

Fox Creek Adaptive Bike Trail

Native Vegetation Clearance

Data Report

Clearance under the *Native Vegetation Regulations 2017*

30 August 2023

Prepared by J. Carpenter – EBS Ecology (NVC Accredited Consultant)



Fox Creek Adaptive Bike Trail Native Vegetation Clearance Data Report

30 August 2023

Version 2

Prepared by EBS Ecology for ForestrySA

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Cover photograph: Unidentified fungi growing from the burnt trunk of a *Eucalyptus* sp. in the Mt Crawford Forest Reserve.

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Glossary and abbreviations

BAM	Bushland Assessment Method
BDBSA	Biological Database of South Australia (maintained by DEW)
DEW	Department for Environment and Water (South Australia)
EBS Ecology	Environment and Biodiversity Services Pty Ltd (trading as EBS Ecology)
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
GDA2020	Geocentric Datum of Australia 2020
ha	Hectare(s)
IBRA	Interim Biogeographical Regionalisation of Australia
km	Kilometre(s)
LSA Act	<i>Landscape South Australia Act 2019</i>
m	metre(s)
MGA2020	Map Grid of Australia 2020
NatureMaps	Initiative of DEW that provides a common access point to maps and geographic information about South Australia's natural resources in an interactive online mapping format
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NV Act	<i>Native Vegetation Act 1991</i>
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool
Project	Fox creek adaptive bike trail construction.
Project Area	The area where native vegetation clearance is proposed (i.e. the footprint of the Project).
Search Area	5 km buffer of the Project Area considered in the desktop assessment database searches
SEB	Significant Environmental Benefit
sp.	Species
spp.	Species (plural)
ssp.	Sub-species
TEC	Threatened Ecological Community
var.	Variety (a taxonomic rank below that of species and subspecies, but above that of form)

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Attachments

Attachment 1 - *Mt Crawford Forest Reserve Cudlee Creek Forest Strategic Plan*

Attachment 2 – NVC scoresheets (electronic Excel format).

Attachment 3 – Spatial data package (Electronic ESRI shapefiles).

1. Application information

Details of the applicant are listed in Table 1, while a summary of the proposed native vegetation clearance is provided in Table 2.

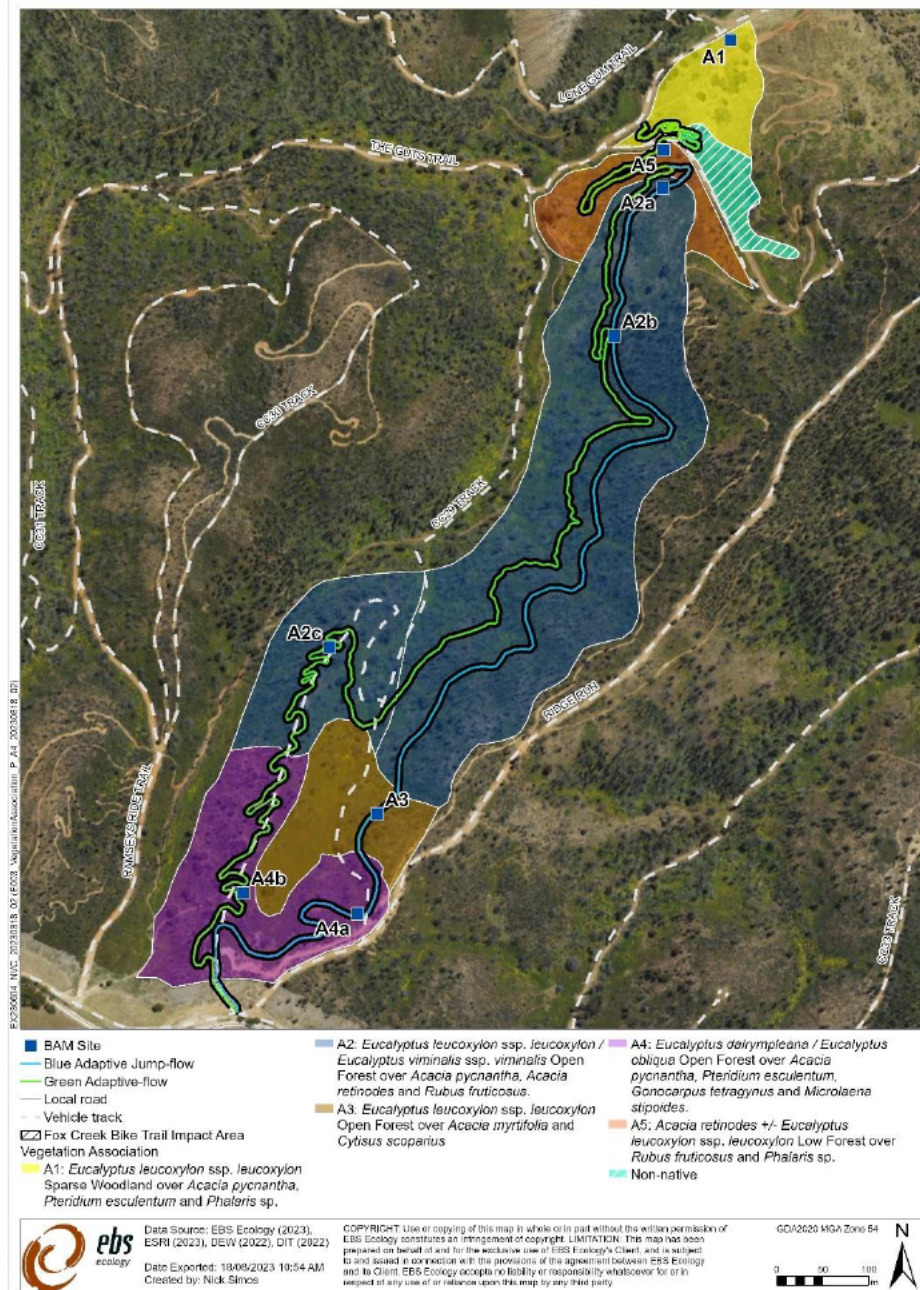
Table 1. Application details.

Applicant:	ForestrySA		
Key contact:			
Landowner:	ForestrySA		
Site Address:	396 Croft Rd, Cudlee Creek, South Australia (SA)		
Local Government Area:	Adelaide Hills Council	Hundred:	Talunga
Title ID:	CR/6091/132	Parcel ID	H105900 S160 H105900 S158

Table 2. Summary of the proposed clearance.

Purpose of clearance:	Clearance is required for two adaptive mountain bike trails.
Native Vegetation Regulation:	Regulation 12, Schedule 1; clause 36, recreation track.
Description of the vegetation under application:	<p>The vegetation under application is in poor to moderate condition and is in an area formerly used for plantation timber. There is generally a high impact from weeds, with woody weeds and introduced grasses dominant in the under storey throughout most of the area.</p> <p>The vegetation under application consists of five degraded vegetation associations, consisting of regrowth:</p> <p>A1. <i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> Sparse Woodland over <i>Acacia pycnantha</i>, <i>Pteridium esculentum</i> and <i>Phalaris</i> sp.</p> <p>A2. <i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> / <i>Eucalyptus viminalis</i> ssp. <i>viminalis</i> Open Forest over <i>Acacia pycnantha</i>, <i>Acacia retinodes</i> and <i>Rubus fruticosus</i>.</p> <p>A3. <i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> open forest over <i>Acacia myrtifolia</i> and <i>Cytisus scoparius</i>.</p> <p>A4. <i>Eucalyptus dalrympleana</i> / <i>Eucalyptus obliqua</i> Open Forest over <i>Acacia pycnantha</i>, <i>Pteridium esculentum</i>, <i>Gonocarpus tetragynus</i> and <i>Microlaena stipoides</i>.</p> <p>A5. <i>Acacia retinodes</i> +/- <i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> Low Forest over <i>Rubus fruticosus</i> and <i>Phalaris</i> sp.</p>
Total proposed clearance – area (ha) and/or number of trees:	1.71 hectares (ha). No scattered trees.
Level of clearance:	Level 4
Overlay (Planning and Design Code):	<ul style="list-style-type: none"> Native Vegetation State Significant Vegetation

Map of proposed clearance area:



Mitigation Hierarchy:

Avoidance

The trail alignment has been microsituated to avoid mature trees, none of which will be impacted by the clearance. However, given the nature of the clearance and the vegetation, it is not possible to avoid all native vegetation.

Minimisation

- The development is consistent with the. *Mt Crawford Forest Reserve Cudlee Creek Forest Strategic Plan* (ForestrySA, 2000).
- The trails are to be constructed within an area of the Mt Crawford Forest Reserve already containing a network of bike trails.
- Alignment has been microsituated to avoid areas mapped as Conservation Management Zones in the *Mt Crawford Forest Reserve Cudlee Creek Forest Strategic Plan* (ForestrySA, 2000) as far as is practicable, given design constraints (see Figure 1 on page 6), with the clearance occurring in areas formerly used to grow timber plantations.
- Most of the trails traverse mid to lower slopes that are dominated by weeds and vegetation in poorer condition than that on upper slopes and ridge tops.
- The trails will be constructed to the narrowest possible width, generally 2 metres (m) and widening to 5 m on tight bends and switchbacks, to allow access for adaptive bikes. A 1

	<p>m verge on either side of the trails will be managed vegetation where only partial clearance will occur.</p> <ul style="list-style-type: none"> • All laydown areas, access tracks and any additional facilities required during construction will be placed within the impact footprint or areas already cleared of native vegetation. This includes existing bike park infrastructure including access tracks, carparks and facilities. <p><u>Rehabilitation</u> The clearance is permanent. No rehabilitation will be undertaken.</p> <p><u>Offset</u> The Proponent intends to offset unavoidable impacts by the establishment of an on-ground offset.</p>
Significant Environmental Benefit (SEB) Offset proposal	Details of the proposed SEB area and required management plan will be submitted as an addendum to this application.

2. Purpose of clearance

2.1. Description

Clearance is required for the construction of two adaptive mountain bike trails in the Fox Creek Bike Park. This proposal is from here on referred to as the Project.

2.2. Background

2.2.1. Project location

Two terms are used to describe the location of the Project:

- Project Area – the area where native vegetation clearance is proposed (i.e. the footprint of the Project).
- Search Area – a 5 kilometre (km) buffer surrounding the Project Area and used for the desktop component of this clearance data report.

2.2.2. Landuse history

The Project Area is in the Cudlee Creek Forest, part of the Mt Crawford Forest Reserve. The area is currently managed by ForestrySA. Prior to the Ash Wednesday Bushfire in February 1983 Cudlee Creek Forest included 692 ha of softwood (*Pinus radiata*) plantation.

Following the fire, ForestrySA decided not to replant the area and subsequently manage pine regeneration as part of converting the area to native vegetation. A range of rehabilitation and revegetation works have been undertaken in the Cudlee creek Forest since 1983. These have been implemented to be consistent with the *Interim Cudlee Creek Management Plan*.

The proposed trails are situated within the area mapped as Transition Zone by the *Mt Crawford Forest Reserve Cudlee Creek Forest Strategic Plan* (ForestrySA, 2000). The Transition Zone contains both commercial and non-commercial pine trees, sometimes in significant numbers, as well as native vegetation. Transition Zones are managed to increase their conservation value by the removal of the remaining pines, by undertaking weed control programs and by facilitating natural regeneration of native vegetation and/or revegetation with endemic native species.

Areas currently managed for conservation purposes (the Conservation Management Zone) are largely avoided by the proposed trails (Figure 1).

The *Mt Crawford Forest Reserve Cudlee Creek Forest Strategic Plan* has been provided as Attachment 1.

2.2.3. Landforms and bioregions

The dominant landforms in the Project Area are steep-sided narrow valleys and gullies, dissected with small, ephemeral watercourses. There are some wider valleys where larger watercourses occur, such as Fox Creek, which are part of the River Torrens catchment.

The Interim Bio-regionalisation of Australia (IBRA) classifies Australia's landscapes into geographically distinct Bioregions based on common climate, landform, geology and native vegetation. The IBRA landscape classifications for the Project Area are described in Table 3.

Table 3. IBRA classification and Remnancy of the Project Area.

IBRA Classification	Region (Project Area)	Remnant Vegetation (Remnancy)
Bioregion	Flinders Lofty Block	-
Subregion	Mt Lofty Ranges	15%
Environmental Association	Mt Terrible	41%

2.3. General location map

The Project is in ForestrySA's Fox Creek Bike Park at Mt Crawford Forest Reserve, approximately 4.5 kilometres (km) north-west of Lobethal. The location of the Project is shown in Figure 2. It is in the Adelaide Hills Council and Hundred of Talunga.

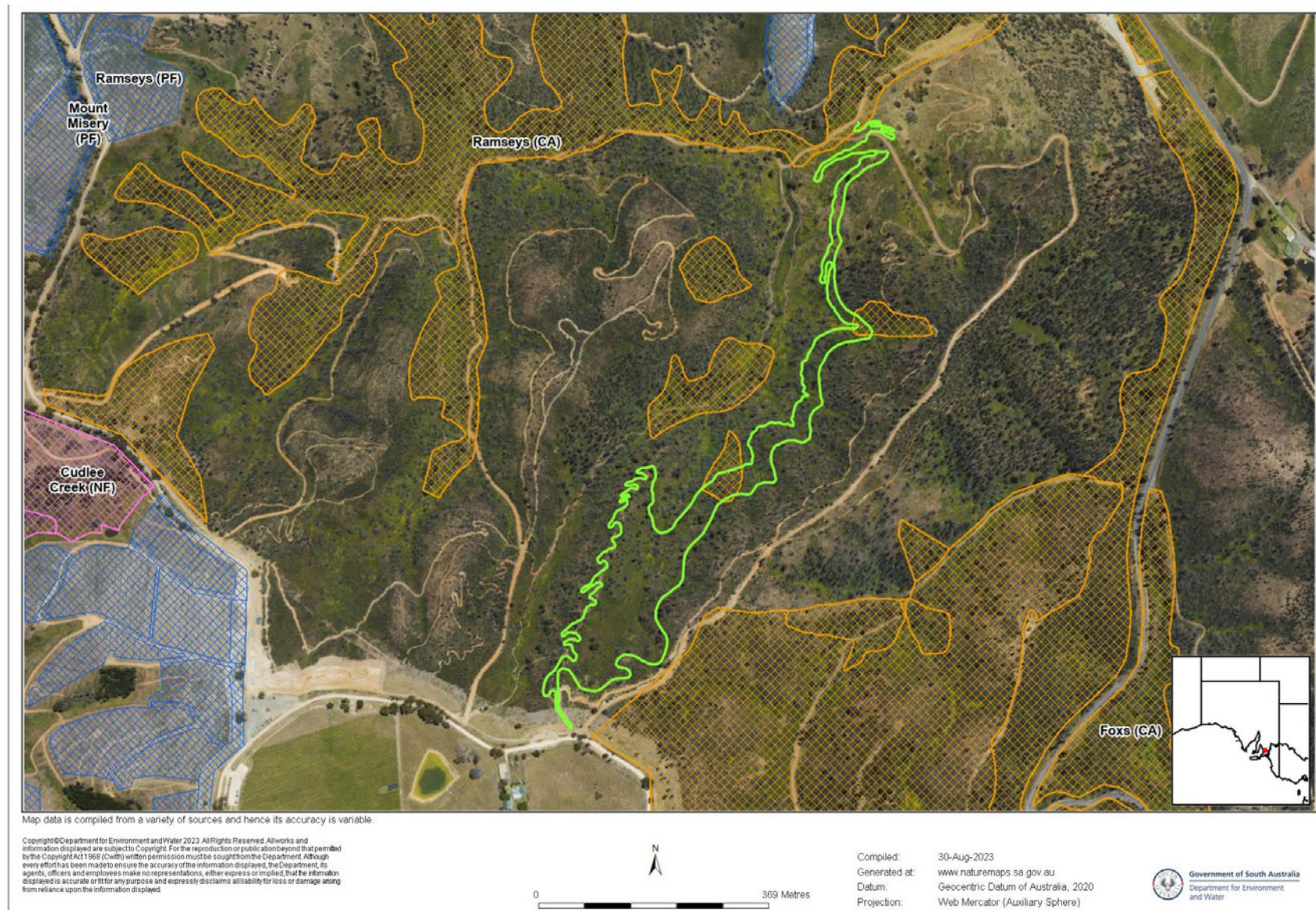


Figure 1. Map indicating the Conservation Management Zones (orange), pine plantations (blue) and native forest (pink) within Cudlee Creek Forest, as mapped by ForestrySA and accessed through NatureMaps (Department for Environment and Water, 2023b). The location of the Project is indicated by the green lines.

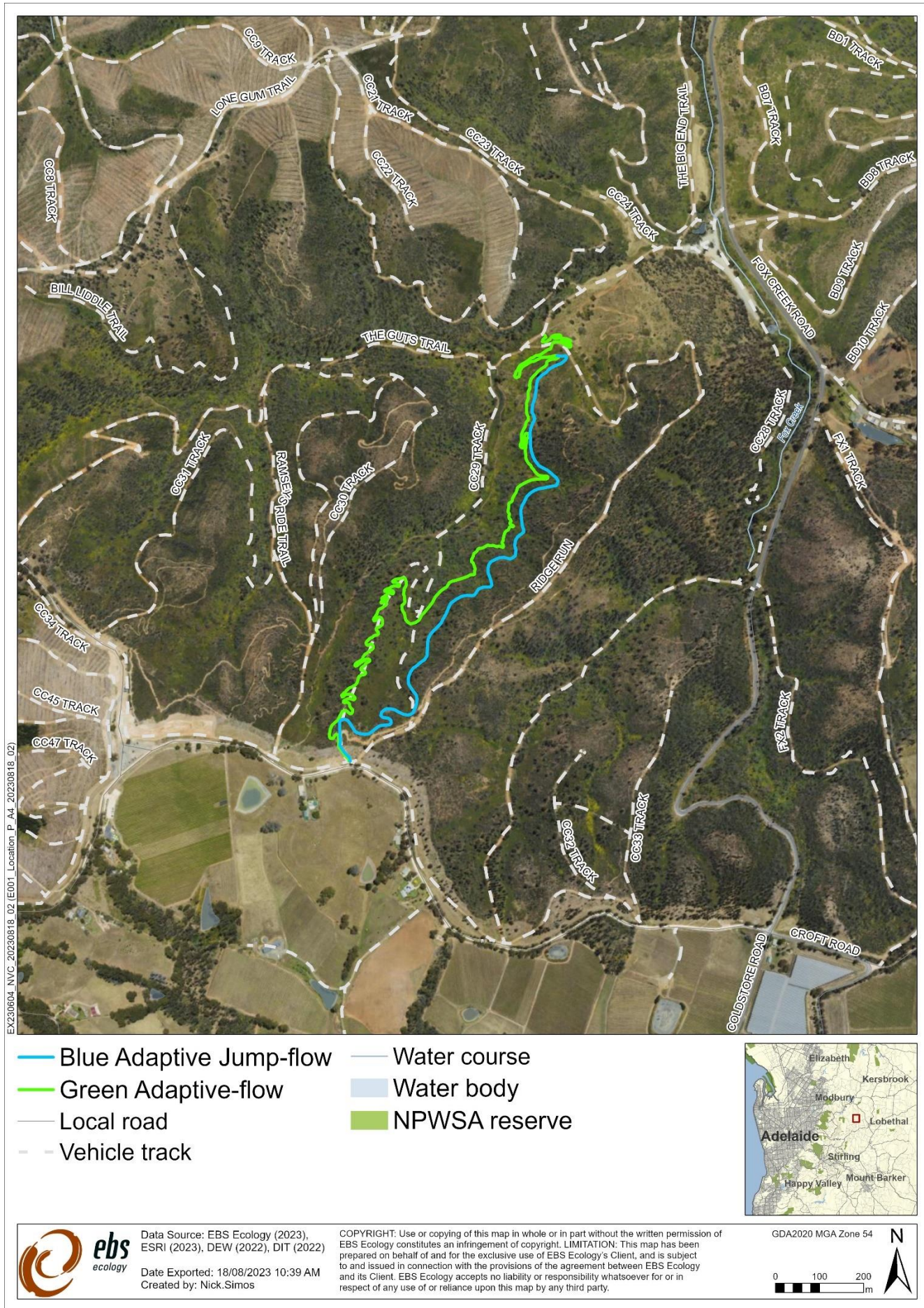


Figure 2. Location of the Project and proposed vegetation clearance.

2.4. Details of the Project

ForestrySA plans to construct two adaptive bike trails in the Fox Creek Bike Park. Each trail will be constructed to a different trail standard as described below:

- Green Adaptive-flow: A combination of fire road or wide single track with a gentle gradient, smooth surface and relatively free of obstacles.
- Blue Adaptive Jump-flow: Single trail with moderate gradients, variable surface and obstacles.

The trails will provide access and riding opportunities for adaptive bike users, facilities that are not currently available at the Fox Creek Bike Park or elsewhere in South Australia.

To allow access for adaptive bikes, a trail footprint of 2 m wide will be required, except on tight corners and switchbacks where 5 m will be required. This width will allow for all batters, curves, surface formations and gradients to be constructed. Any culverts required for drainage will also be constructed within this 5 m width.

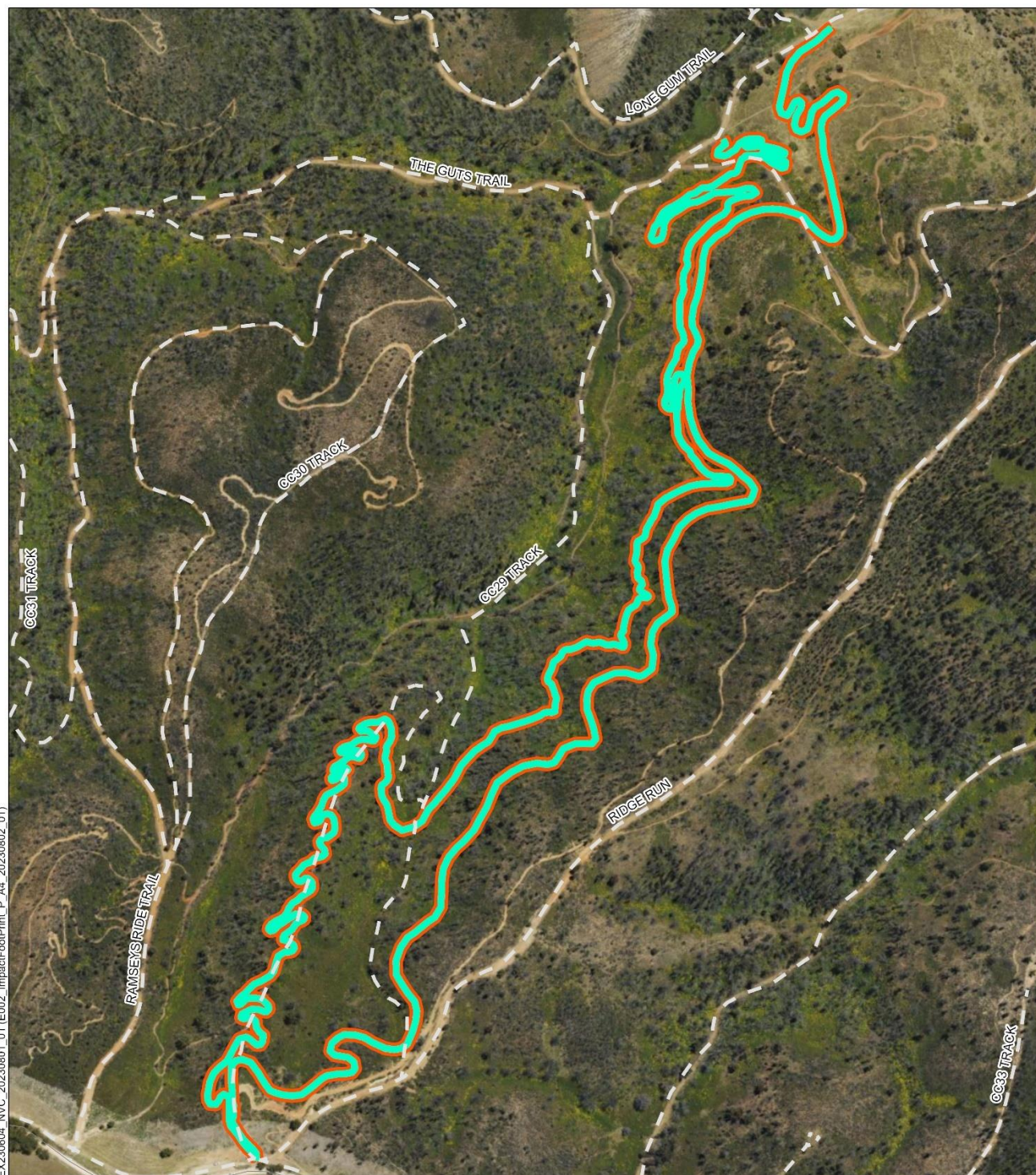
An additional 1 m verge either side of the trail footprint will be required for vegetation management. This verge area will be cleared of tall, overhanging shrubs that is hazardous to adaptive bike uses. However, any mature canopy trees as well as low shrubs and grasses in the verge will not be cleared.

All laydown areas, access tracks and any additional facilities required during construction will be placed within the impact footprint or areas already cleared of native vegetation. This includes existing bike park infrastructure including access tracks, carparks and facilities.

The total expected impact footprint of the Project is summarised in Table 4. Given that the impact footprint of the trails overlaps at some locations, a total footprint of 1.71 ha is expected. This is shown on the map in Figure 3.

Table 4. The expected impact footprint of the Project, including areas of non-native vegetation. Note that the footprint of the two trails overlaps in some areas.

Project	Length (m)	Trail Width (m) (full clearance)	Verge Width (m) (managed vegetation)	Impact Footprint (ha)
Green Adaptive-flow	2,481.72	2 to 5	2	1.71
Blue Adaptive Jump-flow	1,457.55			



- Local road
- - Vehicle track

Fox Creek Bike Trail Impact Area

- Trail Footprint (5 m)
- Trail Verge (3 m)



Data Source: EBS Ecology (2023),
ESRI (2023), DEW (2022), DIT (2022)
Date Exported: 2/08/2023 10:47 AM
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GDA2020 MGA Zone 54

0 50 100
m



Figure 3. Impact footprint of the proposed Project.

2.5. Approvals required or obtained

2.5.1. *Native Vegetation Act 1991*

Clearance of native vegetation will occur as a result of the Project. Approval is required under the *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017* (see Section 2.6).

2.5.2. *Environment Protection and Biodiversity Conservation Act 1999*

No Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Act 1999* (EPBC Act) will be impacted by the Project. Approval under the EPBC Act is therefore not required.

2.5.3. *National Parks and Wildlife Act 1972*

EBS Ecology holds the required scientific permit for the collection of native flora and fauna under the *National Parks and Wildlife Act 1972* (NPW Act):

- K25613-22

2.5.4. *Landscape South Australia Act 2019*

It is likely that plants Declared under the *Landscape South Australia Act 2019* (LSA Act) will be required. Under the LSA Act, there are legislative responsibilities for the control and transport of Declared plants, as described in Section 4.1.4.

2.5.5. *Planning, Development and Infrastructure Act 2016*

Approval under the Planning, Development and Infrastructure Act is not required.

2.6. Native Vegetation Regulation

The proposed clearance is permissible under the following Native Vegetation Regulation:

- Regulation 12, Schedule 1; clause 36, recreation track.

3. Method

3.1. Flora assessment

The flora assessment was undertaken by Native Vegetation Council (NVC) Accredited Consultant J. Carpenter and EBS Ecologist C Panozzo on the 10th and 11th July 2023. The field was undertaken in accordance with the Bushland Assessment Method (BAM). The BAM is described in *Bushland Assessment Manual* (Native Vegetation Council, 2020a) and is summarised below.

3.1.1. Bushland Assessment Method

The BAM is derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012). The BAM is used to assess areas of native vegetation requiring clearance and calculate the Significant Environmental Benefit, or offset, requirements.

Details of site selection/stratification and assessment protocols, and the biodiversity value components assessed and the factors that influence these components are outlined in the *Bushland Assessment Manual* (Native Vegetation Council, 2020a).

The Conservation Significance Scores were calculated from direct observations of flora and direct and historical observations of fauna species of conservation significance. All fauna identified as known to occur in the Protected Matters Search Tool (PMST) report, and fauna with Biological Database of South Australia (BDBSA) records since 1995 and with a spatial reliability of less than 1 km, within 5 km of the Project Area, were included in the BAM scoresheets. Species determined as unlikely to occur within the Project Area will be removed by the Native Vegetation Branch if the finding is supported. Marine and/or wetland species were omitted from the scoresheets given the clearance does not involve impact to wetland or aquatic habitats.

3.2. Fauna and threatened species assessment

A desktop assessment was undertaken to determine the potential for any threatened fauna species and Threatened Ecological Communities (TECs) to occur within the Project Area. This includes species and communities listed under the EPBC Act and species listed under the NPW Act.

This desktop assessment was achieved by undertaking database searches using a Search Area (5 km buffer of the Project Area).

3.2.1. Protected Matters Search Tool report

A PMST report was generated on 22 June 2023 to identify nationally threatened flora and fauna, migratory fauna and TECs listed under the EPBC Act relevant to the Project Area (Department of Agriculture, Water and the Environment, 2023a). Only species and TECs identified in the PMST report that are likely or known to occur within the Search Area were assessed for their likelihood of occurrence within the Project Area.

3.2.2. Biological Database of South Australia data extract

A data extract from the Biological Database of South Australia (BDBSA) was obtained from the Department for Environment and Water (DEW) to identify threatened flora and fauna species that have been recorded within the Search Area (data extracted: 23/07/2023; DEW 2023a Recordset number: DEWNRBDBSA230712-1).

The BDBSA is comprised of an integrated collection of species records from the South Australian Museum, conservation organisations, private consultancies, Birds SA, Birdlife Australia and the Australasian Wader Study Group, which meet the DEW's standards for data quality, integrity and maintenance. Species with records since 1995 and a spatial reliability of less than 1 km were assessed for their likelihood of occurrence, as discussed in Section 3.2.5.

3.2.3. Provisional List of Threatened Ecosystems

The *Provisional List of Threatened Ecosystems* (Department for Environment and Heritage, 2005) was reviewed to determine whether any vegetation associations impacted meet the criteria for listing as a threatened ecosystem at the state level.

3.2.4. Field survey

Fauna

Targeted bird surveys were undertaken at each of the BAM survey sites. Bird surveys were undertaken using an area search method, with 2 ha searched for 20 minutes by an experienced observer.

All fauna species observed opportunistically was recorded, including tracks, scats and other signs. Notes were taken on the presence of habitat features that might be important for fauna, such as hollow-bearing trees and rock outcrops.

Threatened flora species

The entire alignment of each proposed trail was traversed on foot by two experienced ecologists. The alignment was searched for threatened flora species identified by the desktop assessment.

3.2.5. Likelihood of occurrence

Threatened species and TECs were identified by the desktop assessment were assessed for their likelihood of occurrence in the Project Area. All species with historical records since 1995 with a spatial reliability of <1 km and species listed as 'known to occur' by the PMST report were assessed.

The assessment was based on recency or records, habitat preferences and the results of the field survey, with criteria for the likelihood of occurrence described in Table 5. Marine, wetland and aquatic species were not assessed, as the clearance does not impact these or associated habitats.

Table 5. Criteria for the likelihood of occurrence of threatened species within the Project Area.

Likelihood	Criteria
Highly Likely/Known	Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution or; The species was recorded as part of field surveys.
Likely	Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.

Likelihood	Criteria
Possible	Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species. Recorded within 20 - 40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area.
Unlikely	Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter. Recorded within 20 - 40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area. No records despite adequate survey effort.

3.2.6. Limitations

The desktop assessment was based on existing datasets and references from a range of sources. EBS Ecology has not attempted to verify the accuracy of any such information. The findings and conclusions expressed by EBS Ecology are based solely upon information in existence at the time of the assessment.

Flora and fauna records were sourced from both the EPBC Act Protected Matters Database via the PMST, and the BDBSA via DEW. The BDBSA only includes verified flora and fauna records recorded by DEW or submitted to DEW by partner organisations. It is recognised that knowledge is poorly captured and that the spatial reliability of the data varies. It is possible that significant species occur that are not reflected by database records. Although much of the BDBSA data has been through a variety of validation processes, the lists may contain errors and should be used with caution. DEW give no warranty that the data is accurate or fit for any particular purpose of the user or any person to whom the user discloses the information.

3.2.7. Spatial data limitations

All spatial data has been captured or converted to the following coordinate reference system.

Datum: Geocentric Datum of Australia 2020 (GDA2020).

Projection: Map Grid of Australia 2020 (MGA2020), Zone 54.

All location coordinates listed in this report are expressed using this system. Spatial data converted from other coordinate reference systems may have accuracy limitations.

4. Assessment outcomes

4.1. Vegetation assessment

4.1.1. General description of the vegetation, the site and matters of significance

The Project Area consists mostly of steep to moderately steep north-west facing slopes. There is a fall of approximately 155 metres (m) from the southern end to the northern end of the Project Area. Slopes are dissected by numerous steep-sided gullies that form some of the headwaters of tributaries of the River Torrens. Soils range from rocky, skeletal sandy clays on steep slopes and ridge tops to deeper loams at the base of gullies and valleys.

The vegetation under application is within ForestrySA's Mt Crawford Forest. The Project Area was cleared in the past and used for *Pinus radiata* plantations but was not replanted following the Ash Wednesday Bushfire in 1983. Since that time, native forest has been allowed to naturally regenerate in the area.

The vegetation under application is within forest that was burnt by uncontrolled wildfire that impacted the Mt Crawford area in December 2019. All vegetation surveyed has been impacted by this fire. Some large, mature trees have been killed, while those that survive lack a mature canopy, although considerable epicormic growth has occurred (Figure 4). There has been a large amount of regeneration of pioneer species post fire, such as *Acacia pycnantha* (Figure 5), with most areas of native forest having a dense tall shrub/low tree understorey between 1 m and 2 m in height. Grasses and forbs are generally sparse to absent (Figure 6).

Native vegetation is generally in poor to moderate condition and is the result of regeneration following removal of pine plantations. Introduced shrub species dominate the understorey throughout most of the Project Area, particularly in sheltered, wetter areas and near the bottom of slopes (Figure 8). These woody weeds include species such as *Rubus fruticosus* (Blackberry), *Cytisus scoparius* (English Broom) and *Ulex europaeus* (Gorse). For much of the northern half of the Clearance Area, these species dominate and out-compete native plant species. One such area consists entirely of exotic species, including *Phalaris aquatica*, non-native trees English Broom and Blackberry (Figure 7).

In general, impact from weeds is more severe on mid to lower slopes. Ridge tops and upper slopes where soils are shallow have a greater cover of native understorey species. This includes the northern third of the Project Area.

A network of active and disused fire trails accessible by vehicles surrounds the Project Area on all sides. Numerous smaller bike trails and walking trails also cross the Project Area, contributing to some fragmentation of native vegetation and assisting the continued spread of weed species.

Sixty plant species were recorded (Appendix 1), with five native vegetation associations mapped by the field survey. These associations result from regrowth of native vegetation following removal of pine plantations. In much of the Project Area, vegetation lacks some elements of intact vegetation, such as a mature canopy.

Vegetation associations are described in the tables in Section 4.1.2. An area of 0.13 ha in the northern Project Area contains only sparse (<5% cover) of native vegetation. Mapped as non-native vegetation, impact to this small area is not considered native vegetation clearance (Figure 7).

Vegetation associations are mapped in Figure 9. This map also indicates the area of impacted vegetation.

- A1. *Eucalyptus leucoxylon* ssp. *leucoxylon* Sparse Woodland over *Acacia pycnantha*, *Pteridium esculentum* and *Phalaris* sp. (Section 4.1.2, Table 6).
- A2. *Eucalyptus leucoxylon* ssp. *leucoxylon* / *Eucalyptus viminalis* ssp. *viminalis* Open Forest over *Acacia pycnantha*, *Acacia retinodes* and *Rubus fruticosus* (Section 4.1.2, Table 7).
- A3. *Eucalyptus leucoxylon* ssp. *leucoxylon* open forest over *Acacia myrtifolia* and *Cytisus scoparius* (Section 4.1.2, Table 8).
- A4. *Eucalyptus dalrympleana* / *Eucalyptus obliqua* Open Forest over *Acacia pycnantha*, *Pteridium esculentum*, *Gonocarpus tetragynus* and *Microlaena stipoides* (Section 4.1.2, Table 9).
- A5. *Acacia retinodes* +/- *Eucalyptus leucoxylon* ssp. *leucoxylon* Low Forest over *Rubus fruticosus* and *Phalaris* sp. (Section 4.1.2, Table 10).



Figure 4. Some forest trees have been killed by wildfire that occurred in 2019. Surviving mature trees have reshot from epicormic buds post fire.



Figure 5. Post fire, there has been extensive regeneration of short-lived pioneer species such as *Acacia pycnantha*.



Figure 6. Sparse grass/forb understorey (*Dichondra repens* and *Microlaena stipoides*) beneath a dense cover of *Acacia pycnantha*.



Figure 7. Non-native vegetation in the north of the Clearance Area.



Figure 8. Dense understorey of woody weeds, including *Cytisus scoparius* and *Rubus fruticosus*.

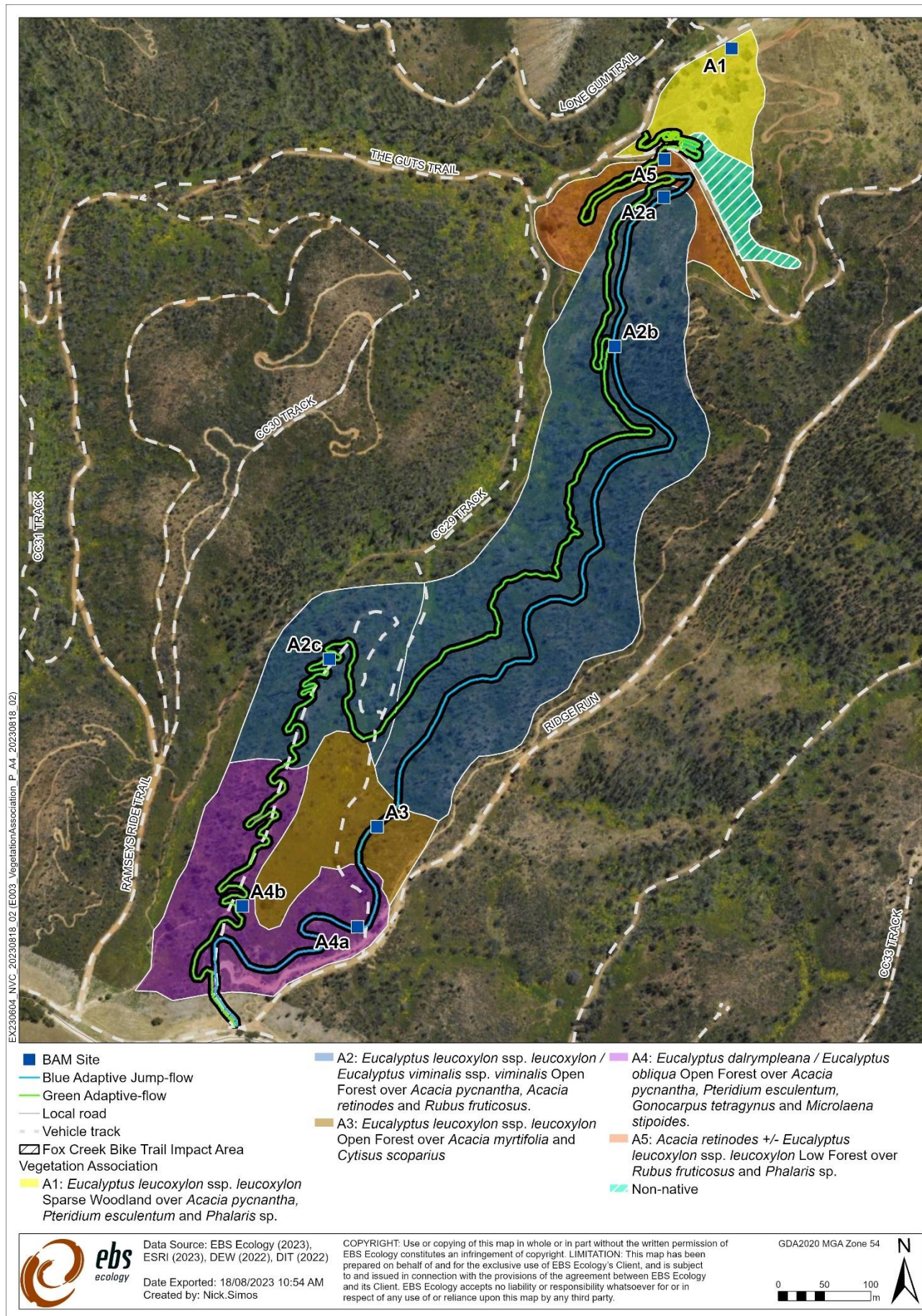


Figure 9. Vegetation associations in the Project Area. The map also indicates the locations of the BAM sites surveyed during the vegetation survey and the location of the vegetation impact (clearance).

4.1.2. Details of the vegetation associates/scattered trees proposed to be impacted

Descriptions of the impacted vegetation associations are provided in the following tables (Table 6 to Table 10).

Table 6. Summary of A1.





Vegetation Association	Acacia melanoxylon +/- Eucalyptus leucoxylon ssp. leucoxylon sparse woodland over Phalaris spp. and Pteridium esculentum.				
Benchmark Community	SMLR 4 – Gully Forests.				
					
	BAM Site A1, looking west.				
General description	Located on the lower slopes of a steep-sided valley, the forest overstorey has been largely cleared, although is regenerating from remnant canopy species. The mid and under storeys are dominated by introduced species, especially grasses such as Phalaris sp. and shrubs including Cytisus scoparius and Rubus fruticosus. In most areas, native mid and understorey species make up at least 5% of the vegetative cover. This includes tall shrub species such as Dodonaea viscosa and the fern Pteridium esculentum. The association is crossed by several existing mountain bike trails and is bordered by vehicle access tracks to the south and west. It is adjacent to the lower Fox Creek Bike Park carpark and access point. The area was formerly a pine plantation, with native vegetation resulting from natural regeneration following removal of plantation post 1983.				
	Over storey	Mid storey		Under storey	
	Eucalyptus leucoxylon ssp. leucoxylon Acacia melanoxylon	Acacia pycnantha Dodonaea viscosa Cytisus scoparius Rubus fruticosus Genista monspessulana		Phalaris sp. Pteridium esculentum Oxalis pes-caprae Juncus subnodulosus	
Threatened species or community	One threatened fauna species was recorded in this vegetation association: <ul style="list-style-type: none">Scarlet Robin (Petroica boodang boodang); NPW Act Rare. Although not recorded during the survey, the vegetation may provide some limited habitat for the following threatened fauna species: <ul style="list-style-type: none">Peregrine Falcon (Falco peregrinus); NPW Act Rare.Restless Flycatcher (Myiagra inquieta); NPW Act Rare.Elegant Parrot (Neophema elegans elegans); NPW Act Rare.				
Landscape context score	1.12	Vegetation Condition Score	3.09	Conservation significance score	1.10
Unit biodiversity Score	3.81	Area (ha)	0.31	Total biodiversity Score	0.72

Table 7. Summary of A2.

Vegetation Association	<i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> / <i>Eucalyptus viminalis</i> ssp. <i>viminalis</i> Open Forest over <i>Acacia Pycnantha</i> , <i>Acacia retinodes</i> and <i>Rubus fruticosus</i> .		
Benchmark Community	SMLR 1 – Forests & Woodlands with a Dense Sclerophyll Shrub Understorey.		
			
BAM Site A2a, looking west.		BAM Site A2b, looking west.	
			
BAM Site A2c, looking south.			
General description	Located on the mid to upper slopes of a steep-sided valley, the forest overstorey has been cleared historically but has regenerated. Although there are some tall, mature trees, large old hollow-bearing trees are absent. The over storey is dominated by <i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> , with <i>Eucalyptus viminalis</i> ssp. <i>viminalis</i> also present. Native tree and shrub species, such as <i>Acacia pycnantha</i> , are regenerating profusely following fire, however native grasses, low shrubs and forbs are sparse to absent. Where it occurs on shallow soils at the top of slopes, there are few weeds, although forbs such as <i>Oxalis pes-caprae</i> and shrubs including <i>Rubus fruticosus</i> are present. Further down slope, woody weeds and introduced grasses including <i>Phalaris</i> sp. and <i>Rubus fruticosus</i> . The area was formerly a pine plantation, with native vegetation resulting from natural regeneration following removal of plantation post 1983.		
	Over storey	Mid storey	Under storey
	<i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> <i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	<i>Acacia pycnantha</i> <i>Acacia retinodes</i> <i>Senecio pterophorus</i>	<i>Rubus fruticosus</i> <i>Phalaris</i> sp. <i>Pteridium esculentum</i> <i>Dichondra repens</i> <i>Scaevola aemula</i>
Threatened species or community	Although none were recorded during the survey, the vegetation may provide some limited habitat for the following threatened fauna species: <ul style="list-style-type: none">White-winged Chough (<i>Corcorax melanorhamphos</i>); NPW Act Rare.Eastern Shriketit (<i>Falcunculus frontatus frontatus</i>); NPW Act Rare.		

	<ul style="list-style-type: none"> • Chestnut-rumped Heathwren (<i>Hylacola pyrrhopygia parkeri</i>); EPBC Act Endangered. • Southern Brown Bandicoot (<i>Isoodon obesulus obesulus</i>); EPBC Act Endangered. • Restless Flycatcher (<i>Myiagra inquieta</i>); NPW Act Rare. • Elegant Parrot (<i>Neophema elegans elegans</i>); NPW Act Rare. • Scarlet Robin (<i>Petroica boodang boodang</i>); NPW Act Rare. • Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>); EPBC Act Vulnerable. • Common Brushtail Possum (<i>Trichosurus vulpecula</i>); NPW Act Rare; • Yellow-tailed Black Cockatoo (<i>Zanda funerea whiteae</i>); NPW Act Vulnerable. • Bassian Thrush (<i>Zoothera lunulata halmaturina</i>); EPBC Act Endangered. 				
Landscape context score	1.12	Vegetation Condition Score	Range: 18.07-35.62 Mean: 27.46	Conservation significance score	A2a, A2c: 1.10 A2b: 1.14
Unit biodiversity Score	Range: 22.26-45.48 Mean: 34.36	Area (ha)	1.82	Total biodiversity Score	Range: 25.82-52.75 Mean: 39.85

Table 8. Summary of A3.


Vegetation Association	Eucalyptus leucoxylon ssp. leucoxylon Open Forest over Acacia myrtifolia and Cytisus scoparius.				
Benchmark Community	SMLR 1 – Forests & Woodlands with a Dense Sclerophyll Shrub Understorey.				
					
		BAM Site A4, looking west.			
General description	A regenerating over storey dominated by Eucalyptus leucoxylon ssp. leucoxylon. Similar in most respects to vegetation association A2, however Acacia pycnantha is largely replaced by Acacia myrtifolia in the mid storey. The association also differs from A2 due to the absence of Eucalyptus viminalis ssp. viminalis. The association is confined to upper slopes of more shallow soils. Weeds are sparse, with introduced forbs such as Oxalis pes-caprae and Hypochaeris glabra found in the under storey. The area was formerly a pine plantation, with native vegetation resulting from natural regeneration following removal of plantation post 1983.				
	Over storey		Mid storey		Under storey
	Eucalyptus leucoxylon ssp. leucoxylon		Acacia myrtifolia Acacia pycnantha Cytisus scoparius Hibbertia sericea Olearia axillaris		Geranium solanderi Gonocarpus tetragynus Hypochaeris glabra Acrotriche serrulata Microlaena stipoides
Threatened species or community	Although none were recorded during the survey, the vegetation may provide some limited habitat for the following threatened fauna species: <ul style="list-style-type: none">• White-winged Chough (Corcorax melanorhamphos); NPW Act Rare.• Eastern Shrikeitit (Falcunculus frontatus frontatus); NPW Act Rare.• Chestnut-rumped Heathwren (Hylacola pyrrhopygia parkeri); EPBC Act Endangered.• Southern Brown Bandicoot (Isodon obesulus obesulus); EPBC Act Endangered.• Restless Flycatcher (Myiagra inquieta); NPW Act Rare.• Elegant Parrot (Neophema elegans elegans); NPW Act Rare.• Scarlet Robin (Petroica boodang boodang); NPW Act Rare.• Grey-headed Flying-fox (Pteropus poliocephalus); EPBC Act Vulnerable.• Common Brushtail Possum (Trichosurus vulpecula); NPW Act Rare;• Yellow-tailed Black Cockatoo (Zanda funerea whiteae); NPW Act Vulnerable.• Bassian Thrush (Zoothera lunulata halmaturina); EPBC Act Endangered.				
Landscape context score	1.12	Vegetation Condition Score	27.82	Conservation significance score	1.10
Unit biodiversity Score	34.27	Area (ha)	0.07	Total biodiversity Score	1.37

Table 9. Summary of A4.




Vegetation Association	Eucalyptus dalrympleana ssp. dalrympleana / Eucalyptus obliqua Open Forest over Acacia pycnantha, Pteridium esculentum, Gonocarpus tetragynus and Microlaena stipoides.				
Benchmark Community	SMLR 1 – Forests & Woodlands with a Dense Sclerophyll Shrub Understorey.				
					
BAM Site A4a, looking south.		BAM Site A4b, looking south.			
General description	Occurring on the upper slopes of high valleys and on ridge tops, a regenerating over storey co-dominated by Eucalyptus dalrympleana ssp. dalrympleana and Eucalyptus obliqua characterises this association. While there are tall, mature trees present, historical clearing has removed old, hollow-bearing trees. Soils are clay to sandy clay with a mid and under storey dominated by native shrubs and forbs, including Acacia pycnantha, Acacia myrtifolia, Hibbertia sericea and Gonocarpus tetragynus. In areas with heavier soils, the fern Pteridium esculentum and shrub Leptospermum juniperina are more common. Weeds are sparse and include species such as Cytisus scoparius and Rubus fruticosus. The area was formerly a pine plantation, with native vegetation resulting from natural regeneration following removal of plantation post 1983.				
	Over storey	Mid storey		Under storey	
	Eucalyptus obliqua Eucalyptus dalrympleana ssp. dalrympleana	Acacia pycnantha Acacia myrtifolia Hibbertia sericea Pultenaea daphnoides		Gonocarpus tetragynus Pteridium esculentum Scaevola aemula Lomandra multiflora ssp. dura Lomandra densiflora Oxalis pes-caprae	
Threatened species or community	The vegetation association is representative of the following endangered ecosystem that is listed on the Provisional List of Threatened Ecosystems: <ul style="list-style-type: none">Eucalyptus dalrympleana ssp. dalrympleana Open Forest on heavy soils of upland valleys. Although none were recorded during the survey, the vegetation may provide some limited habitat for the following threatened species: <ul style="list-style-type: none">White-winged Chough (Corcorax melanorhamphos); NPW Act Rare.Eastern Shrikeitit (Falcunculus frontatus frontatus); NPW Act Rare.Chestnut-rumped Heathwren (Hylacola pyrrhopygia parkeri); EPBC Act Endangered.Southern Brown Bandicoot (Isodon obesulus obesulus); EPBC Act Endangered.Restless Flycatcher (Myiagra inquieta); NPW Act Rare.Elegant Parrot (Neophema elegans elegans); NPW Act Rare.Scarlet Robin (Petroica boodang boodang); NPW Act Rare.Grey-headed Flying-fox (Pteropus poliocephalus); EPBC Act Vulnerable.Common Brushtail Possum (Trichosurus vulpecula); NPW Act Rare;Yellow-tailed Black Cockatoo (Zanda funerea whiteae); NPW Act Vulnerable.Bassian Thrush (Zoothera lunulata halmaturina); EPBC Act Endangered.				
Landscape context score	1.12	Vegetation Condition Score	Range: 24.75 – 25.92 Mean: 25.34	Conservation significance score	A4a: 1.44 A4b: 1.40
Unit biodiversity Score	Range: 39.92-40.64 Mean: 40.28	Area (ha)	0.70	Total biodiversity Score	Range: 17.96-18.29 Mean: 18.13

Table 10. Summary of A5.

Vegetation Association	Acacia retinodes +/- Eucalyptus leucoxylon ssp. leucoxylon Low Forest over Rubus fruticosus and Phalaris sp.				
Benchmark Community	SMLR 1 – Forests & Woodlands with a Dense Sclerophyll Shrub Understorey.				
					
BAM Site A5, looking					
General description	Situated on lower slopes in the northern Project Area, the association is characterised by dense post fire regrowth of Acacia retinodes. Woody weeds are also common, especially Rubus fruticosus. Over storey is sparse and consists of young, mature Eucalyptus leucoxylon ssp. leucoxylon. The sparse understorey is dominated by introduced grasses and forbs, including Phalaris sp. and Oxalis pes-caprae. The area was formerly a pine plantation, with native vegetation resulting from natural regeneration following removal of plantation post 1983.				
	Over storey		Mid storey		Under storey
	Acacia retinodes Eucalyptus leucoxylon ssp. leucoxylon		Rubus fruticosus Senecio pterophorus		Phalaris sp. Bromus diandrus Oxalis pes-caprae
Threatened species or community	Although none were recorded during the survey, the vegetation may provide some limited habitat for the following threatened species: <ul style="list-style-type: none">• White-winged Chough (Corcorax melanorhamphos); NPW Act Rare.• Eastern Shrikeitit (Falcunculus frontatus frontatus); NPW Act Rare.• Chestnut-rumped Heathwren (Hylacola pyrrhopygia parkeri); EPBC Act Endangered.• Southern Brown Bandicoot (Isodon obesulus obesulus); EPBC Act Endangered.• Restless Flycatcher (Myiagra inquieta); NPW Act Rare.• Elegant Parrot (Neophema elegans elegans); NPW Act Rare.• Scarlet Robin (Petroica boodang boodang); NPW Act Rare.• Grey-headed Flying-fox (Pteropus poliocephalus); EPBC Act Vulnerable.• Common Brushtail Possum (Trichosurus vulpecula); NPW Act Rare;• Yellow-tailed Black Cockatoo (Zanda funerea whiteae); NPW Act Vulnerable.• Bassian Thrush (Zoothera lunulata halmaturina); EPBC Act Endangered.				
Landscape context score	1.12	Vegetation Condition Score	8.27	Conservation significance score	1.10
Unit biodiversity Score	10.18	Area (ha)	0.21	Total biodiversity Score	1.43

4.1.3. Threatened Ecological Communities and ecosystems

The PMST report identified one critically endangered TEC listed under the EPBC Act:

- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia.

The report identified that this community may occur in the Search Area. The field survey found that no grassy woodland vegetation associations occur in the Project Area and *Eucalyptus odorata* also does not occur there. Therefore, this TEC does not occur in the Project Area and is not impacted by the clearance.

Vegetation structure and species dominance suggests that two ecosystems that are described by the *Provisional List of Threatened Ecosystems* formerly in the Project Area:

- *Eucalyptus viminalis* ssp. *cygnetensis* and/or *Eucalyptus viminalis* ssp. *viminalis* Woodland on alluvial soils in moist areas (Vulnerable).
- *Eucalyptus dalrympleana* ssp. *dalrympleana* Open Forest on heavy soils of upland valleys (Endangered).

However, given the disturbed nature of the vegetation and the Project Area's former use as a pine plantation, impacted vegetation is not regarded as forming either of these communities.

4.1.4. Weeds

A total of 16 introduced plant species, or weeds, were recorded. This included 6 species of Declared plants under the LSA Act. Declared recorded by the survey plants are listed in Table 11.

Weeds dominated the understorey of all vegetation associations, particularly on the mid to lower slopes. On ridge tops and in areas of more shallow soils, weed cover was significantly less, with the understorey dominated by regenerating native low to tall shrubs species.

Weed cover was dominated by woody species, especially *Rubus fruticosus* (Blackberry) and *Cytisus scoparius* (English Broom), with the introduced grass *Phalaris* sp. also common.

ForestrySA currently undertake weed control activities in the Project Area.

Table 11. Plants Declared under the LSA Act that were recorded by the survey.

Scientific Name	Common Name	Landowner Responsibilities (under the LSA Act)
<i>Cytisus scoparius</i>	English Broom	<ul style="list-style-type: none">• Landowners to take reasonable steps to kill plants and prevent their spread.• Must not be sold or traded in any way, including as a contaminant of anything.• Must not be transported on a public road, including as a contaminant of anything.
<i>Genista monspessulana</i>	Montpellier Broom	<ul style="list-style-type: none">• Landowners to take reasonable steps to kill plants and prevent their spread.• Must not be sold or traded in any way, including as a contaminant of anything.• Must not be transported on a public road, including as a contaminant of anything.
<i>Rosa canina</i>	Dog Rose	<ul style="list-style-type: none">• Landowners to take reasonable steps to kill plants and prevent their spread.

Scientific Name	Common Name	Landowner Responsibilities (under the LSA Act)
		<ul style="list-style-type: none"> • Must not be sold or traded in any way, including as a contaminant of anything. • Must not be transported on a public road, including as a contaminant of anything.
<i>Rubus fruticosus</i>	European Blackberry	<ul style="list-style-type: none"> • Landowners to take reasonable steps to kill plants and prevent their spread. • Must not be sold or traded in any way, including as a contaminant of anything. • Must not be transported on a public road, including as a contaminant of anything. • Must not be imported into the region
<i>Ulex europaeus</i>	Gorse	<ul style="list-style-type: none"> • Landowners to take reasonable steps to kill plants and prevent their spread. • Must not be sold or traded in any way, including as a contaminant of anything. • Must not be transported on a public road, including as a contaminant of anything.
<i>Watsonia meriana</i> var. <i>bulbillifera</i>	Bulbil Watsonia	<ul style="list-style-type: none"> • Landowners to take reasonable steps to kill plants and prevent their spread. • Must not be sold or traded in any way, including as a contaminant of anything. <p>Must not be transported on a public road, including as a contaminant of anything.</p>

4.2. Threatened species assessment

4.2.1. Threatened flora species

Two threatened flora species were recorded during the field survey:

- *Eucalyptus dalrympleana* ssp. *dalrympleana* (Mountain White Gum, Candlebark).
- *Eucalyptus viminalis* ssp. *viminalis* (Manna Gum).

Both species are listed as Rare under the NPW Act. They are not threatened under the EPBC Act. While mature trees have been avoided by the trail alignment, it is likely that some individuals, including saplings and young seedlings, will be impacted by the project.

The desktop assessment identified 21 threatened flora species that might occur in the Project Area (Appendix 2). Only eight of these have been recorded within 5 km of the Project Area since 1995, seven of which have been assessed as possibly, likely or highly likely to occur in the Project Area. These seven species are listed in Table 12, with the likelihood of occurrence assessment provided in full in Appendix 2.

None were observed during the field survey and it is unlikely that any would be impacted by the Project.

The dominance of dense, woody weeds throughout much of the Project Area provides limited habitat for threatened flora species besides those that are not impacted by competition for resources. This includes trees and larger shrub species such as the two species recorded by the field survey.

Table 12. Threatened flora species assessed as possible, likely or highly likely to occur in the Project Area.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Likelihood of Occurrence
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum	R	-	1, 3	2020	Highly likely
<i>Euphrasia collina</i> ssp. <i>osbornii</i>	Osborn's Eyebright	E	EN	1, 2	2020	Possible
<i>Glycine latrobeana</i>	Clover Glycine	V	VU	1, 2	2021	Possible
<i>Poa umbricola</i>	Shade Tussock-grass	R	-	1	2000	Likely
<i>Pterostylis cucullata</i> ssp. <i>sylvicola</i>	Leafy Greenhood	E	VU	1, 2	2022	Possible
<i>Stellaria angustifolia</i> ssp. <i>tenella</i>	Swamp Starwort	R	-	1	2019	Possible
<i>Thelymitra batesii</i>	-	R	-	1	2015	Possible

NPW Act; E = Endangered, V = Vulnerable, R = Rare

EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

Source; 1- BDBSA, 2 - Protected matters search tool, 3 – recorded during the field survey.

4.2.2. Threatened fauna species

The field survey recorded 21 fauna species. This included 19 bird species and two mammals, which are listed in Appendix 3. One species listed under the NPW Act was recorded:

- Scarlet Robin (*Petroica boodang boodang*).

The Scarlet Robin is listed as Rare. Two individuals, a male and female, were observed near BAM site A1. This species is regularly observed in the area and is not likely to be directly or indirectly impacted by the Project. No species listed as threatened under the EPBC Act were recorded by the survey.

One introduced fauna species was observed. A single Red Fox (*Vulpes vulpes*) was seen, also near BAM site A1.

The desktop assessment identified 18 threatened fauna species as either recorded in the BDBSA within 5 km of the Project Area since 1995 or listed as 'known to occur' by the PMST report. Of these, 15 have been assessed as possible, 'likely' or 'highly likely' to occur in the Project Area. These 15 species are listed in Table 13.

Habitat for most threatened species has been heavily impacted by past land use activities, fire and weeds. There are few habitat resources that might be important indicators of threatened species presence, such as large hollow-bearing trees, native understorey and rock outcrops. Nevertheless, the area does provide native forest habitat in an area that has otherwise been heavily cleared in the past.

Given the disturbed condition of vegetation and the current land use of the Project Area, it is unlikely that any threatened fauna species would be directly impacted by the Project, or that there would be any long-lasting indirect impact through the removal of habitat.

The full likelihood of occurrence assessment for threatened fauna is provided in Appendix 4. The Appendix lists all species that were identified as 'may' or 'likely to occur' by the PMST report, as well as those identified by the BDBSA that were assessed as 'unlikely to occur' in the Project Area.

Table 13. Threatened fauna species assessed as possible, likely or highly likely to occur in the Project Area.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Likelihood of Occurrence
<i>Corcorax melanorhamphos</i>	White-winged Chough	R	-	1	2000	Possible.
<i>Egernia cunninghami</i>	Cunningham's Skink	E	-	1	2007	Possible.
<i>Falco peregrinus macropus</i>	Peregrine Falcon	R	-	1	2000	Possible.
<i>Falcunculus frontatus frontatus</i>	Eastern Shriketit	R	-	1	2009	Likely.
<i>Hylacola pyrrhopygia parkeri</i>	Chestnut-rumped Heathwren (Mount Lofty Ranges)	E	EN	1, 2	1996	Possible.
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot	E	EN	2	PMST Known	Possible.
<i>Microeca fascinans</i>	Jacky Winter	R	-	1	2012	Possible.
<i>Myiagra inquieta</i>	Restless Flycatcher	R	-	1	2012	Likely.
<i>Neophema elegans elegans</i>	Elegant Parrot	R	-	1	2021	Likely.
<i>Pachycephala inornata</i>	Gilbert's Whistler	R	-	1	2019	Possible.
<i>Petroica boodang boodang</i>	Scarlet Robin	R	-	1, 3	2021	Highly likely.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	R	VU	1, 2	2020	Highly likely.
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	R	-	1	2022	Highly likely.
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo	V	-	1	2022	Highly likely.
<i>Zoothera lunulata halmaturina</i>	South Australian Bassian Thrush	R	EN	1, 2	2001	Likely.

NPW Act; E = Endangered, V = Vulnerable, R = Rare

EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

Source; 1- BDBSA, 2 - Protected matters search tool, 3 – recorded during the field survey.

4.3. Cumulative impacts

When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must consider the potential cumulative impact, both direct and indirect, that is reasonably likely to result from a proposed clearance activity.

Direct clearance of native vegetation associated with the application includes:

- 0.99 ha, within which all native vegetation will be removed for the construction of adaptive bike trails (trail footprint).
- 0.72 ha, within which native vegetation will be managed, including removal of mid-storey vegetation to reduce hazards to trail users (trail verge).

This includes all impacts associated with trail construction, including laydown and construction areas, access routes for machinery and other facilities.

Once construction is complete and the new trails open for public use, they will be accessible using existing carparking and access facilities. There will be no additional impacts associated with public use.

The following indirect impacts to vegetation may occur:

- Spread of weeds and pathogens, including *Phytophthora*, both during construction and through public use of the completed trails.
- Smothering of vegetation by dust, both during construction and through public use of the completed trails.
- Vegetation in the 1.5 m verge area either side of the trail will be continually managed to prevent overgrown vegetation from becoming a hazard.

Measures for avoiding and minimising these impacts are discussed in Section 4.4.

4.4. Addressing the Mitigation Hierarchy

When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must have regard to the mitigation hierarchy. The NVC will also consider, with the aim to minimize, impacts on biological diversity, soil, water and other natural resources, threatened species or ecological communities under the EPBC Act or listed species under the NPW Act.

a) Avoidance – outline measures taken to avoid clearance of native vegetation

The trail alignment has been microsituated to avoid mature trees, none of which will be impacted by the clearance.

The positioning of the trails is in an area specifically designated as an area for recreational use in ForestrySA management plans and strategic plans for the Cudlee Creek Forest. Areas designated as Conservation Zones and/or native forest reserves have been avoided.

However, given the nature of the clearance and the vegetation, it is not possible to avoid all native vegetation. Clearance has been minimised by taking the steps discussed below.

b) Minimization – if clearance cannot be avoided, outline measures taken to minimize the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent (whether the impact is direct, indirect or cumulative).

Clearance has been reduced to the smallest extent possible, given the design and specification constraints for an adaptive bike trail. The following measures have been taken to minimise native vegetation clearance and associated direct and indirect impacts:

- The trails are to be constructed within an area of the Mt Crawford Forest Reserve already containing a network of bike trails.
- Alignment has been microsituated to avoid areas mapped as Conservation Zones as far as is practicable, given design constraints (see Figure 1 on page 6), with the clearance occurring in areas formerly cleared and used to grow timber plantations.
- Most of the trails traverse mid to lower slopes that are dominated by weeds and vegetation in poorer condition than that on upper slopes and ridge tops.
- The trails will be constructed to the narrowest possible width, generally 1 – 2 m to a width of 5 m on tight corners and switchbacks. To allow access for adaptive bikes, width cannot be reduced further. A 1 m verge on

either side of the trails will be partially cleared to remove hazards and managed following completion of construction.

- All laydown areas, access tracks and any additional facilities required during construction will be placed within the impact footprint or areas already cleared of native vegetation. This includes existing bike park infrastructure including access tracks, carparks and facilities.
- Vegetation will be cleared in accordance with a Vegetation Management Plan approved by Forestry SA. The plan will include measures to limit the extent of clearing (including accidental clearing) and indirect impacts such as the spread of weeds and pathogens. As a minimum, this will include actions as set out in Table 14

Table 14. Management strategies for minimising vegetation clearance and impacts during construction.

Management Plan	Management Strategy	Responsibility
Vegetation Management Plan	All construction personnel will be inducted to be made aware of the Vegetation Management Plan and its content.	Project Supervisor
	Vegetation clearance areas will be clearly defined and marked.	
	No clearing, parking, laydown, stockpiles or other disturbance of native vegetation outside of the defined clearance area.	
	Topsoil and cleared vegetation will be stockpiled for spreading over rehabilitation areas.	
	Trigger points and stop work procedures will be developed and implemented in the event of unplanned and unauthorised vegetation clearance.	
	Vegetation clearance procedures clearly defined and approved by the proponent.	
	Clearance and construction activities to occur during daylight hours only.	
	Limit entry/exit points to the construction footprint to the minimum number possible.	
	All fill materials required for construction (e.g., sand, soil, gravel) will be sourced from certified weed and phytophthora free sites.	
	Water will be used during construction for dust suppression and construction purposes.	
	Restrict the movement of weed material to the vegetation clearance area, including by implementing machinery wash-down guidelines as developed by the Department for Environment and Water.	

- c) Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation.**

Clearance for the trail footprint is permanent and no rehabilitation will occur within that area. However, within the 1 m verge either side of the trail, ground layer vegetation to low shrub level will be allowed to regenerate naturally following construction.

- d) Offset – any adverse impact on native vegetation that cannot be avoided or further minimized should be offset by the achievement of a significant environmental benefit that outweighs that impact.**

The NVC will only consider an offset once avoidance, minimization and restoration have been documented and fulfilled. The SEB Policy explains the biodiversity offsetting principles that must be met.

The Proponent intends to offset unavoidable impacts by the establishment of an on-ground SEB area.

4.5. Principles of Clearance (Schedule 1, Native Vegetation Act 1991)

The Native Vegetation Council will consider Principles 1(b), 1(c) and 1(d) when assigning a level of Risk under Regulation 16 of the Native Vegetation Regulations. The Native Vegetation Council will consider all the Principles of

clearance of the Act as relevant, when considering an application referred under the Planning, Development and Infrastructure Act 2016.

Assessment of the Project against the Principles of Clearance is set out in Table 15.

Table 15. Assessment against the Principles of Clearance.

Principle of clearance	Relevant information	Assessment against the principles	Moderating factors that may be considered by the NVC
Principle 1(b) – significance as a habitat for wildlife	<p>One threatened fauna species, listed as Rare under the NPW Act, was recorded during the survey:</p> <ul style="list-style-type: none"> Scarlet Robin (<i>Petroica boodang boodang</i>). <p>This species is regularly observed in the area and would not be directly impacted by the clearance. Any indirect impacts would be limited to disturbance during to construction activities, with no long-term impacts resulting from the clearance.</p> <p>A further 15 threatened fauna species have been assessed as possibly or likely to use the impacted vegetation. However, given the high impact from weeds and the lack of important habitat features such as hollow-bearing trees, the Project Area is not likely to be essential habitat for threatened fauna species.</p> <p><u>Threatened Fauna Scores:</u> All sites: 0.10</p> <p><u>Unit Biodiversity Scores:</u> A1: 3.81 A2: 34.36 A3: 34.27 A4: 40.28 A5: 10.18</p>	<p>Seriously at Variance All vegetation associations</p>	<p>Impact Significance Only one threatened fauna species was recorded during the field survey. One pair of Scarlet Robins was observed near BAM site A1. This area of vegetation is already impacted by weeds, historical clearing and existing bike trails and fire access roads that fragment native vegetation. It is therefore unlikely to represent habitat that is critical to the survival of any threatened fauna species. These impacts currently exist throughout the Project Area, with any other threatened species that might occur utilising habitat already in poor or, at best, moderate condition. As construction will occur according to the minimisation measures discussed in this report, and that impacted vegetation is not essential habitat (see below), it is unlikely to cause a long-term decline in the population of any threatened fauna species.</p> <p>Non-essential habitat Given the high level of impact from weeds, fragmentation and historical clearing, the vegetation under application is unlikely to represent essential habitat for any threatened fauna species.</p>
Principle 1(c) – plants of a rare, vulnerable or endangered species	<p>The entire alignment of the two proposed trails were traversed on foot, with only two threatened flora species were recorded:</p> <ul style="list-style-type: none"> <i>Eucalyptus viminalis</i> ssp. <i>viminalis</i> <i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i> <p>Most native vegetation is dominated by thick woody growth, including weeds, with ground layer vegetation sparse to absent. There is little chance of threatened forb species, such as orchids, persisting under such conditions.</p> <p>The trails have been micrositied to avoid mature trees, with no clearing of mature</p>	<p>At Variance A2 A4 (Threatened flora score >0 and <0.1).</p> <p>Not at Variance A1 A3 A5 (Threatened flora score 0.00).</p>	Not applicable.

Principle of clearance	Relevant information	Assessment against the principles	Moderating factors that may be considered by the NVC
	<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i> or <i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i> required. <u>Threatened Flora Score(s):</u> A2b: 0.04 A4a: 0.04 All other sites: 0.00		
Principle 1(d) – the vegetation comprises the whole or part of a plant community that is Rare, Vulnerable or endangered	No threatened ecological communities are impacted by the clearance. <u>Threatened Community Score</u> All sites: 1.00	<u>Not at Variance</u> A1 A2 A3 A4 A5	Not applicable.

4.6. Risk assessment

The clearance is a Level 4 clearance, as indicated in Table 16.

Table 16. Summary of the level of risk associated with the application.

Total clearance	No. of trees	0
	Area (ha)	1.71
	Total biodiversity Score	54.62
Seriously at variance with principle 1(b), 1(c) or 1 (d)		1(b) – all vegetation associations
Risk assessment outcome		Level 4

5. Clearance summary

Summaries of the SEB obligations of the clearance are shown in Table 17 (clearance areas summary table) and Table 18 (SEB totals summary totals).

To account for the variation in vegetation condition in vegetation associations A2 and A4, the mean values of all relevant BAM sites have been used to calculate the SEB, as indicated in Table 17. Inside the trail verge, an area limited to a linear strip no more than 1 m wide, only overhanging mid storey vegetation and colonising species will be cleared. Mature trees, low shrubs, grasses and forbs will be retained. For this area, a loss factor of 0.6 has been used. This is also indicated in Table 17.

As the clearance occurs entirely within a ForestrySA reserve, a protected areas loading of 0.5 has been used, in accordance with the *Guide for calculating a Significant Environmental Benefit* (Native Vegetation Council, 2020b).

Table 17. Clearance areas summary table (Sub Total = A1 + A2 Mean + A3 + A4 Mean + A5).

Impact Type	Block	Site	Species diversity score	Threatened Ecological community Score	Threatened plant score	Threatened fauna score	Unit Biodiversity Score	Area (ha)	Total Biodiversity score	Loss factor	Loadings	SEB Points required	Hectares Required (on ground offset)	SEB payment	Admin Fee
Trail footprint	A	1	8.0	1.00	0.00	0.10	3.78	0.04	0.15	1	0.5	0.24	0.03	\$291.25	\$16.02
	A	2a	6.0	1.00	0.00	0.10	22.06	0.60	13.24	1	0.5	20.85	2.61	\$25,515.48	\$1,403.35
	A	2b	16.0	1.00	0.04	0.10	45.07	0.60	27.04	1	0.5	42.59	5.32	\$52,127.45	\$2,867.01
	A	2c	8.0	1.00	0.00	0.10	35.02	0.60	21.01	1	0.5	33.10	4.14	\$40,506.16	\$2,227.84
	A	2 Mean	10.0				34.05	0.60	20.43	1	0.5	32.18	4.02	\$39,383.03	\$2,166.07
	A	3	10.0	1.00	0.00	0.10	33.96	0.02	0.68	1	0.5	1.07	0.13	\$1,309.31	\$72.01
	A	4a	8.0	1.00	0.04	0.10	31.32	0.24	7.52	1	0.5	11.84	1.48	\$14,488.49	\$796.87
	A	4b	8.0	1.00	0.00	0.10	31.65	0.24	7.60	1	0.5	11.96	1.50	\$14,640.29	\$805.22
	A	4 Mean	8.0				31.49	0.24	7.56	1	0.5	11.90	1.49	\$14,564.39	\$801.05
	A	5	2.0	1.00	0.00	0.10	10.09	0.09	0.91	1	0.5	1.43	0.18	\$1,750.82	\$96.30
Sub Total Trail footprint								0.99	29.05			45.75	5.72	\$55,989.49	\$3,079.43

Impact Type	Block	Site	Species diversity score	Threatened Ecological community Score	Threatened plant score	Threatened fauna score	Unit Biodiversity Score	Area (ha)	Total Biodiversity score	Loss factor	Loadings	SEB Points required	Hectares Required (on ground offset)	SEB payment	Admin Fee
Trail Verge	A	1	8.0	1.00	0.00	0.10	3.78	0.02	0.08	0.8	0.5	0.07	0.01	\$87.38	\$4.81
	A	2a	6.0	1.00	0.00	0.10	22.06	0.44	9.71	0.8	0.5	9.17	1.15	\$11,226.81	\$617.47
	A	2b	16.0	1.00	0.04	0.10	45.07	0.44	19.83	0.8	0.5	18.74	2.34	\$22,936.08	\$1,261.48
	A	2c	8.0	1.00	0.00	0.10	35.02	0.44	15.41	0.8	0.5	14.56	1.82	\$17,822.71	\$980.25
	A	2 Mean	10.0				34.05	0.44	14.98	0.8	0.5	14.16	1.77	\$17,328.53	\$953.07
	A	3	10.0	1.00	0.00	0.10	33.96	0.02	0.68	0.8	0.5	0.64	0.08	\$785.59	\$43.21
	A	4a	8.0	1.00	0.04	0.10	31.32	0.18	5.64	0.8	0.5	5.33	0.67	\$6,519.82	\$358.59
	A	4b	8.0	1.00	0.00	0.10	31.65	0.18	5.70	0.8	0.5	5.38	0.67	\$6,588.13	\$362.35
	A	4 Mean	8.0				31.49	0.18	5.67	0.8	0.5	5.36	0.67	\$6,553.98	\$360.47
	A	5	2.0	1.00	0.00	0.10	10.27	0.06	0.62	0.8	0.5	0.58	0.07	\$712.95	\$39.21
Sub Total Trail Verge								0.72	23.55			22.24	2.78	\$27,224.68	\$1,497.36

Table 18. SEB total summary table (Total SEB = Sub Total Trail Footprint = Sub Total Trail Verge).

	Total Biodiversity score	Total SEB points required	Approximate Hectares Required	SEB Payment	Admin Fee	Total Payment
Application	51.08	66.55	8.32	\$81,457.92	\$4,480.20	\$85,938.12

Economies of Scale Factor	0.5
Rainfall (mm)	820

6. Significant Environmental Benefit

A SEB is required for approval to clear under Division 5 of the *Native Vegetation Regulations 2017*. The NVC must be satisfied that as a result of the loss of vegetation from the clearance that an SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

ACHIEVING AN SEB

Indicate how the SEB will be achieved by ticking the appropriate box and providing the associated information:

- ☒ Establish a new SEB Area on land owned by the proponent.
- ☐ Use SEB Credit that the proponent has established.
- ☐ Apply to have SEB Credit assigned from another person or body.
- ☐ Apply to have an SEB to be delivered by a Third Party.
- ☐ Pay into the Native Vegetation Fund.

ON-GROUND SEB

The proponent has indicated their commitment to establish an on-ground SEB to offset impacts to native vegetation. The offset area has not yet been selected, but will be situated in an area previously used for pine plantations and not currently managed for conservation. That is, outside of areas mapped as native forest reserve or Conservation Zone.

Details of the proposed SEB, including the required management plan, will be submitted as an addendum to this clearance application prior to assessment.

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8. Appendices

Appendix 1. Plant species recorded during the survey.

Scientific Name	Common Name	EPBC Act	NPW Act
<i>Acacia melanoxylon</i>	Blackwood	-	-
<i>Acacia myrtifolia</i>	Myrtle Wattle	-	-
<i>Acacia pycnantha</i>	Golden Wattle	-	-
<i>Acacia retinodes</i>	Wirilda	-	-
<i>Acaena</i> sp.	Sheep's Burr	-	-
<i>Acrotriche affinis</i>	Ridged Ground-berry	-	-
<i>Acrotriche serrulata</i>	Cushion Ground-berry	-	-
<i>Austrostipa</i> sp.	Spear-grass	-	-
<i>Boronia nana</i> var. <i>nana</i>	Dwarf Boronia	-	-
<i>Bromus diandrus</i> *	Great Brome	-	-
<i>Bursaria spinosa</i> ssp.	Bursaria	-	-
<i>Caesia calliantha</i>	Blue Grass-lily	-	-
<i>Cheilanthes</i> sp.	Rock-fern	-	-
<i>Clematis microphylla</i>	Old Man's Beard	-	-
<i>Cullen australasicum</i>	Tall Scurf-pea	-	-
<i>Cytisus scoparius</i> *	English Broom	-	-
<i>Dianella</i> sp.	Flax-lily	-	-
<i>Dichondra repens</i>	Kidney Weed	-	-
<i>Dodonaea viscosa</i> ssp.	Sticky Hop-bush	-	-
<i>Erica lusitanica</i> *	Spanish Heath	-	-
<i>Eucalyptus dalrympleana</i> ssp. <i>dalrympleana</i>	Candlebark Gum	-	R
<i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i>	South Australian Blue Gum	-	-
<i>Eucalyptus obliqua</i>	Messmate Stringybark	-	-
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum	-	R
<i>Exocarpos cupressiformis</i>	Native Cherry	-	-
<i>Genista monspessulana</i> *	Montpellier Broom	-	-
<i>Geranium solanderi</i>	Austral Geranium	-	-
<i>Gonocarpus elatus</i>	Hill Raspwort	-	-
<i>Gonocarpus tetragynus</i>	Small-leaf Raspwort	-	-
<i>Hardenbergia violacea</i>	Native Lilac	-	-
<i>Hibbertia riparia</i>	Bristly Guinea-flower	-	-
<i>Hibbertia sericea</i>	Silky Guinea-flower	-	-
<i>Hypericum perforatum</i> ssp. <i>veronense</i> *	St John's Wort	-	-
<i>Hypochaeris glabra</i> *	Smooth Cat's Ear	-	-
<i>Ixodia achillaeoides</i> ssp.	Ixodia	-	-
<i>Juncus subsecundus</i>	Finger Rush	-	-
<i>Kennedia prostrata</i>	Scarlet Runner	-	-
<i>Lagenophora</i> sp.	Bottle-daisy	-	-
<i>Lepidosperma</i> sp.	Sword-sedge/Rapier-sedge	-	-

Scientific Name	Common Name	EPBC Act	NPW Act
<i>Leptospermum continentale</i>	Prickly Tea-tree	-	-
<i>Lomandra densiflora</i>	Soft Tussock Mat-rush	-	-
<i>Lomandra multiflora</i> ssp. <i>dura</i>	Hard Mat-rush	-	-
<i>Medicago</i> sp.*	Medic	-	-
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Rice-grass	-	-
<i>Olearia axillaris</i>	Coast Daisy-bush	-	-
<i>Oxalis perennans</i>	Native Sorrel	-	-
<i>Oxalis pes-caprae</i> *	Soursob	-	-
<i>Phalaris</i> sp.*	Canary Grass	-	-
<i>Pinus radiata</i> *	Radiata Pine	-	-
<i>Plantago lanceolata</i> var.*	Ribwort	-	-
<i>Pteridium esculentum</i> ssp. <i>esculentum</i>	Bracken Fern	-	-
<i>Pultenaea daphnoides</i>	Large-leaf Bush Pea	-	-
<i>Rosa canina</i> *	Dog Rose	-	-
<i>Rubus fruticosus</i> *	Blackberry	-	-
<i>Rumex acetosella</i> *	Sorrel	-	-
<i>Rytidosperma caespitosum</i>	Common Wallaby-grass	-	-
<i>Scaevola aemula</i>	Fairy Fanflower	-	-
<i>Senecio pterophorus</i> *	African Daisy	-	-
<i>Ulex europaeus</i> *	Gorse	-	-
<i>Watsonia meriana</i> var. <i>bulbillifera</i> *	Bulbil Watsonia	-	-

*Denotes an introduced species.

NPW Act; E= Endangered, V = Vulnerable, R= Rare

EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

Appendix 2. Likelihood of occurrence assessment – threatened flora

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Caladenia argocalla</i>	White-beauty Spider-orchid	E	EN	2	Likely	Endemic to the Mount Lofty Ranges Region of SA. Occurs in intact grassy woodlands often with <i>Eucalyptus leucoxylon</i> and <i>Allocasuarina verticillata</i> . Usually grows on a gentle slope with a southerly aspect and in clay loam soils. Flowering in winter. Thought to be extinct within its former range south of Adelaide (Threatened Species Scientific Committee, 2021).	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Caladenia behrii</i>	Pink-lipped Spider-orchid	E	EN	2	Likely	Occurs on the Fleurieu Peninsula of SA. Grows in fertile, shallow loams, amongst <i>Eucalyptus goniocalyx</i> / <i>E. fasciculosa</i> woodland and amongst <i>E. obliqua</i> / <i>E. microcarpa</i> / <i>E. leucoxylon</i> woodland. The understorey is usually open and shrubby. Also recorded amongst <i>E. fasciculosa</i> & <i>Xanthorrhoea semiplana</i> . Generally found in quartzite-derived soils on steep south facing slopes but also on ridge tops and occasionally near creek beds (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Caladenia rigida</i>	Stiff White Spider-orchid	E	EN	2	Known	Ridge tops and hillslopes in grey-brown loam often associated with coarse quartzite gravel or sandstone pebbles. Vegetation is usually an open-forest dominated by <i>Eucalyptus obliqua</i> , <i>E. goniocalyx</i> , <i>E. leucoxylon</i> , <i>E. fasciculosa</i> and <i>E. microcarpa</i> . Sites have a relatively open understorey of low shrubs and sedges dominated by <i>Xanthorrhoea semiplana</i>) <i>Acacia</i>	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						<i>pyncnantha</i> , <i>Hibbertia exutiacies</i> , <i>Pultenaea largiflorens</i> , <i>P. daphnoides</i> (Department of Climate Change, Energy, the Environment and Water, 2023b).	
<i>Caladenia tensa</i>	Greencomb Spider-orchid, Rigid Spider-orchid	-	EN	2	May	Various habitats have been described including Cypress Pine (Family: Cupressaceae) / Yellow Gum Woodland, Pine / Box woodland, mallee-heath sites, healthy woodland and mallee woodland, generally with rock outcrops (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Corybas dentatus</i>	Toothed Helmet-orchid, Finnis Helmet-orchid	E	VU	2	Known	Confirmed from only two locations: Sandy Creek Conservation Park and Scott Conservation Park. At Sandy Creek Conservation Park, grows in <i>Callitris gracilis</i> / <i>Eucalyptus fasciculosa</i> woodland with an understorey of <i>Callistemon rugulosus</i> in damp sandy soil.	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Dodonaea procumbens</i>	Trailing Hop-bush	V	VU	2	May	In SA the species occurs near Port Lincoln, near Clare and Burra in the northern Mt Lofty Range, on Kangaroo Island and near Penola in the SE. <i>Dodonaea procumbens</i> grows in low-lying, often winter-wet areas in woodland, low open forests, heathland and grasslands, on sands and clays, with SA populations recorded in open <i>Eucalyptus camaldulensis</i> , <i>E. fasciculosa</i> and <i>E. leucoxylon</i> woodlands in low-lying areas (Carter, 2010).	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Eucalyptus fasciculosa</i>	Pink Gum	R	-	1	2015	Often in poorer sandy soils, in woodland or as an emergent in low shrublands. Commonly associated with <i>Eucalyptus baxteri</i> , <i>E.</i>	Unlikely. Although there are recent records in the Search Area, the species was

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						<i>cosmophylla</i> , <i>E. diversifolia</i> , <i>E. leptophylla</i> and <i>E. leucoxyton</i> (Nicolle, 2013).	not detected in the Project Area during the field survey. This is despite the species being an easily detected tree species.
<i>Eucalyptus viminalis</i> ssp. <i>viminalis</i>	Manna Gum	R	-	1, 3	2020	Grows on moist, well-drained alluvial soils near watercourses but also grows on drier sites at higher altitudes.	Highly likely. This species was recorded in the Project Area by the field survey.
<i>Euphrasia collina</i> ssp. <i>osbornii</i>	Osborn's Eyebright	E	EN	1, 2	2020	Generally recorded as growing in mallee scrubland but has also been found growing in coastal heathlands, sclerophyll forests and woodlands (Department of Climate Change, Energy, the Environment and Water, 2023b).	Possible. While there are recent records in the search Area, the Project Area does not have suitable habitat. The species was not detected during the field survey, although may be difficult to detect when not flowering.
<i>Glycine latrobeana</i>	Clover Glycine	V	VU	1, 2	2021	Generally found in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer growing on undulating plains, gentle south-west facing ridge slopes and lower south facing river valley slopes. Prefers grassy woodland habitats including low lying seasonally inundated woodlands (Department of Climate Change, Energy, the Environment and Water, 2023b).	Possible. While there are recent records in the search Area, the Project Area does not have suitable open, grassy habitat.
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	V	VU	2	Likely	The silver daisy-bush occurs in sandy, flat areas and in hilly, rocky areas in woodland or mallee. Hilly area soil types include hard pedal mottled-yellow duplex and hard pedal red duplex (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995 and no suitable habitat in the Project Area. The species was not detected during the field survey.
<i>Poa umbricola</i>	Shade Tussock-grass	R	-	1	2000	Associated with woodland communities.	Likely.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
							Recent records are >20 years old, but habitat is potentially suitable.
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	R	VU	2	Known	Well-grassed open forests from the Flinders Ranges to the Northern and Southern Lofty regions of South Australia (Department of Climate Change, Energy, the Environment and Water, 2023b)	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.
<i>Prasophyllum pruinatum</i>	Plum Leek-orchid	E	EN	2	Known	he Plum Leek-orchid is recorded growing on a range of soil types including well-drained sandy loams to heavy clays, usually in association with other species of leek orchid (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.
<i>Pterostylis cucullata</i> ssp. <i>sylvicola</i>	Leafy Greenhood	E	VU	1, 2	2022	Riverbanks or protected alluvial flood plains (Department of Climate Change, Energy, the Environment and Water, 2023b).	Possible. Although there are recent records (<10 years) of the species in the search Area, the Project Area has no suitable habitat.
<i>Senecio macrocarpus</i>	Large-fruit Fireweed		VU	2	May	Most commonly in depressions in low lying closed sedgeland but may occur in sedgeland, herbland, low shrubland to low open woodland where competition from understorey plants is low (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.
<i>Senecio pinnatifolius</i> var. <i>pinnatifolius</i>		R	-	1	2008	Moist soil in forests and coastal areas.	Unlikely. Not detected during the field survey.
<i>Stellaria angustifolia</i> ssp. <i>tenella</i>	Swamp Starwort	R	-	1	2019	Wet areas amongst grasslands, herblands, sedgelands, lignum	Possible.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						thickets in swamps, along watercourses particularly after flooding or underlying in open woodlands and forest.	Although there are recent records (<10 years) of the species in the search Area, the Project Area has no suitable habitat.
<i>Thelymitra batesii</i>		R	-	1	2015	Grows in fertile soils in grassy well drained woodland sites, often on ridges in shallow red earths.	Possible. Although there are recent records (<10 years) of the species in the search Area, the Project Area has no suitable habitat.
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid		VU	2	Likely	<i>Thelymitra matthewsii</i> favours open forests and woodlands in well-drained sand and clay loams. It is a post-disturbance coloniser that is usually found in open areas around old quarries and gravel pits, on road verges, disused tracks and animal trails (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.
<i>Veronica derwentiana ssp. homalodonta</i>	Mount Lofty Speedwell		CR	2	Known	Found in the wetter parts of the Mount Lofty Ranges.	Unlikely. There are no records in the Search Area since 1995. Understorey of open forest areas is thickly vegetated by weed species and is unlikely to be suitable habitat for this species. The species was not detected during the field survey.
<p>Source; 1- BDBSA, 2 - Protected matters search tool, 3 – recorded during the field survey.</p> <p>NPW Act; E= Endangered, V = Vulnerable, R= Rare</p> <p>EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable</p>							

Appendix 3. Fauna species recorded during the survey.

Scientific Name	Common Name	EPBC Act	NPW Act
<i>Acanthiza lineata</i>	Striated Thornbill	-	-
<i>Acanthiza nana</i>	Yellow Thornbill	-	-
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	-	-
<i>Accipiter fasciatus</i>	Brown Goshawk	-	-
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	-	-
<i>Caligavis chrysops</i>	Yellow-faced Honeyeater	-	-
<i>Chrysococcyx basalis</i>	Horsfield's Broze Cuckoo	-	-
<i>Colluricincla harmonica</i>	Grey Shrikethrush	-	-
<i>Cormobates leucophaea</i>	White-throated Treecreeper	-	-
<i>Gymnorhina tibicen</i>	Australian Magpie	-	-
<i>Malurus cyaneus</i>	Superb Fairy-wren	-	-
<i>Neochmia temporalis</i>	Red-browed Finch	-	-
<i>Pachycephala pectoralis</i>	Golden Whistler	-	-
<i>Petroica boodang boodang</i>	Scarlet Robin	-	R
<i>Phascolarctos cinereus</i>	Koala	-	-
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	-	-
<i>Phylidonyris pyrrhopterus</i>	Crescent Honeyeater	-	-
<i>Platycercus elegans</i>	Crimson Rosella	-	-
<i>Sericornis frontalis</i>	White-browed Scrubwren	-	-
<i>Vulpes vulpes</i> *	Red Fox		
<i>Zosterops lateralis</i>	Silvereye	-	-

*Denotes an introduced species.

NPW Act; E= Endangered, V = Vulnerable, R= Rare

EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable

Appendix 4. Likelihood of occurrence assessment – threatened fauna

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Aphelocephala leucopsis</i>	Southern Whiteface	-	VU	2	Likely	Semi-arid woodlands, mallee, mulga, dry-country scrublands. Southern Whiteface favour habitat with low tree densities and an herbaceous understory litter cover (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Aprasia pseudopulchella</i>	Flinders Ranges Worm-lizard	-	VU	2	May	Occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates (Cogger, 2000).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	V	EN	2	Likely	Freshwater wetlands and, rarely, in estuaries or tidal wetlands (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE	2	May	Intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Cereopsis novaehollandiae novaehollandiae</i>	Cape Barren Goose	R	-	1	2000	Inhabits offshore islands, usually granite, in areas of pasture, tussock grass or low heathy scrub.	Unlikely. Although there is a record since 1995, there is no suitable habitat in the Project Area.
<i>Corcorax melanorhamphos</i>	White-winged Cough	R	-	1	2000	Inhabits woodlands and taller mallee, where it feeds on the ground amongst the leaf-litter. Tend to prefer wetter areas with leaf-litter, for feeding, and available mud for nest building. Within the AMLR the preferred broad	Possible. There is a record of the species <40 years old, however the dense understorey and forest habitat is not suitable habitat.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						vegetation groups are Grassy Woodland and Mallee.	
<i>Dasyurus maculatus maculatus</i>	Spot-tailed Quoll	E	EN	2	May	The Spot-tailed Quoll is presumed extinct in South Australia (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. This species is extinct in South Australia.
<i>Egernia cunninghami</i>	Cunningham's Skink	E	-	1	2007	Forests and woodlands with rock outcrops.	Possible. No suitable habitat is impacted (rock outcrops), although there are recent records within 5 km.
<i>Falco hypoleucos</i>	Grey Falcon	R	VU	2	Likely	Timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Falco peregrinus macropus</i>	Peregrine Falcon	R	-	1	2000	This species prefers open habitats such as grasslands. It requires cliffs and rock ledges for nesting habitat.	Possible. There is a record of the species <40 years old, however the dense understorey and forest habitat is not suitable habitat.
<i>Falcunculus frontatus frontatus</i>	Eastern Shrike-tit	R	-	1	2009	Found in eucalypt forests and woodlands, forested gullies and along rivers in drier areas.	Likely. There is suitable habitat in the Project Area, with the most recent record within 5 km between 10 and 20 years old.
<i>Grantiella picta</i>	Painted Honeyeater	R	VU	2	Likely	Forest, woodland, dry scrub, often with abundant mistletoe. Dependent on mistletoe berries.	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	VU	2	Likely	Almost exclusively aerial in Australia, recorded most commonly	Unlikely.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						above wooded areas (Department of Climate Change, Energy, the Environment and Water, 2023b).	There are no records of the species, and it is unlikely to use terrestrial habitats while in Australia.
<i>Hylacola pyrrhopygia parkeri</i>	Chestnut-rumped Heathwren (Mount Lofty Ranges)	E	EN	1, 2	1996	Dense heathland and undergrowth in <i>Eucalyptus</i> forests and woodlands and is mostly found in rocky areas. The vegetation in these areas consists of a mixture of dense shrubs, <i>Xanthorrhoea</i> and ferns <i>Pteridium</i> , beneath a canopy of <i>Eucalyptus</i> trees (including <i>E. obliqua</i> and <i>E. odorata</i>) (Department of Climate Change, Energy, the Environment and Water, 2023b).	Possible. Possible in areas of dense undergrowth, although in the Project Area, this mostly consists of weeds. There have been no records of the species within 5 km in the past 20 years.
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	E	EN	2	Known	Areas of dense ground cover in varied habitat: heathland, shrubland, sedgeland, heathy open forest and woodland (Department of Climate Change, Energy, the Environment and Water, 2023b).	Possible. There is suitable habitat for the species, although it has not been recorded within 5 km of the Project Area.
<i>Leipoa ocellata</i>	Malleefowl	V	VU	2	Likely	Areas of dense ground cover in varied habitat: heathland, shrubland, sedgeland, heathy open forest and woodland (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Litoria raniformis</i>	Growling Grass Frog,		VU	2	May	This species is found mostly amongst emergent vegetation, including <i>Typha</i> sp. (bullrush), <i>Phragmites</i> sp. (reeds) and <i>Eleocharis</i> sp. (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin	R	EN	2	Likely	<i>Eucalyptus</i> woodland and mallee and <i>Acacia</i> shrubland.	Unlikely.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
							There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Microeca fascinans</i>	Jacky Winter	R	-	1	2012	Prefers open woodland (Eucalypt and mallee) with an open shrub layer and bare ground.	Possible. The species has been recorded in the past 20 years within 5 km of the Project Area. However, there is no suitable open woodland habitat in the Project Area.
<i>Myiagra inquieta</i>	Restless Flycatcher	R	-	1	2012	The Restless Flycatcher is found in open forests and woodlands and is frequently seen in farmland.	Likely. Records within 5 km are >20 years old, however habitat is suitable.
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	VU	2	Likely	Prefers grasslands and grassy woodlands.	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Neophema elegans elegans</i>	Elegant Parrot	R	-	1	2021	Open forests, woodlands, mallee, Mulga, and salt marsh.	Likely. Records within 5 km are >20 years old, however habitat is suitable.
<i>Pachycephala inornata</i>	Gilbert's Whistler	R	-	1	2019	Habitat is shrubby woodland and mallee.	Possible. Although there are recent records (<10 years) within 5 km, habitat is not suitable.
<i>Petroica boodang boodang</i>	Scarlet Robin	R	-	1	2021	Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Highly likely. This species was recorded by the field survey. All impacted habitat is suitable for the species.
<i>Podiceps cristatus australis</i>	Great Crested Grebe	R	-	1	2002	Habitat is freshwater lakes with aquatic and marginal vegetation.	Unlikely. No wetland habitat is impacted by the clearance.
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot (eastern)	V	VU	2	May	<i>Eucalyptus camaldulensis</i> , floodplain, woodland and mallee.	Unlikely.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
							There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	R	VU	1, 2	2020	Forests and woodlands, foraging up to 50 km from colonies in flowering and fruiting trees (Department of Climate Change, Energy, the Environment and Water, 2023b).	Highly likely. There are no permanent or temporary colonies in the Project Area. However, the species may forage in mature trees when they are flowering.
<i>Rostratula australis</i>	Australian Painted Snipe		EN	2	Likely	Generally, inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Stagonopleura bella samueli</i>	Western Beautiful Firetail	V	EN	2	May	Dense heath and thick forests especially near sheoaks and tea-trees. Also occurs in coastal and sub-coastal heaths and heathy woodlands	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Stagonopleura guttata</i>	Diamond Firetail	R	VU	2	Known	<i>Eucalyptus</i> dominated vegetation communities that have a grassy understorey, including woodland, forest and mallee (Department of Climate Change, Energy, the Environment and Water, 2023b).	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Tiliqua adelaidensis</i>	Pygmy Blue-tongue Lizard	E	EN	2	May	Ranges from Peterborough in the north to Kapunda in the south. Remnant native grassland or grassy woodland with a sparse over-storey of trees.	Unlikely. There are no records of the species within 5 km and no suitable habitat in the Project Area.
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	R	-	1	2022	Anywhere where trees with suitable hollows occur, including open forests and woodlands but also urban areas and cities.	Highly likely. Although there are no hollow-bearing trees impacted, the species is highly likely to utilise impacted vegetation for foraging.
<i>Zanda funerea whiteae</i>	Yellow-tailed Black Cockatoo	V	-	1	2022	<i>Eucalyptus</i> forests and woodland, heathlands, subalpine areas, pine	Highly likely.

Scientific Name	Common Name	NPW Act	EPBC Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						plantations and occasionally in urban areas.	The species is highly likely to use <i>Pinus radiata</i> trees within the impacted area for foraging.
<i>Zoothra lunulata halmaturina</i>	South Australian Bassian Thrush	R	EN	1, 2	2001	Damp, densely forested areas and gullies are favoured by the Bassian Thrush, usually with a thick canopy overhead and leaf-litter below.	Likely. The species is likely to occur on the lower slopes towards the bottom of gullies, in thick, damp vegetation.
<p>Source; 1- BDBSA, 2 - Protected matters search tool, 6 – others</p> <p>NPW Act; E= Endangered, V = Vulnerable, R= Rare</p> <p>EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable</p>							



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