



Construction of Mountain Bike Trails

Merritts Intermediate Trail & Associated Works

Detailed Rehabilitation and Monitoring Plan



Department of Planning
Housing and Infrastructure

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Signed Z Derbyshire

Sheet No 5 of 8

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1 Introduction

This rehabilitation and monitoring plan has been prepared to detail the rehabilitation required for all areas disturbed by the construction works associated with the development. The rehabilitation activities consist of MTB trail and vehicle access track verge stabilisation & revegetation as well as trench revegetation works.

1.1 Aims and Objectives

The aim of this plan is to achieve successful rehabilitation of all areas disturbed by the works with full vegetation coverage to achieve an erosion resistant state. The objectives of this rehabilitation plan are:

- Detail the rehabilitation works required by the proposal for all disturbed areas;
- Set out the schedule for the rehabilitation activities;
- Provide information on plant species and planting ratios; and
- Dictate the maintenance and monitoring of the disturbed and rehabilitation areas.

2 Rehabilitation Program

2.1 Rehabilitation Areas

The areas to be rehabilitated consist of all areas disturbed as a component of the works. These areas include the verges of the completed MTB trail and vehicle access track, the camera trench any disturbed areas adjacent to the works. The development areas are shown in Appendix 1.

2.2 Rehabilitation and Stabilisation

The rehabilitation and stabilisation works will be consistent with the Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park (NPWS). The works are to be carried out by Kosciuszko Thredbo Pty Ltd (KT) staff or suitable contractor on KT's behalf. Methods will consist of:

Timing	Procedure	Methods
Pre-construction	Establish construction corridors and MTB trail, vehicle access track and camera trench alignments	• Flag all alignments using pin flags and flagging tape • Mark out construction corridors to prevent damage to adjacent areas
	Treatment of weeds	• Treat weeds within disturbance areas to ensure they are not spread further using methods relevant to the weed species being treated
	Identify trees to be removed	• Clearly identify any trees to be removed with flagging tape and inspect for nests / fauna • Alignment of MTB trail is to avoid clearance of mature canopy vegetation where possible. Vehicle access track and camera trench are located in pre disturbed areas and/or lift line
	Implement Site Environmental Management Measures	• Erosion & sediment controls to be put in place prior to construction where possible and during construction

	Cleaning of machinery	Ensure all machinery used on construction sites cleaned at wash down bay prior to accessing sites to prevent spread of weed species in resort
	Identify "No Go" areas	Identify & mark "No Go" areas to clearly delineate sensitive areas to be avoided
	Identify <i>Podocarpus lawrencei</i> (Mountain Plum Pine)	- Identify and mark out <i>Podocarpus lawrencei</i> - Alignments of MTB trail, vehicle access track and camera trench are to avoid <i>Podocarpus lawrencei</i> - Ensure KT staff/contractors are able to accurately identify
	Identify <i>Ranunculus anemoneus</i> (Anemone Buttercup)	- Identify and mark out <i>Ranunculus anemoneus</i> in order to minimise and mitigate impacts during construction works - Alignments of MTB trail, vehicle access track and camera trench are to avoid <i>Ranunculus anemoneus</i> - Ensure KT staff/contractors are able to accurately identify - Environmental Officer to GPS any <i>Ranunculus anemoneus</i> located within construction corridors for on-going monitoring
	Identify set down and stockpile areas	- Identify and mark out appropriate plant & equipment set down areas for short term placement of machinery & materials avoiding areas of native vegetation - Set down areas are to be located within construction zones, identified stockpile site or site compound only and strictly adhered to
	Identify wombat burrows	- Identify and mark out wombat burrows within the construction corridors - Alignments of MTB trail, vehicle access track and camera trench are to avoid wombat burrows
During Construction	Minimise disturbance & stay within trail corridor	- Minimise disturbance to adjacent native vegetation - Limit movement of construction equipment to construction area and nominated set down areas
	Identify <i>Ranunculus anemoneus</i> (Anemone Buttercup)	- If <i>Ranunculus anemoneus</i> is discovered on the MTB trail, access track or camera trench alignment during the course of construction that has not been previously identified, Environmental Officer is to be contacted immediately and works are to cease in that area - Environmental Officer, Trails Manager and Mountain Manager to determine if MTB trail alignment can be moved within the flexible construction corridor of 20m (10m either side of the ground-truthed alignment) or within construction corridors for the access track and camera trench - If alignments are unable to be altered, KT is to consult NPWS regarding most appropriate action

	Regularly maintain site environmental management measures	Conduct regular inspections and maintenance of sediment and erosion controls
	Sod cutting, collection & storage (as per Rehabilitation Guidelines for the Resort Areas of KNP)	- Native forbs and grasses are the most appropriate for sodding - Where sod collection is possible, cut sods to a depth of 10-20cm (leaving a layer of intact topsoil underneath) and to a size of 30cm² - Store sods collected on geofabric adjacent to the construction area - Sod storage time to be kept to a minimum and sods to be utilised as soon as possible after cutting and storage - Monitor sods and environmental conditions and water if necessary
	Soil removal	- Place topsoil & subsoil separately - Adhere to Soil Stockpile Guidelines for Resort Areas of KNP
	Soil replacement	- All excess soil gained from construction works is to be spread over the disturbed areas prior to rehabilitation - Ensure subsoil and topsoil are replaced in correct order
	Spread excess vegetation	- All excess native vegetation to be dispersed on exposed soil along the camera trench, MTB trail & vehicle access track verge, placed on batters & embankments for erosion control or carefully spread further into bushland to avoid smothering of understory vegetation communities - Any excess thatch unable to be used for the above is to be stockpiled off-site for use on other rehabilitation projects with the resort
	Management of ephemeral springs crossing marked trail alignment	- Manage water from ephemeral springs with the installation of rock armouring and/or construction of rock stormwater pits and piping of water underneath the MTB trail and/or vehicle access track - Drainage pipe to discharge into rock dispersion pits to reduce water velocity and erosion
Post Construction	Direct seeding	- Areas of open ski slope adjacent to the MTB trail tread and dominated by EXOTIC grasses - seed using a 1:1 mix of Chewings fescue & <i>Poa fawcettiae</i> - Areas of open ski slope adjacent to the MTB trail tread and dominated by NATIVE species - use only 100% native <i>Poa</i> endemic to the area - Camera trench & access track – as these areas are dominated by NATIVE species, use only 100% native <i>Poa</i> endemic to the area - Seeding rate: Slope grade <40% use 15-20g/m² Slope grade >40% use 20-30g/m² - Broadcast Dynamic Lifter @ 100g/m²

		• Weed free rice straw mulch and jute mesh to be applied over seed to protect soil and provide a favourable environment for establishment
	Sod replacement	• Utilise sod replacement in disturbed areas where possible particularly in areas of native vegetation in accordance with “Rehabilitation Guidelines for the Resort Areas of KNP” – Section C.1.4
	Stabilise disturbed areas (batters/embankments and trail to be closed)	• Spread weed free rice straw on slope grades <40% @ 1 bale per 25m² and weigh down using native thatch / litter gained from works. Jute mesh may be used if thatch amount insufficient • Install Jute mesh (or similar) over straw on batters & embankments >500mm height & with a slope >40% (Grade% = Rise/Run x 100) • Direct seed at rates listed above to stabilise disturbed areas including batters, embankments and trench
	Planting native tube stock	• Plant tube stock on batters, embankments and trench disturbance in areas of native vegetation • Plant shrubs at 3/m² • Plant grasses and forbs at 5/m² • Refer to Appendix 2 for suitable rehabilitation species • Water crystals & organic fertiliser may be used at label rates • <i>Water crystals</i>: 5gm pre-hydrated crystals, crystals must be hydrated for at least 2hrs prior to planting • <i>Fertiliser</i>: 1 x Typhoon Native fertiliser tablet per plant (<i>Poa</i> & shrubs) placed next to or below roots
	Watering	• If required, water rehabilitation areas to assist in seed germination, tubestock establishment and straw retention
	Weed control	• Monitor all areas disturbed by the works (including areas adjacent to the works) for signs of weed infestation • Treat weeds with methods appropriate to weed species being treated including low pressure spot spraying and hand removal techniques • Limit off-target damage by only spraying in the appropriate conditions • Weed monitoring & control is to be conducted on an on-going basis and included in annual resort weed control activities

2.3 MTB Trail Hardening

Trail hardening during and post construction will assist in reducing surface loss from the trail tread which in turn will reduce issues such as breaking bumps, exposed roots and sub-surface rock, water channelling and undercutting and sedimentation of drains, sumps and vegetation.

Trail hardening methods will include:

- Trail grading and compaction using excavator, manual hand tools and vibrating plate;
- Watering of trail tread to aid in compaction;
- Use of rock armouring and aggregate where required;
- Trail not to be used by the general public for a minimum of 30 days following completion;
- Approved KT staff to “ride-in” trail in a steady and controlled manner to aid compaction in the preferred ride line (ride-in staff to be approved at the Mountain Managers discretion).

2.4 Monitoring

Weekly inspections of the construction areas will be carried out by the Environmental Officer during the construction phase as per the Site Environmental Management Plan (SEMP). These inspections are to ensure that all site environmental management measures are in place and in good working order. On-going monitoring will occur as per the Rehabilitation & Monitoring schedule.

2.5 Schedule

The initial rehabilitation and stabilisation works are to be carried out as a component of the construction works during the finishing phase. The maintenance works associated with the rehabilitation areas are to be undertaken on an on-going, as required basis throughout each summer season. The schedule for the rehabilitation works is provided in the table below. The appointed Environmental Officer for the project is responsible for ensuring that all preparation, works, monitoring and reporting are carried out to the required standard. The works will be carried out by KT staff or an appointed contractor.

Rehabilitation and monitoring schedule

AREA	PROCEDURE	TIMING
MTB trail verge, berms, batters & embankments	Site Preparation	During construction
	Seeding and planting tube stock	During construction and ongoing annually until adequate groundcover has been achieved
	Mulching	During construction and ongoing annually until adequate groundcover has been achieved
Vehicle access track verge, batters & embankments	Maintenance (incl. weed control & replacement planting)	Ongoing annually as required (between November and May)
Camera trench	Monitoring	Weekly during construction as per SEMP Monthly post construction for the first 12 months to monitor for erosion, sediment control and plant establishment Annually once stabilisation has been achieved, between November & May each year up until the

		date 5 years after the issue of a final occupation certificate. At the completion of the 5 years general monitoring & maintenance will continue. Monitoring will be conducted by way of site inspection with triggers for action detailed in Section 2.6 - Maintenance & Mitigation
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2.6 Maintenance & Mitigation

In the event that monitoring indicates initial rehabilitation efforts are not effective (minimal grass / shrub establishment, establishment of weed species or declining coverage), additional management actions may be required. Management actions will be determined following 3 consecutive months of poor establishment or declining survival rates of native species planted. If deemed necessary, this period will be brought forward to implement the additional actions required. The management actions are to consist of one or more of the following:

Area	Maintenance trigger	Action
All areas disturbed by construction works	Poor grass & shrub establishment <75% native species coverage	• Additional direct seeding in areas of open non-native vegetation • In-fill planting of native tube stock • Grazing control by use of tree guards where appropriate
	Presence of weeds	• Weeds to be controlled annually include, but not limited to, Milfoil, St John's Wort, thistle & Juncus • Spot spray using low pressure sprayer • Use of hand removal techniques where appropriate
	Identification of erosion & unstable areas	• Installation of Jute mesh, brush matting & mulching • Installation of hay bale and sediment fencing control measures • Maintenance of sediment retention pits, water bars and drains • Carry out additional planting & re-vegetation works as per Rehabilitation table
	Presence of sediment & debris	• Remove build-up of sediment from sediment retention pits and pipe inlets & outlets as required • Removal of any excess sediment from vegetation adjacent to the trail
Drains Water bars Sediment retention pits	Presence of sediment & debris Identification of damage	• Inspection of drains, water bars & sediment retention pits particularly after heavy rainfall • Removal of sediment and debris to prevent blockages / overflow and limit sedimentation of vegetation • Regular inspection to identify damage to system and maintenance

Additional planting & re-vegetation works are to be carried out as per the Rehabilitation table. If it is found that after 12 months of monitoring the rehabilitation efforts are not effective, KT will liaise with NPWS to determine the most appropriate action. The 12-month period will allow time for the rehabilitation area to establish prior to any further intervention.

3 Exotic Species

All areas disturbed by the works are to be monitored on an ongoing basis for the occurrence of any exotic flora and evidence of exotic fauna (scats and tracks). In the event of the detection of exotic species, appropriate control works are to be scheduled as required as set out below.

Exotic flora

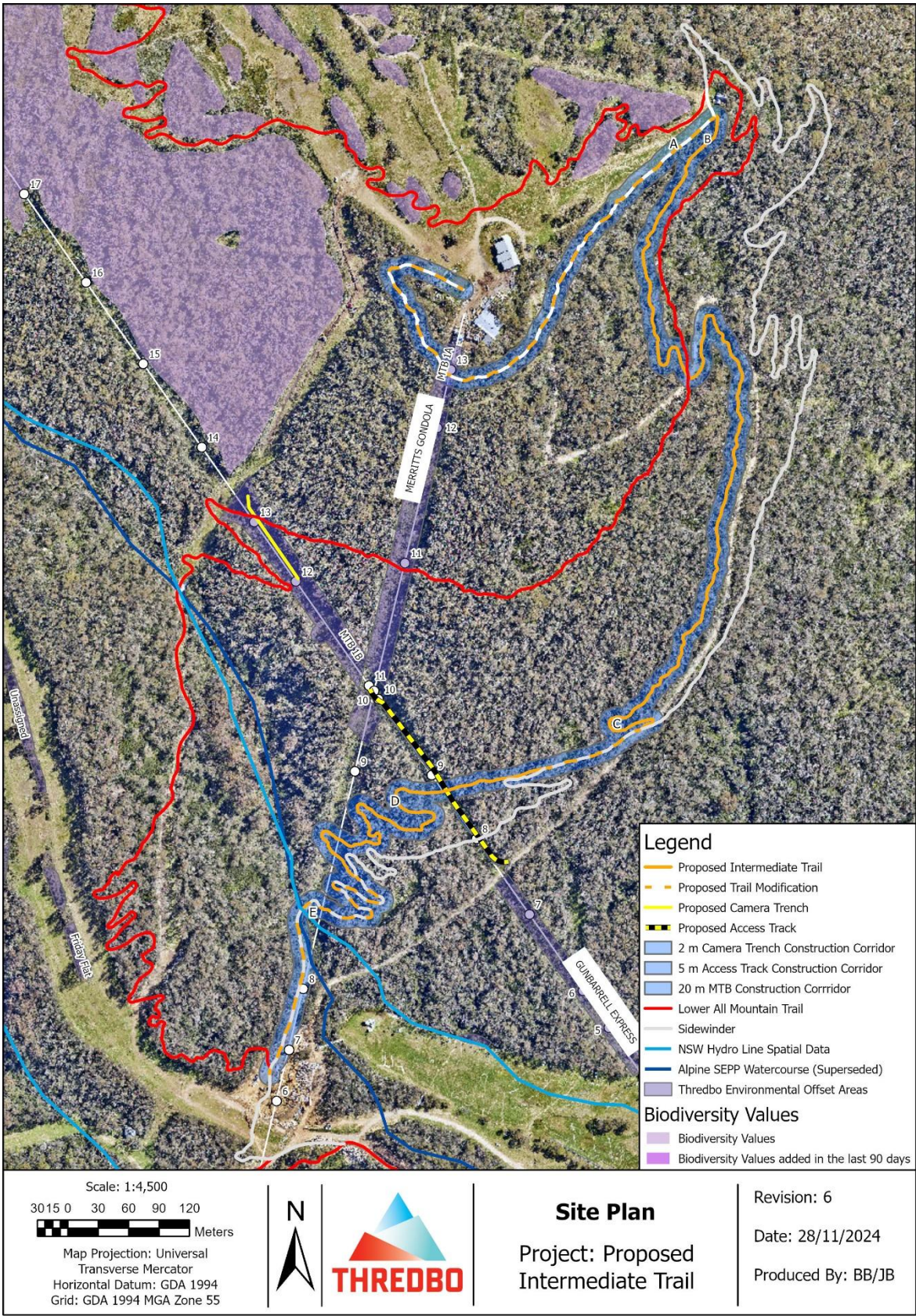
The control of exotic flora is to be undertaken using either spot spraying or hand removal techniques. The spraying activities are to be undertaken using appropriate herbicide for the species being treated and techniques for the conditions on the day. All control activities are to be undertaken prior to plant seed set.

Exotic fauna

The control of exotic fauna is to be undertaken in cooperation with NPWS as a resort wide program targeting the control of cats, foxes and rabbits. The cat and fox trapping program is undertaken by KT during the winter months in the village and on the lower slopes of the resort. Rabbit control programs are conducted in autumn and spring by KT staff also targeting these areas. Feral deer, cat, fox and dog control is undertaken by NPWS outside of the KT lease area.

4 Appendices

4.1 Appendix 1 – Development Area Map



4.2 Appendix 2 – Rehabilitation Species

The following is an extract from the publication; Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park (NPWS 2007). The table represents some of the recommended species for revegetation activities within Thredbo.

Rehabilitation Species List: Thredbo & Bullocks Flat

This appendix provides a list of species known to be successful in rehabilitation, and which would be suited to the Kosciuszko resorts. It does not provide a definitive list of species found in each resort.

Form	Species	Common Name	Community	Propagation and Seed Collection Notes	Direct Seeding
Forbs					
	<i>Craspedia jamesii</i>	James's Billy-button	TAHa, STG	Seed or division	Y
	<i>Craspedia lamicola</i>	Shiny-leaf Billy-button	TAHa, STG	Seed or division	Y
	<i>Craspedia leucantha</i>	Pale Billy-button	SAH, TAHa	Seed or division	Y
	<i>Craspedia maxgrayi</i>	Woolly Billy-button	TAHa, STG	Seed or division	Y
	<i>Helichrysum scorpioides</i>	Button Everlasting	TAHa, W	Seed	Y
	<i>Podolepis robusta</i>	Alpine Podolepis	TAHa, STG	Seed	Y
	<i>Senecio linearifolius</i>	Fireweed Groundsel	SAH, W, SR	Seed	Y
	<i>Stylidium graminifolium</i>	Alpine Trigger-plant	TAHa, STG, H, B, W, SAH, SG	Seed	Y
Grasses, rushes					
	<i>Carex hebes</i>	Dryland Sedge	TAHa, STG	Seed or division	Y
	<i>Poa costiniana</i>	Prickly Snow-grass	STG, F, B, TAHa, H, SAH	Seed or division	Y
	<i>Poa ensiformis</i>	Sword Tussock-grass	W, SAH, SR	Seed or division	Y
	<i>Poa fawcettiae</i>	Smooth-blue Snow-grass	TAHa, STG	Seed or division	Y
	<i>Poa hiemata</i>	Soft Snow-grass	TAHa, SG	Seed or division	Y
Shrubs					
	<i>Acacia obliquinervia</i>	Mountain Hickory Wattle	SAH	Seed (collect in March)	Y
	<i>Cassinia monticola</i>	Cassinia	W, SG		
	<i>Grevillea australis</i>	Royal Grevillea	H, SAH	Tip cutting	
	<i>Hakea microcarpa</i>	Small-fruit Hakea	SAH, W		Y
	<i>Ozothamnus ellipticum</i>	Kerosene Bush	B, H	Soft cutting	
	<i>Ozothamnus secundiflorus</i>	Cascade Everlasting	H, SAH	Soft cutting	
	<i>Podolobium alpestre</i>	Alpine Shaggy-pea	H	Seed (collected in March)	
	<i>Prostanthera cuneata</i>	Alpine Mint-bush	H		Cuttings
Trees					
	<i>Eucalyptus dalrympleana</i>	Mountain Gum	W	Seed	Y
	<i>Eucalyptus delegatensis</i>	Alpine Ash	W	Seed	Y
	<i>Eucalyptus pauciflora</i>	Snow Gum	W	Seed (available all year). 3 weeks cold treatment at 4° recommended.	Y
	<i>Eucalyptus stellulata</i>	Black Sally	W	Seed (available all year). 3 weeks cold treatment at 4° recommended.	Y

Key to Communities:

TAHa Tall Alpine Herbfield *Celmisia* – *Poa* alliance
 TAHb Tall Alpine Herbfield *Brachyscome* – *Austrodanthonia* alliance
 SAH Short Alpine Herbfield
 FMa Feldmark *Epacris* – *Chionohebe* alliance
 FMb Feldmark *Coprosma* – *Colobanthus* alliance

H Heath (alpine)
 F Fen
 B Bog
 STG Sod Tussock Grassland
 W Woodland
 SAH Sub-alpine heath
 SR Subalpine Riparian and wet areas
 SG Subalpine Grassland and dry, treeless areas