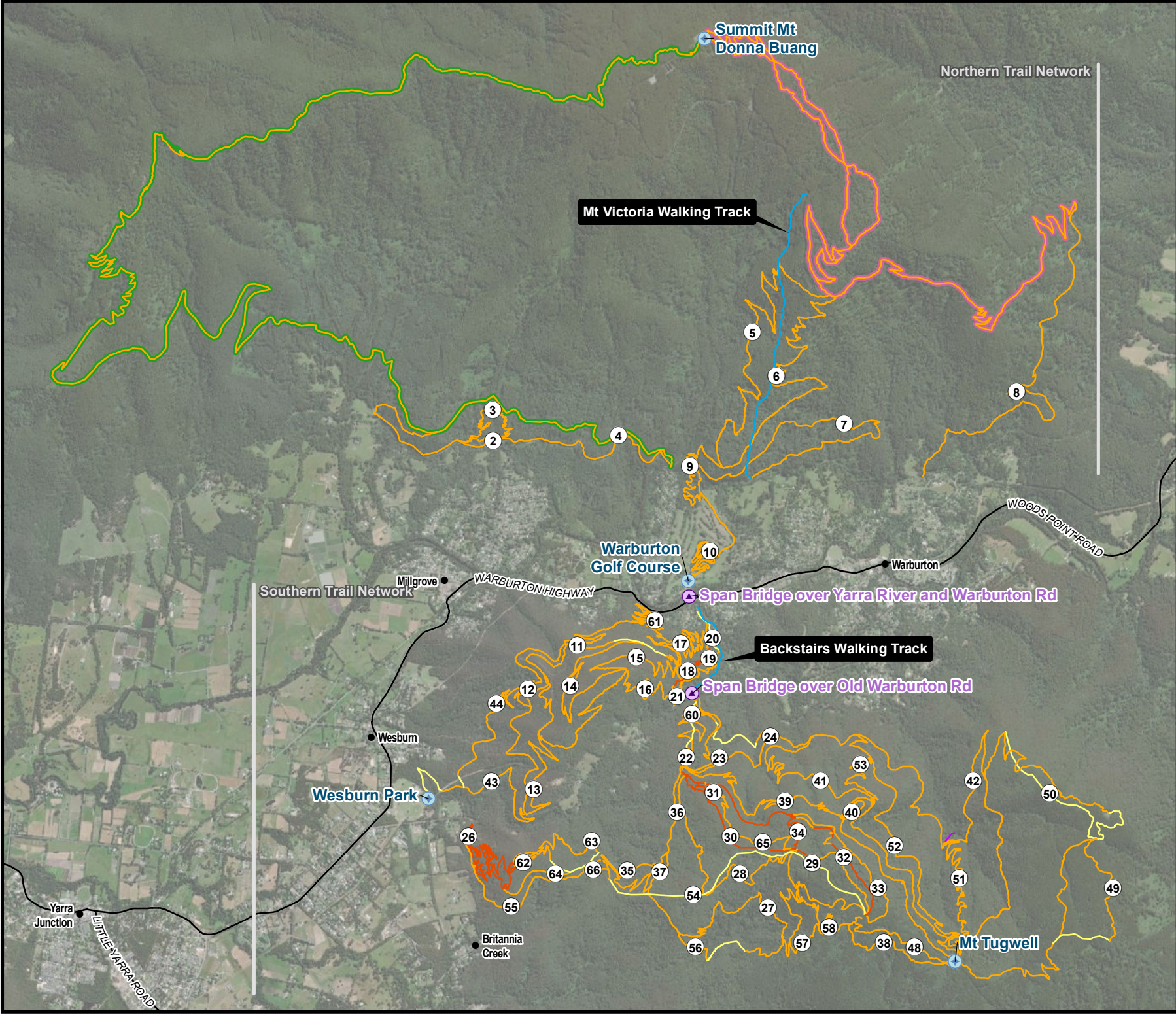
Warburton Mountain Bike Destination Project in relation to Melbourne

Yarra Ranges Council
 Warburton Mountain Bike Destination
 Warburton, Victoria

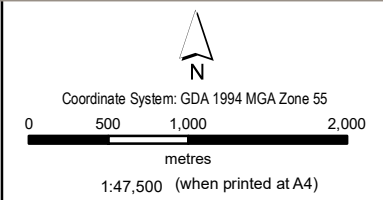
Figure F1



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- LEGEND**
- Localities
 - ⊕ Trail Head
 - ⊕ Span Bridge Locations
 - Access Track
 - Proposed MTB Trail
 - Proposed Walking Trail
 - Existing MTB Trail
 - Existing Walking Trail
 - Trail 1
 - Alternatives to Trail 1



Project Overview

Yarra Ranges Council
 Warburton Mountain Bike Destination
 Warburton, Victoria

Figure F1

3.2 Project development

It is recognised that there are opportunities to avoid and minimise environmental impacts during the many stages of project development. During project inception and early design development stages of the project, decisions on the location of the project, its design and construction techniques have enabled impacts to be significantly avoided and minimised in accordance with the hierarchy presented in Figure 3.

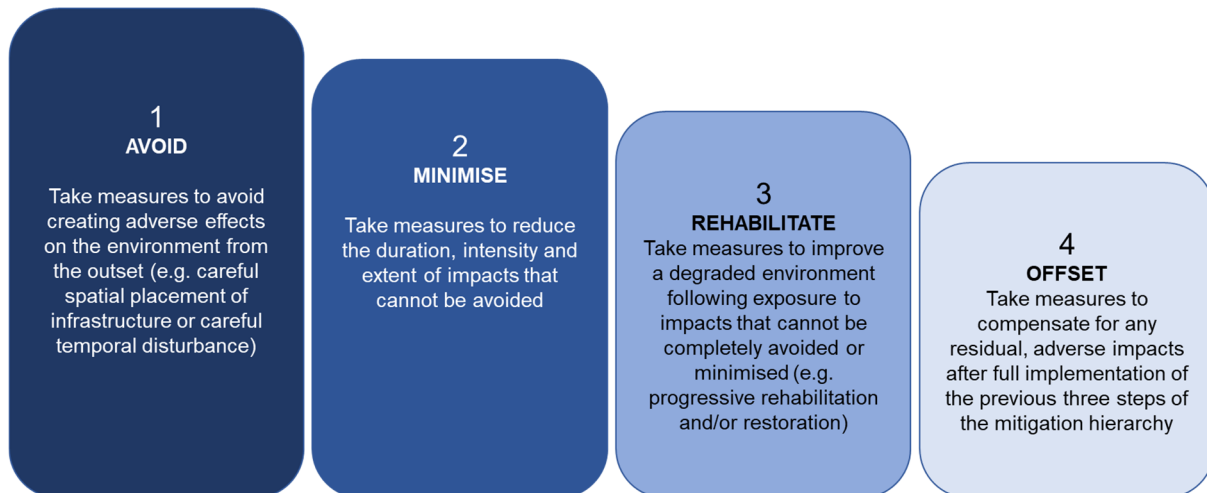


Figure 3 Mitigation hierarchy

Avoidance of impact has been a key focus of development of the trail network and has culminated in the preparation of a project description which is found at Chapter 3 of this EES. A description of how avoidance of impact has informed the design in relation to biodiversity values can be found at Section 6.3.

Examples of this include the decision to design waterway crossings without directly impacting waterways, creating trails on previously disturbed areas wherever possible and adoption of a construction technique which avoids impacts to large trees.

After opportunities to avoid impact were exhausted, minimisation and rehabilitation measures were developed. These are described in the construction and operation impact assessment sections below.

3.3 Main project components

The main project components proposed are as follows:

- The mountain bike trail network, consisting of:
 - Upgrade of existing mountain bike trails - approximately 9 kilometres (five per cent of project length).
 - New mountain bike trails – up to approximately 164 kilometres (92 percent of project length).
 - Upgrade of existing vehicle track - upgrade approximately 4 kilometres (two per cent of project length).
- A new visitor's hub and main trail head at the Warburton Golf Course and new trail head facilities at Mount Tugwell, Mount Donna Buang and Wesburn Park. An additional network access point to the network would be provided at Dee Road.

The network would comprise of 61 trails, each with a length of between 100 metres and 22 kilometres. Each trail has a trail difficulty rating assigned, ranging from easy over intermediate, to difficult and extreme. Some of the trails are returning loops, while others are point-to-point trails. All trails have also been categorised into one of six different styles including adventure, air flow, downhill, flow country, gravity and wilderness, as described in the project description chapter of the EES.

The northern trail network (located on the north side of the valley) consists of around 36 per cent of the trails. The southern trail network (located on the south side of the valley) consists of around 64 per cent of the trails.

Typically, the trails would have a final bench width of approximately 1.2 metres with a ride line within the range of approximately 0.4 to 1.2 metres except for the trail on Cemetery Track. The development footprint to be assessed is based on a variable construction width driven by underlying terrain and proposed construction method (hand versus machine built trail) as detailed in Section 9.1. A head-height clearance of 2.5 metres has been specified.

The trail network would include built form elements such as bridges, platforms, culverts, rock armour, jumps and berms. Minimal signage is proposed to be associated with the trail and trail heads and this would consist of small maps at strategic intersections and along with safety and name signage. Some trail sections would include elevated structures and drainage works to avoid and minimise impacts to waterways and associated biodiversity values.

The grade of individual trail sections would vary according to the local topography. Typically, the maximum trail grade would be less than 15 per cent, with the majority of the trails under 10 per cent.

The new Visitor's Hub and main trail head is proposed to be developed at the south of Warburton Golf Course, where the existing carpark is to be upgraded and extended to accommodate around 180 cars with room for future expansion if required. A new shelter and a bike wash down station would be established for the use of mountain bike riders. Run-off from the wash bays would be captured by a sump and recirculated where practicable. Excess silt and soil would be captured by a silt retention system which would also serve the car park. This system would be designed to meet Melbourne Water requirements. The Visitor's Hub would be the main trail head and would allow direct access to the north and south trail zones.

Three other trail heads are proposed as follows:

- A new trail head would be established on top of Mount Tugwell, off Mount Bride Road and would include a carpark, a bus turnaround bay, a bike wash down station, toilets and picnic area.
- The existing trail head at Mount Donna Buang would be upgraded with improvements to the car park, toilets and picnic area and installation of a bike wash down station.
- An additional 120 car parks would be established at Wesburn Park to facilitate access to connecting trails.

Drainage would be upgraded at these other trail head locations to meet current Melbourne Water requirements.

3.4 Alternative to Trail 1

During the project development process, consideration was given to feasible trail alternatives for key trails where there is potential for significant environmental impact. Through a screening process that focussed on ecological, heritage and socioeconomic factors, the need to investigate alternative trail alignments was identified in order to ensure a network design that minimises the potential for significant environmental effects and impacts. The work completed to date as part of responding to the EES scoping requirements and preparing this technical study is considered to have investigated all viable options to avoid and minimise

impacts on high biodiversity value areas. It is considered there are few remaining options to pursue alternatives without significantly undermining the key objectives of the project.

Further information on this work is provided in the EES Chapter 4 – Project development and alternatives.

The investigations identified trail 1 (nicknamed Droppa A K) as a candidate for consideration of alternative alignments particularly related to this trail's potential to significantly affect threatened species and threatened ecological communities.

Trail 1 is approximately 23 kilometres in length and traverses the Yarra Ranges National Park from the summit of Mount Donna Buang travelling in a westerly direction through forested land alongside Road 2 before meandering generally south-east through towards the Warburton township, also intersecting Woiwurrung State Forest. The project identified an alternative to this trail, being the combination of trails 45, 46 and trail 47 (designed in December 2020 with key stakeholders) with a combined length of approximately 15 kilometres, as shown in Figure 2.

Trails 45 and 46 are within the Yarra Ranges National Park and commence at the summit of Mount Donna Buang, following a south-easterly direction via Mount Victoria through forested land towards the Warburton township, before tying into trails 5 and 6. Trail 47 commences at Mount Donna Buang Road and travels east within the National Park to tie into trail 8. The trails are respectively of length 4 kilometres (trail 45), 5.5 kilometres (trail 46) and 5.6 kilometres (trail 47).

3.5 Project timing

The timing of the key project phases is proposed as follows:

- Project development and approval: 2020 to early/mid 2022.
- Project construction: progressively from mid-2022 depending on funding.
- Project operations and maintenance: staged opening during 2022 and beyond depending on funding.

3.6 Project staging

Two project stages have been determined for the purpose of biodiversity impact assessment. Stage 1 includes all trails south of Warburton including those in the Yarra State Forest. Stage 2 includes all trails to the north of Warburton including those in the Yarra Ranges National Park.

3.7 Location of the project area

The project area is located approximately 70 kilometres north-east of Melbourne and the nearest town is Warburton (Figure 1). The majority of the project area occurs on public land.

The project area is within:

- Two bioregions: most of the assessment area in proximity to Donna Buang Road is within the Victorian Alps Bioregion while the most southerly section of Donna Buang Road transitions into the Highland Southern Falls Bioregion for the remainder of the trail network.
- Yarra River Basin (Melbourne Water Catchment).
- Management area of Port Phillip and Westernport Catchment (CMA).
- Municipality of the Yarra Ranges Shire Council.

The project area traverses several Crown land tenures including:

- The Yarra Ranges National Park managed by Parks Victoria.
- The Dee River Corridor north of Warburton (managed by DELWP and Melbourne Water).
- Warburton Bushland Reserve managed by DELWP.
- The Yarra State Forest managed by DELWP (accounting for the majority of the network within the Mount Tugwell, Mount Little Joe and Mount Bride areas).

The following land zones and overlays occur within the project area (according to the Yarra Range Planning Scheme):

- Public Park and Recreation Zone
- Public Conservation and Recreation Zone
- Public Use Zone
- Rural Conservation Zone
- Green Wedge Zone
- Road Development Zone
- Significant Landscape Overlay and Environmental Significance Overlay variously apply to public and private land in the project area.

More detail regarding the planning zones and overlays relevant to the project is provided in the EES planning and land use technical report.

4. Legislation, policy and guidelines

The legislation, policy and guidelines relevant to this assessment are summarised in Table 3. This section summarised the relevant of key biodiversity legislation and government policy. This section does not describe the legislation and policy in detail. Where available, links to further information are provided.

Table 3 Legislation, policies and guidelines relevant to the assessment

Document title	Summary	Relevance to project
Commonwealth government		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<p>The EPBC Act is a fundamental piece of Commonwealth legislation that provides a legal framework to protect and manage matters of national environmental significance (MNES) including World Heritage properties, National Heritage places, Ramsar wetlands, listed threatened species and ecological communities and listed migratory species.</p> <p>The EPBC Act states that if significant impacts on MNES are likely, then an action is classed as a 'controlled action' and assessment and approval under the EPBC Act is required.</p>	<p>The Warburton Destination Trail was referred to DAWE (EPBC 2019/8605). The proposed action was deemed a 'controlled action' requiring assessment and approval under the EPBC Act, due to the following relevant controlling provisions:</p> <ul style="list-style-type: none"> • listed threatened species and communities (Sections 18 and 18A) <p>Listed threatened species are present or immediately adjacent to the project area. Approval under the EPBC Act is required, and decisions about the granting and conditions of any approval would be informed by assessment under the EES process through the bilateral agreement between the Commonwealth and the State of Victoria. Although migratory species are not considered a controlling provision under the EPBC Act controlled action decision, they have been included in this technical report as some migratory species are also threatened species and it was deemed appropriate to assess all migratory species for completeness of this technical studies.</p>
Victorian government		
<i>Environment Effects Act 1978</i>	<p>The Environment Effects Act provides a legal framework for the assessment and management of potential impacts to the environment as a result of development projects.</p>	<p>The Minister for Planning determined on 21 May 2020 that an EES was required for the project because the project has the potential for significant environmental effects, in particular on native vegetation, flora and fauna species and communities listed under the FFG Act and EPBC Act, as well as environmentally sensitive waterways.</p> <p>An EES is warranted to provide an integrated, robust and transparent process to assess the proposal's effects and associated uncertainties, and to evaluate effectiveness of the proposed avoidance, mitigation, management and offsetting measures, prior to any statutory approval decisions.</p>

Document title	Summary	Relevance to project
<p>Flora and Fauna Guarantee Act 1988</p>	<p>The FFG Act provides a framework for the protection of Victorian flora, fauna and associated habitats. The FFG Act provides a legal framework to promote conservation of Victoria's native flora and fauna and enable management of potentially threatening processes.</p> <p>Threatened species and communities of flora and fauna, as well as threatening processes, are listed under the FFG Act. Section 47 provides that a permit is required for the removal of any listed protected flora from public land.</p> <p>The Act also contains an obligation or duty on public authorities and ministers to consider potential biodiversity impacts when exercising their functions (set out in new section 4B).</p>	<p>A range of FFG Act listed species and protected flora are present within the project area and within the trail alignment. Permits under the FFG Act will be required for the project area where removal of protected species is occurring on public land.</p> <p>The new (July 2021) FFG Act threatened species listings have been used throughout this report however the EES scoping requirements were released prior to listings being gazetted and made publicly accessible.</p> <p>Councils are public authorities for the purpose of the Act and must respond to their public authority obligations. This report and participation in an EES process is considered to fulfil that duty.</p> <p>Future flora and fauna salvage works or similar would require appropriate permits under the Act.</p>
<p>Planning and Environment Act 1987</p>	<p>The P&E Act provides a legal framework for planning the use, development and protection of land in Victoria. The Planning and Environment Act provides for the preparation of planning schemes in each municipality consistent with the Victoria Planning Provisions (VPPs) and procedures by which planning schemes may be amended and planning permits obtained to govern land use and development.</p> <p><i>Guidelines for the Removal, Destruction or Lopping of Native Vegetation</i> ('the Guidelines'; DELWP 2017a) is an incorporated document within the VPPs. It is referenced directly within this Act, within Clause 52.17 (native vegetation) of the local planning scheme.</p>	<p>The project requires native vegetation removal which would ordinarily trigger the requirement for a planning permit and both general and species habitat unit offset prescriptions.</p> <p>A proposed Planning Scheme Amendment would apply a Specific Controls Overlay and an Incorporated Document to the project, and address any vegetation removal requirements for that area. Requirements for construction and/or post-construction monitoring such as monitoring of sediment levels, noise levels and dust levels, which may impact on terrestrial ecological values would be addressed in conditions and environmental management plans required by the Incorporated Document.</p> <p>The project impact assessment would need to meet the assessment and offset requirements of the <i>Guidelines for the Removal, Destruction or Lopping of Native Vegetation</i>.</p>
<p>Catchment and Land Protection Act 1994</p>	<p>The CaLP Act provides a framework for the regulation and control of pests, weeds and diseases within Victorian catchments.</p> <p>Under the CaLP Act, landowners have a responsibility to avoid causing or contributing to land degradation, including taking all reasonable steps to conserve soil, protect water resources, eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds and, where possible, eradicate established pest animals declared under the CaLP Act.</p>	<p>A range of CaLP Act listed weeds and pest animals are present within the project area and would need to be managed, in conjunction with other weed species, during the construction and operational periods to restrict the spread of restricted weeds, and control the spread of regionally controlled weeds.</p>

Document title	Summary	Relevance to project
	<p>The CaLP Act categorises weeds and their respective management requirements into:</p> <ul style="list-style-type: none"> state prohibited weeds; regionally prohibited weeds; regionally controlled weeds; and restricted weeds. 	
Water Act 1989	<p>The Water Act provides a legal framework for the management of Victoria's water resources.</p>	<p>The trail alignments cross waterways that are protected by the Water Act. A licence is required to construct works on a waterway identified under section 67 of the Water Act. The proposed development will involve construction of bridges and crossings over waterways. Consequently, the development will require approval from Melbourne Water.</p>
Fisheries Act 1995	<p>The Fisheries Act provides a legislative framework for the protection, management and regulation of Victorian fisheries including aquatic habitats.</p>	<p>The project area provides habitat for some FFG Act listed fish species which are protected by this Act.</p>
Environment Protection Act 2017 and State Environmental Protection Policy (Waters)	<p>The <i>Environment Protection Act 2017</i> provides a legal framework for the systematic and strategic management of potential and realised environmental impacts. The <i>Environment Protection Act 2017</i>, the Environment Protection Regulations 2021 and Environment Reference Standard introduced from 1 July 2021 provide a regulatory framework designed to prevent harm by eliminating or minimising risks of harm to human health and the environment. Under the regulatory changes certain clauses in the SEPP (Waters) have been saved under the Environment Protection Transitional Regulations 2021 for a period of 2 years after the commencement of the Environment Protection Regulations 2021. As SEPP (Waters) contributes to the state of knowledge and provides guidance on compliance with the General Environmental Duty (GED), the policy remains relevant to the protection and management of Victoria's water environments, including surface waters, estuarine and marine waters and groundwaters.</p>	<p>While not being saved under the Environment Protection Transitional Regulations 2021, the following clauses of SEPP (Waters) applicable to the project remain relevant as they provide guidance for compliance with the GED under the <i>Environment Protection Act 2017</i>:</p> <p>Clause 33 – Surface water management and works:</p> <ul style="list-style-type: none"> Melbourne Water must ensure that public access to water supply catchments is restricted <p>Clause 40 – Management of instream works:</p> <ul style="list-style-type: none"> A person undertaking works in or adjacent to surface waters must minimise risks to beneficial uses Minimise unnatural erosion, sediment re-suspension and other risks to aquatic habitat Ensure that existing and new in situ structures do not pose a barrier to fish movement <p>Clause 42 – Construction activities:</p> <ul style="list-style-type: none"> Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected <p>Clause 45 – Native vegetation protection and rehabilitation:</p> <ul style="list-style-type: none"> Minimise the removal of and rehabilitate native vegetation within or adjacent to surface waters

Document title	Summary	Relevance to project
Wildlife Act 1975	<p>The <i>Wildlife Act 1975</i> (Wildlife Act) is the primary piece of legislation in Victoria providing for protection and management of wildlife. The Wildlife Act does not apply to fish, as defined under the <i>Fisheries Act 1995</i>. The Wildlife Regulations 2002 prescribe penalties for persons who wilfully damage, disturb or destroy any wildlife habitat without appropriate authorisation. DELWP advise that a planning permit (under the planning scheme) constitutes appropriate authorisation and therefore the habitat protection provisions under the Wildlife Regulations 2002 are not applicable once a planning permit has been granted for a project.</p>	<p>Not directly relevant to approvals but regulates field survey permits and licences. Implementation of fauna-specific mitigation measures during the construction phase would require handlers to hold an authorisation and/or licence under the Wildlife Act.</p> <p>Future fauna salvage works or similar would require appropriate permits under the Act.</p>
National Parks Act 1975	<p>The <i>National Parks Act 1975</i> makes provision for National and other parks and for their management, the appointment of a Director of National Parks and the appointment of a National Parks Advisory Council and park advisory committees. The primary purpose of the <i>National Parks Act 1975</i> is for the preservation and protection of the natural environment. The Yarra Ranges National Park Management Plan (Parks Victoria 2002) specifies four management zones including Reference Area, Conservation and Water Supply, Conservation and Recreation, and Recreation Development.</p>	<p>The areas subject to proposed trail development in the national park are within the Conservation and Recreation, and Recreation Development park zones. The park management plan also outlines key management issues to be taken into consideration for development in the park. Approval for permanent works in the Yarra Ranges National Park is required under Section 23 of the Act and amendments to the Yarra Ranges National Park Management Plan for the project will also be required.</p> <p>Future flora and fauna research or similar in the National Park would require appropriate permits under the Act.</p>

5. Consultation

Development of the project and preparation of the EES have been informed by consultation with stakeholders and the community. Table 4 lists specific expert, stakeholder and community consultation. The consultation recorded in Table 4 is confined to engagement undertaken during EES preparation and is in addition to several years of engagement with key agencies, particularly DELWP and Parks Victoria in relation to the project.

Table 5 includes community feedback and how this feedback has been considered by the project or in the biodiversity impact assessment.

Table 4 Community and stakeholder engagement undertaken for biodiversity

Community and stakeholder feedback	Consideration in project design or impact assessment
Technical Reference Group (TRG) Meetings	
Screening assessment of trails	Biosis presented the findings of trail screening assessment to the TRG, highlighting trails for further investigation and potential realignment. The TRG provided input into the approach for the screening assessment, which is being further refined. The findings were used to refine the trail network to avoid and/or minimise impacts on threatened communities and species.
Presentation of Existing Conditions	Biosis presented a summary of existing conditions to the TRG on 11 March 2021 following completion of major fieldwork components and first draft of the existing conditions report.
Field investigations with TRG members	Biosis has been involved in field investigations of alternative trail alignments and field-based discussions of tree impacts with DELWP and Parks Victoria TRG members and local staff: <ul style="list-style-type: none"> • 14-16 December 2020 (alternative alignments) • 19 January 2021 (tree assessment and impact methods)
Community consultation	
Community consultation briefings: 30/11/2020 and 4/12/2020 Environment Group briefing: 16/12/2020	Biosis provided an overview of the Biodiversity Impact Assessment at two community consultation sessions. The presentation included a summary of the purpose, approach and findings to date for the Biodiversity Impact Assessment. A briefing will also be presented to local environment groups within the Warburton region.
Experts and/or specialist consultation	
DELWP Cool Temperate Rainforest expert	Biosis consulted with a DELWP expert regarding the extent and condition of Cool Temperate Rainforest and Cool Temperate Mixed Forest communities. Consultation included discussion of potential impacts and mitigation measures.

Community and stakeholder feedback	Consideration in project design or impact assessment
Threatened Species Biologist, Wildlife Conservation and Science, Zoos Victoria	<p>Biosis has consulted with Zoos Victoria regarding known occurrences of and habitat for Leadbeater's Possum. Consultation has included discussion of methods to document and quantify impacts, and exploration of potential mitigation measures. An on-site meeting was attended by two Zoos Victoria representatives and Clare McCutcheon and Matt Looby of Biosis, on 7 May 2021. This meeting provided valuable information and observations of key habitat attributes for Leadbeater's Possum within the vicinity of Mount Donna Buang and Ben Cairn, and has resulted in further revisions to the alignment to avoid high quality areas of habitat. Zoos Victoria has also provided additional spatial data to Biosis, which is shown in relevant figures within this report.</p>
Australian National University (ANU) Leadbeater's Possum	<p>Biosis had preliminary consultation and engagement with an ANU species expert regarding known occurrences of and habitat for Leadbeater's Possum, including location of nest boxes within the project area.</p>
Eddie Tsyrlin, University of Melbourne Mount Donna Buang Wingless Stonefly	<p>Biosis engaged Eddie Tsyrlin for expert advice on known occurrences of and habitat for the Mount Donna Buang Wingless Stonefly within the project area. Engagement and consultation included discussion of potential impacts and mitigation measures. Mr Tsyrlin has been involved in one site visit in December 2020 with the project team, DELWP and PV representatives. Mr Tsyrlin also undertook additional targeted surveys for the stonefly for alternative trail alignments between Mount Donna Buang and Mount Victoria (Appendix 10).</p>
Treelogic Pty Ltd Arborist	<p>Biosis has engaged Treelogic to undertake an arboricultural assessment of trees in the project area. Treelogic has provided a description of existing conditions for tree health and assessment of potential tree health impacts associated with trail construction. They have also assisted in developing mitigation measures for avoiding and/or minimising impacts on trees, especially large habitat trees and Myrtle Beech trees. Treelogic representative Andrew Traczynski has visited the site with the project team, DELWP and PV representative in mid-February 2021 and then led field investigations in April 2021 (Appendix 8 and 9).</p>
Tim Bloomfield Pest animals and pest plants	<p>Biosis has retained Tim Bloomfield to provide advice on pest animal and pest plant issues associated with the project and will consult with Tim as required.</p>

Table 5 Response to community feedback

Community and stakeholder feedback	Consideration in project design or impact assessment
<p>Concerns that the trails would impact native orchids</p>	<p>Fifteen species of orchid have been recorded in the assessment corridor with 14 of these species being non-threatened taxa, and one species, Mountain Bird-orchid <i>Chiloglottis jeanesii</i>, being considered significant in Victoria. The trails will require the removal of native understorey vegetation and this will result in removal of some common orchid species. Threatened orchid species, if present, will be protected via trail micro-siting. Refer to report Section 9.5.4</p>
<p>Concerns about the impact to critically endangered Myrtle Beech trees, including from introduced pests and diseases.</p>	<p>Myrtle Beech is a component of two threatened ecological communities listed under the FFG Act. Risk assessments of pest plants, animals and pathogens have been undertaken and specific mitigation measures have been developed. Refer to report Sections 7.3.8 and 9.12.2.</p>
<p>Concerns about the impact to Leadbeater's Possum and known habitat</p>	<p>Significant redesign of trail 1 has been undertaken including development of alternative options to trail 1 (i.e. trails 45-47). The new trail 1 alignment now avoids high quality montane thicket habitat and translocation recipient sites between Mount Donna Buang and Ben Cairn. Biosis engaged with species' experts to inform these impact avoidance steps. Other impact minimisation and mitigation measures for this species include minimising fragmentation of sub-canopy connectivity in wet forest habitats and avoiding any night time construction and operational activities in Yarra Ranges National Park and areas of potential habitat in Yarra State Forest (e.g. near Mount Bride). Refer to report Sections 3.4, 6.3, 8, 9.2 and 10.1.</p>
<p>Concerns about impacts to Lyrebird habitat</p>	<p>It is proposed to avoid removing lyrebird mounds or disturbing nest sites by micro-siting trails around these features. Refer to report Section 13.4.</p>
<p>Concerns about the potential impacts that trails and increased traffic would have on native fauna (including disruption to habitat)</p>	<p>The trail network has potential to disturb fauna and to remove understorey habitat, however the National Park and State Forest already support a network of tracks and trails and areas that concentrate human presence (Figure 16). More extensive existing roads, tracks and trails occur in the southern part of the project area (State Forest) compared to the northern part of the project area (Yarra Ranges National Park and the Melbourne Water catchment). Based on an analysis of topographic information and existing trail mapping, there is approximately 340 kilometres of existing roads, streets, forest tracks, walking trails and mountain bike trails in the project area</p> <p>The trail network is considered to be a narrow permeable feature in the landscape that will not prevent movement of forest-dwelling fauna such as birds, ground-dwelling mammals, owls and arboreal species. Impact minimisation and mitigation measures for forest fauna include minimising fragmentation of sub-canopy connectivity in forest habitats and avoiding any night time construction and operational activities in Yarra Ranges National Park and high quality forest habitat in Yarra State Forest (e.g. near Mount Bride). Refer to report Sections 9.6, 9.12.2, 10.5, 12 and 13.4</p>

Community and stakeholder feedback **Consideration in project design or impact assessment**

Concerns about impacts to cool temperate rainforest

All sections of trail that pass through rainforest vegetation or substantial areas of Myrtle Beech canopy will be hand built to minimise impacts on this threatened community. Special mitigation measures will be put in place to avoid and minimise wounding of Myrtle Beech trees to prevent infection and spread of Myrtle Wilt. The majority of impacts are to the mixed forest community rather than pure cool temperate rainforest. Refer to report Sections 7.3.8 and 9.12.2.

6. Methods

6.1 Overview of method

This section describes the method that was used to assess the potential impacts of the project. Figure 4 shows an overview of the assessment method. A risk-based approach was applied to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects.

The approach used in the assessment has been guided by the evaluation framework that applies to the project (that is, existing regulatory framework of relevant legislation and policy) as well as the scoping requirements, set by the Victorian Minister for Planning, incorporating input from the Commonwealth Department of Agriculture, Water and Environment (DAWE) in relation to matters of national environmental significance (MNES).

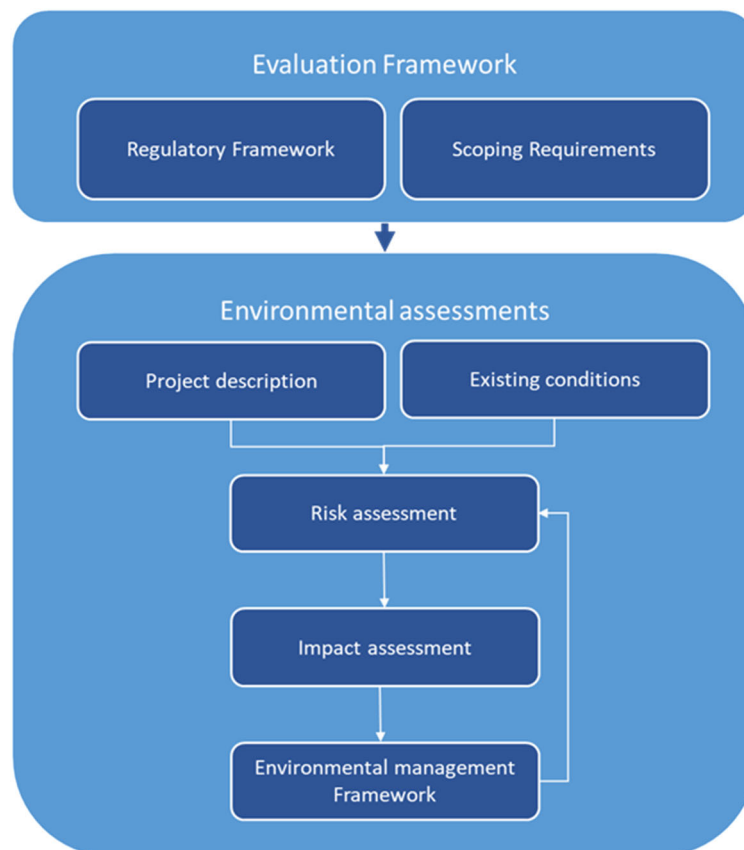


Figure 4 Overview of EES assessment framework

The environmental assessment was undertaken according to the following steps:

- Characterise existing environmental conditions.
- Consider the project design and the proposed construction and operation activities in the context of the existing environmental conditions.
- Undertake an initial risk assessment to evaluate the likelihood and consequence of environmental risks associated with proposed Project activities assuming adoption of standard mitigation measures to determine the relative importance of environmental issues associated with the Project.

- Complete an assessment of potential direct and indirect impacts that analyses the spatial and temporal extent, magnitude and nature of the potential impacts giving consideration to the sensitivity and significance of affected receptors.
- Evaluate the predicted outcomes against applicable legislation, policy and standards.
- Evaluate the potential for cumulative impacts due to impacts from the project in combination with other projects or actions that are taking place or are proposed nearby.
- Where necessary identify additional mitigation measures to address potentially significant environmental effects.
- Identification and evaluation of residual environmental effects including magnitude, duration and extent, taking into account the proposed mitigation measures and their likely effectiveness.

Based on the findings of the environmental assessments, an environmental management framework has been established to monitor and evaluate environmental management and contingency measures in relation to the residual environmental effects. The environmental management framework specifies the committed mitigation and management measures and describes the roles and responsibilities for implementation throughout project construction, operation and decommissioning. The environmental management framework is described fully in the EES.

The specific methods adopted during the key steps are described in the sections below.

6.1.1 Key information sources

Key information sources relevant to the Project are listed in Table 6 and Table 7. Full references are provided in Section 14. Table 6 provides a list of relevant ecology related reports and publications relating to the Project that also informed this biodiversity assessment.

Table 7 provides a list of spatial and species record datasets relating to the Project. A project specific WebApp with available spatial data has been prepared for the project and is hosted by Biosis for agency stakeholder viewing.

Table 6 Ecology related reports and publications relevant to the Project

Title	Scope/Abstract	Geographic Coverage /Relevance	Taxa covered
EES Technical Reports			
Warburton Mountain Bike Destination Surface water, groundwater and geotechnical hazard assessment (GHD 2021).	The scope of this study was to undertake an impact assessment of the Warburton MBT Destination project on surface water, groundwater and geotechnical investigation.	Project area	Not applicable

Title	Scope/Abstract	Geographic Coverage /Relevance	Taxa covered
Field-based			
Biodiversity Impact Assessment Proposed Warburton Mountain Bike Trail (Practical Ecology 2019).	<p>The purpose of this study was to investigate the trail alignment and identify impacts to native vegetation and fauna habitats and how the planning and design of the alignment may minimise impacts to the most significant biodiversity values. Environmental protocols to guide the alignment of the trail network were developed with DELWP, Parks Victoria, Melbourne Water and ecological specialists.</p>	<p>150 km of the trail network was covered in this study based on trail designs in 2019.</p>	<p>All taxa, however assessment focused mostly on flora and did not include field assessment for general fauna values.</p>
<p>Survey of the Wingless Donna Buang Stonefly <i>Riekoperla darlingtoni</i> in relation to the proposed Warburton mountain bike trail (Tsyrlin 2019).</p> <p>Survey of <i>Riekoperla darlingtoni</i> (Illies 1968) east of the Mt Donna Buang for the Warburton Mountain Bike Destination project Tsyrlin (2021).</p>	<p>The scope of these studies was to investigate the presence / absence of the critically endangered Mount Donna Buang Wingless Stonefly to address a possible risk posed by the construction, maintenance and use of a mountain bike trails proposed for the Mount Donna Buang area.</p> <p>Reports provided in Appendix 10.</p>	<p>Area downstream of the proposed mountain bike trails 1, 45 and 46.</p>	<p>Mount Donna Buang Wingless <i>Riekoperla darlingtoni</i></p>
Government publications			
<p><i>Flora and Fauna Guarantee Act 1988 Action Statement: Cool Temperate Rainforest (DSE 2009c).</i></p>	<p>Provides a description of Cool Temperate Rainforest (CTR) from the Final Recommendation of the Scientific Advisory Committee (SAC 1992) in regard to Nomination Number 207, which forms the basis for the listing under the FFG Act. The Action Statement is divided into three sections: 1) information on the nature and extent of the communities and accordance with Section 19 of the FFG Act; 2) brief discussion of the relevant management issues, previous management action and existing protection measures; and 3) management actions that the Victorian Government intends to undertake to conserve the communities and manage the potentially threatening process.</p>	<p>Mount Donna Buang – trail 1</p>	<p>Cool Temperate Rainforest community Mixed Cool Temperate Forest community</p>

Title	Scope/Abstract	Geographic Coverage /Relevance	Taxa covered
FFG Act: Processes List – December 2016 (DELWP 2016c)	Provides a list of threatening processes listed under the FFG Act 1988.	Victoria	Various species impacted by threatening processes
Approved Conservation Advice for EPBC Act listed flora: <i>Pomaderris vacciniifolia</i> (Round-leaf Pomaderris) (DoE 2014)	DAWE endorsed description of species, distribution, habitat, threats, research priorities and priority actions for the species.	Species distribution	<i>Pomaderris vacciniifolia</i>
National Recovery Plan for the Tall Astelia <i>Astelia australiana</i> (Cutler & Murphy 2010)	DAWE endorsed description of species, distribution, habitat, threats, research priorities and priority actions for the species.	Species distribution	<i>Astelia australiana</i>
Approved Conservation Advice for EPBC Act listed fauna: <ul style="list-style-type: none"> • Leadbeater’s Possum • Greater Glider • Broad-toothed Rat • Smoky Mouse • Spot-tailed Quoll • Southern Brown Bandicoot • Swift Parrot • White-throated Needle-tail • Macquarie Perch 	These documents provide a description of each species along with their distribution, habitat, and threats.	National	As listed
National Recovery Plans for EPBC Act listed fauna including: <ul style="list-style-type: none"> • Leadbeater’s Possum • Smoky Mouse • Swift Parrot • Australian Grayling • Murray Cod • Macquarie Perch 	These documents provide a description of each species along with their distribution, habitat, threats, research priorities and priority actions for management and recovery.	National	As listed
Action statements prepared under the FFG Act for the following listed fauna species: <ul style="list-style-type: none"> • Greater Glider • Spot-tailed Quoll • Leadbeater’s Possum • Smoky Mouse • Barking Owl 	These documents provide a description of each species along with their distribution, habitat, threats, research priorities and priority actions for management and recovery.	Victoria	As listed

Title	Scope/Abstract	Geographic Coverage /Relevance	Taxa covered
<ul style="list-style-type: none"> • Masked Owl • Powerful Owl • Sooty Owl • Mt Donna Buang Wingless Stonefly • Brush-tailed Phascogale 			
EPBC Act: Species Profile and Threats Database - Listed Key Threatening Processes (DAWE 2020)	Provides a list of threatening processes listed under the EPBC Act 1999.	Australia	Various species impacted by key threatening processes
Approved Conservation Advice for Alpine Sphagnum Bogs and Associated Fens ecological community (DEWHA 2008)	DAWE description of the national ecological community, condition thresholds and rational for listing as a threatened community under the EPBC Act. Also includes a summary of threatening processes that may impact the community.	Australia	Species associated with this community
Advisory list of environmental weeds in Victoria (White et al. 2018)	Describes an objective 'expert system' for ranking environmental weed species with respect to management urgency, and presents the application of this method as an annotated list	Victoria	Environmental weeds
Other reports and publications			
Warburton Mountain Bike Destination Project – Preliminary Surface Water & Geotechnical Assessment (GHD 2019a)	Preliminary investigations by GHD of surface water and groundwater of the project area.	Project area	Not applicable
Warburton Mountain Bike Destination Project – Desktop Hydrogeological Assessment (GHD 2019b)	Preliminary investigations by GHD of hydrogeology of the project area.	Project area	Not applicable
<i>Chalara australis</i> sp nov (Hyphomycetes), a Vascular Pathogen of <i>Nothofagus cunninghamii</i> (Fagaceae) in Australia and Its Relationship to Other Chalara Species GA Kile and J Walker (1987). Australian Journal of Botany 35(1) 1 – 32.	Discusses the general significance of <i>Chalara</i> spp. in relation to the Fagaceae.	Distribution of pathogen and host	Myrtle Beech trees

Title	Scope/Abstract	Geographic Coverage /Relevance	Taxa covered
Shedding some light on <i>Thismia rodwayi</i> F. Muell. (Fairy Lanterns) in Tasmania: Distribution, Habitat and Conservation Status (Roberts et al. 2003)	This paper reports on the ecology and distribution of the species.	Species distribution	<i>Thismia rodwayi</i>
A review of the conservation ecology of Round-leaf Pomaderris <i>Pomaderris vacciniifolia</i> F. Muell. ex Reissek (Rhamnaceae) (Patykowski, Gibson & Dell 2014)	Summarises the current ecological understanding of Round-leaf Pomaderris.	Species distribution	<i>Pomaderris vacciniifolia</i>
<i>Cyathea cunninghamii</i> Slender Tree-fern – Tasmanian Threatened Flora Listing Statement (DPIPWE 2006)	Summarises ecology of Slender Tree-fern and provides conservation information mostly relevant to Tasmanian populations.	Species distribution	<i>Cyathea cunninghamii</i>
Primary Rainforest Mapping in Victoria 2018 - extent and type (White et al. 2019)	Report summarising approach to map extent of Victoria's remaining primary rainforest. Provides useful definitions for CTR / CTMF.	Ecological community distribution	CTR / CTMF

Table 7 Spatial datasets relevant to the Project

Title	Description	Source
Victorian Biodiversity Atlas	The Victorian Biodiversity Atlas (VBA) is the collated information of flora and fauna sightings across Victoria.	DELWP 2020a
Victorian Wetland Inventory (Current)	Polygons showing the extent and types of wetlands in Victoria. Wetland Current was created in 2013 and updated in 2014.	DELWP 2016a
Native Vegetation Regulation (2017) Habitat Importance Maps (HIM) for VROT species	This data series is a set of spatial maps describing importance of suitable habitat within the current extent of native vegetation for some species. These species are rare or threatened and their habitat is described as either dispersed or highly localised.	DELWP 2019
Native Vegetation - Modelled Extent 2005	Modelled dataset of Native Vegetation and major water-based habitats. The NV2005_EXTENT has been created from time-series (between 1989 and 2005) Landsat Imagery, many thousands of ground-truthing points, other relevant spatial data and expert validation.	DELWP 2014a

Title	Description	Source
Native Vegetation - Modelled Quality (Site condition and landscape context) 2005	This dataset is a modelled dataset of the quality of Terrestrial Native Vegetation as per the "Habitat Hectares" approach.	DELWP 2016b
Native Vegetation Regulation Location (2017)	This dataset describes the native vegetation location category for all land in Victoria for the purposes in the native vegetation removal regulations.	DELWP 2017b
Fire history overlay of most recent fires	This layer has been derived from FIRE_HISTORY data and represents the spatial extent of the last fires recorded, primarily on public land. The layer stores details of the last time an area was known to be burnt by wildfire or prescribed burning and represents a consecutive overlay of all FIRE_HISTORY layers, from older fire seasons to the most recent fire seasons. This data set is current to 2019/20 fire season.	DELWP 2014b
Logging history	Logging history overlay of most recent harvesting activities. This layer has been derived from LOG_SEASON and represents the spatial extent of the most recent timber harvesting activity recorded for any given area in State forest The layer stores details of the last time an area was known to be harvested, the species harvested and the harvesting method used. It represents a consecutive overlay of all seasons, from 1961-62 season to the most recent timber harvesting seasons. Complete to 30 June 2019.	DELWP
Native Vegetation - Modelled 1750 Ecological Vegetation Classes	This layer represents the modelled extent of EVCs in 1750 at scales ranging from 1:25,000 to 1:100,000.	DELWP 2014c
Leadbeater's Possum spatial layers	<p>These layers include:</p> <ul style="list-style-type: none"> the location of Leadbeater's Possum nest boxes that were referenced in Practical Ecology (2019) and provided by Parks Victoria; DELWP confirmed Leadbeater's Possum records and management buffers around those confirmed sites (DELWP 2021d). Additional unpublished records from Zoos Victoria of Leadbeater's Possum in the Mount Donna Buang and Ben Cairn area. 	DELWP, Parks Victoria and Zoos Victoria

Title	Description	Source
2015-16 Central Highlands LiDAR Project	The Central Highlands LiDAR survey provides elevation data over a 4,580 km ² northeast of Melbourne in Victoria. The LiDAR data will be used in conjunction to map the key forest structure. The LiDAR was captured between January to May 2016, at a nominal density of four outgoing laser pulses per square metre with 50% overlap in swaths. A set of seamless products were produced to project specifications, including a digital elevation model (DEM), Canopy Height model (CHM), Foliar Cover Models (FCMs), and First Return Intensity Images.	DELWP

6.2 Existing conditions approach

The assessment of existing conditions incorporates:

- A desktop assessment of government biodiversity datasets.
- Review of previous biodiversity assessment reports (mainly Practical Ecology 2019).
- Review of biodiversity literature.
- Consultation with the Technical Reference Group.
- Consultation with the specialists listed in Table 4.
- Field assessment to collect data on native vegetation (including large trees), fauna habitat, threatened species habitat and other ecological values.
- Field assessment to explore alternative trail alignments and assess these.

6.2.1 Database review

In order to provide a context for the project area, information about flora and fauna from within 10 kilometres of the project area (the 'search area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Environment, Land, Water and Planning (DELWP) or the Australian Government DAWE. Records from the following databases were collated and reviewed:

- DELWP's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- DAWE's Protected Matters Search Tool for matters protected by EPBC Act.

Other sources of biodiversity information were examined including:

- DELWP's NatureKit mapping tool.
- DELWP's Habitat Importance maps (HIM).
- DELWP's Native Vegetation Information Management (NVIM) system.

6.2.2 Flora and native vegetation assessment

Previous assessments (non-Biosis investigations)

Previous flora assessments were undertaken by Practical Ecology from October 2017 through to November 2019. These assessments covered approximately 150 kilometres of the proposed mountain bike trail network.

The field assessments included (Practical Ecology 2019):

- Vegetation mapping to EVC level.
- Vegetation Quality Assessments using the habitat hectares method.
- Significant tree mapping – see further discussion in 7.3.3.
- Mapping the location of significant flora species and high threat weeds where they were encountered.

Biosis investigations

Biosis has assessed the trails outlined in Table 9. These include alternative trail alignments near Mount Donna Buang as well as trails that were not surveyed, or partially surveyed, by Practical Ecology (2019). The Biosis field assessments were undertaken by Steve Mueck, Jane Kenny, John Muchan, Georgie Zacks, Matilda Terry, Jack Fursdon, Ewan Kelly, Sarah Hilliar and Matt Looby on the following dates:

- 15 and 16 April 2020
- 17 to 19 November 2020
- 23 to 27 November 2020
- 18 and 19 January 2021
- 1 to 5 February 2021
- 10 and 11 February 2021
- 7 May 2021
- 5 to 7 July 2021.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA). All flora species lists collected by Biosis will be submitted to DELWP for incorporation into the VBA. Planted species have not been recorded unless they are naturalised.

Yarra Ranges Council investigation

Several data gaps were identified in Practical Ecology (2019) field data and Yarra Ranges Council staff with guidance from Biosis ecologist undertook field checking of data, particularly of gaps in vegetation and large tree mapping. Where these gaps were deemed to be significant and likely to undermine an appropriate description of existing conditions or impact assessment, the trails were re-surveyed by Biosis ecologists. This was relevant for all of Trail 1.

6.2.3 Defining, assessing and mapping native vegetation

6.2.3.1 Definition of native vegetation in Victoria

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey cover is native plants.
 - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary of a tree canopy) of each tree touches the drip line of at least one other tree, forming a continuous canopy.
 - Any mapped wetland included in the *Current wetlands map*, available in DELWP systems and tools.
- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.

6.2.3.2 Assessing native vegetation type and condition

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

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DELWP's NVIM.

Vegetation Quality Assessment (VQA) sampling was undertaken for representative patches of native vegetation of the same EVC and condition state identified in the assessment corridor. Samples were collected in 0.25 hectare quadrats.

The VQA score was then applied to vegetation of the same EVC and condition state throughout the assessment corridor and impact footprint. In accordance with Appendix 6 of the *Assessor's handbook* (DELWP 2018), adjoining habitat zones of the same EVC were merged with the VQA score for each resulting zone calculated based on the average percentage cover of lifeforms, weeds, canopy and organic litter across the entire zone.

Sampling was stratified based on the area of each EVC and condition state within the impact footprint. This method aimed to sample over 20 percent of each EVC and condition state within the impact footprint. This assessment and the use of sampling in large patches is consistent with DELWP's habitat hectare method (DSE 2004a) and the Assessor's Handbook (DELWP 2018).

Where relevant, notes were made on specific issues such as noxious weed infestations, evidence of land/forest management works, fire, erosion, current grazing impacts and the regeneration capacity of the vegetation. Regeneration capacity is driven by the intactness and context of native vegetation whereby intact forest environments are more likely to regenerate to a native condition state after minor disturbance as opposed to fragmented or highly disturbed native vegetation that will continue to decline after disturbance without significant intervention.

6.2.3.3 Mapping native vegetation

Habitat hectare assessment

Habitat zones (HZs) were used to map native vegetation within the assessment corridor in accordance with the procedure outlined in the *Assessor's Handbook* (DELWP 2018, p. 58). According to this procedure HZs were only split when:

- A different EVC was present, or
- The site condition score (out of 75) varied by at least 15 points, and the extent of the continuous patch of vegetation was greater than 1 hectare.

Any adjoining habitat zones of the same EVC were merged and considered as a single zone (DELWP 2018, p. 58).

Mapping Cool Temperate Mixed Forest

The FFG listed Cool Temperate Mixed Forest (CTMF) ecological community occurs within the assessment corridor on the upper slopes of Mount Donna Buang and surrounds. This area is more broadly mapped by DELWP as Montane Wet Forest (MWF) (EVC 39) (DELWP 2014a). The CTMF community is described as 'a structurally complex forest that has an upper canopy of eucalypts above an understorey layer of smaller trees of species that characterise Cool Temperate Rainforest communities' (DELWP 2021b, p. 4). Smaller tree species that characterise CTR include Myrtle Beech *Nothofagus cunninghamii*, Southern Sassafras *Atherosperma moschatum*, Black Olive-berry *Elaeocarpus holopetalus* or Blackwood *Acacia melanoxylon* (DELWP 2021b). Within the assessment corridor patches of CTMF were mapped where there was a tall eucalypt canopy variously dominated by Alpine Ash *Eucalyptus delegatensis* subsp. *delegatensis*, Mountain Ash *Eucalyptus regnans* or Shining Gum *Eucalyptus nitens* with an understorey dominated by Myrtle Beech. Adjacent areas not dominated by Myrtle Beech were mapped as MWF (EVC 39).

Under the Guidelines every patch of native vegetation mapped during a site assessment must be assigned an EVC (DELWP 2017a, p. 23). However, CTMF is not acknowledged or mapped as a separate EVC by DELWP. This creates uncertainty about how to correctly assign an EVC to patches of native vegetation in which this ecological community occurs. Due to this uncertainty a conservative approach was applied to map patches of CTMF as CTR (EVC 31), which has a bioregional conservation status (BCS) of Endangered in the Victorian Alps and Highlands – Southern Fall bioregions, rather than Montane Wet Forest (EVC 39), which has a BCS of Least Concern in the two bioregions. In the absence of definitive guidance from DELWP, habitat zones that represent patches of CTMF remain mapped as the CTR EVC (EVC 31), due to the higher BCS of CTR (EVC 31) versus MWF (EVC 39).

However, as a result of more detailed analysis of the CTMF patches against EVC benchmarks and the characteristics of FFG Act threatened communities, it was determined that the areas of CTMF were more ecologically similar to Montane Wet Forest (i.e. EVC 39 description and bioregional benchmarks) than CTR (i.e. EVC 31 description and bioregional benchmarks). Through analysis of EVC benchmarks, it was ascertained that the EVC 31 benchmark lacks a range of lifeforms and expected understorey species diversity that was observed in stands of CTMF, and therefore, scoring the CTMF habitat zones against the EVC 39 benchmark rather than the EVC 31 benchmark avoided potentially under-representing the condition scores of these habitat zones. Further details regarding this decision are available in Section 7.5.2.

Large trees in patches and scattered trees

For trails assessed by Biosis (see Table 9), the location, species and Diameter at Breast Height (DBH) within fixed diameter classes of all large trees within patches and all scattered trees, as defined by the relevant EVC benchmark, were mapped within the 20 metre wide assessment corridor (i.e. 10 metres either side of the trail centreline). See further details in Section 6.2.10 regarding tree mapping for the project.

6.2.4 Native vegetation impacts

Based on the trail construction methods outlined in the project description (rev2.1), it is proposed to remove understorey vegetation up to a height of 2.5 metres during construction of the trail surface. No large trees will be felled during construction and impacts on sub-canopy species will be minimised. Vegetation removal within the construction footprint will be based on a variable width clearing footprint driven by underlying slope and proposed construction method. For forest and woodland vegetation, a partial clearing score (i.e. half the recorded condition score using the VQA method) will be applied to calculate native vegetation offset requirements as outlined in the Guidelines (DELWP 2017a) and the *Assessor's Handbook* (DELWP 2018). A detailed explanation of the variable width impact footprint is provided in Section 9.1.

Where elevated structures or bridges are proposed, the vegetation under these structures will be 'deemed lost' and included in offset calculations by applying the appropriate construction footprint which is not more

than 1.2 metres wide for all structures. Despite deeming this vegetation lost, recent examples from other mountain bike trail projects in Victoria and NSW demonstrate that such vegetation is likely to persist under structures that allow rainfall and light to penetrate to the ground.

6.2.5 Arboricultural assessment

Treelogic Pty Ltd has provided expert advice on tree impacts, specifically related to assessment of tree protection zone (TPZ) and structural root zone (SRZ) encroachment likely to result from minor earthworks for trail construction. A detailed method statement and sampling approach was developed in consultation with DELWP and Parks Victoria and finalised on 25 March 2021. The detailed methods are provided in Appendix 8

The method statement includes:

- A discussion of the application of TPZs and SRZs to the project and current DELWP policy guidance for assessing tree impacts from tracks and trails.
- A sampling method based on EVCs and terrain as it was not deemed practical nor necessary to assess trees along all trails given the relative uniformity of forest types in the project area.
- Methods for collecting data to describe the existing conditions for trees, especially large trees, and approaches to avoiding direct impacts.
- Methods for quantifying impacts on forest trees, particularly large trees using the arborist's advice, to determine whether large trees will require offsetting based on assumed losses (i.e. TPZ and SRZ encroachment).

The results of the arboricultural assessment are provided in a separate report by Treelogic (Appendix 9).

6.2.6 General fauna assessment

The general fauna values of the study area were assessed using a combination of desktop review of existing information and field assessments to inspect fauna habitat and collect fauna observations. The review of existing information largely focussed on the biodiversity impact assessment undertaken by Practical Ecology (2019), however this only included a brief incidental fauna survey and a habitat assessment that largely focussed on hollow-bearing trees (referred to as significant trees in Practical Ecology 2019). The assessment does not contain a list of fauna species recorded.

To address those knowledge gaps and the scoping requirements for the Project, four days of field-based assessments and observations were undertaken by Biosis zoologists across the project area on 24 November 2020 and 24-26 February 2021. These field assessments were designed to assess and sample areas that were representative of all the habitat types present within the project area, and to determine the potential for the EPBC Act listed Broad-toothed Rat *Mastacomys fuscus mordicus* to be present within areas previously identified by botanists as having a high cover of grasses and sedges.

All species of fauna observed during these field assessments were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. In addition, Biosis ecologists/botanists undertaking updated vegetation assessments between November 2020 and February 2021 have collected lists of incidental fauna observations. These fauna observations help to document the characteristic fauna of the project area and will be supplemented by existing information and expert consultation to describe existing conditions and assess impacts.

Landscape scale impacts and cumulative impact assessments on wildlife were informed by current and historical land uses in the project area and large scale disturbance events that have occurred across the Highlands Southern Fall and Victorian Alps bioregions in recent years (e.g. other major projects, major bushfires, logging and floods). With regard to fire impacts on continental-scale threatened wildlife

populations, the DAWE wildlife and threatened species bushfire recovery research and resources products were reviewed to inform decision on impacts. These results are presented in the EPBC significant impact assessments in Appendix 7.

6.2.7 Targeted surveys for threatened flora and fauna

Threatened species having a medium or higher likelihood of occurrence were considered for whether targeted surveys would inform the impact assessment. This was further refined based on the assessment of 'survey effort commensurate with project impacts' as discussed in Section 2.2.1 and Table 2. Where targeted surveys were not undertaken for listed species, but suitable habitat is present, the species were assumed to be present for the purposes of impact mitigation considerations. Only those species where a significant impact is likely were considered for biodiversity offset requirements.

The majority of the existing conditions assessments were conducted according to the EES scoping requirements prior to the FFG Act threatened lists being gazetted in May 2021. We understand these lists were also only made official and publicly available on DELWP's website on 16 July 2021. The changes to state listings of significant flora has meant many species that were previously considered geographically 'rare' have now been elevated to vulnerable or endangered in Victoria. The consideration of targeted flora surveys has therefore focussed on species that were FFG Act listed, or were DELWP Advisory listed threatened species and had been recorded in the trail assessment corridor, at the time the EES scoping requirements were released in November 2020. Notwithstanding this, the conservation status of flora and fauna species has been updated in this report to reflect recent FFG Act listings.

6.2.7.1 Nationally significant flora species

Tall Astelia

Targeted surveys for Tall Astelia (EPBC Act vulnerable and now FFG Act critically endangered) were not undertaken as part of the existing conditions assessment. There are no records of the species within the search area and Tall Astelia was only included in the likelihood assessment based on modelled habitat. Suitable rainforest habitat for the species is present within the project area in the moist soils of gully heads and along stream margins in association with CTR (dominated by Myrtle Beech) or CTMF. As the species is highly distinctive and can be detected year-round, it is highly likely that any individuals within the assessment corridor would have been detected during the ecological surveys conducted by Practical Ecology (PE 2019) and Biosis through 2020 and 2021. These ecological surveys have seen the entire trail alignment walked by qualified ecologists and are considered adequate to assess potential impacts to the species.

Round-leaf Pomaderris

Targeted surveys for Round-leaf Pomaderris (EPBC and now FFG Act critically endangered) were not undertaken as part of the existing conditions assessment. Records of the species in the local area suggest the species is most likely to occur in the project area at lower elevations (lower slopes forest types) in close proximity to major drainage lines; namely the Yarra River, Dee River, and the lower reaches of Scotchmans Creek, Backstairs Creek, Four Mile Creek, Cemetery Creek and Yankee Jims Creek. Trail works are proposed in proximity to these areas though they represent a small fraction of the total network. As the species is highly distinctive and can be detected year-round, it is highly likely that any individuals within the assessment corridor would have been detected during the ecological surveys conducted by Practical Ecology (PE 2019) and Biosis through 2020 and 2021. These ecological surveys have seen the entire trail alignment walked by qualified ecologists and are considered adequate to assess potential impacts to the species.

6.2.7.2 State significant flora species

Slender Tree-fern

Targeted surveys for Slender Tree-fern (now FFG Act critically endangered) were not undertaken as part of the existing conditions assessment. Slender Tree-fern is confined to deep gullies in wet forests. As few of these features occur within the assessment corridor it is unlikely that the assessment corridor supports large numbers of this species. As the species is conspicuous and can be detected year-round, it is highly likely that any individuals within the assessment corridor would have been detected during the ecological surveys conducted by Practical Ecology (PE 2019) and Biosis through 2020 and 2021. These ecological surveys have seen the entire trail alignment walked by qualified ecologists and are considered adequate to assess potential impacts to the species.

Clasping Hypocreopsis

Targeted surveys for Clasping Hypocreopsis (now FFG Act critically endangered) were not undertaken as part of the existing conditions assessment. Clasping Hypocreopsis is a target species of the Royal Botanic Garden's 'Fungimap' fungi mapping project. Despite it being a target of this program for several decades, it is one of the least reported species. Clasping Hypocreopsis is thought to be an obligate mycoparasite forming its own sporing bodies on top of the sporing bodies of another fungus in the Hymenochaete family. The host fungus usually grows on dead branches of Tea-tree *Leptospermum* spp., Paperback *Melaleuca* spp. and Burgan *Kunzea* spp. in long unburnt areas (RBG 2020). This extremely cryptic species is unlikely to be detected without an extensive survey effort in areas of suitable habitat within the assessment corridor, which is unlikely to be commensurate with expected impacts to the species from the project. The combined ecological surveys by Practical Ecology (PE 2019) and Biosis through 2020 and 2021, which have seen the entire trail alignment walked by qualified ecologists, are considered adequate to assess potential impacts to the species.

Fairy Lanterns

Targeted surveys for Fairy Lanterns (now FFG Act endangered) were not undertaken as part of the existing conditions assessment given the highly cryptic nature of this species. Fairy Lanterns is a small saprophytic plant that is apparently restricted to damp humus and leaf-litter in deeply shaded tall forests and fern gullies. The vegetative part of the plant is entirely subterranean and colourless. The species' small, orange and red, fleshy flowers appear from spring to autumn, barely penetrate the soil surface and are typically covered by leaf-litter (Roberts et al. 2003). This extremely cryptic species is unlikely to be detected without an extensive survey effort in suitable habitat, which occurs throughout much of the assessment corridor. Targeted surveys are therefore unlikely to be commensurate with potential impacts from the project. The species is assumed to be present and project's ecological surveys to date of forest vegetation are considered adequate to assess potential impacts to the species.

Grey Pouchwort

Targeted surveys for Grey Pouchwort (now FFG Act critically endangered) were not undertaken as part of the existing conditions assessment. Grey Pouchwort is an epiphytic or log-dwelling rainforest liverwort with shoots scarcely over 1 millimetre wide (UTAS 2019a). There are no records of the species within the search area however DELWP's HIM modelling indicates suitable habitat for the species occurs within the project area. Given the species is tiny and its habitat preferences encompass a significant portion of the assessment corridor, the targeted surveys are considered unlikely to provide value in reducing the likelihood of potential impacts to the species. The project's ecological surveys to date are considered adequate to assess potential impacts to the species.

Beech Finger-fern

Targeted surveys for Beech Finger-fern (now FFG Act endangered) were not undertaken as part of the existing conditions assessment. Beech Finger-fern is a small epiphytic or lithophytic fern of wet forests. This species has been recorded once in the project area in 1999. It is unlikely to be detected without an extensive survey effort in suitable habitat, which occurs throughout much of the assessment corridor. Targeted surveys are therefore unlikely to be commensurate with potential impacts from the project. The project's ecological surveys to date are considered adequate to assess potential impacts to the species.

Tree Geebung

Targeted surveys for Tree Geebung (now FFG Act endangered) were not undertaken as part of the existing conditions assessment. Tree Geebung is endemic to the Central Highlands of Victoria and has distinctive foliage, flowers and fruit that readily identify it year-round. Practical Ecology (2019) encountered this species numerous times nearby, but not within, the assessment corridor. Biosis also recorded this species in November 2020 between Mount Donna Buang and Mount Victoria, in February 2021 near Mount Tugwell and in July 2021 Between Mount Donna Buang and Ben Cairn. As the species can be detected year-round, and the trail alignments have been surveyed by either Practical Ecology or Biosis ecologists it is unlikely that there remain significant numbers of undetected individuals within the assessment corridor. The project's ecological surveys to date are considered adequate to assess potential impacts to the species.

Floating Bladderwort

Targeted surveys for Floating Bladderwort (now FFG Act endangered) were not undertaken as part of the existing conditions assessment. Floating Bladderwort is a carnivorous aquatic herb that in Victoria occurs in freshwater swamps and wetlands at low elevations. As the species is also a common weed of aquaria and botanic gardens throughout the world the origin of individuals around Melbourne remains contentious (VicFlora 2019). As elevated structures will be used to cross waterways within the assessment corridor, targeted surveys for this species is not considered commensurate with the minor potential impacts to the species expected from the project.

6.2.7.3 Nationally and state significant fauna species

For fauna species, an approach of assuming presence of threatened species with a medium or higher likelihood of occurrence has been adopted for all areas of suitable habitat within the project area. Targeted surveys across such a long, linear project area were considered unlikely to prove absence of species, and carried a high risk of false negative results. Furthermore, survey effort needed to be commensurate with potential project impacts as discussed in Section 2.2.1 and Table 2.

An approach was therefore adopted to assume presence and avoid and mitigate impacts to known and potential habitat accordingly. Further assessment and/or targeted surveys were only considered for those species which were likely to be impacted by the project. Further assessment and consideration was undertaken for Leadbeater's Possum and Broad-toothed Rat, as these species were considered most at risk from the impacts of trail construction in or adjacent to occupied habitat. A site meeting and habitat assessment was undertaken for Leadbeater's Possum with representatives from Zoos Victoria on 7 May 2021 (as detailed in Section 5), which resulted in realignment of trail 1 between Mount Donna Buang and Ben Cairn to avoid areas where construction had potential to directly impact Leadbeater's Possum habitat (i.e. dense montane thicket habitat and translocation recipient sites). Further field-based habitat assessments were also undertaken for Broad-toothed Rat in February 2021, as it was determined that trail construction could potentially result in a significant impact if trails were constructed through occupied sedgeland habitat, should it be present. Further detail on the field-based habitat assessment for Broad-toothed Rat is provided below,

and Section 7.4.5 contains further details on all significant fauna species that are known or assumed to be present within the Project area.

Broad-toothed Rat habitat assessment

A field assessment to determine the likely presence of Broad-toothed Rat was undertaken by two experienced zoologists from 24 to 26 February 2021 through field-based habitat assessments and active searching for scats and runways within areas of potential habitat. Figure 6 shows areas along trails where these habitat assessments and searches were undertaken.

In their initial biodiversity impact assessment, Practical Ecology (2019) stated that Broad-toothed Rat was unlikely to occur as the habitat within the project area was unsuitable due to the absence of flowing streams along the alignment (page 138, Practical Ecology 2019). During a review of this assessment and determination, Biosis concluded that further assessment and consideration of this species was warranted, as the presence or absence of flowing streams is not considered a suitable determinant or proxy for Broad-toothed Rat habitat. The presence of flowing streams within the project area also contradicted the initial determination by Practical Ecology (2019) and also justified the need for further consideration. In addition to this, it was also determined that the potential impacts of the project to Broad-toothed Rats and their habitat, should they be present, would likely require specific management and mitigation, and this also warranted further survey and assessment to adequately inform the project.

Broad-toothed Rats are typically confined to areas with a high cover of sedges and grasses that occur in association with drainage lines, particularly in lowland parts of their range below altitudes of approximately 1,500 metres (Shipway et al 2020). The species has been previously recorded to the north, south and south-east of the project area (DELWP 2020a), and there is one previous record from 1977 that occurs within 150 metres of the project area, near the intersection of Burns Road and Mount Bride Road in Yarra State Forest near Mount Bride (DELWP 2020a). The field assessment to determine the likely presence of the species focussed on the following:

- Active searching and assessment of habitat at and around the 1977 record near Mount Bride.
- Assessment of areas flagged during vegetation assessments as supporting a high cover of grasses and/or sedges (and any additional areas supporting suitable habitat features opportunistically encountered).
- Broad assessment of representative areas of the project area to further qualify, define and describe the types and extents of fauna habitat present, to further inform a revised assessment of the likelihood of Broad-toothed Rat occurring within the project area.

Active searching for the characteristic scats and runways of Broad-toothed Rat was the primary survey method applied to any areas of potentially suitable habitat identified within the project area (i.e. sedge-dominated areas described above). Active searching for scats is a highly effective survey method for this species, with previous studies indicating that Broad-toothed Rat can be detected with 98% confidence within five minutes of searching for scats in areas of suitable habitat (Green and Osborne 2003; Shipway et al 2020). The closest known population of Broad-toothed Rat to the project area is located at Bellell Creek, Cambarville, approximately 25 kilometres north-east of the project area. To confirm the suitability of scat searches and to view a representative area of lowland habitat, Bellell Creek was visited on 24 February 2021 and Broad-toothed Rat scats were located within approximately 3 minutes of searching suitable sedgeland habitat at that location. Broad-toothed Rat scats are readily identifiable by their colour (bright green when fresh, and pale straw colour when old) and fibrous contents, which distinguishes them from the scats of other species.

6.2.8 Aquatic habitat assessment

To describe the existing conditions for aquatic habitats in the project area, a desktop assessment of aquatic ecological values was undertaken, except for Mount Donna Buang Wingless Stonefly where targeted surveys were undertaken (see Section 6.2.8.1 and Appendix 10). The objectives of the desktop aquatic assessment were to:

- Broadly characterise aquatic habitat types, and their distribution, within the project area in response to the EES scoping requirements.
- Assess the general condition of the described aquatic habitat values.
- Determine the aquatic fauna likely to be inhabiting the Yarra River basin to better understand those known or predicted to occur within the project area.

The desktop assessment is the culmination of a two stage process whereby waterways within the project area were first prioritised for broad analysis based on stream hierarchy. Following prioritisation, waterways were reviewed using a combination of aerial imagery, ground photos and descriptions from the Biosis terrestrial ecology team, surrounding fauna records (sourced from the VBA) and information highlighted in existing technical reports (GHD 2019a, Practical Ecology 2019), where applicable, in order to infer instream habitat types, condition and inhabiting aquatic fauna.

The methods for each stage of the desktop aquatic assessment are described below.

Stream order and riparian vegetation classification

Due to the numerous waterways and watercourses in the project area, desktop aquatic habitat investigations have been focussed on waterways as defined according to the *Waterway Determination Guidelines* (DNRE 2002), which include:

- Named river, creeks or streams.
- Unnamed tributaries with an upstream catchment area of 60 hectares or more.

The *Waterway Determination Guidelines* (DNRE 2002) also defines a waterway as having a natural channel that is fed by a spring or absorbent soil. Spatial analysis by GHD did not identify waterways using this definition, although ground-truthing by World Trail sought to identify springs at the time of field assessment (GHD 2019a). A hydrogeological conceptualisation of groundwater interactions with waterways within the project area undertaken by GHD (GHD 2019b) indicates that the system is not static and that spring discharges are likely to vary both spatially and temporally, depending on prevailing weather and seasonal conditions. As such, there is the potential for the presence of additional waterways, as per the Water Act definition, to have been missed during aquatic desktop assessment.

Waterways determined to meet the criteria listed within the *Waterway Determination Guidelines* were then broadly categorised into their hierarchy (as displayed in the Australian State of Victoria's stream network dataset contained in the VicMap Hydro product).

Instream habitat and condition

Following the categorisation of project area waterways, a combination of aerial imagery, ground photos, surrounding fauna records and existing technical reports, where applicable, were reviewed in order to infer and broadly describe the instream habitat values existing in the project area. Ground photos and waterway/watercourse descriptions provided by the terrestrial ecologists that walked the trails and inspected crossing points assisted in characterising instream habitats, habitat suitability for significant species and

general aquatic conditions. Due to the large size of the project area, descriptions of instream habitat and assessments of condition were undertaken for grouped waterways and wetlands according to hierarchy.

During this assessment, records for aquatic fauna (including frogs, fish, aquatic invertebrates, molluscs and crustacea) were searched for the entire Yarra River basin (as defined in the Australian Water Resources Council system) and were obtained from the VBA.

HABSCORE is a visually-based aquatic and riparian habitat assessment that evaluates the structure of the surrounding physical habitat that influences the quality of the water resource and the condition of the resident aquatic community (EPA Victoria 2003). HABSCORE was designed to complement surface water quality assessments and is based on the assumption that the quality and quantity of available physical habitat has a direct influence on biotic communities.

As complementary field assessments (including HABSCOREs) were not undertaken at a representative range of waterways within the project area to ground truth our desktop findings, we have developed a desktop quality criteria based on the summarisation of all available information from the desktop assessment in order to assign an aquatic habitat condition rating to assessed waterways.

The criteria used for assigning the aquatic habitat condition rating is provided in Table 8 below.

Table 8 Criteria for assigning aquatic habitat condition rating to waterways

Aquatic values condition rating	Criteria
Low	<ul style="list-style-type: none"> • Instream habitat highly modified/disturbed; and/or • No Platypus or significant aquatic species habitat
Moderate	<ul style="list-style-type: none"> • Some good quality instream habitat present; and/or • Limited Platypus or significant aquatic species habitat present; and/or • Dry season refuge for common (Least Concern) species.
High	<ul style="list-style-type: none"> • Continuous riparian vegetation; and/or • Platypus or significant aquatic species habitat clearly present; and/or • Near natural/excellent instream habitat.

Habitat suitability for significant aquatic species

Desktop habitat suitability assessments for significant aquatic species were undertaken on the basis of database record locations (for spatially accurate records), stream hierarchy and habitat connectivity.

6.2.8.1 Mount Donna Buang Wingless Stonefly surveys

Appendix 10 contains the methods and results for Mount Donna Buang Wingless Stonefly surveys between 2019 and 2021 in the vicinity of Mount Donna Buang that were undertaken specifically for this project.

6.2.9 Mapping

AECOM and Yarra Ranges Council supplied spatial data for the proposed trail alignments. Practical Ecology provided native vegetation mapping (EVCs, trees, habitat hectare assessments) and threatened ecological community mapping included in their 2019 biodiversity impact assessment report (Practical Ecology 2019).

Additional field mapping undertaken by Biosis between November 2020 and February 2021 was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is

therefore subject to the accuracy of the tablets (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes and pre-construction micro-siting will provide opportunities to refine any of this spatial data.

6.2.10 Large tree mapping

Biosis mapped all large trees within the assessment corridor for trails where Biosis ecologists collected field data. This is in accordance with the standard practice for mapping large trees according to EVC benchmark in native vegetation patches. Biosis ecologists collected data on large tree variables such as diameter at breast height (within 5 to 10 centimetre size classes), tree species, tree health, stem count and presence of hollows. The hollow-bearing status of each benchmark large tree was assessed rapidly from ground observations and where there was doubt regarding the presence of tree hollows a 'no value' result was applied to the large tree in question.

For trails surveyed by Practical Ecology (2019), a non-standard method of large tree assessment was applied by their ecologist and it also appears tree mapping was based on sampling along many of the trails they assessed. Biosis has obtained and reviewed the Practical Ecology field dataset and these data have been merged with the Biosis large tree dataset using DBH results from the Practical Ecology data as an indicator of large tree presence along the trails. A number of gaps in the Practical Ecology large tree dataset were reviewed and re-assessed (e.g. Trail 1).

6.2.11 Definitions of significant species and ecological communities

The project EES scoping requirements use the terms 'protected species', 'listed species', 'threatened species' and 'significant species', and these terms imply different things related to conservation status and legislative protection. The use of these terms interchangeably often leads to confusion regarding the status of significant species and ecological communities.

To avoid confusion, we use the following terms consistently throughout the existing conditions reporting and impact assessment:

Significant species – a collective term that covers all species with a conservation status under the EPBC Act and under the FFG Act. The FFG Act status gazetted in May 2021 and released to the public in July 2021 now supersedes conservation status on DELWP's advisory lists. DELWP's Advisory lists previously contained species that may not be threatened but have a rare, near threatened, data deficient or poorly known status. The Guidelines and species habitat units offsets requirements still use superseded DELWP's Advisory list status and therefore the new FFG Act listings are not aligned with the Guidelines approach to conservation status. Therefore, DELWP's Advisory lists conservation status have been retained in some places in this report.

Threatened species – a collective term for species listed as threatened with extinction (i.e. critically endangered, endangered or vulnerable) under the EPBC Act and the new FFG Act listing or a species listed as threatened on DELWP's advisory lists (i.e. critically endangered, endangered or vulnerable).

Threatened ecological community (TEC) – an ecological community listed as threatened under the EPBC Act or FFG Act.

Nationally threatened species/communities – a species or community listed as threatened with extinction (i.e. critically endangered, endangered, vulnerable) under the EPBC Act.

State threatened species/communities – a species or community listed as threatened under the FFG Act or a species listed as threatened on DELWP's advisory lists (i.e. critically endangered, endangered or vulnerable).

Protected flora – flora species that have legal protection on public land under the FFG Act, some of these species are also listed threatened taxa or part of a threatened ecological community. Some of these protected flora species are not threatened with extinction but are protected on public land to regulate collection for commercial purposes.

It should be noted that DELWP has recently updated the FFG Act by adding a conservation status listing of plants, animals and fungi in Victoria through the 'Conservation Status Assessment Project'. Where relevant we have referred to new listings from this review. However, the majority of the existing conditions assessments were conducted according to the EES scoping requirements prior the FFG Act threatened lists being gazetted in May 2021. We understand these lists were also only made official and publicly available on DELWP's website on 16 July 2021.

Lists of significant species generated from the databases are provided in Appendix 2 (flora) and Appendix 3 (fauna) and the species have been assessed to determine their likelihood of occurrence based on the process outlined below.

6.2.12 Determining likelihood of occurrence of significant species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the project area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix 2 (flora) and Appendix 3 (fauna). Those species for which there is little or no suitable habitat within the project area are assigned a likelihood of low or negligible and are not considered further.

All significant species from the database review were assessed to determine their likelihood of occurrence. This assessment included all species that have no VBA records within the search area but have modelled habitat in the project area based on DELWP's HIM.

The habitat value for species listed on the DELWP Advisory Lists is calculated by the Habitat Importance Modelling produced by DELWP (DELWP 2019). Significant species that are not also threatened species i.e. those with a rare, near threatened, data deficient or poorly known status on DELWP's advisory list are considered using data from this modelling.

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered. Where targeted surveys were not undertaken for listed species, but suitable habitat is present, the species were assumed to be present for the purposes of impact mitigation considerations. Only those species where a significant impact is likely were considered for biodiversity offset requirements.

6.2.13 Biosis permits

Biosis undertakes flora and fauna assessments under the following permits and approvals (these permits do not apply to work not undertaken by Biosis):

- Research Permit/Management Authorisation and Permit to Take/Keep Protected Flora & Protected Fish issued by DELWP under the Victorian *Wildlife Act 1975*, *Flora and Fauna Guarantee Act 1988* (FFG Act), *National Parks Act 1975* and *Crown Land (Reserves) Act 1978* (Permit Number 10008711; expires 30 April 2021)
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the Victorian *Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041; expires 10 February 2024)

- Approvals 30.17 and 19.18 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR; expires 12 July 2021).
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020; expires 30 June 2021).

6.2.14 Summary of trail assessment effort

Below is an outline of trail survey effort by Biosis and Practical Ecology between 2019 and 2021 (Table 9). Practical Ecology also undertook surveys for the project as early as 2017 and the survey dates below have been derived from their spatial data.

Table 9 Trail survey timing and effort (note - PE dates derived from their spatial data)

Trail number	Surveyor	Survey date
1	Practical Ecology	17/10/2019
1	Biosis	21/02/2021
1	Biosis	5-8/07/2021
2	Biosis	25/02/2021
2	Practical Ecology	17/10/2019
3	Practical Ecology	17/10/2019
4	Practical Ecology	17/10/2019
5	Practical Ecology	17/10/2019
6	Practical Ecology	17/10/2019
7	Practical Ecology	17/10/2019
8	Practical Ecology	17/10/2019
9	Biosis	21/02/2021
10	Biosis	21/02/2021
11	Practical Ecology	17/10/2019
12	Practical Ecology	17/10/2019
13	Practical Ecology	17/10/2019
14	Practical Ecology	17/10/2019
15	Practical Ecology	17/10/2019
16	Practical Ecology	17/10/2019
17	Biosis	23/11/2020
18	Practical Ecology	17/10/2019

Trail number	Surveyor	Survey date
18	Biosis	24/11/2020
19	Practical Ecology	17/10/2019
20	Practical Ecology	17/10/2019
21	Practical Ecology	17/10/2019
22	Practical Ecology	17/10/2019
23	Practical Ecology	17/10/2019
24	Practical Ecology	17/10/2019
25	Existing vehicle track	
26	Existing MTB trail	
27	Practical Ecology	17/10/2019
27	Practical Ecology	18/10/2019
27	Biosis	21/02/2021
28	Practical Ecology	17/10/2019
29	Existing vehicle track	
30	Practical Ecology	17/10/2019
31	Practical Ecology	17/10/2019
32	Practical Ecology	17/10/2019
33	Practical Ecology	17/10/2019
33	Biosis	21/02/2021
34	Existing MTB trail	
35	Practical Ecology	17/10/2019
35	Practical Ecology	18/10/2019
35	Biosis	21/02/2021
36	Practical Ecology	17/10/2019
37	Biosis	21/02/2021
38	Practical Ecology	17/10/2019
39	Practical Ecology	17/10/2019
40	Biosis	25/11/2020
41	Biosis	24/11/2020

Trail number	Surveyor	Survey date
41	Biosis	25/11/2020
41	Biosis	21/02/2021
41	Biosis	23/02/2021
42	Biosis	24/11/2020
42	Biosis	25/11/2020
42	Biosis	26/11/2020
43	Biosis	21/02/2021
44	Biosis	21/02/2021
45	Biosis	8/09/2020
45	Biosis	2/02/2021
45	Biosis	3/02/2021
46	Biosis	21/02/2021
46	Biosis	24/02/2021
47	Biosis	21/02/2021
48	Biosis	21/02/2021
49	Biosis	8/09/2020
49	Biosis	1/02/2021
50	Biosis	8/09/2020
50	Biosis	1/02/2021
51	Biosis	21/02/2021
52	Biosis	8/09/2020
52	Biosis	24/11/2020
52	Biosis	3/02/2021
52	Biosis	4/02/2021
52	Biosis	21/02/2021
53	Biosis	24/11/2020
53	Biosis	21/02/2021
54	Biosis	21/02/2021
55	Biosis	21/02/2021

Trail number	Surveyor	Survey date
56	Biosis	21/02/2021
57	Biosis	21/02/2021
58	Biosis	21/02/2021
59	Biosis	25/11/2020
60	Existing vehicle track	
61	Biosis	23/11/2020
62	Biosis	21/02/2021
63	Biosis	21/02/2021
64	Biosis	21/02/2021
65	Biosis	8/09/2020
65	Biosis	2/02/2021
66	Biosis	21/02/2021

6.3 Avoidance and design

This section discusses the key design phase principles, actions and measures to avoid and minimise impacts on biodiversity values. A risk-based approach has underpinned project design and key biodiversity risk pathways were identified and addressed prior to the project requiring an EES and EPBC Act approval. The risk-based approach was further refined during the early stages of the biodiversity technical study and, in combination with the EES scoping requirements, informed the focus of existing conditions assessments and avoid and minimise strategies.

Considerable effort was applied to avoiding and minimising the likely magnitude, extent and duration of trail construction and operation impacts. A particular focus was placed on trail alignments and design responses that would avoid a significant impact on EPBC Act listed threatened plants, mammals and bird, and also reduce the potential significant effects on State significant biota. Consequently, the principles of avoiding and minimising impacts on threatened biota have translated into minimising impacts on general biodiversity values including native vegetation, trees, non-threatened wildlife and aquatic habitats. Avoidance and minimisation principles have underpinned the project alternatives screening process mandated by the EES scoping requirements. In practice this has required, additional field investigations to find trail alignments that avoided and/or minimised impacts and to arrive at feasible sensitive construction methods. These avoid and minimise strategies are coupled with a range of standard and highly project-specific construction and operation mitigation measures.

The following design principles and measures have been adopted across the project design phase and will underpin the construction and operation phases to adequately describe and quantify biodiversity impacts and to ensure these impacts are avoided and minimised (detailed risk assessments and mitigation measures are presented in Section 6.4, Section 8 and Section 12):

- Placement of the proposed visitor hub and other major trailhead infrastructure in areas absent of native vegetation or areas subject to previous disturbance, i.e. in cleared areas at Wesburn Park and the Warburton Golf Course, and previously logged areas at Mount Tugwell along Mount Bride Road.
- Siting several new trails on existing formal and informal tracks and benches where possible, especially in State Forest areas with a recent history of logging operations and recreational access.
- Incorporating existing informal MTB trails in the Mount Tugwell area of Yarra State Forest.
- Where possible, designing trails to be within proximity to existing roads, walking trails or information MTB trails. This has resulted in 45% of the proposed trail network being within 100 metres of an existing track or trail (i.e. existing linear disturbance footprints, see Figure 16).
- Choice of shuttle bus routes that avoid the need for road widening in forested environments.
- The new bridge over the Yarra River to fully span the river and not require works in the waterway. Riparian vegetation at this location is poor quality.
- Ensuring trail styles and construction methods only require the removal of understorey vegetation so the forest canopy and sub-canopy will remain intact.
- Designing trails to follow land contours and take advantage of flat spurs and ridges, where possible, minimising the need for major soil excavation.
- Using trail designs and styles to achieve a balance of cut and fill soil material in trail construction, meaning that surplus spoil will not require disposal and fill would not be imported into the project area.

- Using the design principle of elevating all waterway crossings to minimise disturbance of aquatic habitats and to reduce ongoing point sources for sedimentation of local waterways.
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid significant flora species populations, minimise disturbance of wildlife habitat, minimise indirect impacts on significant trees and minimise impacts on waterways, other watercourses, springs and soaks.
- Engaging a professional arborist at the design stage to review existing conditions for trees in the project area provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of forest trees.
- Applying trail operation and maintenance standards to minimise ongoing residual impacts. These include prohibiting night riding in the Yarra Ranges National Park and high quality forest habitats in the Yarra State Forest to minimise nocturnal fauna disturbance, and applying seasonal closures of high elevation trails to maintain trail integrity and to minimise sedimentation during the winter months.
- Siting of trails to **avoid** areas of high ecological value, including:
 - Avoiding siting trails in dense montane thicket vegetation that provides high quality habitat and translocation recipient sites for Leadbeater’s Possum between Mount Donna Buang, Mount Victoria and Ben Cairn.
 - Avoiding any direct removal of hollow-bearing trees, and avoiding the removal of any tree stems greater than 10 centimetres DBH in Yarra Ranges National Park and tree stems greater than 20 centimetres DBH in Yarra State Forest.
- Siting and construction of trails to **minimise** impacts to the extent possible on areas of high ecological value, including:
 - Minimising impacts on headwater springs and soaks between Mount Donna Buang, Mount Victoria and Ben Cairn that provide habitat for Mount Donna Buang Wingless Stonefly. It is proposed to elevate any trails that intersect these habitat types. The intention of using low impact elevated structures is to minimise soil disturbance and reduce sources of sedimentation.
 - Minimising impacts on Cool Temperate Rainforest and Cool Temperate Mixed Forest threatened communities through reducing trail alignments that intersect these communities and committing to hand build any trails within areas that have Myrtle Beech canopy cover. Hand built trails have a significantly smaller impact footprint than machine built trails and also reduce the risk of wounding and damage to rainforest vegetation and Myrtle Beech trees.
 - Minimising the removal of understorey or sub-canopy vegetation that provides structural connectivity in forest habitats, this will be achieved in part through having a maximum overhead height clearance of 2.5 metres from ground level.
 - Committing to hand build a range of trails within Yarra Ranges National Park and Yarra State Forest to minimise overall understorey vegetation removal and project offset requirements.
 - Minimising impacts on watercourses and headwater areas that provide Mount Donna Buang Wingless Stonefly habitat.
- Adoption of specific measures to avoid and minimise ecological values for project scenario 1 that involves development of trail 1:

- Realigning this trail in July 2021 after consultation with species experts to avoid direct impacts on high quality Leadbeater’s Possum habitat and translocation recipient sites along the headwaters of Walker Creek, parallel to the summit section of the Donna Buang Road. This alignment has now been shifted upslope into open forest to the north-west out of this gully system that supports dense thickets. This has pushed the trail 1 alignment into the Melbourne Water catchment but has avoided impacts on high quality Leadbeater’s Possum habitat. The alternative to this is trail development scenario 2 that has alternative alignments between Mount Donna Buang and Mount Victoria (i.e. trails 45, 46 and 47).
- Realigning this trail in July 2021 to use the Donna Buang Road surface near Ben Cairn to avoid disturbing a second high quality Leadbeater’s Possum habitat, translocation recipient site and research sites.
- Committing to hand build trail 1 from Mount Donna Buang summit to beyond Ben Cairn. The remaining section below Ben Cairn (except for rainforest vegetation) will be machine built.
- Investigating feasible alternative alignments to achieve further avoidance and minimisation of biodiversity impacts in accordance with the Assessment of Alternative Trails process (see Section 11).

6.4 Risk assessment

6.4.1 Risk overview and purpose

An environmental risk assessment was completed to inform the focus of the impact assessment through identifying and prioritising potential environmental issues associated with construction and operation of the project. The risk-based approach is integral to the EES as required by section 3.1 of the Scoping Requirements and the Ministerial guidelines for assessment of the environmental effects under the *Environment Effects Act 1978*.

Specifically, the EES risk assessment aimed to:

- Provide a consistent evaluation tool that is used for all assessments to systematically rate the key issues associated with the project.
- Identify and prioritise potential environmental issues associated with the project that may require further examination through the detailed impact assessments.
- Inform project development and / or development of measures to avoid, mitigate and manage potential environmental impacts.

In accordance with *Environment Effects Act 1978 Advisory Note DELWP Impact Assessment Guidance Use of impact assessment and risk assessment in environment effects statements* (DELWP 2021a), the risk assessment is a tool to identify and assess impacts and mitigation measures but does not form the main basis for prediction and assessment of impacts.

6.4.2 Risk assessment process

The risk assessment process adopted is consistent with the AS/NZS ISO 31000:2018 Risk Management Process. The following tasks were undertaken to identify, analyse and evaluate risks:

- Use existing environmental conditions and identify applicable legislation and policy to establish the context for the risk assessment.
- Develop likelihood and consequence criteria and a risk matrix.
- Consider construction and operational activities in the context of existing conditions to determine risk pathways.
 - Each risk pathway was assigned a code relating to the nature of the pathway. For biodiversity impacts the code **BR##** i.e. **BR01** was used.
- Identify standard controls and requirements to mitigate identified risks.
 - Initial mitigation measures to inform the risk assessment included:
 - Measures included in the Construction Environment Management Plan (CEMP) or Operations Weed and Maintenance Plan (OWMP) that the project has committed to.
 - Requirements under existing legislation.
 - Standard measures implemented on similar projects.
 - Each mitigation measure was assigned a code relating to the nature of the measure. For measures relating to biodiversity the code **BM##** i.e. **BM01** was used.
- Assign likelihood and consequence ratings for each risk to determine risk ratings considering design, proposed activities and mitigation measures.

The assessment of risk combines the consequences of a threat and the likelihood of that consequence occurring, resulting in an overall risk rating. Any risk with an overall rating of medium or above requires further analysis, in line with the avoid, minimise or manage hierarchy.

Risk can be defined as a combination of:

- The magnitude of potential consequences of an event occurring.
- The likelihood of the consequence event occurring.

6.4.3 Assigning a consequence level

Consequence refers to the outcome of an event affecting an asset, value or use. Table 10 presents the consequence framework describing the consequence levels from 'Insignificant' to 'Severe'. The consequence criteria have been developed in the form of project-wide criteria rather than discipline specific, to enable a consistent assessment of consequences across a range of potential environmental effects.

Consequence criteria is assigned based on the maximum credible consequence of the risk pathway occurring. Where uncertainty regarding consequences existed, a conservative approach to assessing risk has been adopted.

Consequence criteria considered the following characteristics:

- Spatial extent of impact.
- Duration and reversibility of potential impacts.
- Sensitivity and significance of the receiving environment.
- Magnitude, or severity of potential impact.

Each risk pathway will be assigned a level of consequence taking into account the guidance in Table 10. That consequence level, together with the likelihood level will be used to determine a risk rating in accordance with the risk matrix presented in Table 12.

Table 10 Guide to consequence levels

Level	Criteria
Insignificant	<ul style="list-style-type: none"> • No detectable changes or very short-term and localised • Readily reversible (insignificant) impact (<1 year for recovery). • Resilient or highly disturbed receiving environment or population. • No impact to native vegetation or habitat. • No impact on critical habitats for significant species or ecological communities.
Minor	<ul style="list-style-type: none"> • Short-term localised detectable changes. • Impact likely to be readily reversible (within 5 years for recovery). • Resilient or disturbed receiving environment or population. • No impact on critical habitats for significant species or ecological communities.
Moderate	<ul style="list-style-type: none"> • Short or medium-term detectable changes at a number of locations within the project area. • Impact likely to be medium-term and reversible (5–10 years for recovery). • Undisturbed receiving environment or population. • Short-term, localised impacts on critical habitats for significant species or ecological communities.

Level	Criteria
Major	<ul style="list-style-type: none"> Long-term changes that are significant regionally Impact likely to be medium to long-term and potentially irreversible (> 10 years to recover). Sensitive receiving environment or population. Material impacts on critical habitats for significant species or ecological communities.
Severe	<ul style="list-style-type: none"> Permanent changes that are significant at a State or Commonwealth level. Impact likely to be long-term and irreversible. Highly sensitive receiving environment or population. Significant impacts on critical habitats for significant species or ecological communities.

6.4.4 Assigning a likelihood level

‘Likelihood’ the combination of chance of an event and the chance of the identified consequence occurring. The likelihood criteria ranges from ‘Rare’ where the event and consequence may occur only in exceptional circumstances to ‘Almost Certain’ where the event and consequence is expected to occur in most circumstances. Likelihoods are assigned for the maximum credible consequence according to the levels presented in Table 11.

Table 11 Guide to likelihood levels

Level	Description
Rare	The event could occur but only in exceptional circumstances
Unlikely	The event could occur but is not expected in the course of normal circumstances
Possible	The event may occur in the course of normal circumstances
Likely	The event will probably occur in the course of most normal circumstances
Almost Certain	The event is expected to occur in the course of most normal circumstances

6.4.5 Assigning a level of risk

Risk is defined as combination of the likelihood of an event occurring and the consequence of that event occurring. A risk rating was determined by these factors using the risk matrix, presented in Table 12.

Table 12 Risk matrix

		Consequence rating				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood rating	Rare	Very Low	Very Low	Low	Medium	Medium
	Unlikely	Very Low	Low	Medium	Medium	High
	Possible	Very Low	Low	Medium	High	High
	Likely	Low	Medium	High	High	Very High
	Almost certain	Low	Medium	High	Very High	Very High

When risks are rated as medium or above, the impacts associated with the risk pathway are assessed in an increasing level of detail and will prompt further exploration of potential mitigation and management actions to reduce the overall impact.

6.5 Impact assessment methods

The impact assessment was undertaken to address potential impacts of construction and operation of the mountain bike trails on terrestrial flora (plants and native vegetation), terrestrial and aquatic fauna, and terrestrial and freshwater ecosystems identified in the existing conditions assessment. The existing conditions assessment incorporates the review and collation of a number of existing assessment reports and the results of field assessments and analysis undertaken by Biosis. The impact assessment responds to the EES Scoping Requirements and a similar approach to impact assessment was applied for both the trail construction and operational phases of the project.

The assessment of biodiversity impacts considers the risks identified during the risk assessment (i.e. risk pathways themed around biodiversity values). With regards to potential environmental effects, we have considered the key residual impacts of the project and described or quantified these, where possible, in terms of expected magnitude, extent and duration. The assessment of residual impacts takes into account the proposed avoidance, minimisation, mitigation and management commitments. This approach is consistent with that outlined by DELWP (2021a).

In addition, the assessment of impacts to biodiversity values was guided by state and Commonwealth policy and legislation relating to impacts to native vegetation, threatened species and ecological communities. Impacts to MNES protected under the EPBC Act are assessed against significant impact guidelines developed by the Commonwealth of Australia, to determine whether impacts are 'significant' as defined under the Act. The following EPBC Act policy documents were considered in the impact assessment for the Project:

- Matters of National Environmental Significance (MNES). Significant impact guidelines 1.1 (Commonwealth of Australia 2013b).
- Draft referral guidelines for the endangered Southern Brown Bandicoot (eastern) (Commonwealth of Australia 2011a).

Vegetation Quality Assessments (VQA) were undertaken for all patches of native vegetation in the assessment corridor that sits within the project area. This approach used DELWP's VQA method that underpins the concept of Habitat Hectares (DSE 2004a).

The outcomes of other EES technical reports were used as inputs to determine impacts to surface water, Groundwater Dependent Ecosystems (GDEs) and impacts that might arise from noise or air pollution.

6.6 Assessment of alternatives to Trail 1

The assessment of the identified alternative to trail 1 (the combination of trails 45, trail 46 and trail 47) contained in this report included the following tasks:

- Describe the existing conditions relevant to trail 1 and the alternative to trail 1 based on field and desktop information.
- Identify the residual environmental impacts determined for construction and operation of trail 1 and the alternative to trail 1.
- Undertake a comparative analysis of trail 1 and the alternative to trail 1.

- Identify the preferred trail for each discipline based on the comparative analysis.

Biosis participated in the trail alternative assessment process which involved an assessment of where effort should be prioritised to realign trails to reduce biodiversity impacts based on a four-tiered rating system (i.e. very high, high, moderate or low priority for trail realignment). The methods and results of this 'trail screening process' are provided in the project EES chapters.

6.7 Limitations, uncertainties, assumptions

Assumptions and limitations relating to this terrestrial and aquatic biodiversity impact assessment are provided below, and referred to throughout the report where relevant. These factors do not present a significant limitation to the current assessment except where data is yet to be collected or collated.

- A large portion of the existing conditions assessment is based on data gathered and reported by Practical Ecology (2019). This included flora and ecological community surveys, threatened fauna habitat mapping, as well as mapping and scoring of native vegetation along approximately 150 kilometres of the proposed trail network. Biosis has reviewed this data for accuracy and consistency and in places has re-assessed trails due to data gaps (especially related to EVC and rainforest mapping) or due to realignment of trail sections.
- Mapping of Cool Temperate Rainforest and Cool Temperate Mixed Forest relied on a combination of data collected by Biosis and Practical Ecology, and Myrtle Beech canopy mapping undertaken by trail designers (World Trail). Due to the absence of an EVC mapping unit and benchmark for Cool Temperate Mixed Forest any areas of mixed eucalypt/Myrtle Beech forest, that were not pure Cool Temperature Rainforest in sheltered gullies, were assigned the Cool Temperate Rainforest EVC mapping unit (i.e. EVC 31) but were assessed against the Montane Wet Forest EVC benchmark. See Section 6.2.3.3 for further details on CTR / CTMF mapping.
- No comprehensive fauna surveys have been completed within the project area to inform the existing conditions assessment. The assessment of fauna values is largely based on a desktop assessment of existing available information, habitat-based fauna surveys by Biosis zoologists, observations by Biosis ecologists/botanists during vegetation mapping and a habitat assessment undertaken by Practical Ecology (2019).
- Aquatic habitat assessments were desktop-based (except for Mount Donna Buang Wingless Stonefly) and relied on database records, hydrology/watercourse mapping, aerial photography interpretation and ground photos of waterways/watercourses and habitat descriptions gathered during other field surveys.
- Where targeted surveys were not undertaken for listed species, but suitable habitat is present, the species were assumed to be present for the purposes of impact mitigation considerations. Only those species where a significant impact is likely were considered for biodiversity offset requirements. DELWP Habitat Importance Models will not be contested using the alternative arrangements for site-based information regardless of pre-construction micro-siting survey findings and records (refer to Section 11 of the *Guidelines for the removal, destruction or lopping of native vegetation*).
- Ecological surveys and assessments provide a sampling of the flora and fauna at the time and do not provide a comprehensive list of all species that have the potential to utilise the site over time.
 - The Biosis flora and fauna assessment of additional trails was conducted in spring, summer and winter, which cover most survey seasons. Each trail was assessed once over a short time period. Weather conditions were mostly fine during the November 2020 to February 2021 assessments with some rainfall experienced on 23 November. Weather was cold with some high elevation

snow cover in July 2021. It is likely that some species, particularly cryptic species such as terrestrial orchids, may not have been present or flowering at the time of assessment and may not have been recorded. The survey effort is considered sufficient to assess the general values of the project area and undertake biodiversity impact assessments.

- Practical Ecology's (2019) flora surveys were undertaken over a range of seasons between 2017 and 2019 though mostly in late spring. Each trail was only assessed once, over a short time period and in combination with Vegetation Quality Assessments. Again, although late spring is an optimal time to observe many plant species, it is likely that other species, particularly cryptic species such as terrestrial orchids, may not have been present or flowering at the time of assessment and may not have been recorded. Despite this, their survey effort is considered sufficient to assess the general values of the project area and undertake biodiversity impact assessments.
- Biosis has relied on the accuracy of models and tests outlined in other EES technical reports (i.e. noise, groundwater, light) for assessing impacts on terrestrial and freshwater biodiversity.
- For the purposes of this assessment, information and database records for flora and fauna have been drawn from a variety of pre-existing third party sources and from investigations undertaken specifically for the project. Pre-existing records are included where they are documented in publications and reports that have been subject to, or available for peer review. Biosis therefore relies on the accuracy of relevant third-party fauna databases, such as the VBA managed by DELWP and the PMST managed by DAWE. Some databases have time lags between submission of records and their inclusion on searchable versions. This is usually due to time required for their internal expert scrutiny and subsequent acceptance of records.
- Native Vegetation Removal Reports are prepared through DELWP's NVIM system or requested through DELWP's Ensym NVR Tool Support team. Biosis supplies relevant site-based spatial information as inputs to DELWP and we are entirely reliant on DELWP's output reports for all assessment pathway applications. Biosis makes every effort to ensure site and spatial information entered into the NVIM, or supplied to DELWP, is an accurate reflection of proposed native vegetation removal. The Native Vegetation Removal Report are available in Appendix 11.

6.8 Inputs from other EES technical reports

Biosis has drawn on information in the surface water, groundwater, geotechnical, noise and air quality technical reports in undertaking the existing conditions assessment, risk assessment and impact assessment. The qualifications made in those technical reports apply to the conclusions drawn from those sources.