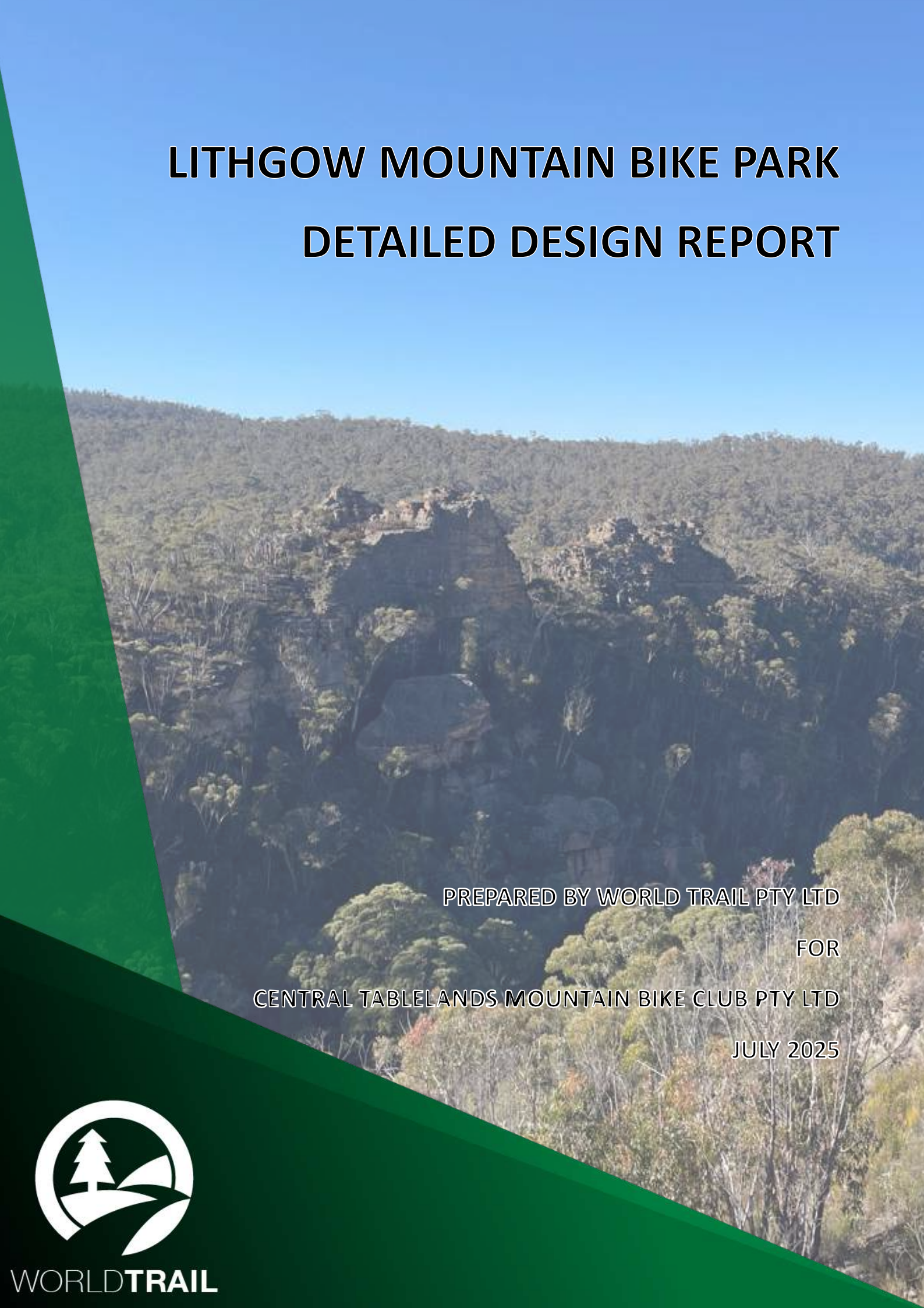
LITHGOW MOUNTAIN BIKE PARK
DETAILED DESIGN REPORT



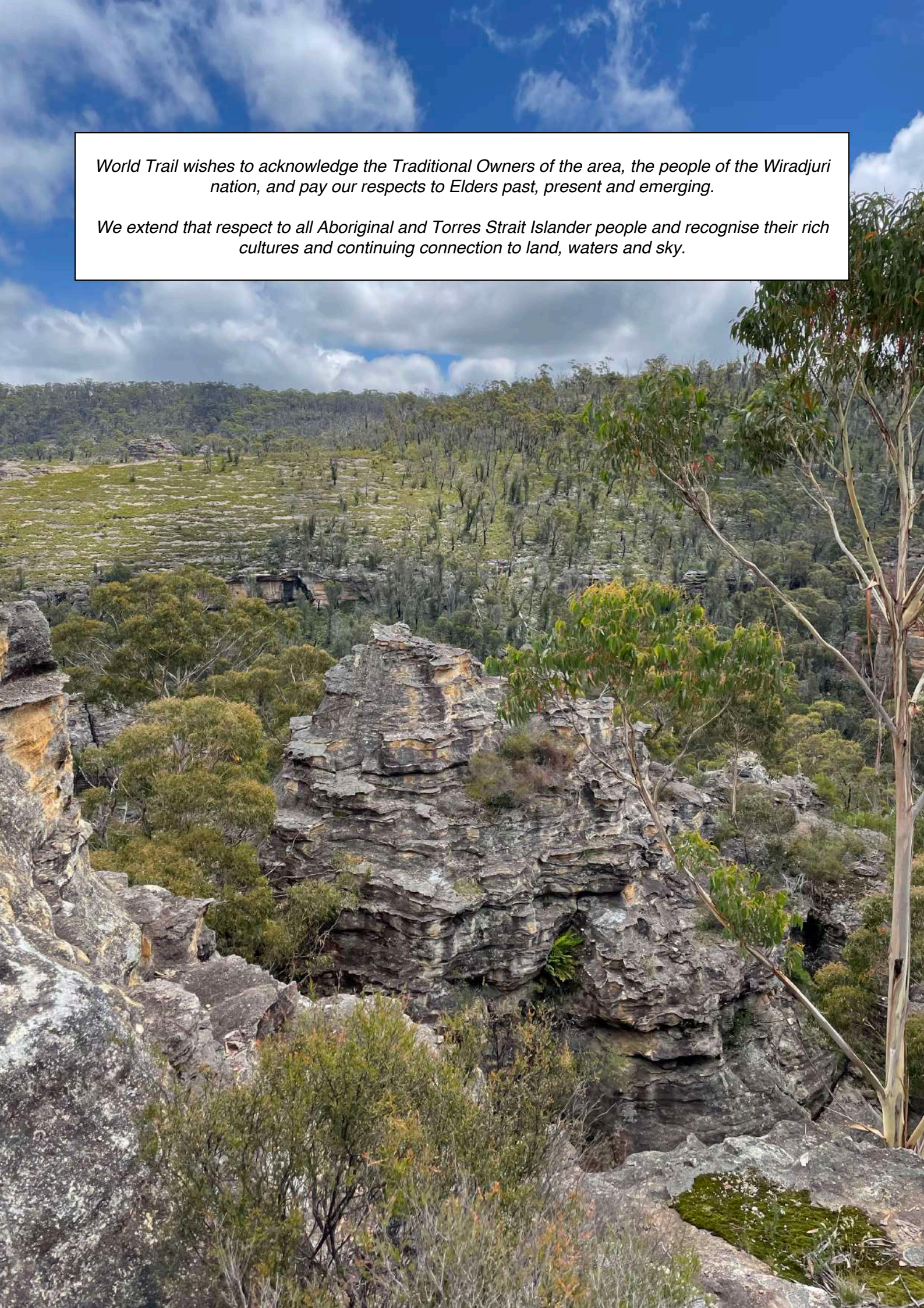
PREPARED BY WORLD TRAIL PTY LTD

FOR

CENTRAL TABLELANDS MOUNTAIN BIKE CLUB PTY LTD

JULY 2025

WORLDTRAIL



World Trail wishes to acknowledge the Traditional Owners of the area, the people of the Wiradjuri nation, and pay our respects to Elders past, present and emerging.

We extend that respect to all Aboriginal and Torres Strait Islander people and recognise their rich cultures and continuing connection to land, waters and sky.

Disclaimer

This document, *Lithgow Mountain Bike Park – Detailed Design Report,* has been prepared by World Trail Pty Ltd for Central Tablelands Mountain Bike Club Pty Ltd. This document is the work of World Trail and does not necessarily reflect the final views or opinions of all stakeholders. It has been prepared in accordance with the relevant federal, state and local legislation and current industry best practice. World Trail accepts no liability for any damages or loss incurred as a result of reliance placed upon the report content or for any purpose other than that for which it was intended.

Version Control

Version	Date	Author	Notes
Draft	*13/8/2024*	*G. McHugh*	
Final	*2/7/2025*	*G. McHugh*	*Minor revisions. Title change.*
Final - Revised	*25/7/2025*	*G. McHugh*	*Minor revisions.*

CONTENTS

1 INTRODUCTION

World Trail (WT) visited Lithgow and the State Mine Gully precinct from June 24-28, 2024, to investigate, finalise and map the trail alignments for a network of mountain bike (MTB) trails that is proposed to be constructed in the State Mine Gully area. This report presents the findings from this work and provides information about the location, type, length and specifications for the proposed trail network. This report and the associated spatial files represent the final design stage for the trail network, prior to construction.

The trail network represented in this report is a refinement of the proposed trail network presented in the *Gardens of Stone Mountain Bike Trails Concept Report* (January 2023). The trails presented herein largely follow the alignments proposed in the earlier concept plan but have been modified in response to opportunities and constraints encountered in the field, such as the available parcels of land, terrain, topography, vegetation and soils. A significant body of work was undertaken prior to fieldwork to firstly confirm the available land parcels, and then to modify the concept accordingly to ensure trails were located only on available land parcels.

Any reference to 'REF' in this report should be taken to mean 'Review of Environmental Factors'.

World Trail was engaged to undertake this project by the Central Tablelands Mountain Bike Club Pty Ltd (CTMBC). CTMBC is supported in this project by the following stakeholders:

- Lithgow City Council (LCC)
- The City of Greater Lithgow Mining Museum Inc (CGLMM)
- National Parks and Wildlife Service (NPWS)

2 PROJECT BACKGROUND

State Mine Gully is located on the western slopes of the Blue Mountains, on the northern outskirts of Lithgow– see Figure 1 below. It is about two hour's drive from Sydney.

Figure 1. State Mine Gully Location

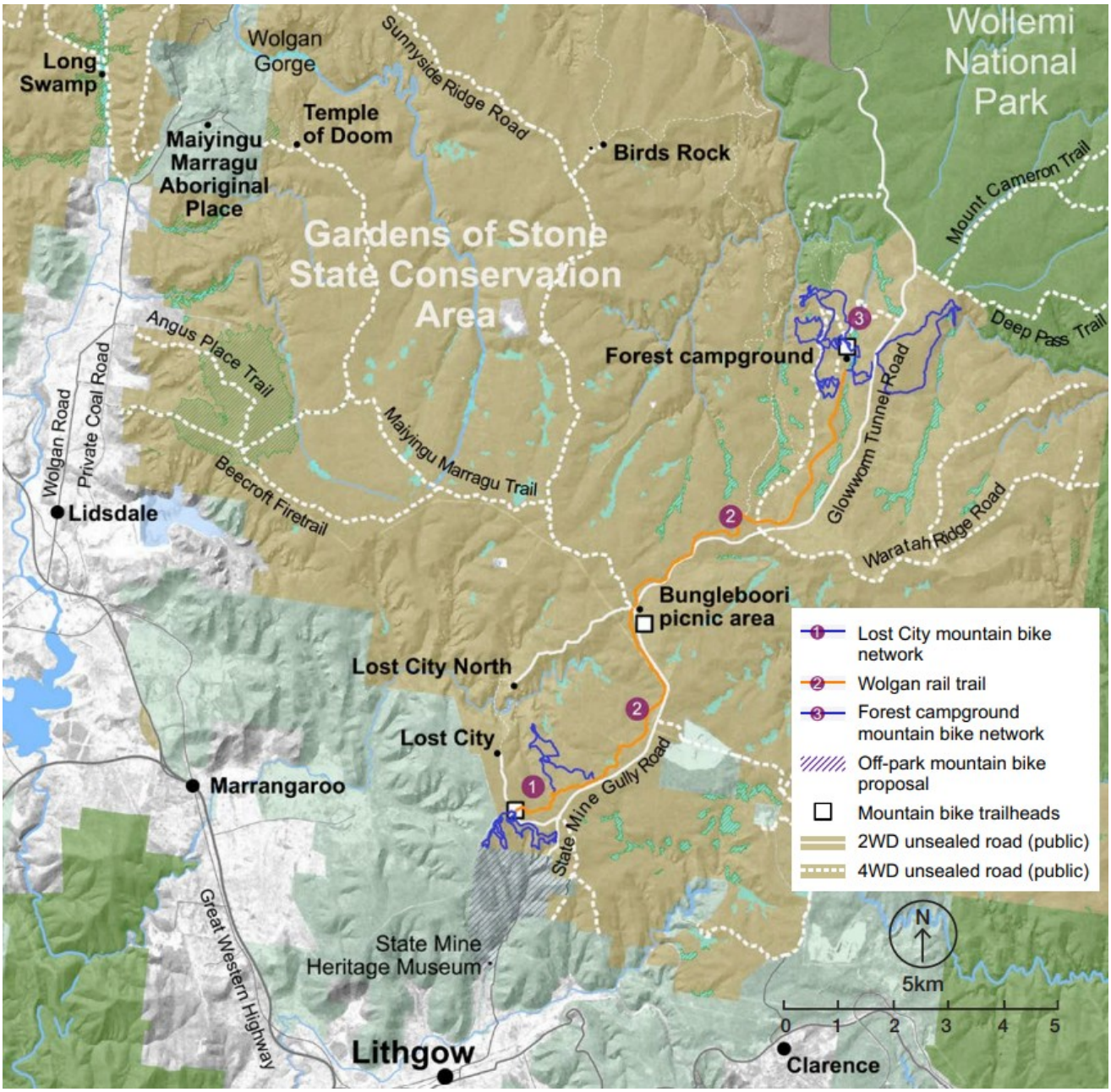
The 220-hectare State Mine Gully precinct is centred around the Lithgow State Mine Heritage Park and comprises numerous parcels of public and freehold lands of various ownership and status. Historically used for mining, the area today has little formal use but possesses many outstanding attributes that make it suitable for development as a mountain biking destination.

With the precinct situated just south of the Gardens of Stone State Conservation Area (GOSSCA) on the northern outskirts of Lithgow, this development will connect Lithgow's existing accommodation and hospitality services with new walking and mountain biking trails and other infrastructure proposed to be constructed within the GOSSCA, as part of a large eco-adventure project.

Announced in 2022, The Gardens of Stone State Conservation Area was formally gazetted in May 2022 as part of a $49.5 million NSW Government investment to establish Lithgow as a world-class ecotourism destination, while conserving the exceptional natural and cultural heritage values of the region. The project initially included a range of recreational opportunities, including new walking tracks, mountain biking trails, new camping areas and facilities, 4WD and motorcycle touring circuits and ziplines and climbing routes.

Since the project was initially announced, the concept for the MTB trail network has moved through a number of design stages and iterations. Figure 2 below shows the proposed conceptual design from the NPWS Master Plan April 2025 (subject to NPWS approvals). The Lithgow Mountain Bike Park (shown as 'Off-park mountain biking proposal' in Figure 2) connects to the proposed NPWS Master Plan Concept Bike Network.

Figure 2. Gardens of Stone MTB Trail Network Master Plan Concept April 2025



The 62.71km trail network proposed across GOSSCA and Lithgow Mountain Bike Park can be broken down by land tenure as follows:

- 38.17km within GOSSCA – The proposed works by NPWS (subject to approval, under review & to be self determined by REF after public exhibition), are not covered in detail in this report.
- 24.54km within State Mine Gully – as detailed in this report for the development application (DA) with Central Tablelands Mountain Bike Club as the Proponent for the DA. This 24.54km network is the subject of this Design Report.

While the completed trail network will be continuous across these land tenures and will function effectively as one trail network, it spans across the GOSSCA and the State Mine Gully precinct. The Primary Trailhead, or main visitor node, is proposed to be located at the State Mine Heritage Park, adjacent to the museum.

The State Mine Gully MTB Trail Network, being outside GOSSCA, would need to be developed using funding from a different source. The local mountain biking club, CTMBC, with support from CGLMM, LCC and NPWS, applied to the NSW Government's $150 million Round Two Regional Tourism Activation Fund. It was successful, being awarded $3.5 million for the construction of the State Mine Gully MTB Trail Network, positioning Lithgow as a drawcard destination for mountain biking enthusiasts. A further $3m grant was received in 2025 from the Federal Government's Growing Regions Program.

The concept plan for the State Mine Gully MTB Trail Network includes a mix of cross-country style loops, gravity point-to-point mountain biking trails, and a shared-use trail suitable for hiking. Additionally, the project will feature the construction of a trailhead at the State Mine Heritage Park and provide vehicle shuttle services to support the mountain bike trail network.

3 SITE OBSERVATIONS

The Stage Mine Gully precinct in New South Wales holds significant industrial heritage centred around the Lithgow State Mine Heritage Park and Railway.

Lithgow State Mine was a major coal mine established in the Western Coalfield in 1919 and was operational until 1992. At its peak, it employed up to 490 workers and produced 1,650 tons of coal per eight-hour shift using faithful pit horses (the photo on the preceding page is a sculpture paying tribute to the pit horses) and advanced technologies like an endless rope system for coal extraction. The mine faced a major setback in 1964 when severe flooding led to its temporary closure, resulting in widespread job losses and community upheaval. By 1990, the property was sold, and ownership transferred to the Lithgow City Council, which converted the site into the State Mine Heritage Park. Today, the park not only preserves artifacts and historical items from its mining days in a museum but also serves as a venue for various events, including weddings, celebrations, and commercial photoshoots.

The coal seams around Lithgow were essential for the Great Western Railway's development, establishing Lithgow as a major railhead in 1869. The construction of the line to Bathurst included a 'Zig-Zag' system to navigate the descent to the Lithgow Valley, but this approach soon became inadequate due to limitations on train length and growing demand. In 1994, the State Mine Railway was created to restore the State Mine branch line and develop a tourist route linking heritage sites like the Lithgow State Mine and Zig Zag Railway. However, arson in 2001 severely damaged the project, causing a suspension of operations. In 2006, the Lithgow State Mine Railway Limited was formed to focus on rail activities, while the Greater Lithgow Mining Museum continued to preserve mining history. Despite slow progress, volunteers remain vital in maintaining the railway through ongoing efforts and working bees.

Surrounding the State Mine Heritage Park is the State Mine Valley, notable for its diverse geological formations such as rocky plateaus and sandstone pagodas. This valley also supports a rich variety of native flora and fauna, ranging from eucalyptus forests to riparian zones. Its natural beauty and biodiversity make it an important area for conservation and recreational activities, offering scenic views and opportunities for visitors to explore both the industrial history and natural splendour of the region.

The figures on the following page illustrate some of the outstanding natural scenery and values found within the State Mine Gully. The horse sculpture shown in Figure 3 is a memorial to the ‘pit ponies’ that were used to haul coal in the mine.

Figure 3. Horse sculpture

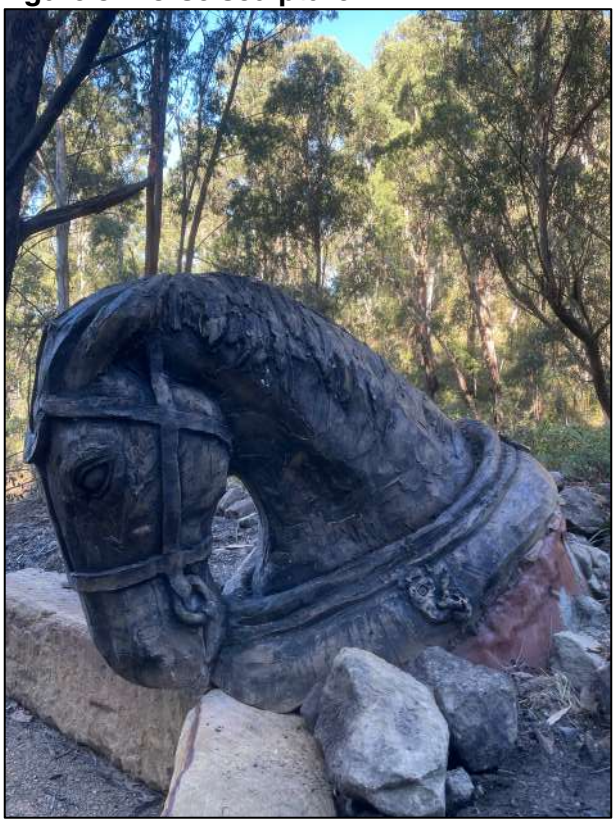


Figure 4. View over State Mine Heritage Park

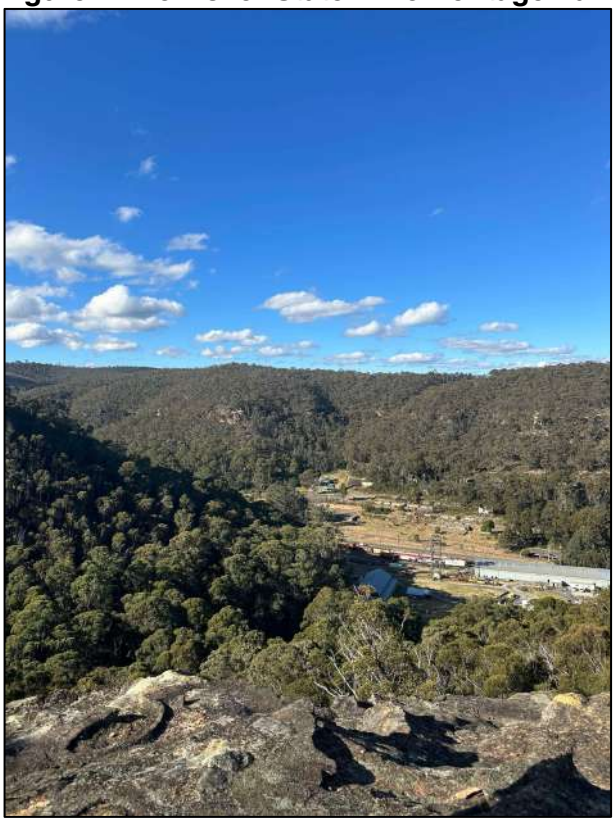
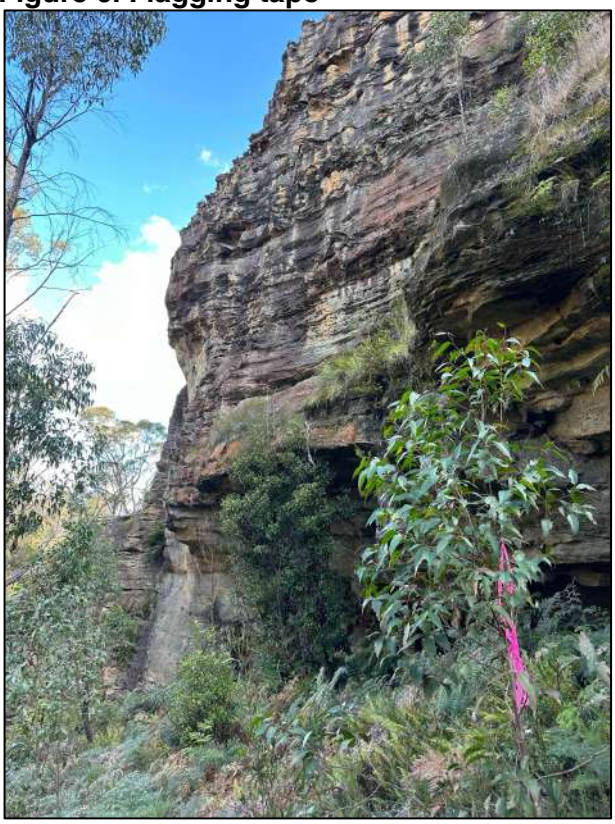


Figure 5. Sandstone pagodas

Figure 6. Flagging tape



4 GROUND-TRUTHED TRAIL NETWORK

4.1 GUIDING PRINCIPLES

The following Guiding Principles have been developed through many years of designing and building MTB trails and embody a range of underlying drivers such as risk management, safety, visitor experience, navigation, event compatibility, ride flexibility and sustainability. They are not listed in any priority order.

1. **Trails to offer a good mix of trail difficulty ratings** – a suitable breakdown of trail difficulties might be 30% Easy, 50% Intermediate and 20% Very Difficult. WT uses the Trail Difficulty Rating System (TDRS) published by AusCycling 2023 in the Australian Mountain Bike Trail Guidelines. The complete TDRS is provided in Appendix 6.1.

2. **Trail network to offer a wide spectrum of riding styles where compatible with the topography, terrain, soil and users** – in order to maximise the attractiveness of the trail network to the widest group of riders as possible, the network should ideally include opportunities for a variety of types of MTB riding, however, only where the 'raw ingredients' exist to do so. Over many years WT has developed a suite of trail styles to communicate the features found on the different types of trails. These styles are listed and explained in Appendix 6.2.

3. **Trails to be single direction** – Single direction trails provide the safest and most enjoyable visitor experience. By directing people to use the trails in a recommended direction, head-to-head interactions with other MTB riders are minimised. Riders only interact with other riders where one rider catches and overtakes another. Single direction trails are not only safer, but they provide a better visitor experience through a more intuitive traffic flow and decreased disruptive interactions with other riders. Dual direction trails can be useful in some situations, but should generally only be used on flatter terrain with slower speeds and good sight-lines.

4. **Trail network to follow a logical pattern and rotation direction with minimal cross-overs** – by ensuring all trails within a trail network follow the same direction (i.e. clockwise or anti-clockwise), it helps to create a trail network that is intuitive and easy to navigate and that minimises conflicts at intersections.

5. **Trail network should be event ready** – that is, the trail network works well for day-to-day recreational riding, but is also ready to host any competitive MTB events. This means having good event staging areas available, but also means having the right types of trails, minimal conflict/cross-over zones, access for emergency vehicles, spectator access and a flexible trail network offering maximum course configuration options.

6. **Trail network to maximise use of existing trails and minimise new trails** – where existing informal MTB trails are found to offer a safe and enjoyable experience and meet modern MTB trail sustainability guidelines, they should be incorporated into the trail network instead of constructing new trails.

7. **New trails to be designed to minimise environmental impacts** – where new trails are to be constructed, they should be designed to avoid areas of high environmental values. Previously disturbed areas, unused management vehicle tracks, heavily modified or degraded areas, areas with introduced vegetation (e.g. pines) etc. should be prioritised for trail development, where the rider experience is not negatively impacted.

8. **Trails to maximise use of singletrack as much as possible** – Singletrack is the preferred experience sought by all MTB riders, from beginner to advanced and must be the primary focus of the proposed trail network. Where existing trails or management vehicle tracks are found to

be in good condition and provide an appropriate experience for MTB riding, they may be incorporated into the proposed MTB trail network.

9. **Trails should not re-appropriate popular walking tracks for MTB** – this project is not seeking to take away trail opportunities from one user group while rewarding another. Where an existing trail is deemed to be heavily used by walkers, it should not be incorporated into the proposed MTB trail network, except in exceptional circumstances, and only if appropriate – i.e. flat or uphill for MTBs, good forward sight lines etc.

10. **Trails to maximise opportunities for views and lookouts** – not all riders are obsessed with speed – many want to stop and take in the sights and smells, especially in beautiful locations like the Blue Mountains. Achieving this principle leads to increased rider satisfaction and also has a direct correlation with increased visitation – visitation to MTB destinations is heavily influenced by imagery. In the modern age of social media (especially the new wave of fitness tracking social media apps like Strava) spectacular trails stand out and a single persuasive image can be enough to influence a rider to visit a new area.

11. **Trails to incorporate adequate signage to ensure safe and enjoyable usage by all visitors –** An effective trail network will ensure information provision, signage and education for users on difficulty levels/grades, distances/times, expected users, etc. to ensure that actual experiences meet expectations.

4.2 TRAIL NETWORK OVERVIEW

The key features of the proposed Lithgow Mountain Bike Park are:

- Thirty-four mountain bike trails, encompassing 24.54km of trail subject to DA approval (State Mine Gully Precinct), and 14.53km of proposed trail (subject to approval) to be developed by NPWS (GOSSCA) under their planning processes as previously mentioned;
- The State Mine Gully Precinct (the subject of this report and development application (DA)), shall encompass twenty-two mountain bike trails totaling 24.54km in length as follows:
    - Eleven 'Adventure' trails – most closely analogous to cross-country trails, generally including a mix of climbs, descents and flats and are mostly loop trails;
    - Nine 'Flow' trails – dedicated point-to-point descending trails with gentle to moderate gradients, bermed corners, rollers and jumps;
    - One 'Shared-use' trail – this Easy trail is intended to be shared by walkers and MTB riders and forms the main climbing trail from the bottom to the top. Note that it is intended to be dual directional for walkers, but single direction for MTB riders (uphill direction).
    - One 'Gravity' trail – dedicated point-to-point descending trail, but generally rawer and more natural in form than a flow trail;
    - The Trail Difficulty Ratings breakdown of the trail network is:
        - 9 trails rated Easy (41% by number of trails; 37% by length of trails);
        - 3 trails rated Easy / Intermediate (14% by number of trails; 14% by length of trails);
        - 7 trails rated Intermediate (32% by number of trails; 30% by length of trails).
        - 2 trail rated Intermediate/ Difficult (9% by number of trails; 11% by length of trails).
        - 1 trail rated Difficult (4% by number of trails; 8% by length of trails).

Note that throughout this report, the trails are referred to as Trail 02, Trail 50 etc. These names are for use in this report only, and should not be used for the final completed trails. WT recommends that all trails have a unique name, rather than simple trail numbers. Names help to create an identity and culture for each trail, and can assist in marketing and promotion of trails.

Table 1 on the next page provides a summary of the entire trail network, summarizing both developments by Central Tablelands Mountain Bike Club and the proposed network by NPWS, providing a brief description, the trail difficulty rating, the style and the length for each trail.

Table 1. State Mine Gully MTB Trail Network Summary

Trail Name	Description	Trail Difficulty Rating	Trail Style	GOSSCA Length (m)	State Mine Gully Length (m)	Total Length (m)
01	Flat, easy, traversing trail, providing access to Trails 50, 51, 52 and 53. Single direction, northeast to southwest.	 Easy	Adventure	668		668
02	Long, flowing descent from Lost City South Trailhead, all the way down to State Mine Gully Trailhead. Acts as the 'home trail' which majority of other descents merge onto.	 Easy with Intermediate Sections	Flow	2333	2467	4800
03	Provides an alternative option to the start of Trail 2, with more challenging features and terrain, amidst stunning rock formations.	 Intermediate	Flow	2346		2346
50	Long, cross-country style, traversing descent. Features rocky terrain and slabs, with some challenging technical sections.	 Easy	Adventure/flow	540	2360	2901
51	Existing downhill trail - Left Hand Gully. Mostly in good condition, but some trails could benefit from better drainage and some minor reshaping.	 Intermediate	Gravity	400	1396	1796
52	Intertwined with Left Hand Gully (Trail 51) like a DNA helix, this trail will be a fast, flowing descent.	 Intermediate With Difficult Sections	Flow	467	1249	1716
53	Trail 53 provides an alternative entry into Trail 51 and 52, starting high up on the exposed ridgeline before making its way down into the valley.	 Intermediate	Flow	453	697	1150
54	Trail 54 is located high up on a rocky ridgeline, providing some exciting optional rock chute A-lines and long views towards Lithgow. Mellow gradients mean slower speed and higher technical challenges.	 Intermediate	Adventure	1025	1536	2561
55	Rockier and more technical alternative to Trail 56.	 Intermediate	Flow	914	626	1539
56	Fast, flowing trail located deep in a valley surrounded by towering rocky pagodas. Roller-coaster like shape.	 Easy	Flow	1181	285	1466

57	Signature climbing trail from the State Mine Gully Trailhead, all the way to the Lost City South Trailhead. Gentle gradients, but consistently uphill.	 Easy	Adventure	2764	4003	6767
58	Gentle climbing trail located in the base of a deep, moist gully. Provides access to Trails 50 and 59.	 Intermediate	Adventure		854	854
59	Challenging trail for experienced riders. Includes narrow hand-built sections of trail, steep rocky chutes and steep drop-offs beside the trail. Mix of climbing and descending.	 Difficult	Adventure		3031	3031
60	Being the first trail from the State Mine Gully Trailhead, Trail 60 forms the entry and exit for all the trails connecting back to the Primary Trailhead.	 Easy	Adventure		307	307
61	Easy, meandering cross-country style loop trail in the shady valley near the State Mine Gully Trailhead.	 Easy	Adventure		714	714
62	Cross-country style loop trail, starting on Trail 61 and finishing on Trail 60.	 Easy	Adventure		546	546
63	Longer, more challenging cross-country loop trail, climbing up above the valley floor, before descending back down to Trail 62. Offers some A-line options.	 Intermediate With Difficult Sections	Adventure		2314	2314
64	Super easy warm-up trail for kids and beginners.	 Easy	Adventure		142	142
65	Loop trail, providing access to the main climb (Trail 57) and exit from most of the descending trails.	 Easy	Adventure		516	516
66	Cross-country style loop trail - mix of climbing and descending.	 Intermediate	Flow		1083	1083
67	Short, but scenic trail offering a cool experience through a deep ferny gorge.	 Easy with Intermediate Sections	Adventure		168	168
68	Short, fun descent, cutting off some of the climbing from Trail 66.	 Easy with Intermediate Sections	Flow		248	248
Total				**13091**	**24542**	**37633**

4.3 MAPS

The maps on the following pages illustrate the proposed State Mine Gully MTB Trail Network.

Map 1 shows the trails represented by different colours corresponding to their proposed trail difficulty rating and includes waypoints such trailheads, shuttle pick-up points and lookouts. Recommended direction of travel is represented by small white arrows on the trails.

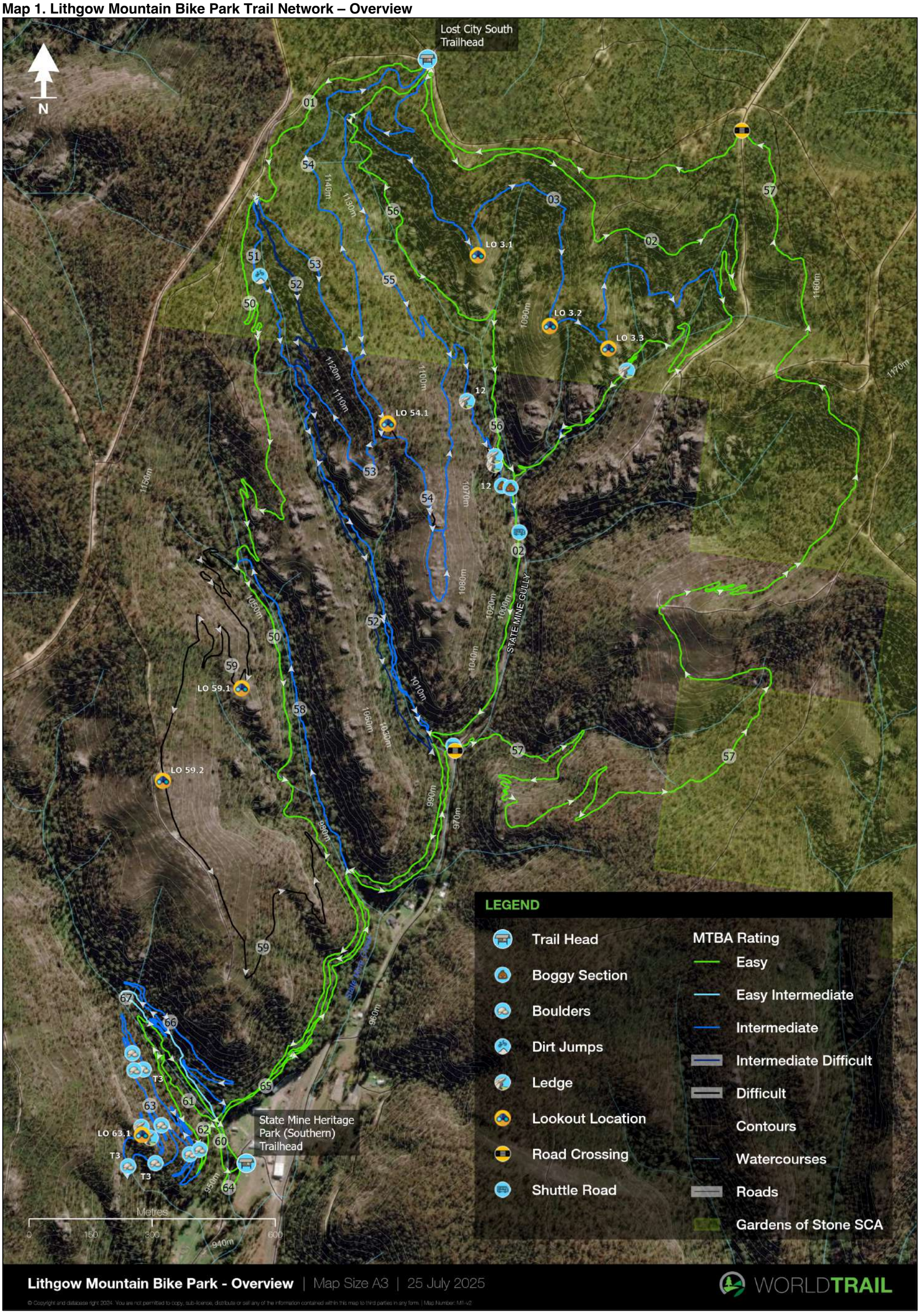
Map 2 shows the trails represented by different colours and line styles corresponding to trail type and showing waypoints relating to construction treatments such as rock armours, bridges and trail surfacing. Recommended direction of travel is represented by small white arrows on the trails.

All waypoints have been given a unique label, which is shown in the maps. These labels are comprised of letters and numbers – the letters indicate the type of waypoint and the numbers indicate the trail on which it is located, and the numbered position of that waypoint along the trail. Letter codes used are:

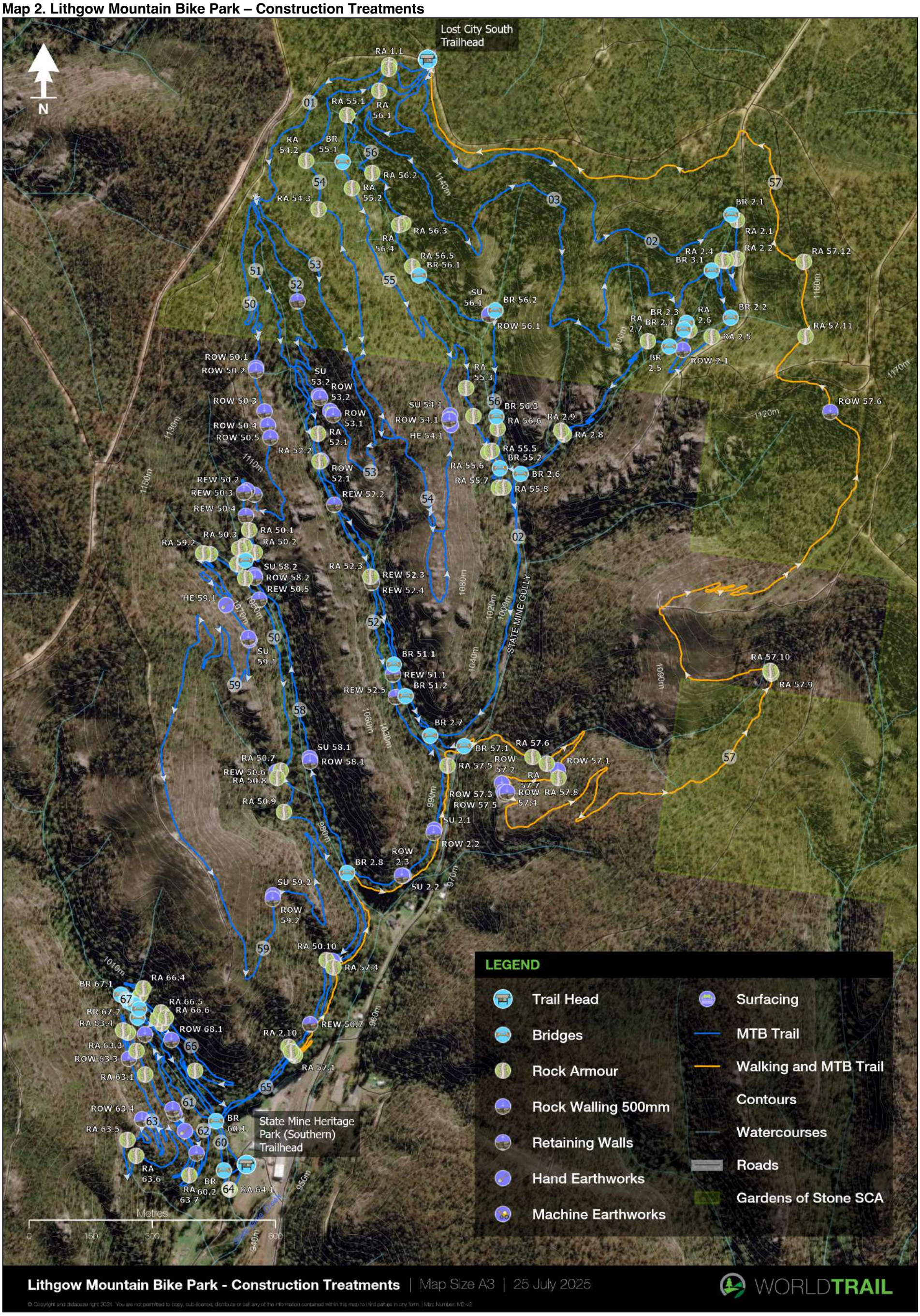
- BR – Bridge
- HE – Hand earthworks
- LO – Lookout
- RA – Rock Armour
- REW – Retaining wall (greater than 500mm)
- ROW – Rock walling (up to 500mm)
- SU – Surfacing

As an example, waypoint LO3.1 is a lookout, located on Trail 3 and is the first lookout located on that trail. LO3.2 is a lookout, located on Trail 3 and is the second lookout located on that trail.

Map 1. Lithgow Mountain Bike Park Trail Network – Overview



Map 2. Lithgow Mountain Bike Park – Construction Treatments

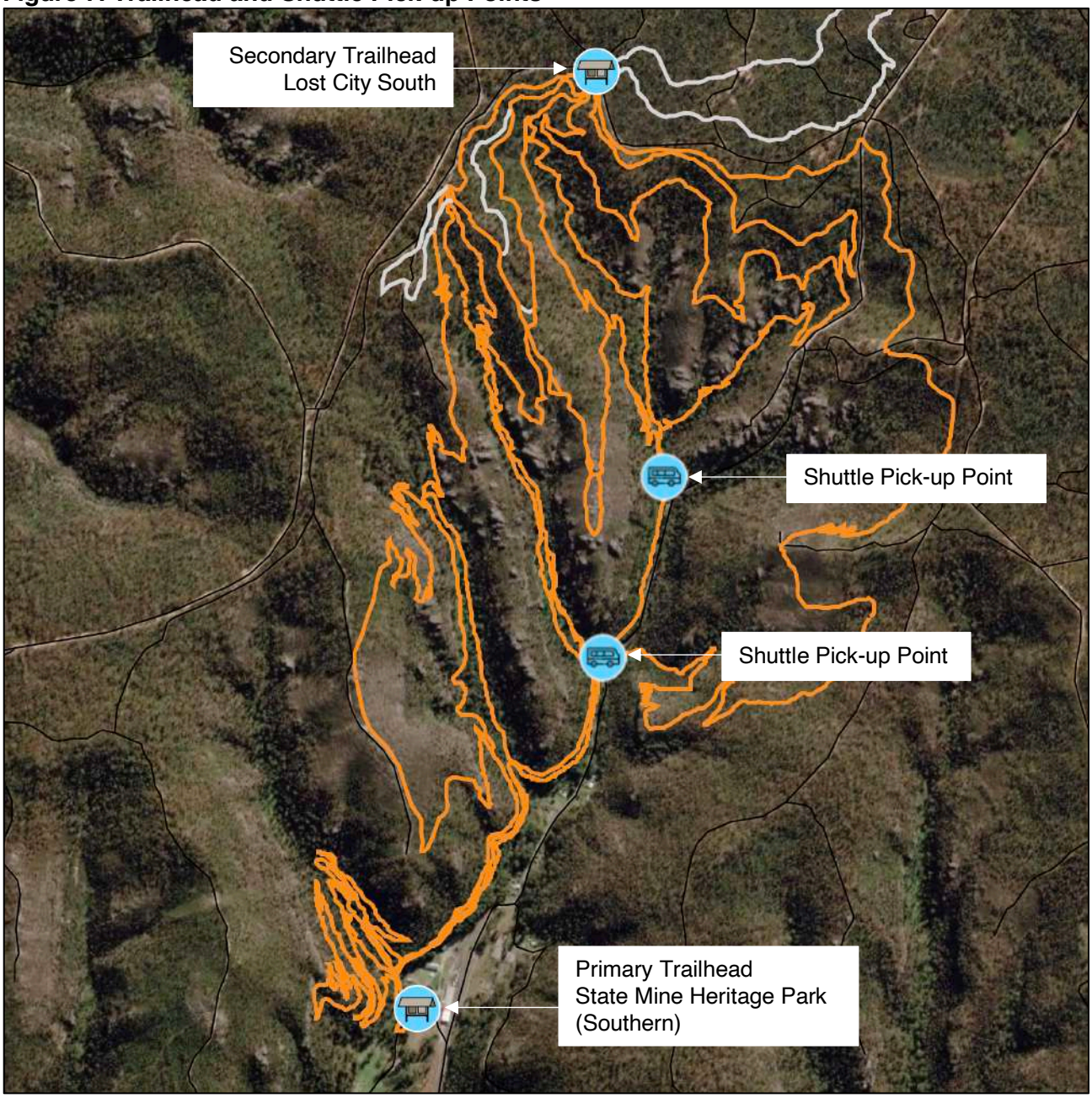


4.4 TRAILHEADS

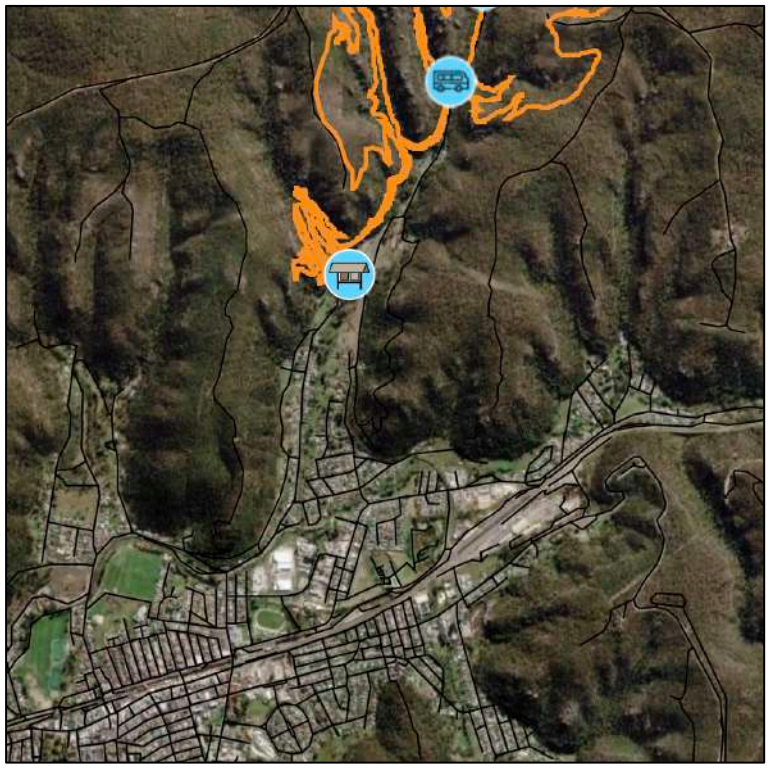
Two separate trailheads are proposed within this project to service the MTB trail network – the Primary Trailhead at State Mine Heritage Park (Southern) and a Secondary Trailhead at Lost City South. Two additional Shuttle Pick-up Points are recommended at key locations along State Mine Gully Rd, allowing riders more flexibility in how they choose to utilise the trail network. These are shown in Figure 7 below.

Further design work has been undertaken to determine the requirements of the trailheads, and the southern trail head is documented clearly in other documents within the DA.

Figure 7. Trailhead and Shuttle Pick-up Points



4.4.1 Primary Trailhead – State Mine Heritage Park

Description	The Primary Trailhead at State Mine Heritage Park is an existing park located on the site of the old Lithgow State Coal Mine. It has an existing museum on site. A large open area just south of the museum will be converted into a car park for MTB riders, with the trails accessible on the western side of the car park. This trailhead is close to Lithgow, and as such, will be the first contact point for visitors coming to ride the trails or heading into the GOSSCA. It will also operate as the lower shuttle pick-up point on State Mine Gully Road.
Location	State Mine Heritage Park, State Mine Gully Rd, Lithgow
Driving Distance from Lithgow	2.5km from the town centre
Car Parking	Yes
User Group	MTB riders and hikers
Potential Facilities	Maps, signage, toilets, drinking water, picnic tables, rubbish bins etc.
Trails Accessible	1, 2, 3 and 4
Other Activities	Walking/hiking trails will provide access to Lost City South trailhead and beyond into the GOSSCA.
Map	

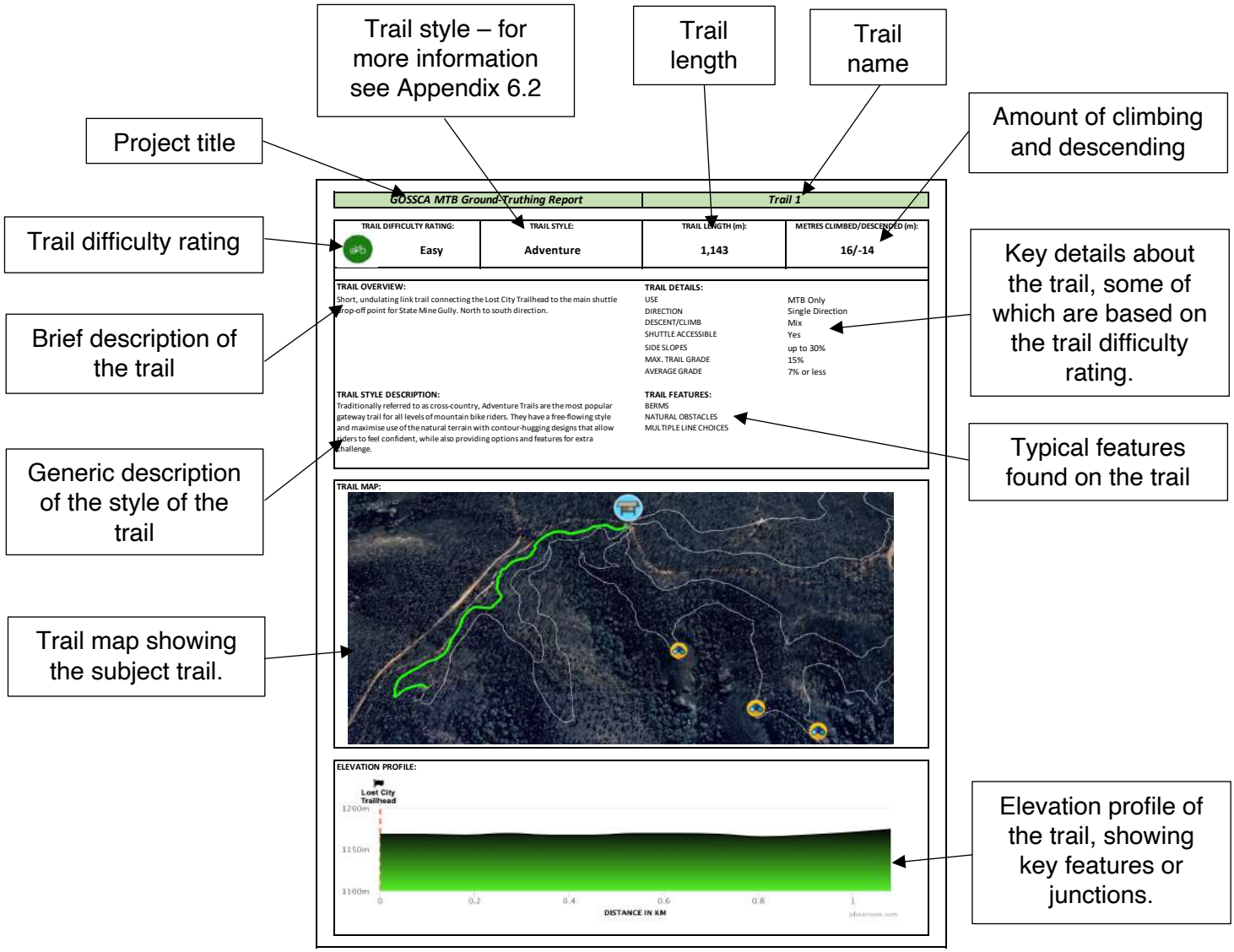
4.4.2 Secondary Trailhead – Lost City South Trailhead

Description	The Lost City South Trailhead is essentially the shuttle drop-off point for the State Mine Gully MTB Trail Network, with all the descending trails starting from this point, and heading southwards into State Mine Gully. Two key shared-use trails also connect to this point: 1. One heads northeast from here, into the GOSSCA, eventually connecting to Forest Camp and the other MTB trails located there. 2. One heads north towards a trailhead that will be the key access point for the hiking trail in Lost City. It is located in a flat area with plenty of available space for car parking and other facilities. As the secondary trailhead, it doesn't require extensive car parking – MTB visitors should be encouraged to park at the Primary Trailhead at State Mine Heritage Park – and only moderate facilities such as signage and maybe a small shelter.
Location	1km west of State Mine Gully Rd near the southern boundary of GOSSCA.
Driving Distance from Lithgow	6.8km
Car Parking	Limited – encourage visitors to use the Primary Trailhead
User Group	MTB riders and hikers
Potential Facilities	Maps, signage, shelter
Trails Accessible	1, 2, 3 and 4
Other Activities	Hiking and shared-use trail connections to the northeast and north
Map	

4.5 TRAIL DESCRIPTIONS

The following pages provide details and attributes for each of the proposed trails.

The graphic below provides a brief explanation of the information contained within each Trail Description.



Lithgow Mountain Bike Park	***1***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**668**	**8.9/-7.88**

TRAIL OVERVIEW:

Ground-truthed 2022. Flat, easy, traversing trail, providing access to Trails 50, 51, 52 and 53. Single direction, northeast to southwest.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:

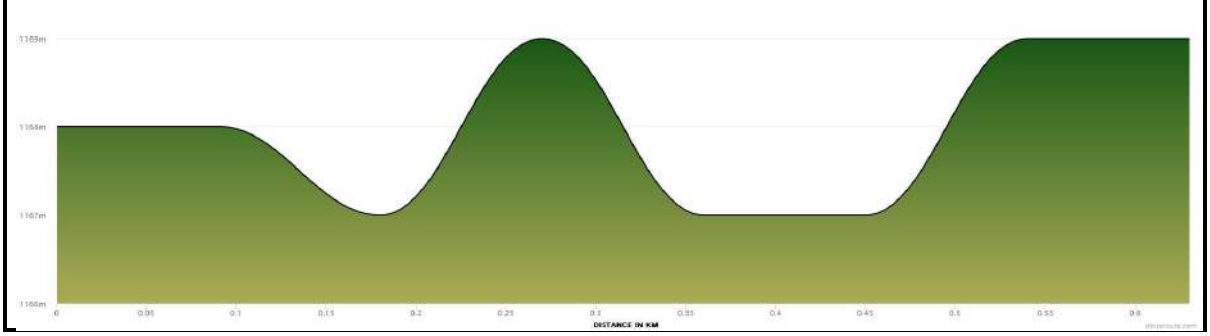
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	*2*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy with Intermediate Sections	**Flow**	**2,467**	**120/-314**

TRAIL OVERVIEW:

Long, flowing descent from Lost City South Trailhead, all the way down to State Mine Gully Trailhead. Acts as the 'home trail' which majority of other descents merge onto.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:

A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:

BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:

Lithgow Mountain Bike Park	*3*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	**Flow**	**2,345**	**138/-191**

TRAIL OVERVIEW:

Ground-truthed 2022. Provides an alternative option to the start of Trail 2, with more challenging features and terrain, amidst stunning rock formations.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

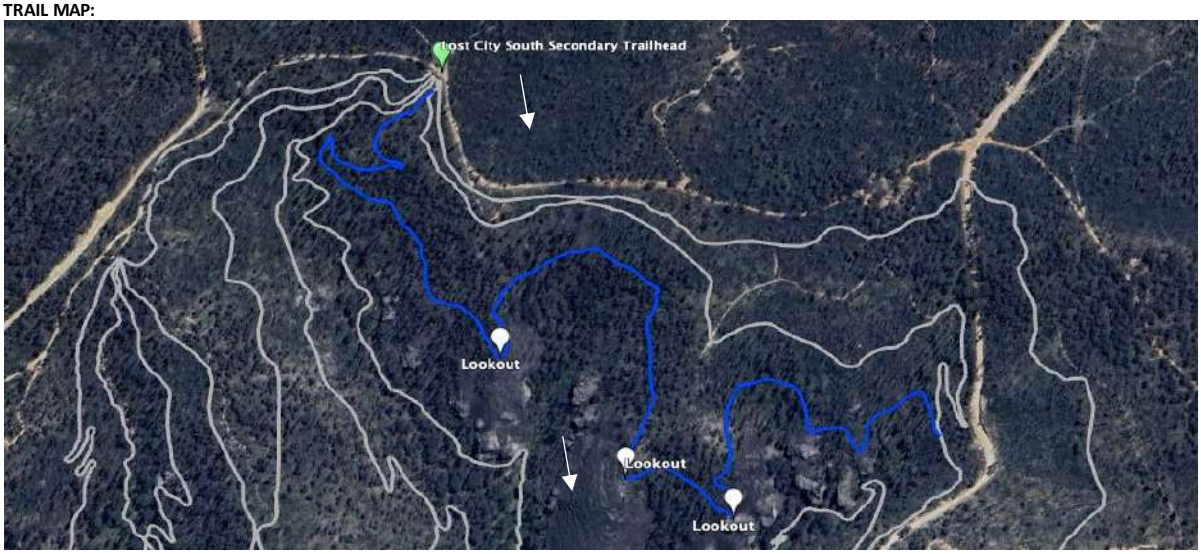
TRAIL STYLE DESCRIPTION:

A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:

BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:

Lithgow Mountain Bike Park	***50***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**2,360**	**53.3/-239**

TRAIL OVERVIEW:
Long, cross-country style, traversing descent. Features rocky terrain and slabs, with some challenging technical sections.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:

Lithgow Mountain Bike Park	*51*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	Gravity	1,396	1.63/-165

TRAIL OVERVIEW:

Existing downhill trail - Left Hand Gully. Mostly in good condition, but some trails could benefit from better drainage and some minor reshaping.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

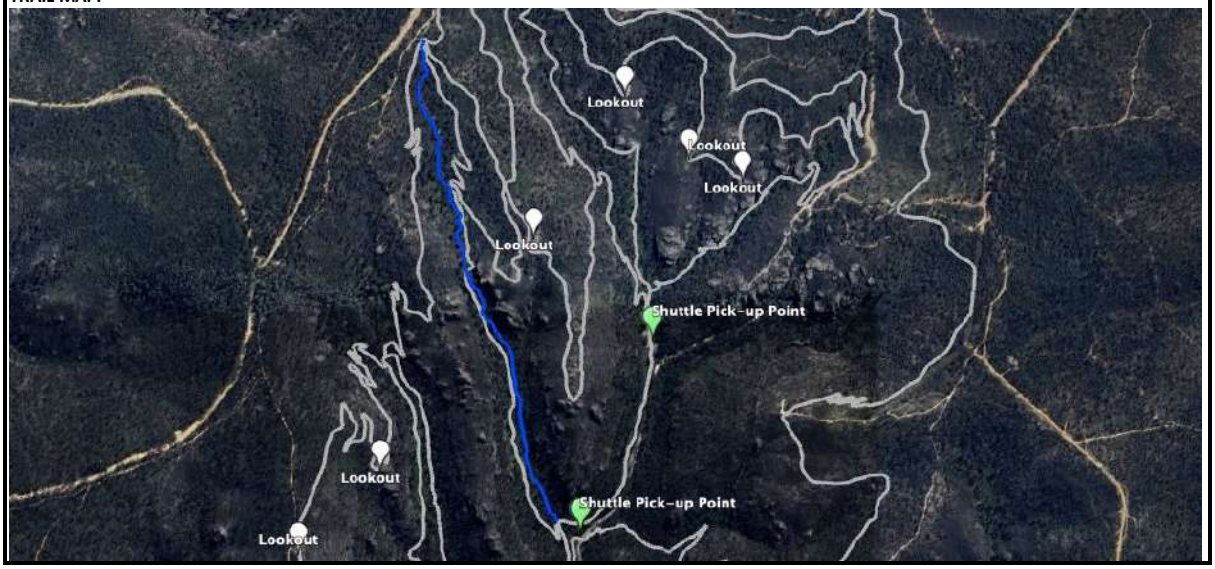
TRAIL STYLE DESCRIPTION:

Offering a mix of Flow, Air Flow and Downhill, Gravity Trails embrace the raw beauty of the terrain in an exciting and challenging descent. They will often provide multiple line choices and a variety of features, and may include occasional short uphill sections.

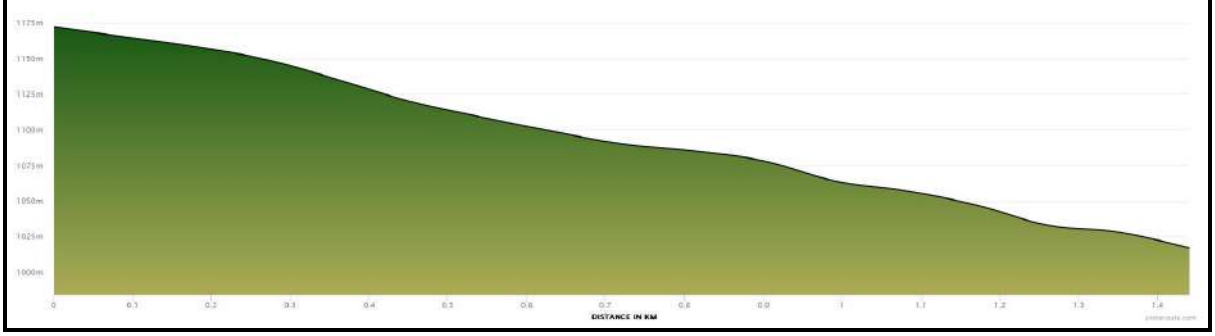
TRAIL FEATURES:

BERMS
MULTIPLE LINE CHOICES
JUMPS AND DROPS
ROCK SLABS AND ROCK GARDENS

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	*52*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate with Difficult Sections	**Flow**	**1,249**	**14.8/-183**

TRAIL OVERVIEW:

Intertwined with Left Hand Gully (Trail 51) like a DNA helix, this trail will be a fast, flowing descent.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	#N/A
MAX. TRAIL GRADE	#N/A
AVERAGE GRADE	#N/A

TRAIL STYLE DESCRIPTION:

A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:

BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:

Lithgow Mountain Bike Park	***54***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	**Adventure**	**1,536**	**41.8/-132**

TRAIL OVERVIEW:

Trail 54 is located high up on a rocky ridgeline, providing some exciting optional rock chute A-lines and long views towards Lithgow. Mellow gradients mean slower speed and higher technical challenges.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

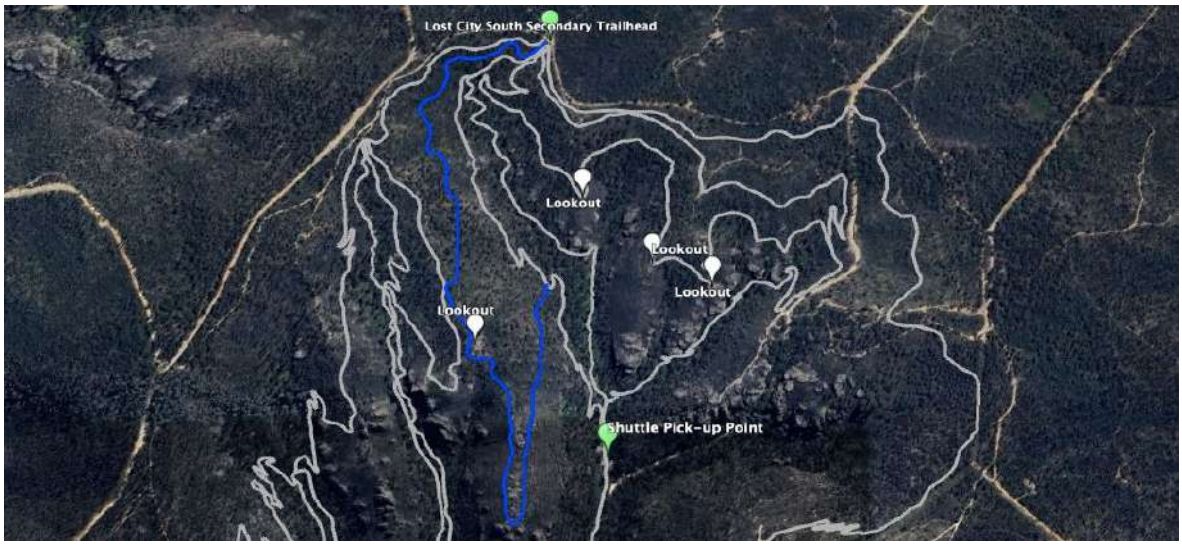
TRAIL STYLE DESCRIPTION:

Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

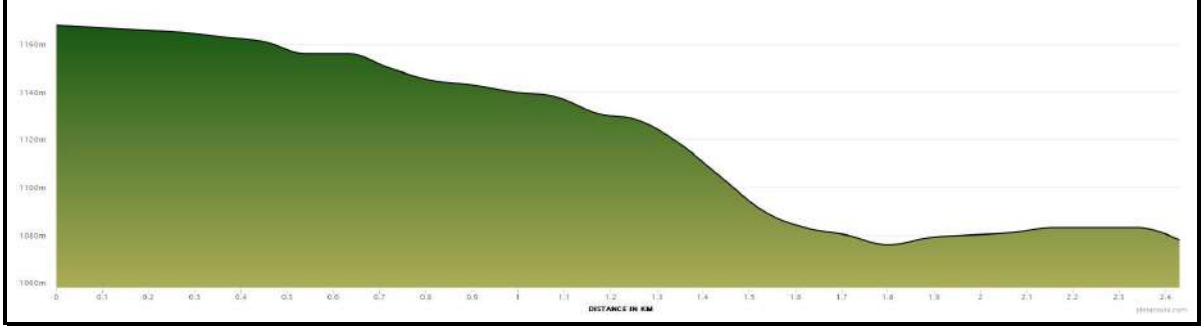
TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	***55***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	**Flow**	**626**	**18.9/-148**

TRAIL OVERVIEW:

Ground-truthed 2024. Rockier and more technical alternative to Trail 56.

TRAIL DETAILS:

USE	0
DIRECTION	0
DESCENT/CLIMB	0
SHUTTLE ACCESSIBLE	0
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

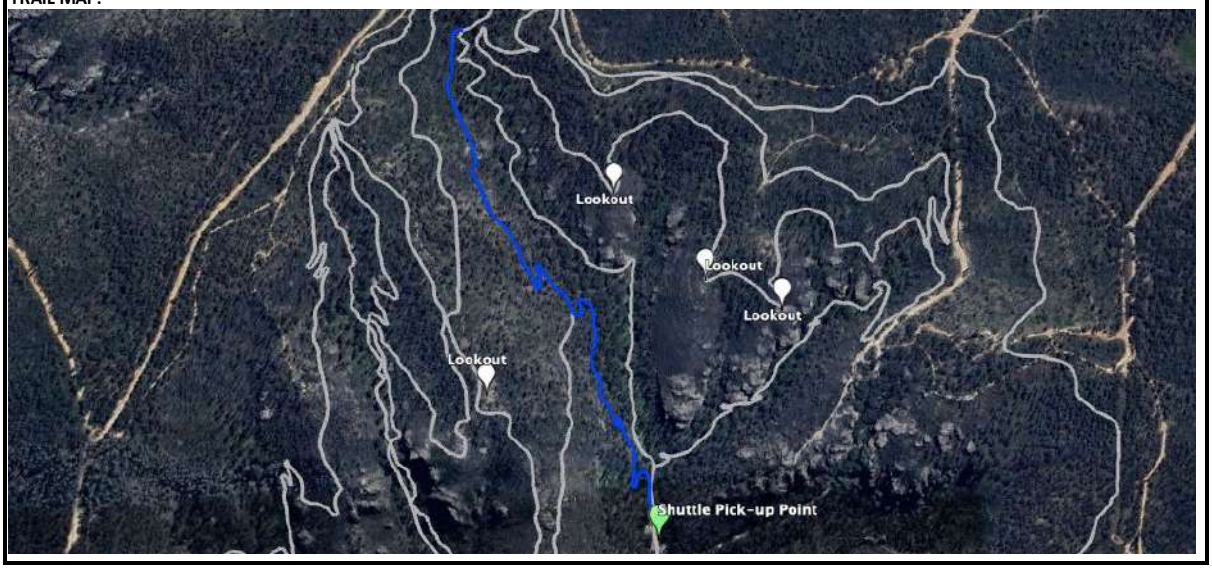
TRAIL STYLE DESCRIPTION:

A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

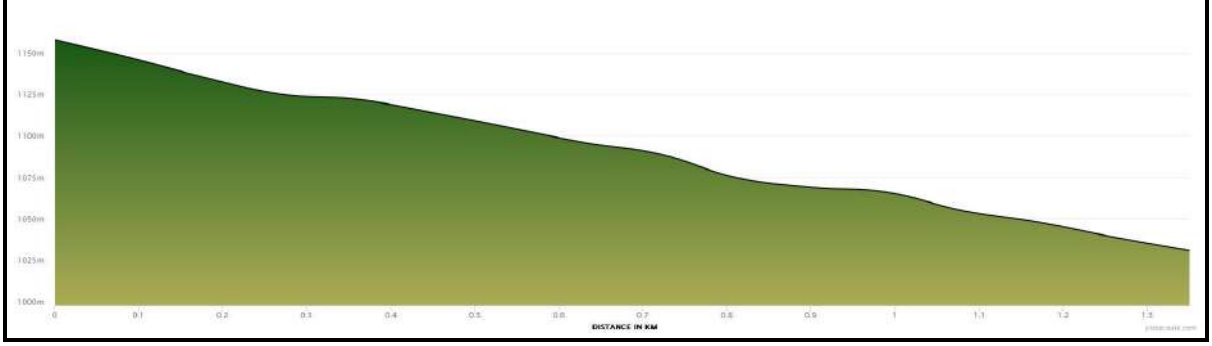
TRAIL FEATURES:

BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	*56*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Flow**	**285**	**6.75/-138**

TRAIL OVERVIEW:
Fast, flowing trail located deep in a valley surrounded by towering rocky pagodas. Roller-coaster like shape.

TRAIL DETAILS:

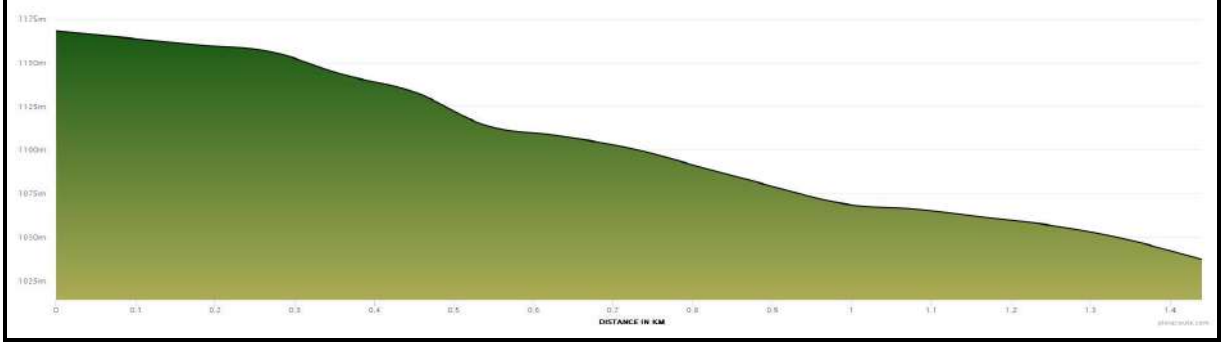
USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:
A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:
BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	***57***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**4,003**	**383/-190**

TRAIL OVERVIEW:
Signature climbing trail from the State Mine Gully Trailhead, all the way to the Lost City South Trailhead. Gentle gradients, but consistently uphill.

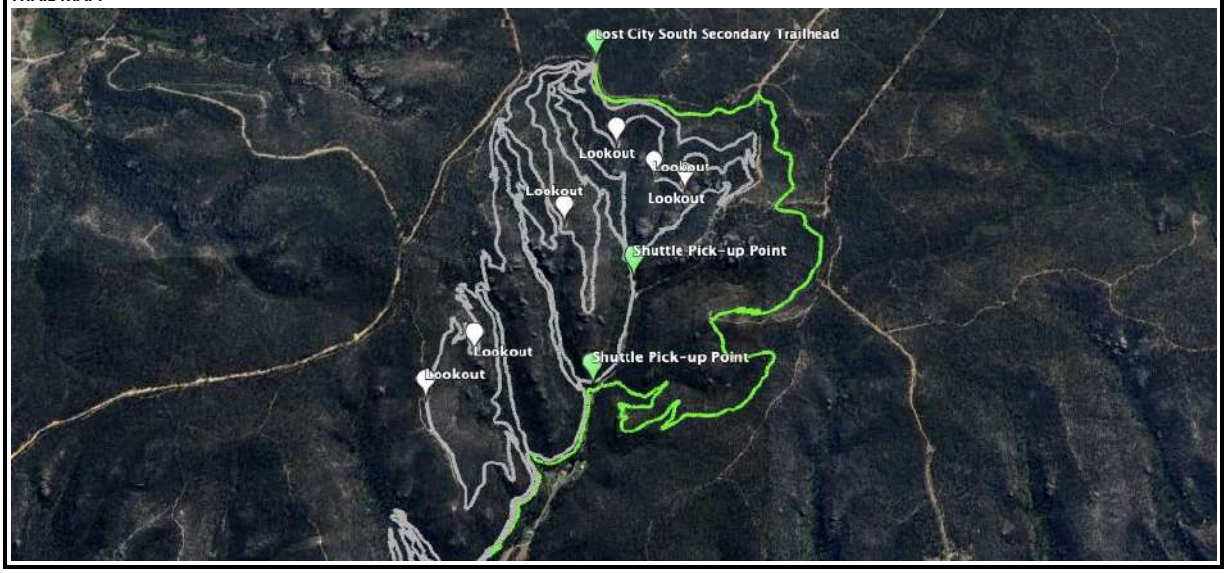
TRAIL DETAILS:

USE	Shared Use
DIRECTION	Single Direction
DESCENT/CLIMB	Climb
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

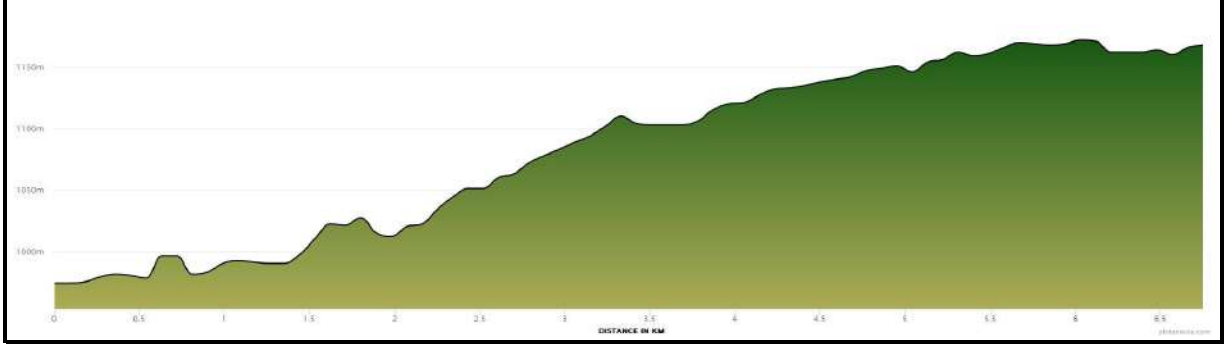
TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	***58***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	**Adventure**	**854**	**81/-6.87**

TRAIL OVERVIEW:
Gentle climbing trail located in the base of a deep, moist gully. Provides access to Trails 50 and 59.

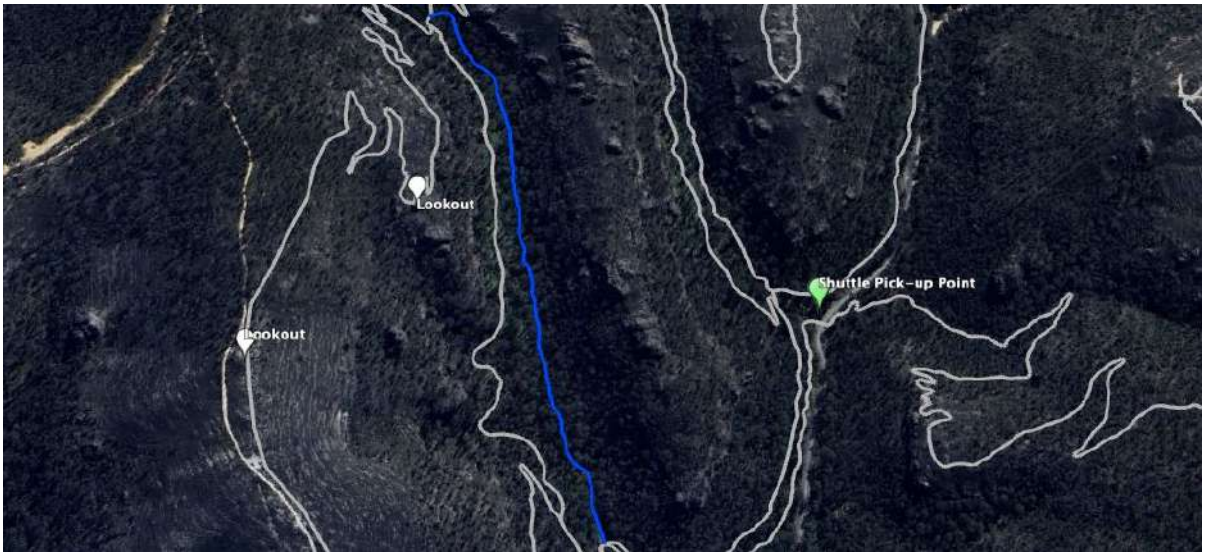
TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Climb
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

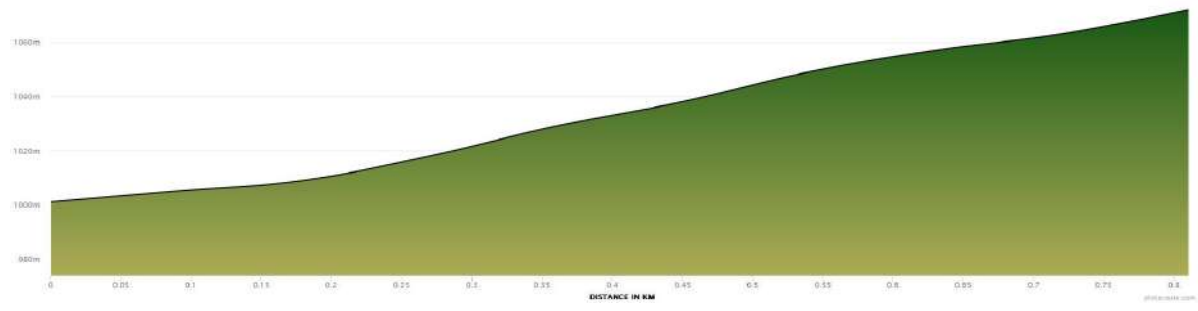
TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	*59*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Difficult	**Adventure**	**3,031**	**160/-224**

TRAIL OVERVIEW:

Challenging trail for experienced riders. Includes narrow hand-built sections of trail, steep rocky chutes and steep drop-offs beside the trail. Mix of climbing and descending.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	> 50%
MAX. TRAIL GRADE	30%
AVERAGE GRADE	20%

TRAIL STYLE DESCRIPTION:

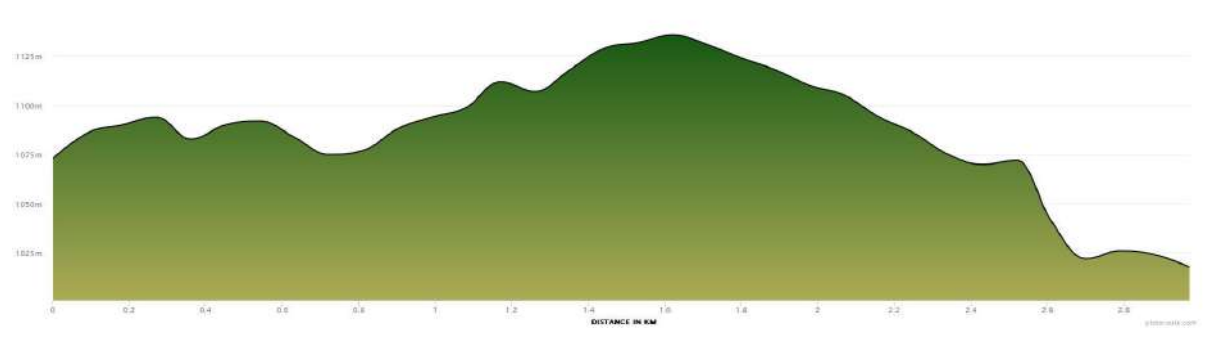
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	*60*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**307**	**17.9/-18**

TRAIL OVERVIEW:

Being the first trail from the State Mine Gully Trailhead, Trail 60 forms the entry and exit for all the trails connecting back to the Primary Trailhead.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

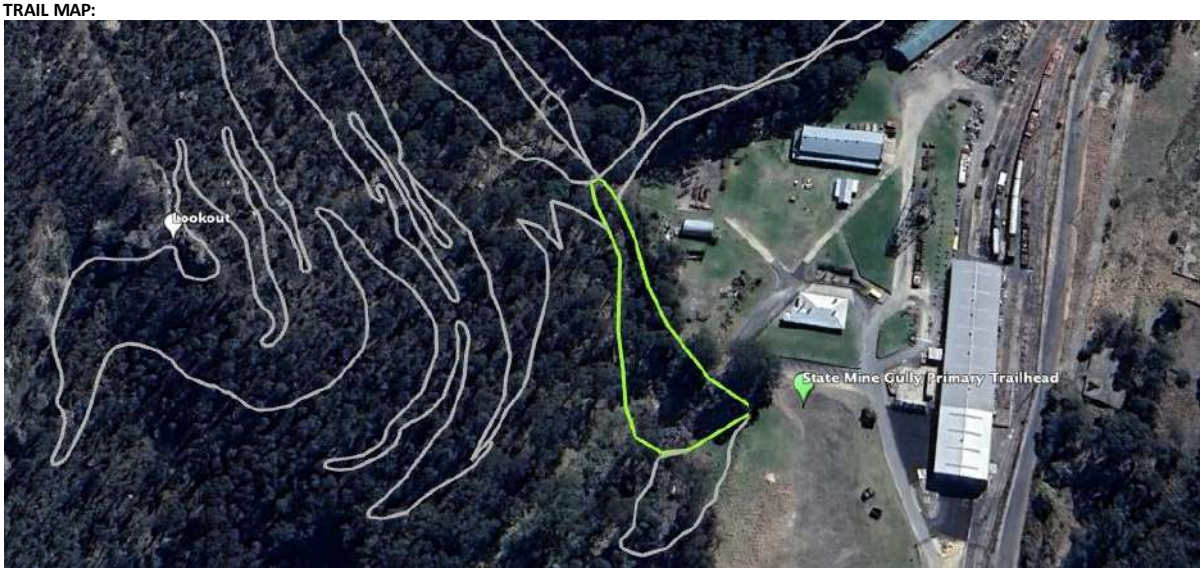
TRAIL STYLE DESCRIPTION:

Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

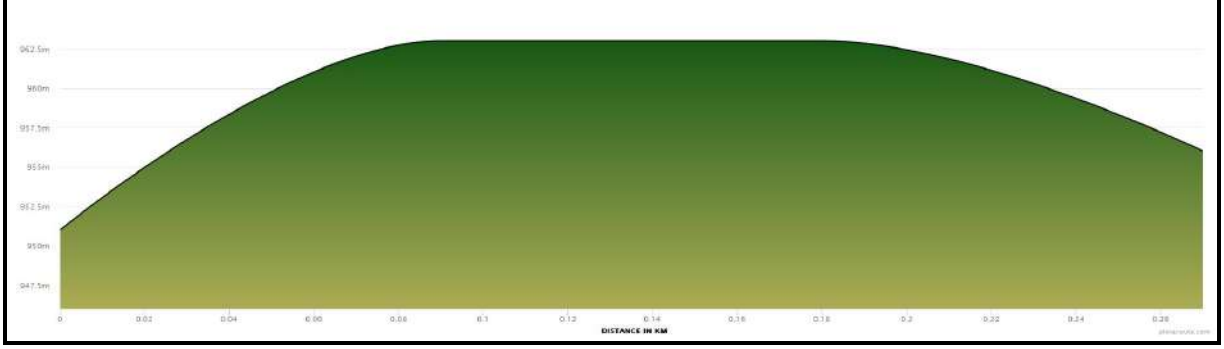
TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	***61***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**714**	**55/-55.2**

TRAIL OVERVIEW:
Easy, meandering cross-country style loop trail in the shady valley near the State Mine Gully Trailhead.

TRAIL DETAILS:

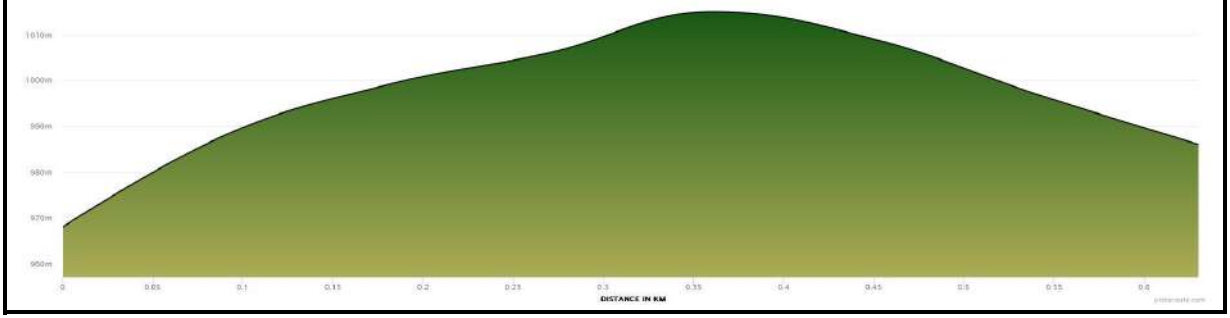
USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Climb
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	***62***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**546**	**23.6/-63.2**

TRAIL OVERVIEW:

Cross-country style loop trail, starting on Trail 61 and finishing on Trail 60.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

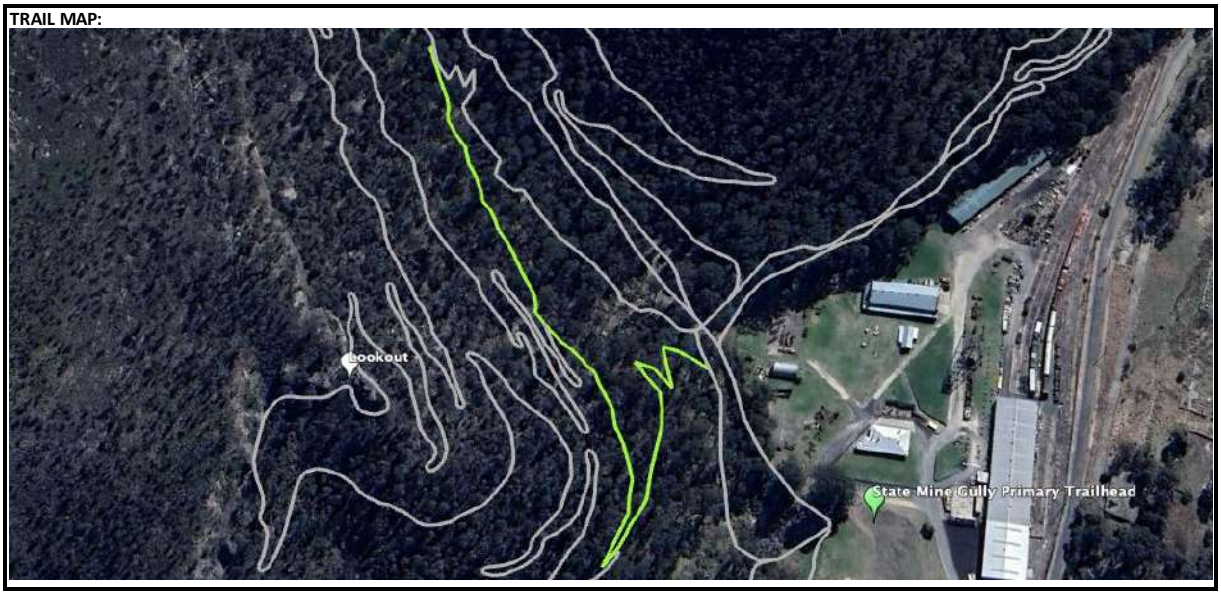
TRAIL STYLE DESCRIPTION:

Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:

Lithgow Mountain Bike Park	*63*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate with Difficult Sections	**Adventure**	**2,314**	**174/-193**

TRAIL OVERVIEW:
Longer, more challenging cross-country loop trail, climbing up above the valley floor, before descending back down to Trail 62. Offers some A-line options.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	#N/A
MAX. TRAIL GRADE	#N/A
AVERAGE GRADE	#N/A

TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:

Lithgow Mountain Bike Park	***64***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**142**	**9.9/-7.4**

TRAIL OVERVIEW:
Super easy warm-up trail for kids and beginners.

TRAIL DETAILS:

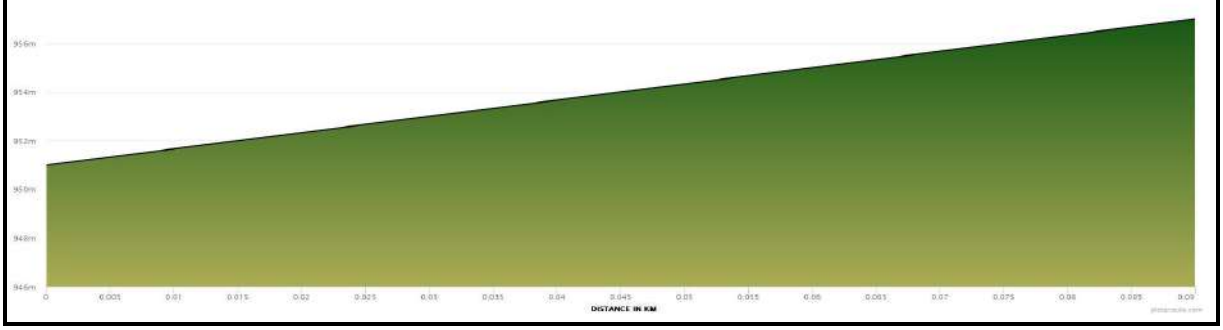
USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Climb
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:
BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	***65***

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy	**Adventure**	**516**	**56.8/-53.9**

TRAIL OVERVIEW:

Loop trail, providing access to the main climb (Trail 57) and exit from most of the descending trails.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	15%
AVERAGE GRADE	7% or less

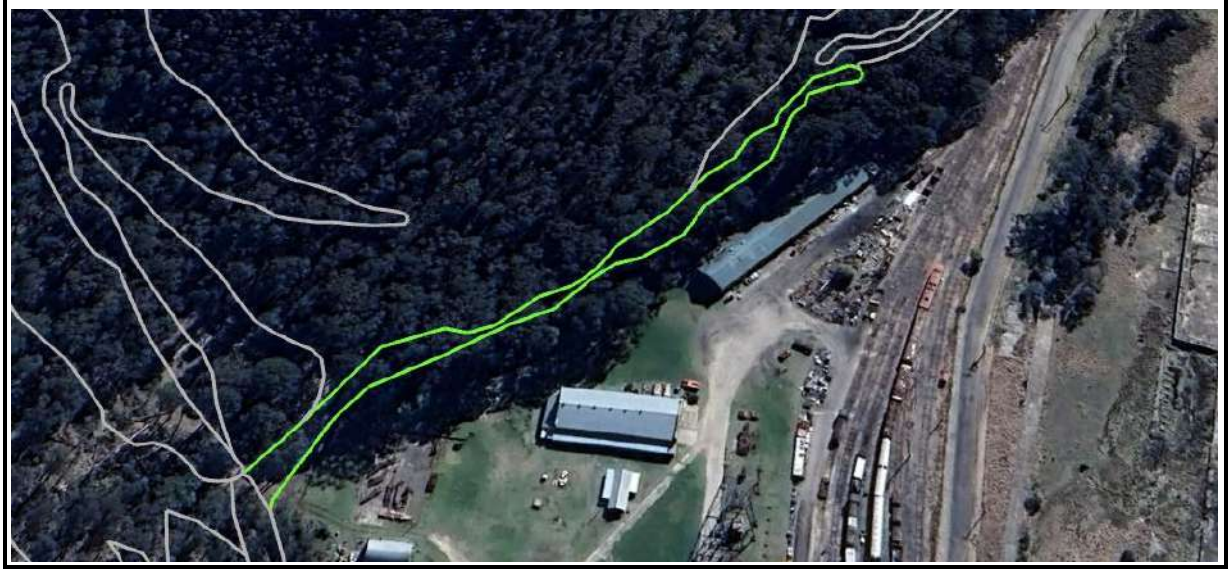
TRAIL STYLE DESCRIPTION:

Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

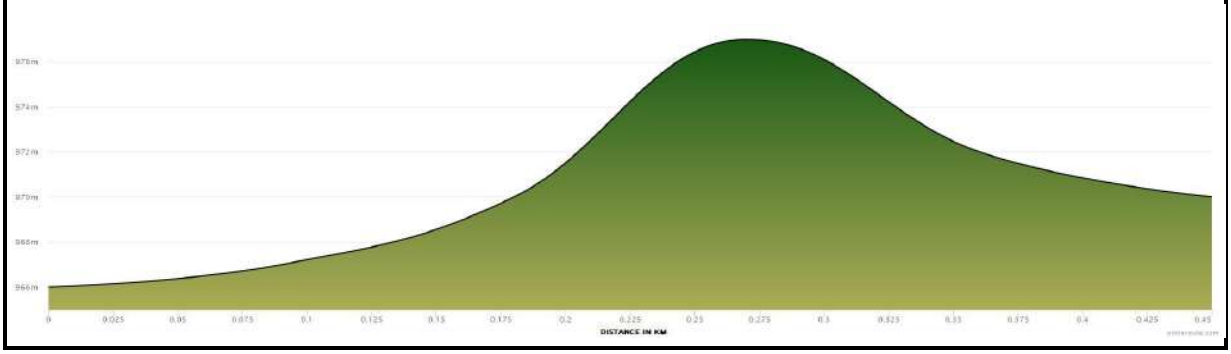
TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	*66*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Intermediate	**Flow**	**1,083**	**54.5/-95.9**

TRAIL OVERVIEW:
Cross-country style loop trail - mix of climbing and descending.

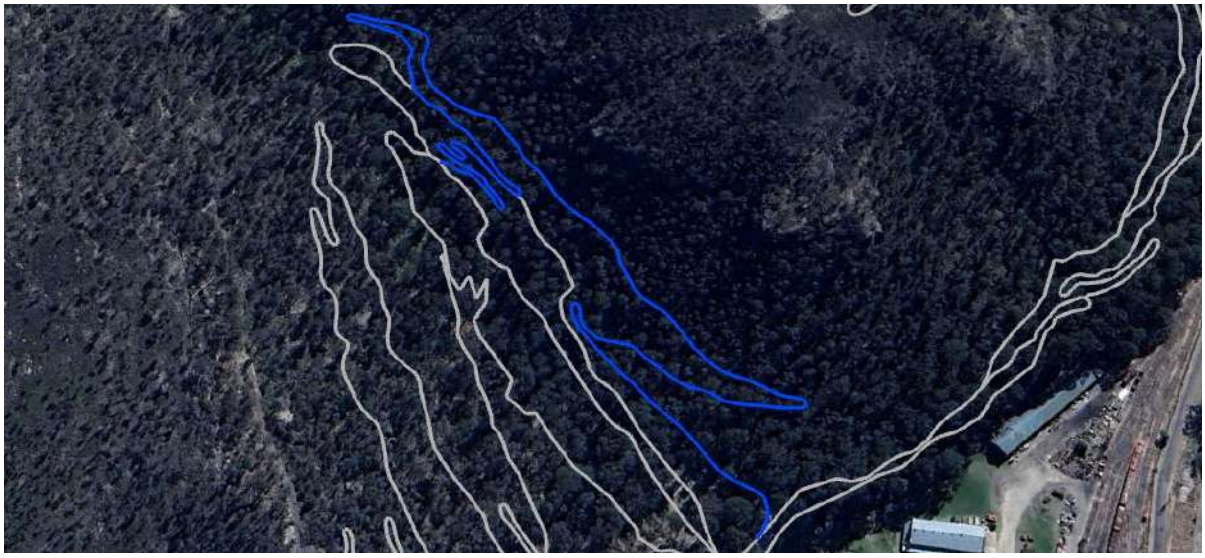
TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Mix
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 50%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	10% or less

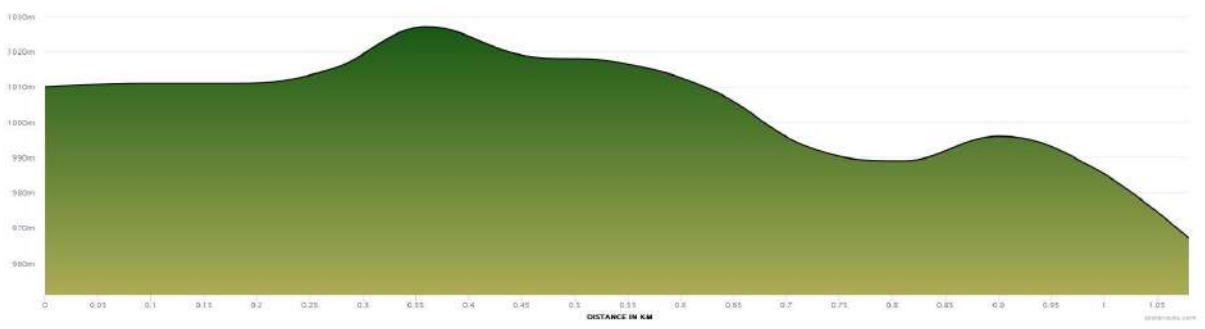
TRAIL STYLE DESCRIPTION:
A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:
BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:



ELEVATION PROFILE:



Lithgow Mountain Bike Park	*67*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy with Intermediate Sections	**Adventure**	**168**	**7.93/-14.3**

TRAIL OVERVIEW:

Short, but scenic trail offering a cool experience through a deep ferny gorge.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Climb
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:

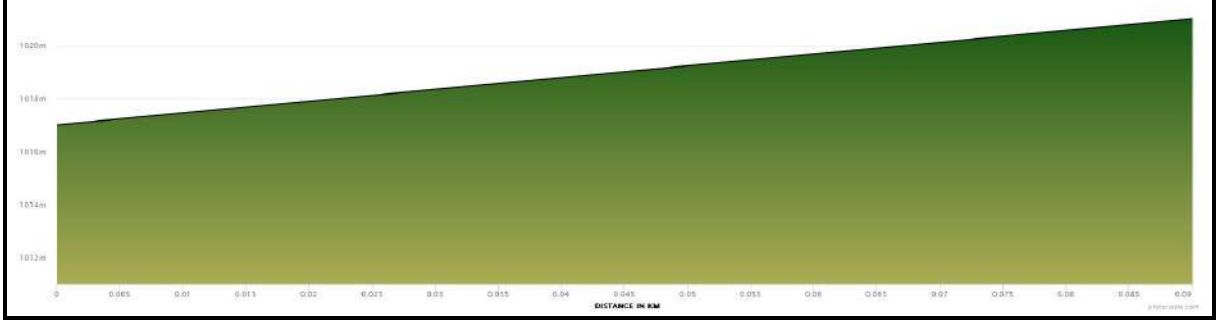
Traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

TRAIL FEATURES:

BERMS
NATURAL OBSTACLES
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



Lithgow Mountain Bike Park	*68*

TRAIL DIFFICULTY RATING:	TRAIL STYLE:	TRAIL LENGTH (m):	METRES CLIMBED/DESCENDED (m):
Easy with Intermediate Sections	**Flow**	**248**	**1.96/-42.5**

TRAIL OVERVIEW:

Short, fun descent, cutting off some of the climbing from Trail 66.

TRAIL DETAILS:

USE	MTB Only
DIRECTION	Single Direction
DESCENT/CLIMB	Descent
SHUTTLE ACCESSIBLE	Yes
SIDE SLOPES	up to 30%
MAX. TRAIL GRADE	20%
AVERAGE GRADE	7% or less

TRAIL STYLE DESCRIPTION:

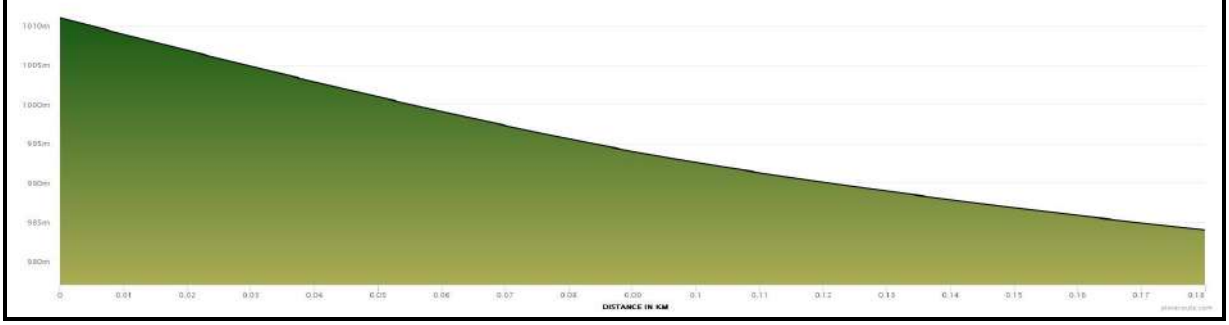
A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sends riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

TRAIL FEATURES:

BERMS
ROLLERS
OPTIONAL/ROLLABLE JUMPS
MULTIPLE LINE CHOICES

TRAIL MAP:

ELEVATION PROFILE:



4.6 TRAIL PRIORITISATION

For planning and construction purposes, it is useful to rank the trails based on their overall importance or priority.

In order to determine the priority of a trail, three criteria were assessed – connectivity, market demand and style abundance.

Network connectivity is related to the overall functionality of the trail network. Trails with high network connectivity are those that provide access to other trails. For example, Trails 65 and 57 (green) in Figure 8 below have higher network connectivity compared to Trails 63 and 64 (red). Removing these trails would have a significant impact on the trail network functionality.

Figure 8. Trail Network Connectivity

Market demand relates to popularity in the broader mountain biking market – i.e. what sort of trails do people want to ride? Although gravity trails cater to a niche group, their technical nature means that only a relatively small portion of the market find them appealing. In recent years, flow trails have been growing in demand.

While market demand is a key consideration, it's equally important that the trail network offers a variety of trail styles to ensure the network appeals to all types of riders. In the currently proposed network, 50% are adventure, 41% are flow, 4.5% are gravity and 4.5% are shared-use. Style abundance assesses how many of a particular style of trail are in the current trail network, and therefore what impact it would have on removing a particular trail.

It is noted that the trail network on top of the plateau in the GOSSCA provides more adventure and cross-country style trails. The steeper terrain of the SMG escarpment is more suited to descending flow and gravity point-to-point trails.

Considering all of these elements, the trails have been ranked according to their priority, as shown in Table 2 on the next page.

Table 2. Priority rankings of trails

Priority	Trail	Trail Length (m)	Total Length (m)
High	01	668	18,138
	02	4799	
	50	2901	
	56	1466	
	57	6767	
	60	307	
	61	714	
	65	516	
Medium	03	2346	10,079
	53	1150	
	54	2561	
	55	1539	
	58	854	
	62	546	
	66	1083	
Low	52	1716	7,619
	59	3031	
	63	2314	
	64	142	
	67	168	
	68	248	

Note – Trail 51 is not included in this priority ranking, as it is an existing trail.

This information can be used to guide decision-making if the network needs to be reduced due to budget constraints or other reasons. We recommend that no highly ranked connective trails should be removed, regardless of their style abundance or market value. Furthermore, it is possible to change trail difficulty ratings or styles of some of the trails prior to construction, although some re-design work may be required if making significant changes.

4.7 TRAIL BREAKDOWN BY LOT PARCELS

Table 3 below shows the trails that occur on each of the various land parcels within the overall study area, and the cumulative length of trail proposed on each of the parcels.

Table 3. Trail Allocation by Lot Parcel

Tenure	Parcel No.	Trails	Length (m)
GOSSCA	NPWS estate (proposed)	01, 02, 03, 50, 51, 52, 53, 54, 55, 56, 57,	14535
State Mine Gully	DP787403	02, 50, 51, 52, 54, 55, 56, 57, 58	8748
	DP965231	02, 50, 51, 52, 53, 54, 57, 58, 59	5034
	DP876025	02, 50, 57	893
	DP1240259	02, 57, 60, 61, 62, 63, 64, 65, 66, 68	4163
	DP1110346	50, 51, 58, 59, 61, 62, 63, 66, 67, 68	5490
	Road Corridor	02, 57	154
	State Forest	53,54	60
Total			39075

Note – DP1110346 consists of two distinct land parcels, and the results shown combine data from both.

This information can be used as a guide to calculate and manage the amount of vegetation cleared per land parcel. Table 6 provides information about the construction impact widths of trails, allowing the total trail footprint to be calculated.

4.8 CONNECTIVITY TO GARDENS OF STONE

This report is focused on the State Mine Gully MTB Trail Network. The State Mine Gully MTB Trail Network is one of two separate sub-networks that make up the proposed Lithgow Mountain Bike Park. The other proposed sub-network (referred to in the table below as 'Northern') is located further north within the GOSSCA and is covered in a separate report developed for NPWS. The two proposed sub-networks are planned to be linked by a shared-use rail trail.

Table 4. Sub-Network Lengths

Sub-Network	Trails	GOSSCA (NPWS estate) (m)	GOSSCA (NPWS estate) (%)	Other Tenures (this DA) (m)	Other Tenures (this DA) (%)	Total Length (m)
Northern	4, 5, 12, 13, 14, 17, 18, 19, 20, 21, 22, 25	23,635	100%	0	0%	**23,635**
Southern (State Mine Gully MTB Trail Network)	1, 2, 3, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68	14,535	37%	24,540	63%	**39,075**
Totals		**38,170**		**24,540**		**62,710**

Note that Trails 4 and 5 are shown as part of the northern network, but they could probably be considered part of the southern network, based on their location.

While the two different sub-networks have gone through separate design and planning processes and will most likely go through construction as two separate projects, they form one overall trail network, which will be called the Lithgow Mountain Bike Park. Both of these design processes have been coordinated and integrated by World Trail. Note that the NPWS trails are proposed and subject to approval at this stage.

5 CONSTRUCTION

5.1 CONSTRUCTION NOTES

With the completion of this design report and other associated DA documentation, CTMBC will possess all trail information and data required to seek DA Approval and to move forward into the construction phase for the State Mine Gully Precinct works (24.54km).

This section of the report provides some important notes relating to construction.

5.1.1 Ground-truthed Trail Alignments

During ground-truthing, the approximate centreline of each trail was flagged in the field with orange flagging tape and mapped with GPS. Natural features were identified in the field and incorporated into the alignment for the trails, including rock slabs, boulders and rock outcrops, rock gardens, fallen trees and so on.

When attempting to located and follow the trail alignments in the field, it is recommended that the following three sources of information are used:

1. Flagging tape – this indicates the true and accurate trail alignment and should be used first and foremost. Orange flagging tape was used for this project;
2. Spatial data – this should be used where flagging tape is missing;
3. Maps.

Care needs to be taken when following ground-truthing alignments, to ensure that the flagging tape is correctly interpreted. Typically, in dense vegetation, flagging tape is placed more frequently, ensuring that each tape is visible to/from the next/last. In sparser vegetation, tape is placed less frequently. The flagging tape indicates the approximate centreline of the trail, but scope should remain for trail builders to adjust the trail 5-10m to either side of the centreline. Switchback corners are generally flagged with three pieces of flagging tape placed together (see Figure 9 below).

Figure 9. Triple flagging tape indicating switchback corner

5.1.2 GIS Data

In addition to identifying, flagging and mapping the final alignment of trails, information was also captured during ground-truthing about the required construction treatments, such as bridges, boardwalks, rock armouring, hand construction etc. This information has been captured with photos, labels, notes and measurements. Table 5 below lists the different GIS shapefiles that make up the complete data set for this project. This dataset has been provided to CTMBC along with this report. All trails and waypoints in the GIS dataset have been labelled as per the maps and descriptions provided in this report.

Table 5. GIS Data Collected

Item	Data Type	Description
1. Bridges	Point data	This layer includes details about all specified bridges and boardwalks. It nominates span lengths, footing types and indicative height.
2. Earthworks	Point data	This layer includes details about any sections requiring hand construction.
3. Field Notes	Point data	This layer contains simple notes that may be useful for trail builders and land managers such as “Merge onto vehicle track”, “Trail junction” and “Old flagging tape in this area”. These notes relate to navigation and do not include any prescribed construction treatments.
4. General Points of Interest	Point data	This layer includes features like switchbacks, waterfalls lookouts, trailheads and shuttle drop-off points.
5. Rock Armour	Point data	This layer includes details about all specified rock armouring, differentiating between natural rock armour using onsite rock, and imported, manufactured Adjustable Rock Matting (ARM).
6. Rock Walls 0 - 500mm	Point data	This layer includes details of any small rock retaining walls, from 0-500mm in height.
7. Rock Retaining Walls 500mm – 1000mm	Point data	This layer includes details of any taller rock retaining walls, from 500mm-1000mm in height.
8. Surfacing	Point data	This layer includes details about any specified surfacing treatments.
9. Trail Alignments	Line data	This layer includes the ground-truthed trail alignments, numbered as per this report, captured with details relating to trail style, trail type, trail difficulty rating etc.

5.1.3 Approvals and Permits

When seeking approvals for construction, it is recommended that approval be sought for placement of the trail within a 10-20m corridor on both sides of the flagged and mapped centreline. This allows the trail builders some flexibility to modify and adapt the trail in response to opportunities or constraints that weren't apparent during ground-truthing. It also allows for more creative expression by the trail builders who may interpret landscape features in slightly different ways.

The overall width of the trails to be constructed is usually an important consideration in seeking approvals and permits, as it correlates directly with the amount of vegetation to be removed. The actual construction impact width is wider than just the trail – it also includes the upper and lower batters. Overall construction impact width is influenced by a number of variables – side slope gradient, construction method (i.e. machine or hand) and the style of trail being constructed.

Table 6 below summarises typical construction impact widths for five different slope classes and both hand and machine construction.

Table 6. Average Trail Construction Footprint[1]

Slope Class	Build Type	Average Total Disturbance Width (m)
<=25%	Hand	1.2
	Machine	2.4
>25% to <=50%	Hand	1.6
	Machine	2.5
>50% to <=75%	Hand	1.8
	Machine	2.6
>75% to <=100%	Hand	2.0
	Machine	2.7
>100%	Hand	2.1
	Machine	3.3

Using these measurements above, it is possible to model the exact disturbance footprint of the proposed trail network to determine the exact area of native vegetation impact. This requires further GIS analysis to build a digital terrain model (DTM) and then to apply the impact widths of the trails to the relevant slope classes. World Trail has been informed by CTMBC that this work has since been undertaken by consultants, Blue Sky Trails. The disturbance footprint (including construction) based on cross slope was calculated along the alignments and provided to ecologists and heritage consultants for their reports. The area calculated should represent an accurate disturbance footprint for the ecology and heritage processes.

[1] *Measuring Mountain Bike Trail Soil and Vegetation Disturbance*, World Trail, July 2021

5.1.4 Variability of Data

It should be noted that the construction treatments identified should be considered indicative and subject to review by the project manager and contractor during construction. Minor alignment changes within the approved corridor can result in changes to the length of the trail and any proposed construction treatments, possibly reducing or eliminating some of the proposed treatments. For example, by raising or lowering a trail by a few metres on a steep side slope, the construction of a small rock retaining wall may become necessary.

Therefore, while every attempt has been made to identify and quantify the likely construction treatments required, it is a normal occurrence in MTB trail construction for new or additional trail construction treatments to be identified as construction proceeds. Contractual mechanisms need to be put in place during construction to allow for these variations. Contingency allowances have been included in the cost estimate to allow for these variations and unknowns.

Another consideration is that the trail lengths provided in this report are two-dimensional calculations only, not taking into consideration changes in vertical elevation. When applied in the real three-dimensional world, where the trail will rise and fall, the actual lengths of the trails will be up to 10% longer than estimated here (without also considering any changes that may be made to the actual alignments by the trail builders).

5.1.5 Construction Challenges

The topography, soils, geology and vegetation present in State Mine Gully present some particular challenges for MTB trail construction:

- Rocky landscape of ridges and valleys – the landscape in the State Mine Gully can be described as a series of parallel flat-topped ridges and valleys, running in a northwest to southeast direction, generally sloping downwards towards the southeast. Many of the ridgetops end in steep cliff edges. The ridgetops are very rocky with only sparse soil cover and large areas of rock slabs. The valleys generally have deeper soils and taller trees and are generally better suited to trail construction. The northwest heads of the valleys offer good conditions with wide gently sloping bowls with the valleys tending to become more incised and deeper towards the southeast. Finding routes down from the ridgetops into the valleys, was a challenging prospect and many trails traversing through such areas often used narrow ledges or benches, some of which may not be suitable for excavator construction.
- Sloping rock slabs – there are numerous locations where trails traverse along bare rock slabs. During ground-truthing, trail alignments were carefully chosen to avoid these rock slabs where possible, especially steep rock slabs. In some instances, rock slabs have been used to create short fall-line sections of trail – that is, sections where the trail goes straight up or straight down the slope – as they provide interesting and challenging features with good grip and excellent sustainability characteristics. In other instances, where the side slope was suitably gentle, or a small ledge or platform provided a corridor across the rock slab, the trails traverse or contour across sloping rock slabs. These sections will need to be carefully managed during construction to ensure safe passage of excavators across the slab and to ensure that the trail is positioned correctly to ensure it provides adequate traction for riders. Many of these sloping rock slab sections may not be suitable for Easy trails in their natural form – off-camber rock slabs can be intimidating to less experienced riders. The recommended solution is to construct a small rock wall (less than 500mm high) which would then be backfilled with fill materials until level with the top of the rock wall, to create the bench for the trail. Trail builders will need to determine the best method to ‘fix’ the rock retaining wall in place – methods could include the use of concrete/mortar, using steel rods and adhesives to pin into the rock slab, or other solutions.
- Property boundaries – the State Mine Gully MTB Precinct is located across multiple land parcels and is surrounded by a number of blocks of private freehold land. During ground-truthing the design intent was, where possible, to ensure that all trails maintained a minimum buffer of 10m from any property boundary and avoid overlooking any houses or buildings.

5.1.6 Construction Opportunities

The topography, soils, geology and vegetation present in State Mine Gully also present some particular opportunities for MTB trail construction:

- Rocky landscape of ridges and valleys – the topography of ridges and valleys, while challenging for construction, is also one of the key opportunities. It is a beautiful and compelling landscape, delivering scenery that will be a major drawcard for the trail network. The ridgetops offer endless views and long forward sightlines and interesting technical, rocky terrain. The valleys offer shade, tall trees, ferns and deep soils enabling the construction of berms, rollers, jumps and other earthen features.
- Abundance of rock – There is an abundance of useful and available rock that can be used in the trail construction. Large flat plates can be used for rock armouring, jumps and other applications. Much of this rock can be sourced within the trail corridor, as construction progresses, without having to scout large distances to find suitable rock. It should also be soft enough to be broken or split by trail builders during construction, providing an excellent resource for trail construction.
- Construction access – construction access is generally good, with a network of management vehicle tracks, fire roads and 4WD tracks surrounding the trail network. It is intended that trails are constructed along their alignment and subsequently used for access so as not to disturb the flora and fauna outside the environmental assessment areas as outlined in those documents which accompany the DA.

5.2 BILL OF QUANTITIES

Table 7 on the following page lists all the trails that have been ground-truthed and are presented in this report.

Note that the trails have been broken into sections (A, B, C etc.) to allow them to be split across the different land tenures, or to allow them to have different cost rates applied to them, where the style/construction type changes mid trail (for example, the climbing portion of a trail is built and costed differently to the descending portion). Section labels are applied in the intended direction of travel – section A is the first section, B the second, etc.

Table 7. Bill of Quantities – Trails

Land Tenure	Trail Number	Section	Trail Style	AusCycling Trail Difficulty Rating	Proposed MTB Trail (m)	Proposed Shared-use Trail (m)	Total Trail Length (m)
GOSSCA	01	A	Adventure	Easy	668	0	668
GOSSCA	02	A	Flow	Easy	1830	0	1830
GOSSCA	02	B	Flow	Easy	502	0	502
GOSSCA	03	A	Flow	Intermediate	2346	0	2346
GOSSCA	50	A	Flow	Easy	540	0	540
GOSSCA	51	A	Gravity	Intermediate	400	0	400
GOSSCA	52	A	Flow	Intermediate Difficult	467	0	467
GOSSCA	53	A	Flow	Intermediate	453	0	453
GOSSCA	54	A	Adventure	Intermediate	1025	0	1025
GOSSCA	55	A	Flow	Intermediate	914	0	914
GOSSCA	56	A	Flow	Easy	1181	0	1181
GOSSCA	57	B	Adventure	Easy	0	383	383
GOSSCA	57	D	Adventure	Easy	0	2382	2382
Sub-total					**10326**	**2765**	**13091**
SMG	02	C	Flow	Easy	1203	0	1203
SMG	02	D	Flow	Intermediate	32	0	32
SMG	02	E	Adventure	Easy	70	0	70
SMG	02	F	Flow	Easy	1162	0	1162
SMG	50	B	Adventure	Easy	2360	0	2360
SMG	51	B	Gravity	Intermediate	1109	0	1109
SMG	51	C	Gravity	Intermediate	221	0	221
SMG	51	D	Gravity	Intermediate	67	0	67
SMG	52	B	Flow	Intermediate Difficult	396	0	396
SMG	52	C	Flow	Intermediate Difficult	853	0	853
SMG	53	B	Flow	Intermediate	697	0	697
SMG	54	B	Adventure	Intermediate	1054	0	1054
SMG	54	C	Adventure	Difficult	63	0	63
SMG	54	D	Adventure	Difficult	43	0	43
SMG	54	E	Adventure	Intermediate	375	0	375
SMG	55	B	Flow	Intermediate	514	0	514
SMG	55	C	Flow	Difficult	111	0	111
SMG	56	B	Flow	Easy	285	0	285
SMG	57	A	Adventure	Easy	0	2907	2907
SMG	57	C	Adventure	Easy	0	1096	1096
SMG	58	A	Adventure	Intermediate	854	0	854
SMG	59	A	Adventure	Difficult	1757	0	1757
SMG	59	B	Gravity	Difficult	1273	0	1273
SMG	60	A	Adventure	Easy	307	0	307
SMG	61	A	Adventure	Easy	714	0	714
SMG	62	A	Adventure	Easy	546	0	546
SMG	63	A	Adventure	Intermediate	2269	0	2269
SMG	63	B	Adventure	Difficult	23	0	23
SMG	63	C	Adventure	Difficult	22	0	22
SMG	64	A	Adventure	Easy	142	0	142
SMG	65	A	Adventure	Easy	516	0	516
SMG	66	A	Flow	Intermediate	1083	0	1083
SMG	67	A	Adventure	Easy Intermediate	168	0	168
SMG	68	A	Flow	Easy Intermediate	248	0	248
Sub-total					**20537**	**4003**	**24450**
TOTAL					**30863**	**6768**	**37,631**

Table 8 on the following page lists all of the construction treatments that have been specified across the State Mine Gully MTB Trail Network. Again, the table is split to show the two land tenures separately.

The construction treatments that have been specified include:

- Bridges
    - Short (<8m), No handrail
    - Short (<8m), With Handrail
- Earthworks: Hand Construction
- Lookouts
- Rock Armour:
    - Adjustable Rock Matting
    - Standard Rock Matting
- Surfacing: Imported Deco/ Road base
- Rock Walling (up to 500mm): Onsite Materials
- Retaining Walls (up to 1000mm): Onsite Materials

For each included construction treatment, the number of sites (where the treatment has been specified) is provided followed by the total cumulative length of those treatments. For example, Trail 2 (within GOSSCA) has 3 bridges, totalling 16m in length.

Table 8. Bill of Quantities – Construction Treatments

		Bridges: Short (<8m) No handrail		Bridges: Short (<8m) With Handrail		Earthworks: Hand Construction		Lookouts	Rock Armour: Adjustable Rock Matting		Rock Armour: Standard Rock Armour		Surfacing: Imported Deco/ Road base		Rock Walling (up to 500mm): Onsite Materials		Retaining Walls (up to 1000mm): Onsite Materials	
Land Tenure	**Trail Name**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**	**No. of sites**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**	**No. of sites**	**Length (m)**
GOSSCA	01	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0	0	0
GOSSCA	02	3	16	0	0	0	0	0	5	26	2	10	0	0	1	10	0	0
GOSSCA	03	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
GOSSCA	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOSSCA	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOSSCA	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	40
GOSSCA	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOSSCA	54	0	0	0	0	0	0	0	3	12	0	0	0	0	0	0	0	0
GOSSCA	55	1	3	0	0	0	0	0	1	8	1	4	0	0	0	0	0	0
GOSSCA	56	2	9	0	0	0	0	0	1	10	4	20	1	10	1	10	0	0
GOSSCA	57	0	0	0	0	0	0	0	0	0	2	12	0	0	1	4	0	0
Sub-total		**6**	**28**	**0**	**0**	**0**	**0**	**3**	**11**	**66**	**9**	**46**	**1**	**10**	**3**	**24**	**1**	**40**
SMG	02	2	8	0	0	0	0	0	0	0	3	15	2	40	3	55	0	0
SMG	50	0	0	0	0	0	0	0	0	0	9	66	0	0	5	23	3	210
SMG	51	2	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMG	52	0	0	0	0	0	0	0	0	0	3	17	0	0	1	6	0	0
SMG	53	0	0	0	0	0	0	0	0	0	0	0	2	20	2	20	0	0
SMG	54	0	0	0	0	1	150	1	0	0	0	0	1	150	1	150	0	0
SMG	55	0	0	0	0	0	0	0	0	0	6	30	0	0	0	0	0	0
SMG	56	1	4	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0
SMG	57	1	8	0	0	0	0	0	0	0	10	50	0	0	5	25	0	0
SMG	58	1	5	0	0	0	0	0	0	0	0	0	2	30	2	30	0	0
SMG	59	0	0	0	0	1	300	2	0	0	2	11	2	60	2	60	0	0
SMG	60	2	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMG	61	0	0	1	8	0	0	0	0	0	0	0	0	0	1	20	0	0
SMG	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMG	63	0	0	0	0	1	50	1	0	0	7	31	0	0	5	80	0	0
SMG	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMG	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SMG	66	0	0	0	0	0	0	0	0	0	7	44	0	0	1	10	0	0
SMG	67	0	0	0	0	0	0	0	0	0	1	10	0	0	0	0	0	0
SMG	68	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0
Sub-total		**9**	**52**	**1**	**8**	0	0	**4**	**0**	**0**	**49**	**277**	**9**	**300**	**29**	**484**	**3**	**210**
TOTAL		**15**	**80**	**1**	**8**	**3**	**500**	**7**	**11**	**66**	**58**	**323**	**10**	**400**	**32**	**508**	**4**	**250**

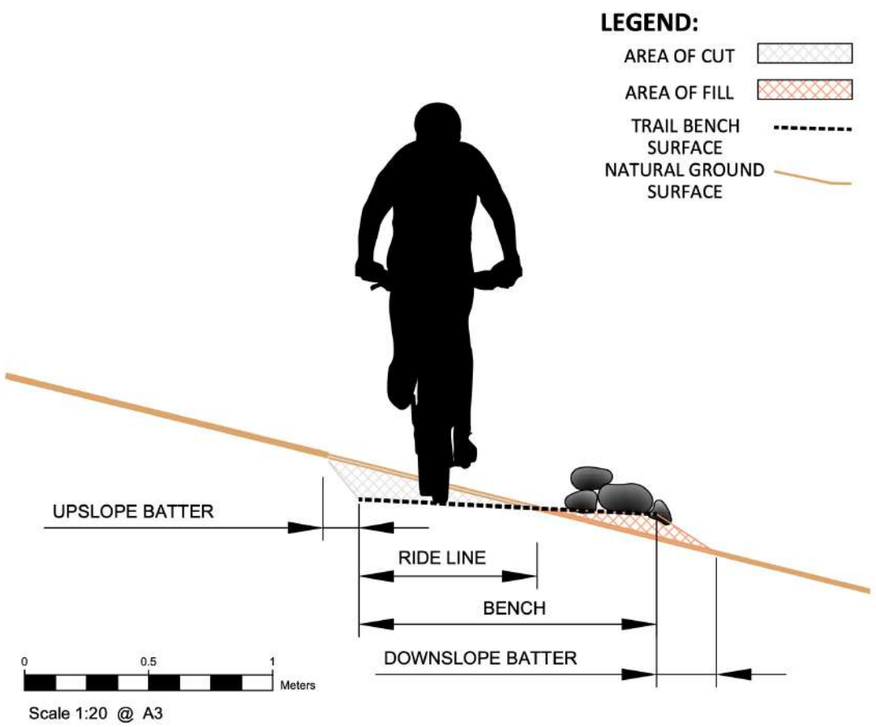
5.3 SPECIFICATIONS

The following pages provide indicative specifications for each of the main construction treatments described and costed in this report (excluding bridges and lookouts).

These specifications are intended to guide further detailed design, assist in obtaining relevant permits and approvals and may be used for tendering purposes.

Note that not all specifications may be relevant and not all construction treatments suggested in this report may be included in this section. These specifications are intended as a guide only and may need to be modified to reflect local conditions or DA approval conditions.

5.3.1 Trails – Standard Machine Bench Construction



TYPICAL SECTION - 4:1 (25%) CROSS SLOPE

NOTES:

GENERAL

- Standard bench construction is cut and fill. The cut material is used to create the outer edge of the bench.
- On very steep slopes, full bench construction can be used. In full bench construction, all spoil is removed from the trail. It is rarely used due to the logistical challenge and cost of removing the spoil. In some instances, the spoil can be used elsewhere along the trail to construct features such as berms or jumps.
- Standard bench construction is usually undertaken using a small (1.6-1.8T) rubber-tracked excavator. As the width of the tracks on these excavators is approx. 1m, the bench must be constructed to that width to allow the excavator to operate safely. This usually results in a bench width of 1m.
- Standard bench construction can be undertaken using hand construction. With hand construction techniques, the bench can be kept narrow, as it doesn't need to accommodate an excavator.
- The ride line is located on the inner side of the bench, where the soil is better compacted. The ride line is the part of the bench actually trafficked by riders. With usage, the ride line becomes well defined and parts of the bench outside of the ride line may be recolonised by plants. Ride line width varies along the trail - for example, it is often wider in corners than straight sections. Average ride line width is 600mm.
- Rocks and/or logs can be placed (or remain) on the outer edge of the bench to define the ride line and encourage riders away from the outer edge.
- Naturally occurring rock may be used to protect the upslope butter and downslope batter toe where available and appropriate. Rocks can be used in the toe of the downslope batter to provide additional stabilisation on steeper slopes.
- The angle of the upslope batter varies, but should be laid back the minimum amount to ensure batter stability, accounting for different soil types.
- The depth of excavation varies, depending primarily on the side slope - steeper side slopes require deeper excavation.
- Mountain bike trails are usually natural surface - that is, the 'tread' of the trail is the naturally occurring, in situ, soil. Imported materials such as gravel or crushed rock are occasionally used to improve grip or provide a more durable or uniform surface.
- Dimensions in millimetres unless otherwise noted.
- Drawing and dimensions are indicative only.
- Trail gradients and other elements should generally comply with the "Sustainability Guidelines" summarised below. These guidelines are adapted from the Australian Mountain Bike Guidelines 2019 and are to be treated as a guide only.

TRAIL SUSTAINABILITY GUIDELINES

THE HALF RULE:
- A trail's grade shouldn't exceed half the grade of the hill slope or sideslope that the trail traverses.
- Grades exceeding the half rule may cause water to flow along the trail causing erosion.

THE TEN PERCENT AVERAGE GUIDELINE:
- The overall grade of a trail should be 10% or less.
- Some sections may be steeper than 10% and some less steep.
- The ten percent average guideline may need to be adjusted to suit different soil types.

MAXIMUM SUSTAINABLE GRADE:
- The maximum sustainable grade is typically 15% to 20% but is dependent on a wide range of factors.
- These factors include soil type, annual rainfall, vegetation and topography constraints and the level of difficulty for users.

GRADE REVERSALS:
- Grade reversals are points at which the trail gradient changes from down to up (or up to down), creating a low point where water is pushed off the trail.
- The more frequent the grade reversals, the smaller the amount of water that needs to cross at each point thereby reducing the potential erosion and the need for drainage infrastructure.

OUTSLOPE:
- Outslope is the grading of the trail to a cross slope of 5% following the general slope direction of the local terrain.
- Outsloping enables stormwater to flow across the trail as a sheet rather than as concentrated flow.
- Outslopes will not be appropriate near berms or banked turns or in some loose soil types.

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: MOUNTAIN BIKE TRAIL SECTIONS STANDARD BENCH CONSTRUCTION STANDARD DRAWING

Project No.

Scale 1:20

Sheet Size A3

Drawing No.

Rev.

5.3.2 Trails – Dual Use

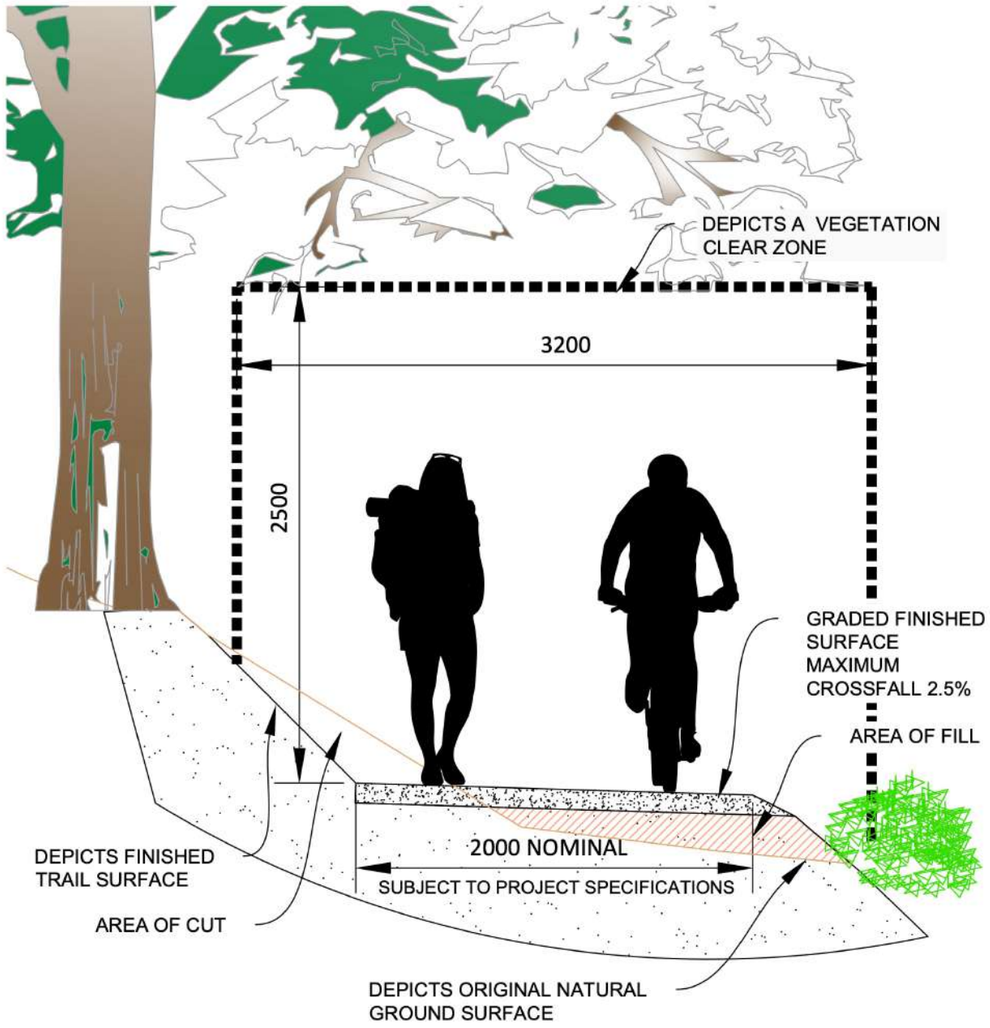
NOTES:

GENERAL:
- Dual direction (two way) trail.
- The trail will provide access along a slightly modified, natural environment alignment, with little provision of interpretive signage and few facilities.
- Users can expect few encounters with others.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

CLASS 4 TRAIL AS DEFINED IN AS 2156.1-2001
- Trail will generally be distinct without major modifications to the ground.
- Encounters with fallen debris and other obstacles are likely.
- It will generally be less than 1200mm and be mostly clear of intrusions and obstacles..
- Trail gradient to be limited to environmental and maintenance considerations.
- Steps may be common in some steeper sections.
- Ensure sides are protected by backfilling with suitable local materials.
- Facilities will generally not be provided apart from some specific safety and environmental considerations
- Users require a moderate level of specialised skills such as navigation skills. Users may require maps and navigation equipment and need to be self-reliant, particularly in regard to emergency first aid and possible weather hazards.
- Users may encounter natural hazards such as steep slopes, unstable surfaces and minor water crossings and are responsible for their own safety.
- Storms may effect navigation and safety.

MTBA GREEN SQUARE DIFFICULTY RATING (EASY)
- Single trail with gentle gradients, smooth surface and relatively free of obstacles.
- Short sections may exceed these criteria.
- Trail width to be 900mm, or greater, with an allowance of plus or minus 300mm for tread areas or bridges.
- The trail surface should be mostly firm and stable.
- Average longitudinal grades are to be 7%. or less.
- May include steeper sections.
- Maximum trail grade to be 15%.
- Exposure to either side of trail corridor includes slopes of up to 10% (1 in 10).
- Trail may include avoidable, rollable, obstacles.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles (less than 50mm) such as logs, roots and rocks.
- Trail alignment may include unavoidable bridges at 900mm wide.
- Bridge deck width is to be half the bridge deck height.
- Short sections of the trail may exceed criteria.
- The trail is rated for beginner/novice cyclists with basic riding skills.
- Suitable for off-road bikes.
- Trailheads, route marking and intersections should be clearly signposted.

NOTE:
Some trail specifications have been extracted from AS 2156.1-2001 & the MTBA - Australia, Trail Difficulty Rating System, 2019, version 3.0.



TYPICAL CROSS SECTION DUAL USE
A.S. 2156.1-2001 CLASS 4 &
MTBA GREEN SQUARE RATING (EASY)

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters
Scale 1:25 @ A3

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project: WORLD TRAIL STANDARD DRAWING

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: TRAIL SECTIONS - DUAL USE CLASS 4 WALKING - GREEN SQ. RIDING STANDARD DRAWING

Project No.
Scale 1:25
Sheet Size A3
Drawing No.
Rev.

5.3.3 Trails – Easy Trail Difficulty Rating

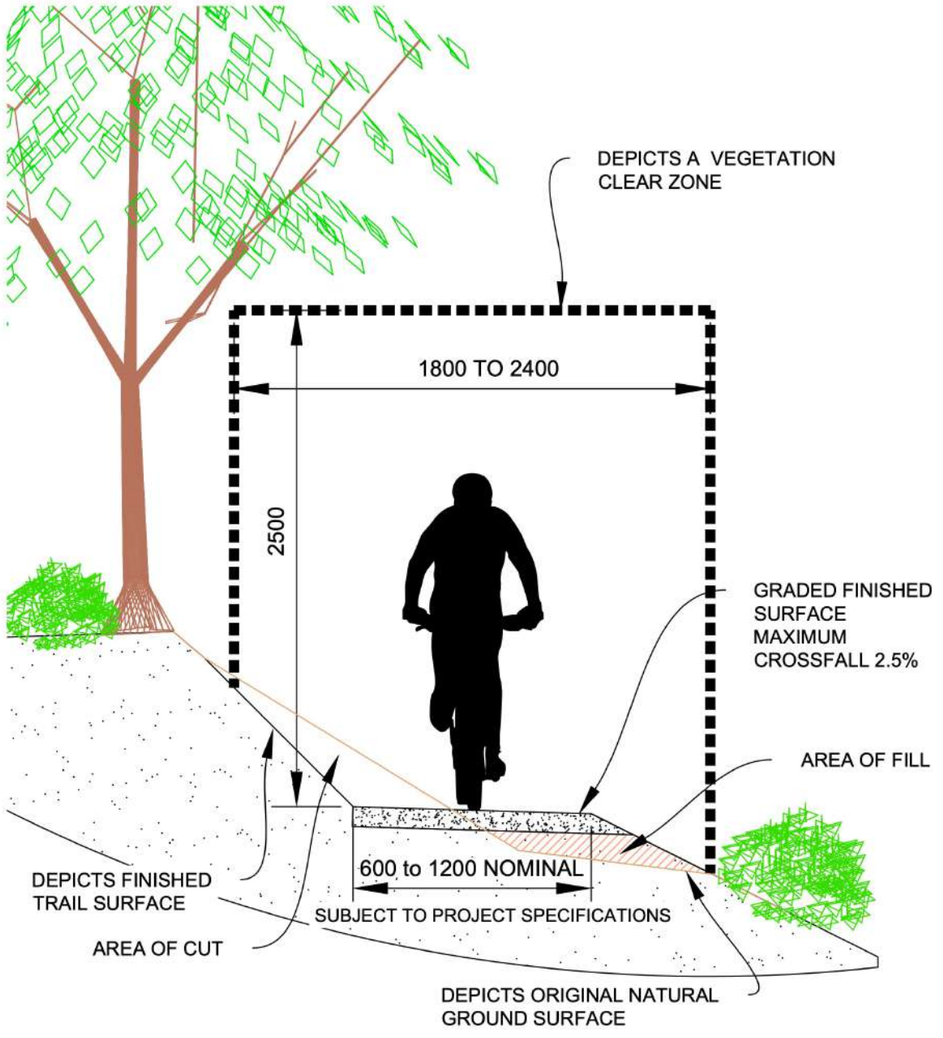
NOTES:

GENERAL:

- Single use and direction trail.
- The trail will provide access along a slightly modified, gentle natural environment alignment.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

MTBA EASY DIFFICULTY RATING

- Wide single trail and/or fire road with gentle gradients, smooth surface and relatively free of obstacles.
- Trail width to be 900mm, or greater, with an allowance of plus or minus 300mm for tread areas or bridges.
- The trail surface should be mostly firm and stable.
- Average longitudinal grades are to be 7%. or less.
- Maximum trail grade to be 15%.
- May include some moderately steeper sections.
- Short sections may exceed these grade criteria.
- Exposure to either side of trail corridor includes slopes of up to 30% (3.3:1).
- Trail may include avoidable, rollable, obstacles or jumps.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles up to 100mm high such as logs, roots and rocks.
- Trail alignment may include unavoidable bridges at 900mm wide or wider.
- Bridge deck width is to be half the bridge deck height.
- Short sections of the trail may exceed the bridge and obstacle criteria.
- The trail is rated for beginner/novice cyclists with basic riding skills.
- Suitable for off-road bikes.
- Trailheads, route marking and intersections should be clearly signposted.



TYPICAL CROSS SECTION - MTB TRAIL
MTBA EASY RATING

NOTE:
Some trail specifications have been extracted from the MTBA - Australia, Australian Mountain Bike Guidelines, 2019 updated to the Trail Difficulty Rating System, October 2020.

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters
Scale 1:25 @ A3

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: TRAIL SECTIONS – MTB TRAIL DIFFICULTY RATING SYSTEM EASY CLASSIFICATION STANDARD DRAWING

Project No.

Scale 1:25 | Sheet Size A3

Drawing No. | Rev.

5.3.4 Trails – Easy/Intermediate Trail Difficulty Rating

NOTES:

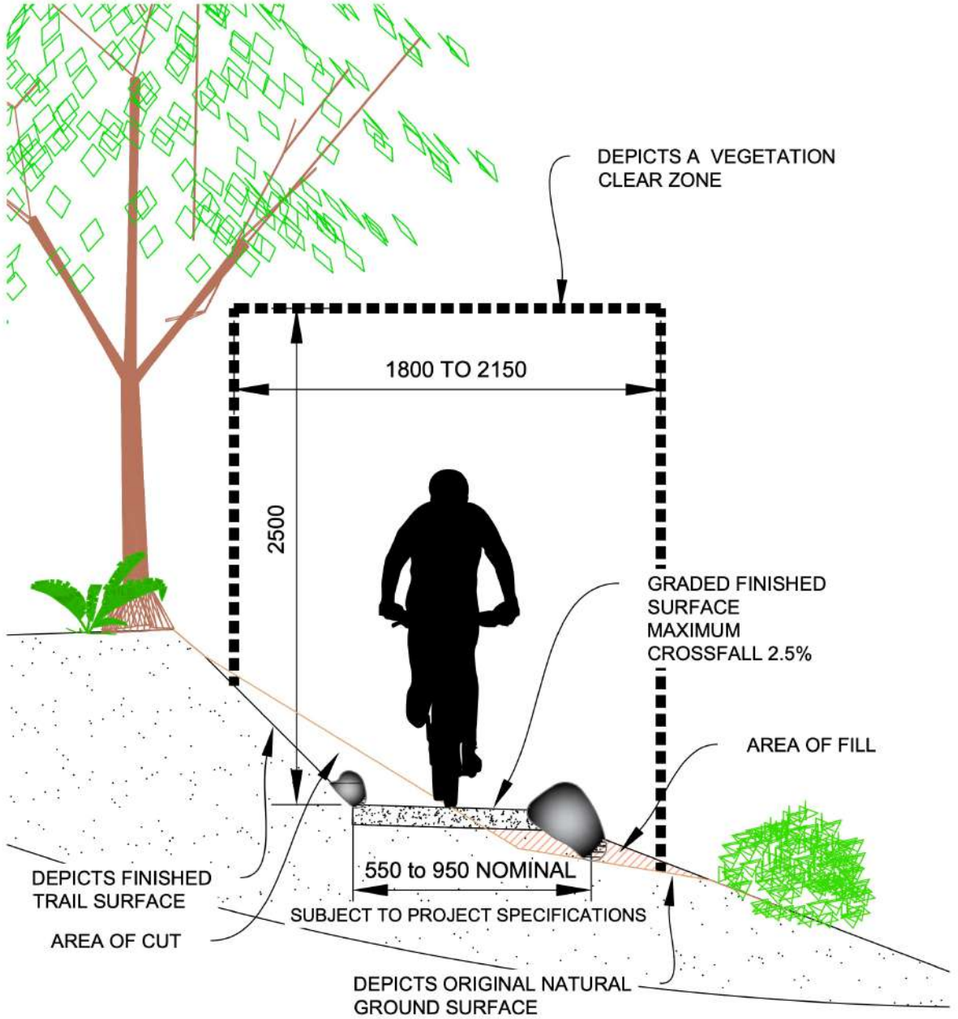
GENERAL:

- Single use and direction trail.
- The trail will provide access along a slightly modified, natural environment alignment, with a moderate gradient, variable surface and some obstacles.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

MTBA EASY/INTERMEDIATE DIFFICULTY RATING

- Likely to be a single trail with a moderate gradient, variable surface and possibly some obstacles.
- Trail width to be 750mm, or greater, with an allowance of plus or minus 200mm for tread areas or bridges.
- The trail surface should be mostly firm and stable.
- Average longitudinal grades are to be 7%. or less.
- Climbs and descents are mostly shallow, but trail may include some moderately steep sections.
- Maximum trail grade to be 20%.
- Short sections may exceed these grade criteria.
- Exposure to either side of trail corridor includes slopes of up to 30% (3.3:1).
- Trail may include avoidable, rollable, obstacles and jumps.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles up to 200mm such as logs, roots and rocks.
- Trail alignment may include unavoidable bridges at 900mm wide or wider.
- Short sections of the trail may exceed criteria for avoidable & unavoidable obstacles and bridges.
- The trail is suitable for beginner/novice cyclists with basic mountain bike skills.
- Suitable for off-road bikes.
- Trailheads, route marking and intersections should be clearly signposted.

NOTE:
Some trail specifications have been extracted from the MTBA - Australia, Australian Mountain Bike Guidelines, 2019 updated to the Trail Difficulty Rating System, October 2020.



TYPICAL CROSS SECTION MTB TRAIL
MTBA EASY/INTERMEDIATE RATING

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters
Scale 1:25 @ A3

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:
Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: TRAIL SECTIONS – MTB TRAIL DIFFICULTY RATING SYSTEM EASY/INTERMEDIATE CLASSIFICATION STANDARD DRAWING

Project No.
Scale 1:25
Sheet Size A3
Drawing No.
Rev.

5.3.5 Trails – Intermediate Trail Difficulty Rating

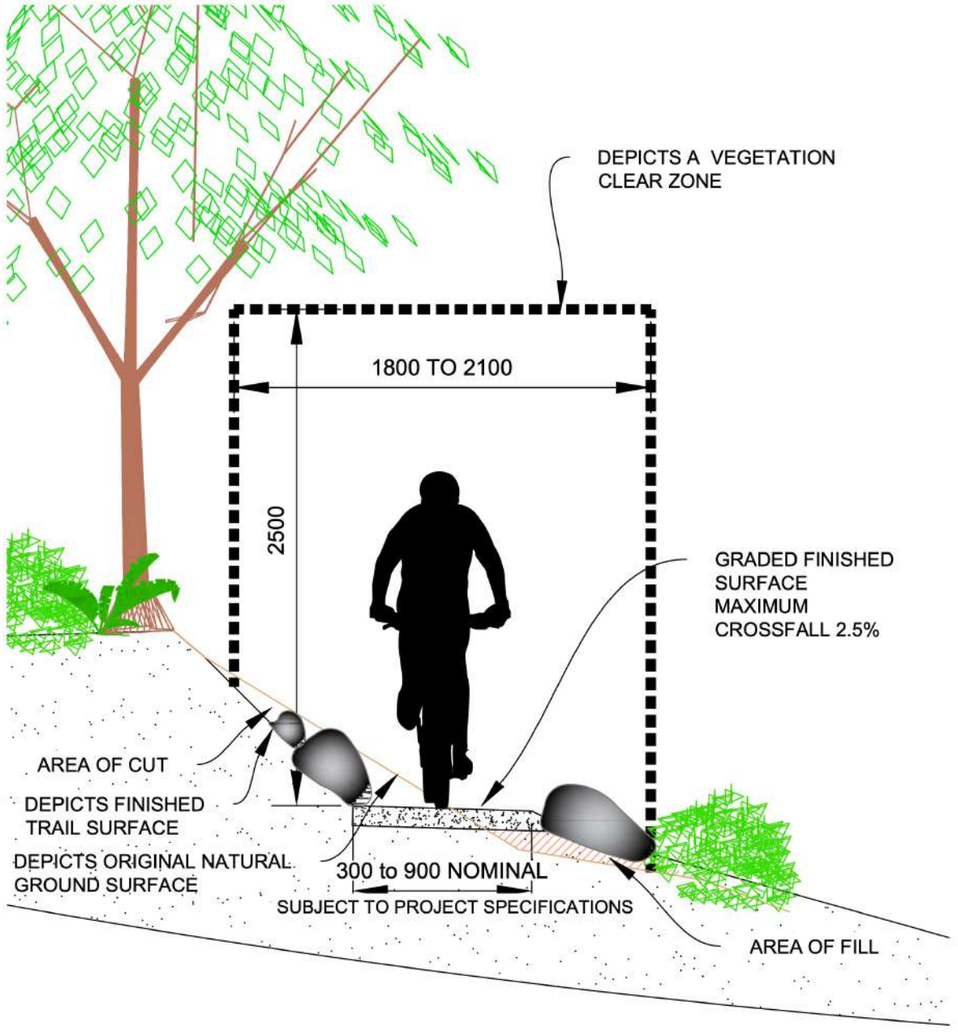
NOTES:

GENERAL:

- Single use and direction trail.
- The trail will provide access along a slightly modified, natural environment alignment, with moderate gradients and possibly occasional steep sections.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

MTBA INTERMEDIATE RATING

- Single trail with moderate gradients, varaible surface and possible obstacles.
- Trail width to be 600mm plus or minus 300mm for general trail, tread areas or bridges with handlebar clearance on both sides.
- The trail surface may include rocky or loose tread sections.
- Mostly moderate grades but may include steeper sections.
- Average longitudinal trail grades are to be 10% or less.
- Maximum trail grade to be 20%.
- Short sections may exceed the grade criteria.
- Exposure to either side of trail corridor includes slopes of up to 50% (2:1).
- Trail may include avoidable, rollable, obstacles.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles up to 350mm high such as logs, roots and rocks.
- Tabletop jumps to 1500mm high, rollable double jumps and avoidable gap jumps may exist along the trail.
- Trail may have sections with avoidable obstacles up to 600mm where the deck width must be greater than half the height of the obstacle.
- Trail alignment may include unavoidable bridges at 600mm wide, or wider.
- Short sections of the trail may exceed the obstacle criteria.
- The trail is suitable for skilled mountain bikers with basic riding skills.
- Suitable for mountain bikes.
- Trailheads, route marking and intersections should be clearly signposted.



TYPICAL CROSS SECTION MTB TRAIL
MTBA INTERMEDIATE RATING

NOTE:
Some trail specifications have been extracted from the MTBA - Australia, Australian Mountain Bike Guidelines, 2019 updated to the Trail Difficulty Rating System, October 2020.

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters
Scale 1:25 @ A3

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:
Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: TRAIL SECTIONS – MTB TRAIL DIFFICULTY RATING SYSTEM INTERMEDIATE CLASSIFICATION STANDARD DRAWING

Project No.
Scale 1:25
Sheet Size A3
Drawing No.
Rev.

5.3.6 Trails – Intermediate/Difficult Trail Difficulty Rating

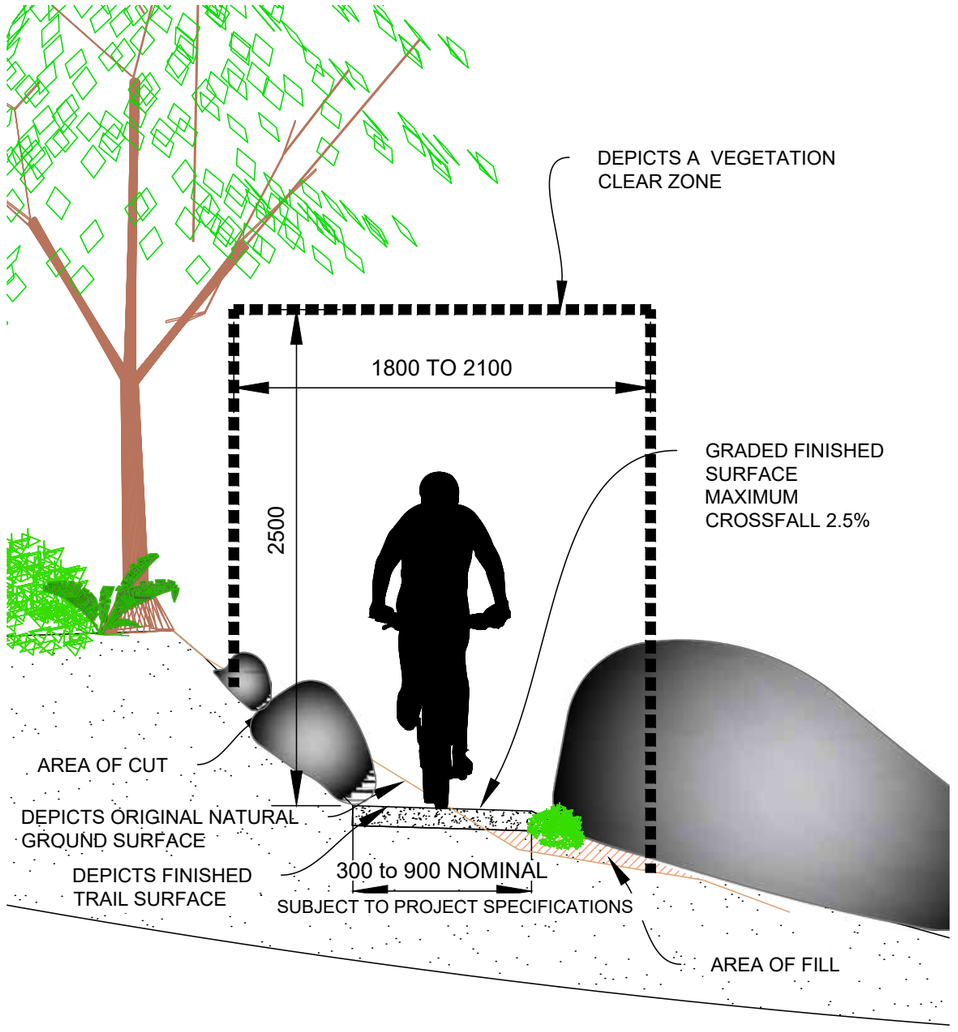
NOTES:

GENERAL:

- Single use and direction trail.
- The trail will provide access along a minimally modified, natural environment alignment, with a range of intermediate and difficult sections.
- It is suitable for competent mountain bikers, used to physically demanding routes.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

MTBA INTERMEDIATE/DIFFICULT RATING

- Single trail with moderate gradients, variable surface and possible obstacles.
- Consists of varying sections with either intermediate or difficult ratings.
- The trail is generally graded as intermediate but it may have difficult sections at stages.
- Trail width to be 600mm plus or minus 300mm for general trail, tread areas or bridges with handlebar clearance on both sides.
- The trail surface may include rocky or loose tread sections.
- Mostly moderate grades but may include steeper sections.
- Average longitudinal trail grades are to be 20%. or less.
- Maximum trail grade to be 30%.
- Short sections may exceed these grade criteria.
- Exposure to either side of trail corridor includes slopes of up to 50% (2:1).
- Trail may include avoidable obstacles to 1000mm.
- The width of the deck is to be greater than half the height of the obstacle.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles up to 400mm, such as logs, roots and rocks.
- Tabletop jumps to 2000mm high, rollable double jumps and avoidable gap jumps may exist along the trail.
- Trail alignment may include unavoidable bridges at 600mm wide.
- Short sections of the trail may exceed these obstacle criteria.
- The trail is suitable for competent mountain bikers with good riding skills.
- Suitable for mountain bikes.
- Trailheads, route marking and intersections should be signposted.



TYPICAL CROSS SECTION MTB TRAIL
AUSCYCLING INTERMEDIATE/DIFFICULT RATING

NOTE:
Trail specifications have been extracted from the AusCycling, Australian Mountain Bike Trail Guidelines. Mountain Biking Australia (MTBA) became part of AusCycling in 2020.

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters
Scale 1:25 @ A3

FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn JR	Signed	Date 06/02/24	
Designed DJ	Signed	Date 06/02/24	
Verified DS	Signed	Date 06/02/24	
Approved	Signed	Date	

Drawing Title: TRAIL SECTIONS - MTB TRAIL DIFFICULTY RATING SYSTEM INTERMEDIATE/DIFFICULT CLASSIFICATION STANDARD DRAWING

Project No. WT2019-107
Scale 1:25
Sheet Size A3
Drawing No. WTSTD-060-YV
Rev. D

5.3.7 Trails – Difficult Trail Difficulty Rating

NOTES:

GENERAL:

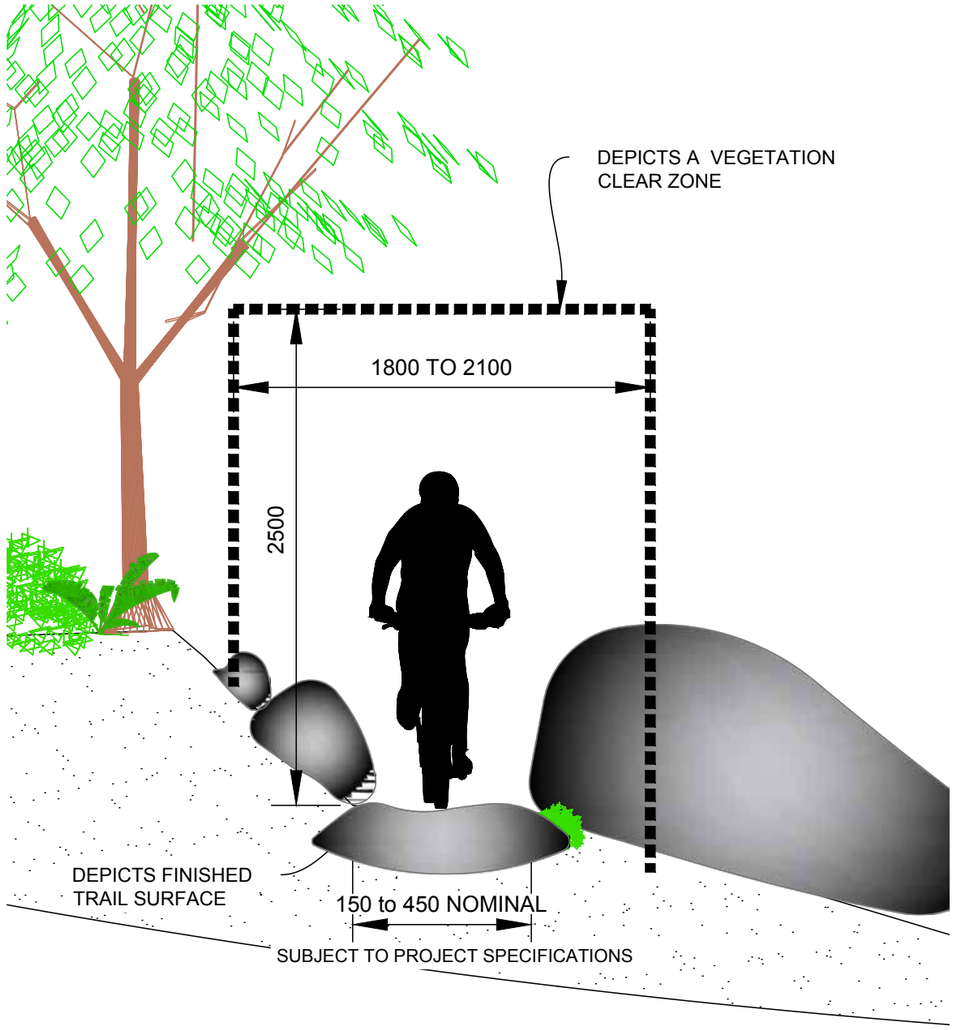
- Single use and direction trail.
- The trail will provide access along a minimally modified, natural environment alignment, with sections of difficult trail.
- Locate and protect any underground or overhead services prior to commencement of works.
- Refer to project specific details for sub-grade preparation and surface finish methodologies and specifications.
- Trail excavation is to be cut and fill.
- Naturally occurring rock is to be used to protect the uphill cut and the downhill toe where available and appropriate.
- Dimensions in millimetres unless otherwise notated.
- Details shown are subject to final project specifications.

MTBA DIFFICULT RATING

- Single trail with challenging steep gradients, variable surface and many obstacles.
- The Trail may consist of multiple optional lines.
- The trail is graded as difficult and should be suitable for cross country, airflow, adventure, wilderness, flow, gravity, downhill or trials.
- Trail width to be 300mm plus or minus 150mm for general trail, tread areas or bridges and may be less than handlebar width.
- The trail surface will be variable and challenging and may include optional lines.
- Longitudinal trail grades will include steep descents and climbs.
- Average trail grade to be 20% or less.
- Maximum trail grade to be 30%.
- Short sections may exceed the grade criteria.
- Exposure to either side of trail corridor includes slopes that may be steep downward slopes or even freefall.
- Trail may include avoidable obstacles to 1200mm.
- The width of the deck is to be greater than half the height of the obstacle.
- Trail may have sections of rocky or loose tread and have unavoidable small obstacles up to 500mm, such as logs, roots, rocks, drop off's or constructed obstacles.
- Tabletop jumps to 2500mm high, rollable double jumps and avoidable gap jumps may exist along the trail.
- Trail alignment may include unavoidable bridges at 600mm wide.
- Short sections of the trail may exceed the criteria for avoidable & unavoidable obstacles, tabletop jumps and bridges.
- The trail is suitable for experienced mountain bikers with good riding skills and are used to physically demanding routes.
- Some sections will be easier to walk.
- Navigation and personal survival skills are highly desirable.
- Suitable for better quality mountain bikes.
- Trailheads, route marking and intersections may have limited signage.

NOTE:

Trail specifications have been extracted from the AusCycling, Australian Mountain Bike Trail Guidelines. Mountain Biking Australia (MTBA) became part of AusCycling in 2020.



TYPICAL CROSS SECTION MTB TRAIL AUSCYCLING DIFFICULT RATING

GENERAL ARRANGEMENT
SCALE 1:25

0 0.5 1 Meters

Scale 1:25 @ A3

FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	JR	Signed	Date 06/02/24
Designed	RJ	Signed	Date 06/02/24
Verified	DJ	Signed	Date 06/02/24
Approved		Signed	Date

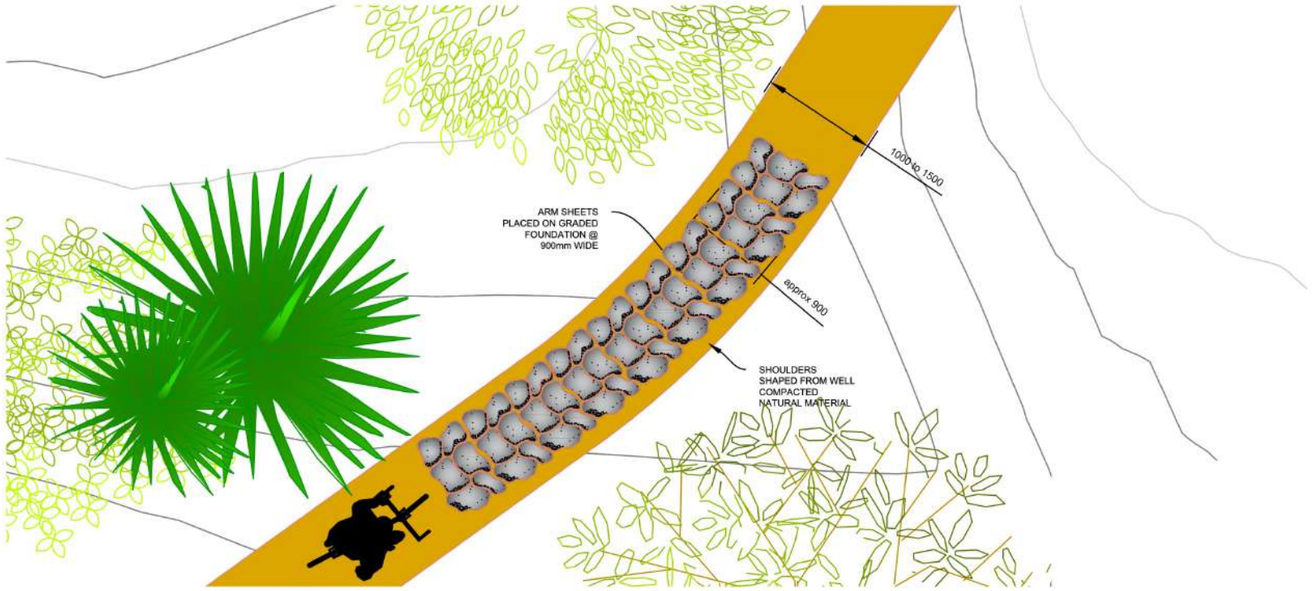
Drawing Title: TRAIL SECTIONS - MTB TRAIL DIFFICULTY RATING SYSTEM DIFFICULT CLASSIFICATION STANDARD DRAWING

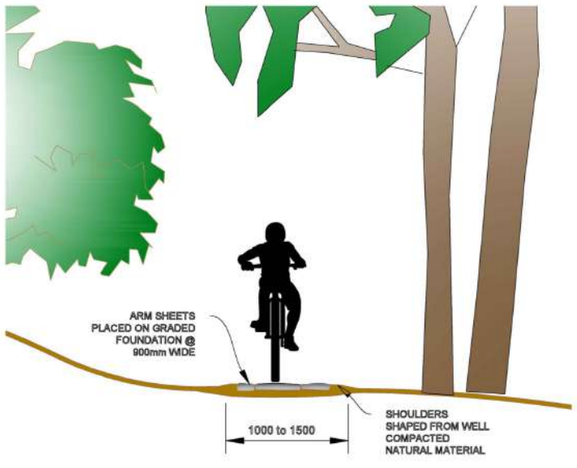
Project No. WT2019-107
Scale 1:25
Sheet Size A3
Drawing No. WTSTD-061-YV
Rev. D

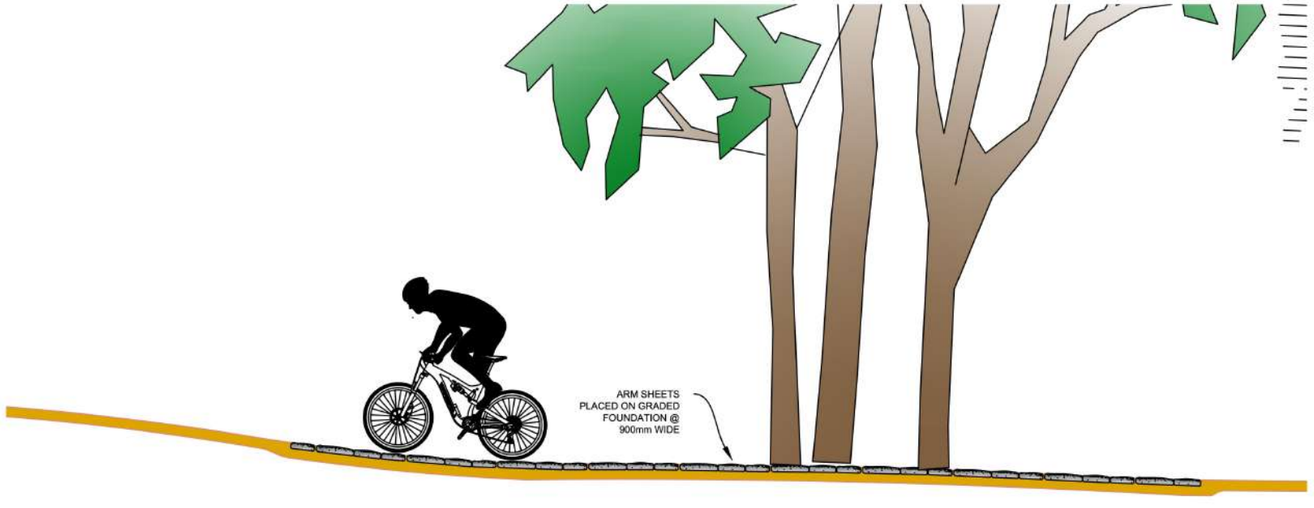
5.3.8 Rock Armouring – Adjustable Rock Matting

NOTES:

- Adjustable Rock Matting (ARM) is to be used in trail sections that are often wet and boggy or to provide a safe braking surface on unavoidable declines.
- ARM is manufactured in 600mm by 900mm sheets that have the capacity to be bent either vertically or horizontally to suit the required topography and trail alignment.
- Refer to World Trail's "ARM Fact Sheet - Installation Process" for more detailed information on design and installation of ARM trail sections.
- The trail section providing a foundation for ARM should be leveled and treated to be free of protruding rocks or roots prior to installation.
- A base layer of imported material may be required to provide a suitable foundation for the ARM if the natural material is found to be unsuitable.
- Any excess loose material should be stockpiled nearby to be used as a coating surface after the ARM has been installed.
- ARM sheets should be installed from the lowest point and working uphill, checking the alignment as installation proceeds.
- Sheets can be cut to allow removal of sections to facilitate alignment around large unmovable objects or to allow tighter curves in difficult trail alignment sections.
- Each sheet should be checked to ensure it is sitting evenly and solidly on the ground without rocking or movement under pressure.
- The ARM sheets should be joined with cable ties and any excess matting trimmed.
- Secure the ARM sheets to the ground with pegs placed through the matting..
- Finish by raking or sweeping the stockpiled topsoil over the ARM sheets, filling and compacting soil into the gaps between the rocks.
- Ensure the ARM placement and soil topping provides a trafficable surface.







0 1.5 3 Meters Scale 1:50 @ A3

GENERAL ARRANGEMENT
SCALE 1:50

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: ADJUSTABLE ROCK MATTING 900mm PLACEMENT AND DIMENSIONS WORLD TRAIL - STANDARD DRAWING

Project No.

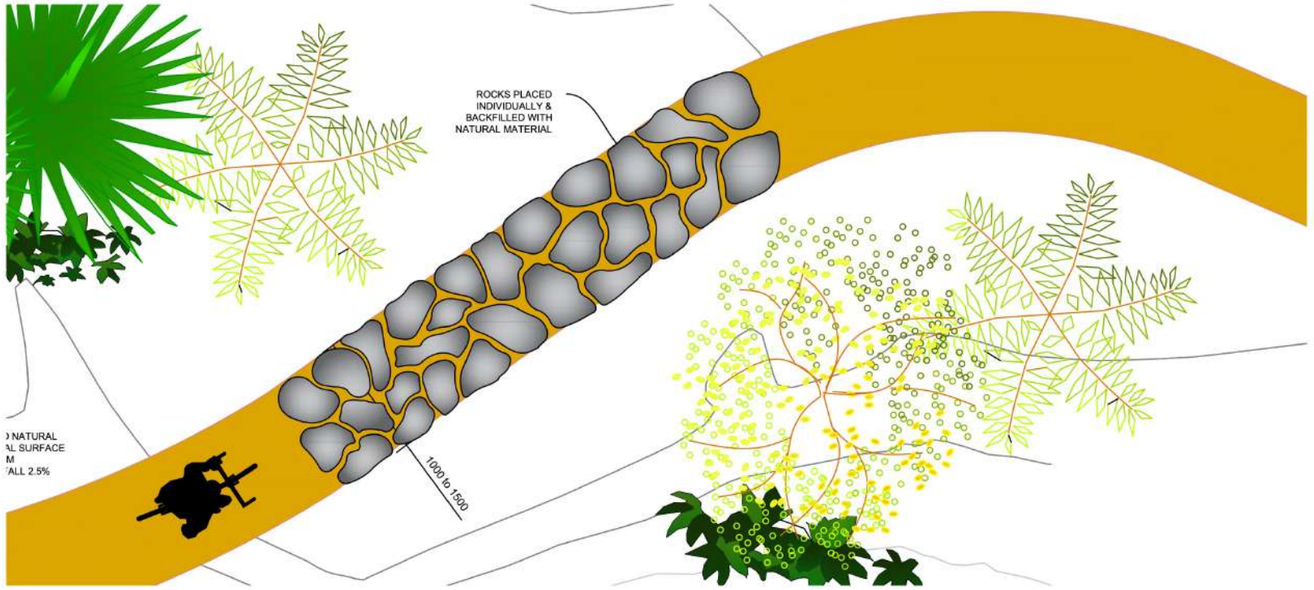
Scale 1:50 | Sheet Size A3

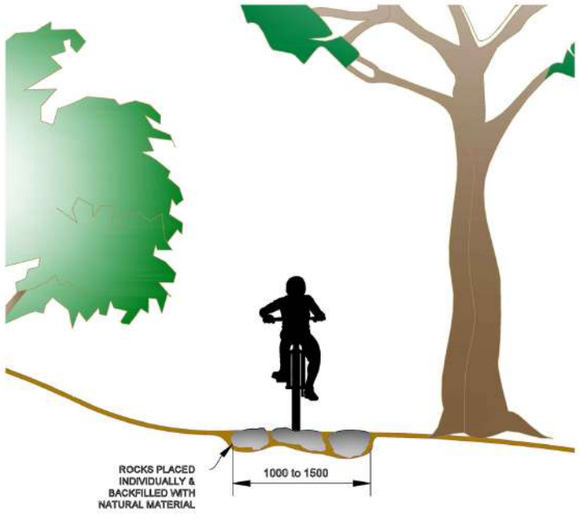
Drawing No. | Rev.

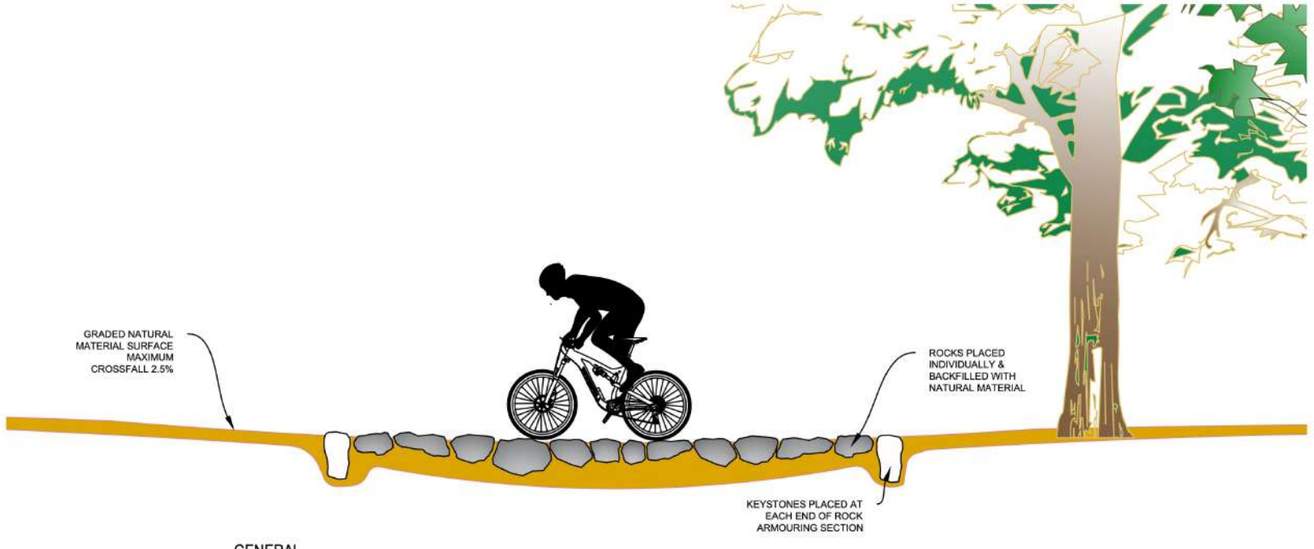
5.3.9 Rock Armouring – Standard Rock Armouring

NOTES:

- Rock Armouring (RA) is to be used in trail sections that are often wet and boggy or to reduce erosion and increase traction on steeper trail sections.
- RA consists of natural or imported rock depending on availability with a minimum size of 400mm and up to 800mm.
- Typical dimensions for rock armoured areas would be 1200mm (minimum) wide and often 5000mm long
- RA sections may be straight or curved depending on the local topography and the track alignment at that location.
- Rocks are to be placed into the wet foundation material and backfilled with dry graded local material that is of a similar consistency to the general track surface.
- Each rock should be bedded into graded foundation material in such a way that it will remain stable with no rocking or misplacement.
- Rocks used for armouring should be of an appropriate shape, texture and colour to match the native rock and must provide a natural appearance relative to its location .
- Rocks should be placed so that the top surface provides reasonable traction for cycle and foot traffic. Distance between rocks will depend on the degree of "bogginess" and the ability of the foundation material to hold up the backfill material between the individual rocks.
- The texture of the top surface of the rocks should allow for reasonable traction for cycle and foot traffic with minimal slippage.
- Once the rocks have been placed, natural topsoil should be raked or swept into the gaps between the rocks and compacted to minimise future slumping or rock instability.







0 1.5 3 Meters Scale 1:50 @ A3

GENERAL ARRANGEMENT
SCALE 1:50

FOR INFORMATION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	Signed	Date	
Designed	Signed	Date	
Verified	Signed	Date	
Approved	Signed	Date	

Drawing Title: ROCK ARMOURING - MTB PLACEMENT AND DIMENSIONS WORLD TRAIL - STANDARD DRAWING

Project No.

Scale 1:50

Sheet Size A3

Drawing No.

Rev.

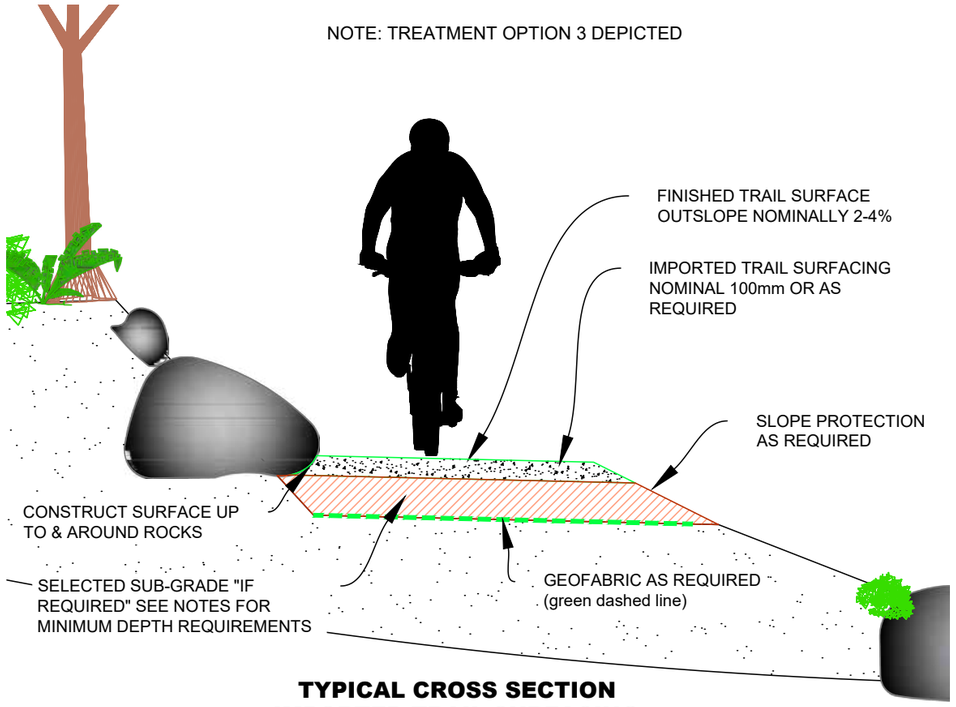
5.3.10 Surfacing

NOTES:

1. Ensure drainage is always correctly constructed and/or installed to manage water flows along or across the trail. surfacing is not a substitute for drainage.
2. Use surfacing when:
   a. *finished trail surface/soil type is susceptible to becoming boggy or soaked*
   b. *surface is susceptible to damage from tyres or footfall in all conditions*
   c. *project specifications include the need for specific surfacing (eg surfaced walking trail)*
3. Imported surfacing material will consist of either an application specific "trail mix" or a material that may be defined in the project requirements if specified.
4. Trail mix should consist of an aggregate base material mixed with a clay/loam binder as agreed with the project principle.
5. The selection of surfacing material will depend on:
   a. *application requirements (MTB, Walking or Dual Use Trail).*
   b. *compaction/hardness required for the trail.*
   c. *amount of "grip" the material provides.*
   d. *amount of rainfall likely in the trail location.*
6. The imported surfacing material should be placed on a prepared sub-grade surface.
7. Sub-grade material should be compacted and inspected for suitability by a qualified or experienced person prior to the placement of imported trail surfacing.
8. There are 4 treatment options depending on the results of this assessment.
9. Compaction should be achieved through track rolling or manual compaction with a ramming tamper.
10. All loose stones, tree roots, organic matter or other deleterious material should be removed from the subgrade surface.
7. Imported surfacing material is to be compacted to either a project specified compaction rate or to a level of compaction that allows the material to remain hard and intact during wet weather or normal trail usage.
8. Geofabric may be required to provide a separation between underlying highly plastic material and a bridging layer of sub-grade and trail surfacing.
9. Geofabric should be non-woven, strength class c & filtration class 3 or better. example - BIDIM A29 or equivalent.
10. Geofabric should have a minimum of 200mm of sub-grade and surfacing placed over the top of it for walking trails and 300mm for mtb trails.
11. In accordance with project CEMP, any fill material introduced to the site must be certified clean and be weed and pathogen free and exhibit similar properties to the natural soil e.g pH, drainage, texture. In addition, any fill material introduced to the State Forest will be undertaken according to DEECA FFM procedures.
12. Fill areas will be monitored for germination of weeds.
13. The type/source of selected sub-grade will be project and/or application specific.
14. Ballast fill or gabion edging may be required to treat the trail foundations in heavily boggy or highly plastic locations.
15. See standard drawings WTSTD-045 & WTSTD-017 for details.

TREATMENT OPTIONS	
TREATMENT TYPE	TREATMENT
TYPE 1	SURFACE CAPPING
TYPE 2	SURFACE CAPPING WITH SELECTED SUB-GRADE
TYPE 3	SURFACE CAPPING WITH GEOFABRIC UNDERLAY AND SELECTED SUB-GRADE
TYPE 4	THICKER SURFACE CAPPING WITH GEOFABRIC UNDERLAY

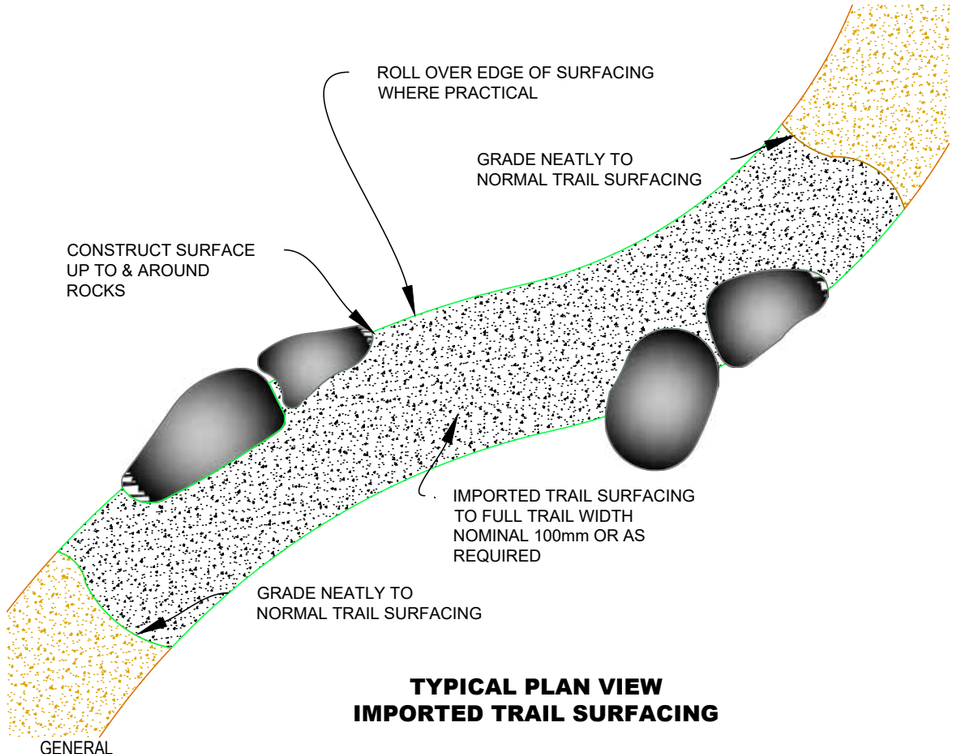
NOTE: TREATMENT OPTION 3 DEPICTED



TYPICAL CROSS SECTION
IMPORTED TRAIL SURFACING

Scale 1:25 @ A3

0 0.5 1 Meters



TYPICAL PLAN VIEW
IMPORTED TRAIL SURFACING

GENERAL ARRANGEMENT
SCALE 1:25

0 1 2 Meters

Scale 1:50 @ A3

FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	JR	Signed	Date 06/02/24
Designed	DS	Signed	Date 06/02/24
Verified	DS	Signed	Date 06/02/24
Approved		Signed	Date

Drawing Title: IMPORTED TRAIL SURFACING TRAIL SURFACE TREATMENT STANDARD DRAWING

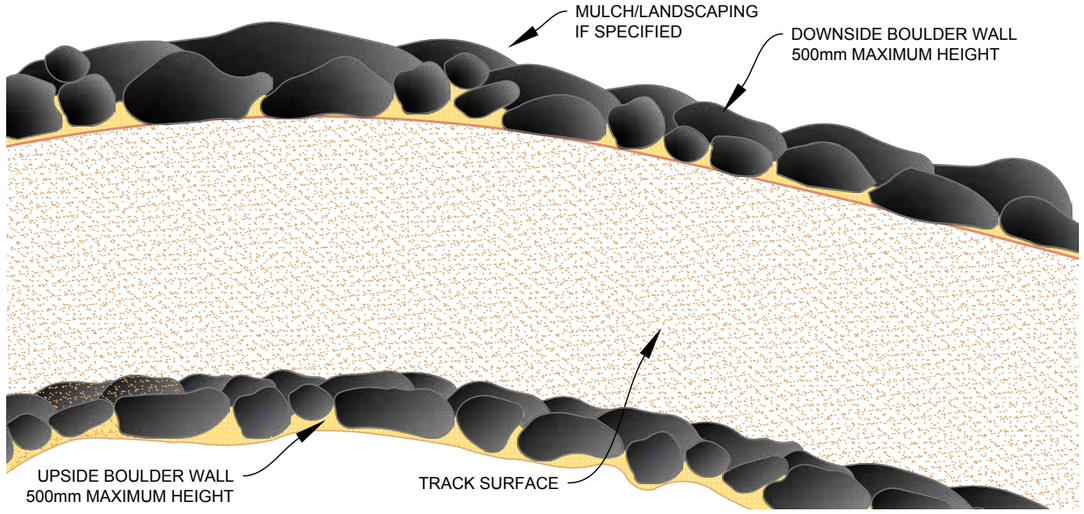
Project No. WT2019-107
Scale 1:25
Sheet Size A3
Drawing No. WTSTD-063-YV
Rev. C

5.3.11 Rock Walling (up to 500mm)

NOTES:

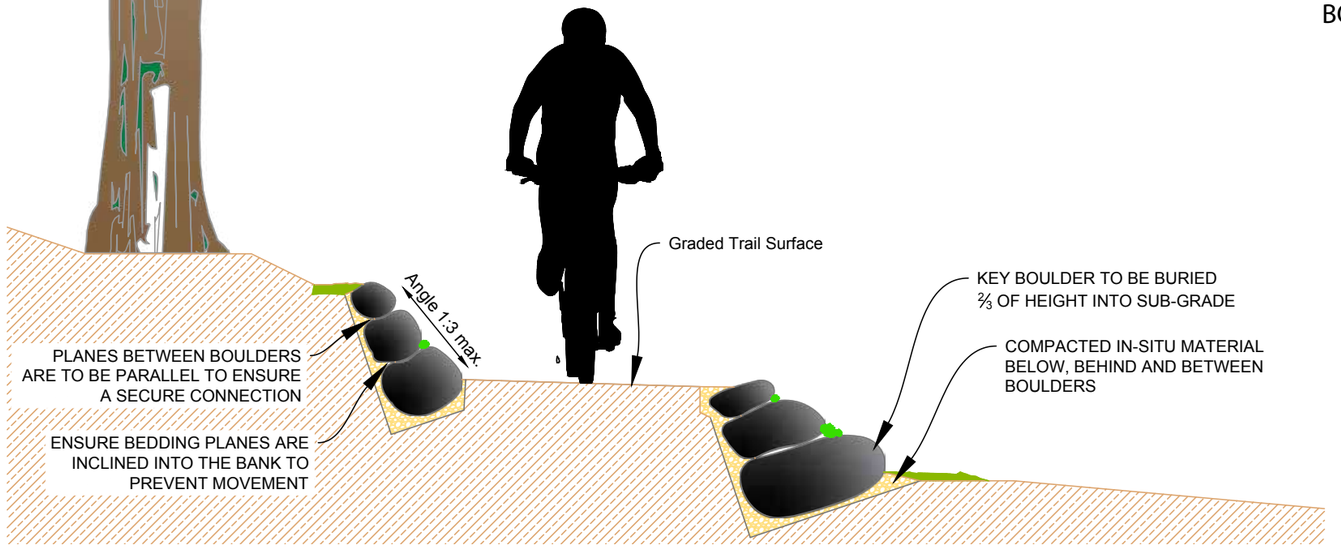
GENERAL:

Boulders used for the retention wall to be a minimum size of 300mm * 300mm * 300mm.
The approved boulder type used to form the wall shall be of one consistent type. Typically Granite, Sandstone, Volcanic Red Rock, Phorphyry or other Natural BushRock Boulders unless specified otherwise.
Boulders as specified with the best and most natural surfaces exposed.
Sharp / Angled edges are not acceptable.
Boulder wall to be constructed by an experienced contractor and must not exceed 500mm in height.
Refer to Standard Drawing WTMSTD-067-YV for locations where the rock wall needs to be over 500mm.
Fill used under, behind and between boulders to be in-situ material or equivalent approved material.
In-situ material is to be compacted to 90% Modified Maximum Dry Density to AS1289.5.4.1.
This plan depicts boulder walls on both the upside and downside of the track.In many locations only the upside or the downside walls will be required. This plan is meant to be used for the construction of one or the other or both types of retention depending on the local topography.



PLAN VIEW - 500mm BOULDER RETAINING WALL BOTH SIDES

Scale 1:25 @ A3



LEGEND:

- GRADED TRAIL SURFACE
- IN-SITU MATERIAL
- NATURAL GROUND

0 0.5 1 Meters

Scale 1:25 @ A3

TYPICAL SECTION - 500mm BOULDER RETAINING WALL BOTH SIDES

GENERAL ARRANGEMENT
SCALE 1:25

FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn.	Ver.	App.

Client:

Project:

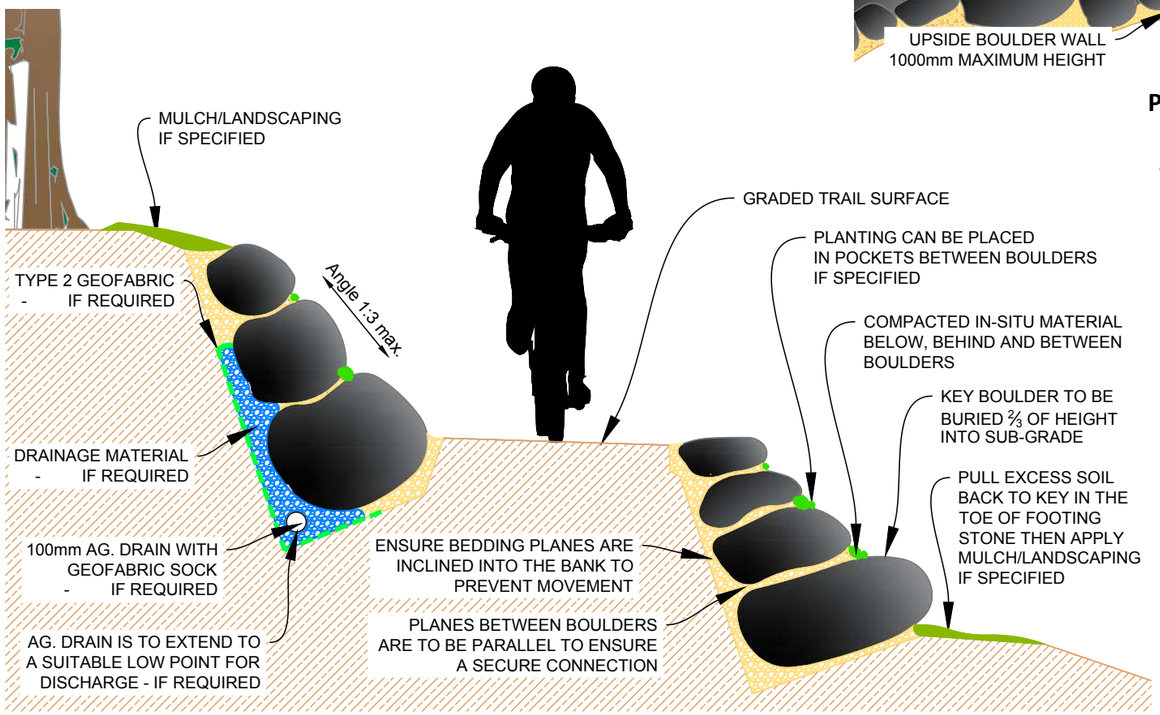
Drawn JR	Signed	Date 06/02/24	Drawing Title: ROCK WALLING - UP TO 500mm - MTB PLACEMENT AND DIMENSIONS WORLD TRAIL - STANDARD DRAWING
Designed DS	Signed	Date 06/02/24	
Verified DS	Signed	Date 06/02/24	
Approved	Signed	Date	

Project No. WT2019-107
Scale 1:25
Sheet Size A3
Drawing No. WTSTD-034-YV
Rev. B

5.3.12 Rock Retaining Walls (500 - 1000mm)

LEGEND:

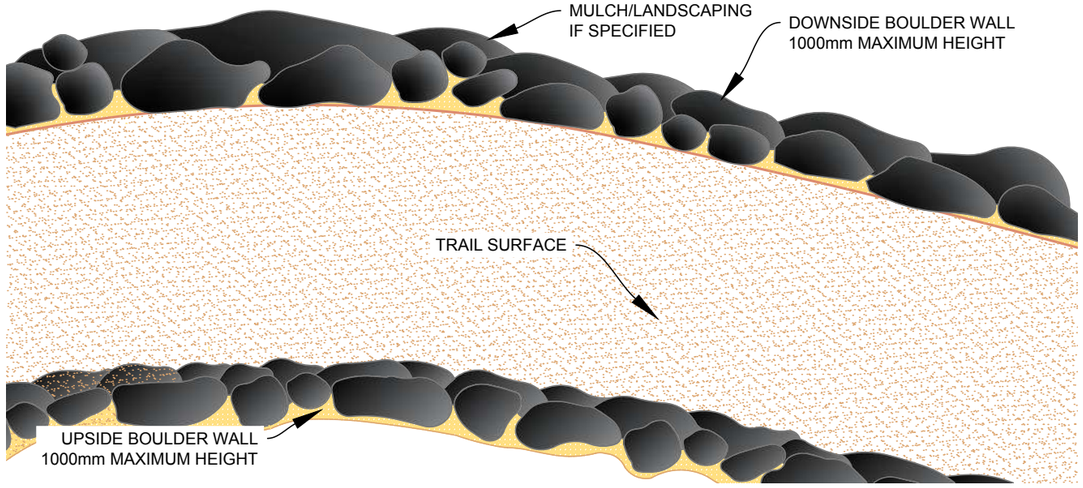
- PROJECT SPECIFIC SURACING
- APPROVED BACKFILL MATERIAL
- DRAINAGE MATERIAL
- TYPE 2 GEOFABRIC
- NATURAL GROUND



TYPICAL SECTION - 1000mm BOULDER RETAINING WALL BOTH SIDES

0 0.5 1 Meters

Scale 1:25 @ A3



PLAN VIEW - 1000mm BOULDER RETAINING WALL BOTH SIDES

Scale 1:25 @ A3

NOTES:

Boulders used for the retention wall to be a minimum size of 400mm * 400mm * 400mm with the larger stones to be placed on the bottom to ensure a strong and secure base.

The approved boulder type used to form the wall shall be of one consistent type. Typically Granite, Sandstone, Volcanic Red Rock, Phorphyry or other Natural Bush Rock Boulders unless specified otherwise.

Boulders as specified with the best and most natural surfaces exposed.

Boulders should be hand or machine placed with staggered vertical joints (brickwork pattern) to increase interlocking strength and load distribution.

Sharp / Angled edges are not acceptable.

Boulder wall to be constructed by an experienced contractor and must not exceed 1000mm in height.

The site is to be assessed by an experienced and qualified person to assess whether "behind wall" drainage is required.

If drainage is required, the wall should be constructed as shown in the uphill wall depicted with 100mm Ag. pipe, free draining material such as 7mm to 14mm screenings and geofabric.

The drainage material should not extend closer than 300mm from the top or toe of the wall to prevent the intrusion of surface water behind the wall.

If the wall does not require behind wall drainage it is to be constructed as shown in the downhill wall depicted. Fill used under, behind and between boulders to be in-situ material or equivalent approved material.

In-situ material under the foundation boulder is to be compacted to 95% Modified Maximum Dry Density to AS1289.5.4.1.

This plan depicts boulder walls on both the upside and downside of the track.In many locations only the upside or the downside walls will be required. This plan is meant to be used for the construction of one or the other or both types of retention depending on the local topography.

Trail construction is to consist of the removal of existing sub-grade material and the placement of a Sub-Base layer and a Final Surface as described in the project specification.

Final Surface and Sub-Base are to consist of materials as defined in the project specification.

GENERAL ARRANGEMENT
SCALE 1:25

FOR CONSTRUCTION

Rev.	Date	Revision Details	Drn.	Ver.	App.

WORLDTRAIL

Client:

Project:

Drawn	JR	Signed	Date 06/02/24
Designed	DJ	Signed	Date 06/02/24
Verified	DS	Signed	Date 06/02/24
Approved		Signed	Date

Drawing Title: ROCK WALLING - UP TO 1000mm PLACEMENT AND DIMENSIONS STANDARD DRAWING

Project No. WTSTD-2021

Scale 1:25 | Sheet Size A3

Drawing No. WTSTD-067-YV | Rev. B

5.3.13 Bridges

Sixteen bridges, totalling eighty-eight metres in length, are required to cross the various small watercourses encountered throughout the trail network. Costs provided in the cost estimate section are indicative only and further design resolution and detail will be necessary.

Each bridge was measured in the field for approximate length (from end of deck to end of deck, with no accounting for footing locations or actual span lengths) and height. They were then classified as either short (less than 8m), medium (8 – 12m) or long (greater than 12m). If the deck height was measured to be over 1m at its highest point, the bridge would be noted as requiring a handrail. Table 9 below lists the different bridge types required, and the number of each.

Table 9. Bridge Summary

Bridge Type	No. of sites	Length (m)
Short Bridge (< 8m) – no handrail	15	80
Short Bridge (< 8m) – handrail	1	8
Medium Bridge (8 -12m) – no handrail	0	0
Long Bridge (> 12m) – no handrail	0	0
Total	**16**	**88**

Further detailed design work is required to determine the exact location and dimensions of each bridge and to determine an appropriate design. The specified width of each bridge should comply with the recommended width in the AusCycling Trail Difficulty Rating System. Where possible, bridges should be kept below 1m in height to avoid the need for handrails. While only one bridge specified has a handrail, it may be possible to avoid a handrail through minor alignment changes or through innovative design. Where handrails are required, the design must ensure that the handrails don't pose a hazard to riders – handrails are often at similar height to MTB handlebars and can pose a risk of causing hand injury.

Given the remote locations and construction challenges relating to access, design solutions should focus on lightweight and durable materials (such as fibre-reinforced plastic [FRP] mesh decking), minimalistic structures and be fit-for-purpose for mountain biking (i.e. riders travelling in single-file, generally spaced 5-10m apart).

Finally, although bridges have been specified for each of these sites, other solutions may be available for crossing these watercourses and should be further investigated. In particular, in any ephemeral or seasonal watercourses, rock armouring (i.e. the embedment of rocks into the trail tread, such that the surface of the rocks forms the 'tread' of the trail) could be used to create fords. When the water level rises, water flows over the top of the rock armouring. The rock armouring provides a firm base, allowing riders to ride through the water without damaging the stream bed. Care should be taken to ensure relevant fisheries approvals are in place prior to implementing any work in creek beds.

The advantages of using this rock armoured ford technique described above are:

1. No introduced materials – uses locally available in situ materials;
2. Lower construction cost – per metre rates for rock armouring are significantly cheaper than bridge/boardwalk construction, although this depends on the design / specifications / materials.
3. No bushfire hazard;
4. Longer lifespan;
5. Less susceptible to flood damage.

The main disadvantage is that water crossings may become temporarily impassable after heavy rainfall.

5.3.14 Lookouts

Seven lookout sites were identified across the trail network. The visual impressiveness of these lookouts varies, but some are truly spectacular, providing views down into deep gorges and valleys.

Each lookout site will need to be separately assessed in detailed design to determine the suitability, risk and infrastructure requirements for each one. Some will have minimal risk and infrastructure requirements, whereas others are located on the edge of large cliffs with significant safety risks, requiring the installation of safety barriers and other visitor infrastructure. Where trails pass close to cliff edges, they have generally been designed to maintain a buffer from the cliff edge itself. The intent is for the main trail to pass these features at a safe offset distance, with the option for riders to leave their bike and walk up/down to a lookout point that would include appropriate barriers, signage etc. No designs or specific advice in relation to these lookout areas is provided, and it is recommended that further detailed design and risk assessments be undertaken prior to construction and designs be developed for any structures/barriers that may be required. As each lookout site has different infrastructure requirements, no specifications are provided in this report.

Figure 10 below shows Lookout LO 63.1 which has a significant and sheer drop from atop a large rock formation, that will potentially require barriers, signage and other infrastructure. Figure 11 on the next page shows Lookout LO 3.2, which is located atop a gentle, rounded hilltop, requiring minimal infrastructure.

Figure 10. Lookout LO 63.1

Figure 11. Lookout LO 3.2

5.4 CONSTRUCTION COST ESTIMATE

This section presents the overall cost estimate for the construction of the trail network in the State Mine Gully Precinct, including all the trail features and trail treatments identified during the ground-truthing of the Lithgow Mountain Bike Park subject to this DA.

Table 10 below presents the schedule of rates for each of the cost items identified in this report. Note that these rates are estimates only, based on previous projects of a similar nature and taking into consideration local conditions and circumstances.

As described in the previous specifications section, bridges and lookouts require further investigation and design work before accurate cost estimates can be made. While rates have been provided for these items for overall budgeting purposes, further works to design and refine the cost estimates for these items are strongly recommended. Lookouts have been allocated a nominal allowance based on approximately 100 hours of labour, but no allowance has been made for any built structures, imported or precast materials, barriers or signage.

Note that the construction cost estimates provided in this section only include trails and construction treatments within the State Mine Gully precinct, excluding all proposed trails and construction treatments within the GOSSCA land tenure (as these are being constructed and funded from NPWS funding & subject to approval).

Table 10. Schedule of Rates

Item Type	Item Sub-Type	Rate
Trail	Adventure	$62.50 / m
	Gravity	$70.00 / m
	Flow	$70.00 / m
Bridges	Short Bridge (<8m) – no handrail	$5,000.00 / m
	Short Bridge (<8m) – handrail	$6,500.00 / m
Earthworks	Hand Construction	$100.00 / m
Rock Armour	Adjustable Rock Matting	$340.00 / m^2
	Standard Rock Armour	$400.00 / m^2
Surfacing	Imported Deco / Road base	$175.00 / m
Rock Retaining Walls	0 – 500mm	$300.00 / m
	500mm – 1000mm	$550.00 / m
Lookouts	-	$10,000.00 / each site

Table 11 below provides Base Trail Cost Estimate. Base trail is the standard earthen bench, including all earthen features such as switchbacks, grade reversals, berms, rollers, jumps etc. constructed by the excavator as part of standard bench construction.

Table 11. Base Trail Cost Estimate

Land Tenure	Trail Number	Section	Trail Style	Length (m)	Rate / m	Section Cost	Trail Cost
SMG	02	C	Flow	1203	$70.00	$84,210.00	$172,165.00
SMG	02	D	Flow	32	$70.00	$2,240.00	
SMG	02	E	Adventure	70	$62.50	$4,375.00	
SMG	02	F	Flow	1162	$70.00	$81,340.00	
SMG	50	B	Adventure	2360	$62.50	$147,500.00	$147,500.00
SMG	51	B	Gravity	1109	$70.00	$77,630.00	$97,790.00
SMG	51	C	Gravity	221	$70.00	$15,470.00	
SMG	51	D	Gravity	67	$70.00	$4,690.00	
SMG	52	B	Flow	396	$70.00	$27,720.00	$87,430.00
SMG	52	C	Flow	853	$70.00	$59,710.00	
SMG	53	B	Flow	697	$70.00	$48,790.00	$48,790.00
SMG	54	B	Adventure	1054	$62.50	$65,875.00	$95,937.50
SMG	54	C	Adventure	63	$62.50	$3,937.50	
SMG	54	D	Adventure	43	$62.50	$2,687.50	
SMG	54	E	Adventure	375	$62.50	$23,437.50	
SMG	55	B	Flow	514	$70.00	$35,980.00	$43,750.00
SMG	55	C	Flow	111	$70.00	$7,770.00	
SMG	56	B	Flow	285	$70.00	$19,950.00	$19,950.00
SMG	57	A	Adventure	2907	$62.50	$181,687.50	$250,187.50
SMG	57	C	Adventure	1096	$62.50	$68,500.00	
SMG	58	A	Adventure	854	$62.50	$53,375.00	$53,375.00
SMG	59	A	Adventure	1757	$62.50	$109,812.50	$198,922.50
SMG	59	B	Gravity	1273	$70.00	$89,110.00	
SMG	60	A	Adventure	307	$62.50	$19,187.50	$19,187.50
SMG	61	A	Adventure	714	$62.50	$44,625.00	$44,625.00
SMG	62	A	Adventure	546	$62.50	$34,125.00	$34,125.00
SMG	63	A	Adventure	2269	$62.50	$141,812.50	$144,625.00
SMG	63	B	Adventure	23	$62.50	$1,437.50	
SMG	63	C	Adventure	22	$62.50	$1,375.00	
SMG	64	A	Adventure	142	$62.50	$8,875.00	$8,875.00
SMG	65	A	Adventure	516	$62.50	$32,250.00	$32,250.00
SMG	66	A	Flow	1083	$70.00	$75,810.00	$75,810.00
SMG	67	A	Adventure	168	$62.50	$10,500.00	$10,500.00
SMG	68	A	Flow	248	$70.00	$17,360.00	$17,360.00
TOTAL				**24540**		**$1,603,155.00**	**$1,603,155.00**

Note that Trail 51 is an existing trail (Left Hand Gully). It is costed in the table above as though it is a new trail, but it is likely that this cost item could be reduced significantly, based on the fact that it exists and that any works required to improve the trail should be undertaken at a lesser cost, as there would be less labour involved.

Table 12 below provides the Construction Treatments Cost Estimate for all construction treatments that were specified during ground-truthing. Construction treatments are the additional works that need to be undertaken to improve sustainability, improve stability or width, or that require imported materials. Construction treatments include items such as rock walling, rock armouring, bridges, surfacing, etc.

Table 12. Construction Treatments Cost Estimate

Land Tenure	Trail Name	Bridges: Short (<8m) No handrail		Bridges: Short (<8m) With Handrail		Earthworks: Hand Construction		Lookouts		Rock Armour: Adjustable Rock Matting		Rock Armour: Standard Rock Armour		Surfacing: Imported Deco/ Road base		Rock Walling (up to 500mm): Onsite Materials		Retaining Walls (up to 1000mm): Onsite Materials		Trail Total
		Length (m)	Cost ($)	Length (m)	Cost ($)	Length (m)	Cost ($)	No. of sites	Cost ($)	Length (m)	Cost ($)	Length (m)	Cost ($)	Length (m)	Cost ($)	Length (m)	Cost ($)	Length (m)	Cost ($)	
SMG	02	8	$40,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	15	$6,000.00	40	$7,000.00	55	$16,500.00	0	$0.00	$69,500.00
SMG	50	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	66	$26,400.00	0	$0.00	23	$6,900.00	210	$115,500.00	$148,800.00
SMG	51	12	$60,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	$60,000.00
SMG	52	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	17	$6,800.00	0	$0.00	6	$1,800.00	0	$0.00	$8,600.00
SMG	53	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	20	$3,500.00	20	$6,000.00	0	$0.00	$9,500.00
SMG	54	0	$0.00	0	$0.00	150	$15,000.00	1	$10,000.00	0	$0.00	0	$0.00	150	$26,250.00	150	$45,000.00	0	$0.00	$96,250.00
SMG	55	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	30	$12,000.00	0	$0.00	0	$0.00	0	$0.00	$12,000.00
SMG	56	4	$20,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	3	$1,200.00	0	$0.00	0	$0.00	0	$0.00	$21,200.00
SMG	57	8	$40,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	50	$20,000.00	0	$0.00	25	$7,500.00	0	$0.00	$67,500.00
SMG	58	5	$25,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	30	$5,250.00	30	$9,000.00	0	$0.00	$39,250.00
SMG	59	0	$0.00	0	$0.00	300	$30,000.00	2	$20,000.00	0	$0.00	11	$4,400.00	60	$10,500.00	60	$18,000.00	0	$0.00	$82,900.00
SMG	60	15	$75,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	$75,000.00
SMG	61	0	$0.00	8	$52,000.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	20	$6,000.00	0	$0.00	$58,000.00
SMG	62	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	$0.00
SMG	63	0	$0.00	0	$0.00	50	$5,000.00	1	$10,000.00	0	$0.00	31	$12,400.00	0	$0.00	80	$24,000.00	0	$0.00	$51,400.00
SMG	64	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	$0.00
SMG	65	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	$0.00
SMG	66	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	44	$17,600.00	0	$0.00	10	$3,000.00	0	$0.00	$20,600.00
SMG	67	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	10	$4,000.00	0	$0.00	0	$0.00	0	$0.00	$4,000.00
SMG	68	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	0	$0.00	5	$1,500.00	0	$0.00	$1,500.00
TOTAL		**52**	**$260,000.00**	**8**	**$52,000.00**	**500**	**$50,000.00**	**4**	**$40,000.00**	**0**	**$0.00**	**277**	**$110,800.00**	**300**	**$52,500.00**	**484**	**$145,200.00**	**210**	**$115,500.00**	**$826,000.00**

Table 13 below combines the Base Trail and Construction Treatments to provide the overall total cost per trail.

Table 13. Total Trail Cost

Land Tenure	Trail Name	Base Trail Cost	Construction Treatments Cost	Total Trail Cost	Total Trail Cost plus Contingency (20%)
SMG	02	$172,165.00	$69,500.00	$241,665.00	$289,998.00
SMG	50	$147,500.00	$148,800.00	$296,300.00	$355,560.00
SMG	51	$97,790.00	$60,000.00	$157,790.00	$189,348.00
SMG	52	$87,430.00	$8,600.00	$96,030.00	$115,236.00
SMG	53	$48,790.00	$9,500.00	$58,290.00	$69,948.00
SMG	54	$95,937.50	$96,250.00	$192,187.50	$230,625.00
SMG	55	$43,750.00	$12,000.00	$55,750.00	$66,900.00
SMG	56	$19,950.00	$21,200.00	$41,150.00	$49,380.00
SMG	57	$250,187.50	$67,500.00	$317,687.50	$381,225.00
SMG	58	$53,375.00	$39,250.00	$92,625.00	$111,150.00
SMG	59	$198,922.50	$82,900.00	$281,822.50	$338,187.00
SMG	60	$19,187.50	$75,000.00	$94,187.50	$113,025.00
SMG	61	$44,625.00	$58,000.00	$102,625.00	$123,150.00
SMG	62	$34,125.00	$0.00	$34,125.00	$40,950.00
SMG	63	$144,625.00	$51,400.00	$196,025.00	$235,230.00
SMG	64	$8,875.00	$0.00	$8,875.00	$10,650.00
SMG	65	$32,250.00	$0.00	$32,250.00	$38,700.00
SMG	66	$75,810.00	$20,600.00	$96,410.00	$115,692.00
SMG	67	$10,500.00	$4,000.00	$14,500.00	$17,400.00
SMG	68	$17,360.00	$1,500.00	$18,860.00	$22,632.00
TOTAL		**$1,603,155.00**	**$826,000.00**	**$2,429,155.00**	**$2,914,986.00**

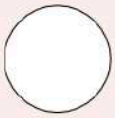
This table includes a contingency amount of 20% to allow for additional construction treatments (rock armouring, bridges, surfacing etc.) that become apparent during construction, but were not identified during ground-truthing. This is a commonplace occurrence in trail construction – it is simply not possible to identify every single trail construction treatment during the ground-truthing stage.

In relation to these cost estimates, please note:

1. The rates and cost estimates provided in this section may not fully represent the entire construction scope and that quantities for trail treatments such as rock armouring and trail surfacing may exceed the quantities estimated in this report.
2. The following items are excluded from the cost estimate:
    a. Engineering solutions, certification or advice;
    b. Community consultation;
    c. Signage and wayfinding, including design, fabrication and installation;
    d. Trailhead (and all other associated items such as car parks and toilets) design and construction;
    e. Approvals and permits and any other studies or investigations required;
    f. Cultural heritage monitoring, if required;
    g. Contractor mobilisation and demobilisation expenses;
    h. Helicopter transport of materials, if required;
    i. Construction management documentation;
    j. Project management;
    k. GST.

6 APPENDICES

6.1 TRAIL DIFFICULTY RATING SYSTEM

Difficulty Symbol	Short Description
	**Very easy** Wide trail with a gentle gradient smooth surface and no obstacles Suitable for beginner cyclists with basic bike skills, and most bikes
	**Easy** Wide trail with a gentle gradient smooth surface Some obstacles such as roots, logs and rocks Suitable for beginner cyclists with basic mountain bike skills, and off-road bikes
	**Easy with Intermediate Sections** Likely to be single track with a moderate gradient, variable surface and some obstacles Some obstacles such as roots, logs and rocks Suitable for mountain bikers with mountain bikes
	**Intermediate** Single trail with moderate gradients, variable surface and obstacles May include steep sections Suitable for skilled mountain bikers with mountain bikes
	**Intermediate with Difficult Sections** Suitable for competent mountain bikers, used to physically demanding routes Expect large and unavoidable obstacles and features Challenging and variable with some steep climbs or descents and loose surfaces
	**Difficult** Suitable for experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Expect large, dangerous and unavoidable obstacles and features Challenging and variable with long steep climbs or descents and loose surfaces Some sections will be easier to walk
	**Extreme** Suitable for highly experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Severe constructed trails and/or natural features, all sections are challenging Includes extreme levels of exposure and / or risk Expect large and unavoidable obstacles and features Some sections will be easier to walk

Trail Classification Matrix

The Trail Classification Matrix incorporates the Trail Difficulty Rating System and provides detailed information to use when planning, designing, constructing and maintaining mountain bike trails to ensure a consistent classification standard is applied.

Very easy mountain bike trail / Fire trail

		Technical Description (for land Manager use)	Trail Description (for public information)	Generic Description (for public information)	Short Classification Key
	Grade of trail	Very easy			
	Description	Likely to be a fire road, rail trail or wide single track with a gentle gradient, smooth surface and free of obstacles	Likely to be a fire road, rail trail or wide single track with a gentle gradient, smooth surface and free of obstacles	Wide trail with a gentle gradient smooth surface and no obstacles Suitable for beginner cyclists with basic bike skills, and most bikes	Wide trail, gentle gradient smooth surface, no obstacles For beginner cyclists with basic bike skills
Guiding Criteria	**Trail Width**	2100 mm plus or minus 900 mm	Two riders can ride side by side		
Guiding Criteria	**Trail Surface**	Hardened or smooth	Hardened with no challenging features on the trail		
Guiding Criteria	**Trail Gradient**	Climbs and descents are mostly shallow Ave. trail grade – 7% or less Max. trail grade – 15%	Climbs and descents are mostly shallow		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable bridges 2100mm or wider	No obstacles		
	Experience Required	Suitable for beginner / novice cyclists with basic bike riding skills Suitable for most bikes	Suitable for beginner / novice cyclists with basic bike riding skills Suitable for most bikes		

Easy mountain bike trail

		Technical Description (for land Manager use)	Trail Description (for public information)	Generic Description (for public information)	Short Classification Key
	Grade of trail	Easy			
	Description	Likely to be a combination of fire road or wide single track with a gentle gradient, smooth surface and relatively free of obstacles Short sections may exceed these criteria	Likely to be a combination of fire road or wide single track with a gentle gradient, smooth surface and relatively free of obstacles Short sections may exceed these criteria	Wide trail with a gentle gradient smooth surface Some obstacles such as roots, logs and rocks Suitable for beginner cyclists with basic mountain bike skills, and off-road bikes	Wide trail, gentle gradient, some obstacles For beginner mountain bikers with basic mountain bike skills
Guiding Criteria	**Trail Width**	900 mm plus or minus 300 mm	Handlebar width or greater		
Guiding Criteria	**Trail Surface**	Mostly firm and stable	Mostly firm and stable		
Guiding Criteria	**Trail Gradient**	Climbs and descents are mostly shallow, but trail may include some moderately steep sections Ave. trail grade – 7% or less Max. trail grade – 15%	Climbs and descents are mostly shallow, but trail may include some moderately steep sections		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles to 100mm high, such as logs, roots and rocks Avoidable, rollable obstacles or jumps may be present Unavoidable bridges 900mm or wider Short sections may exceed these criteria	Trail may have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for beginner / novice mountain bikers with basic mountain bike skills Suitable for off-road bikes	Suitable mountain bikers with basic mountain bike skills Suitable for most bikes		

Easy / Intermediate mountain bike trail

		Technical Description *(for land Manager use)*	Trail Description *(for public information)*	Generic Description *(for public information)*	Short Classification Key
	Grade of trail	Easy with Intermediate Sections			
	Description	Likely to be single track with a moderate gradient, variable surface and some obstacles Short sections may exceed these criteria	Likely to be single track with a moderate gradient, variable surface and some obstacles Short sections may exceed these criteria	Likely to be single track with a moderate gradient, variable surface and some obstacles Some obstacles such as roots, logs and rocks Suitable for mountain bikers with mountain bikes	Single track, moderate gradient and some obstacles For beginner mountain bikers with basic mountain bike skills
Guiding Criteria	**Trail Width**	750 mm plus or minus 200 mm	Handlebar width		
Guiding Criteria	**Trail Surface**	Mostly firm and stable	Mostly firm and stable		
Guiding Criteria	**Trail Gradient**	Climbs and descents are mostly shallow, but trail may include some moderately steep sections Ave. trail grade – 7% or less Max. trail grade – 20%	Climbs and descents are mostly shallow, but trail may include some moderately steep sections		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles to 200mm high, such as logs, roots and rocks Avoidable, rollable obstacles and jumps may be present Unavoidable bridges 900mm or wider Short sections may exceed these criteria	Trail may have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for beginner / novice mountain bikers with basic mountain bike skills Suitable for off-road bikes	Suitable mountain bikers with basic mountain bike skills Suitable for most bikes		

Intermediate mountain bike trail

		Technical Description *(for land Manager use)*	Trail Description *(for public information)*	Generic Description *(for public information)*	Short Classification Key
	Grade of trail	Intermediate	Intermediate	Intermediate	Intermediate
	Description	Single trail with moderate gradients, variable surface and obstacles Dual use or preferred use	Single trail with moderate gradients, variable surface and obstacles	Single trail with moderate gradients, variable surface and obstacles May include steep sections Suitable for skilled mountain bikers with mountain bikes	Single trail, moderate gradients, obstacles and some steep sections For skilled mountain bikers
Guiding Criteria	**Trail Width**	600 mm plus or minus 300 mm	Handlebar width or greater		
Guiding Criteria	**Trail Surface**	Possible sections of rocky or loose tread	Possible sections of rocky or loose tread		
Guiding Criteria	**Trail Gradient**	Mostly moderate gradients but may include steep sections Ave. trail grade – 10% or less Max. trail grade – 20% Short sections may exceed these criteria	Mostly moderate gradients but may include steep sections		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers at intersections	Signposted		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes downward slopes of up to 50%	Sections of trail will include moderate exposure on either side of the trail corridor		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles to 350 mm high, such as logs, roots and rocks Avoidable, obstacles to 600 mm may be present, width of deck is greater than half the height of the obstacle Tabletop jumps to 1500mm high, rollable double jumps and avoidable gap jumps Unavoidable bridges 600mm or wider Short sections may exceed these criteria	Trail will have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for skilled mountain bikers with basic mountain bike skills Suitable for mountain bikes	Suitable for skilled mountain bikers with basic mountain bike skills Suitable for mountain bikes		

Intermediate / Difficult mountain bike trail

		Technical Description *(for land Manager use)*	Trail Description *(for public information)*	Generic Description *(for public information)*	Short Classification Key
	Grade of trail	Intermediate with Difficult Sections			
	Description	Likely to be a challenging single trail with moderate gradients, variable surface and obstacles Dual use or preferred use	Likely to be a challenging single trail with moderate gradients, variable surface and obstacles	Suitable for competent mountain bikers, used to physically demanding routes Expect large and unavoidable obstacles and features Challenging and variable with some steep climbs or descents and loose surfaces	For competent mountain bikers Large, unavoidable obstacles and features Some steep climbs or descents and loose surfaces
Guiding Criteria	**Trail Width**	600 mm plus or minus 300 mm	Handlebar width or greater		
Guiding Criteria	**Trail Surface**	Possible sections of rocky or loose tread	Possible sections of rocky or loose tread		
Guiding Criteria	**Trail Gradient**	Mostly moderate gradients but may include steep sections Ave. trail grade – 20% or less Max. trail grade – 30% Short sections may exceed these criteria	Mostly moderate gradients but may include steep sections		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers at intersections	Signposted		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes downward slopes of up to 50%	Sections of trail will include moderate exposure on either side of the trail corridor		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles to 400 mm high, such as logs, roots and rocks Avoidable, obstacles to 1000 mm may be present, width of deck is greater than half the height of the obstacle Tabletop jumps to 2000mm high, rollable double jumps and avoidable gap jumps Unavoidable bridges 600mm or wider Short sections may exceed these criteria	Trail will have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for competent mountain bikers with good mountain bike skills Suitable for mountain bikes	Suitable for competent mountain bikers with good mountain bike skills Suitable for mountain bikes		

Difficult mountain bike trail

		Technical Description *(for land Manager use)*	Trail Description *(for public information)*	Generic Description *(for public information)*	Short Classification Key
	Grade of trail	Difficult			
	Description	Likely to be a challenging single trail with steep gradients, variable surface and many obstacles Single use and direction Optional lines Suitable for cross country, downhill or trials	Likely to be a challenging single trail with steep gradients, variable surface and many obstacles	Suitable for experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Expect large, dangerous and unavoidable obstacles and features Challenging and variable with long steep climbs or descents and loose surfaces Some sections will be easier to walk	For experienced mountain bikers Challenging trail Large, unavoidable obstacles and features Long, steep climbs or descents and loose surfaces
Guiding Criteria	**Trail Width**	300 mm plus or minus 150 mm for tread and bridges	Can be less than handlebar width		
Guiding Criteria	**Trail Surface**	Variable and challenging	Variable and challenging		
Guiding Criteria	**Trail Gradient**	Contains steep descents and climbs Ave. trail grade – 20% or less Max. trail grade – 30% Short sections may exceed these criteria	Contains steep descents and climbs		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers may be limited	Limited signs		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes steep downward slopes or freefall	Exposure to either side of the trail corridor includes steep downward slopes or freefall		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles to 500 mm high, such as logs, roots, drop off's or constructed obstacles Avoidable, obstacles to 1200 mm may be present, width of deck is greater than half the height of the obstacle Tabletop jumps to 2500mm high, rollable double jumps and avoidable gap jumps Unavoidable bridges 600mm or wider Short sections may exceed these criteria	Unavoidable obstacles such as logs, roots, drop off's, jumps or constructed obstacles		
	Experience Required	Suitable for experienced mountain bikers with good skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for better quality mountain bikes	Suitable for experienced mountain bikers with good skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for better quality mountain bikes		

Extreme mountain bike trail

		Technical Description *(for land Manager use)*	Trail Description *(for public information)*	Generic Description *(for public information)*	Short Classification Key
	Grade of trail	Extreme			
	Description	Extremely difficult trails incorporating very steep gradients, highly variable surface and unavoidable, severe obstacles Single use and direction Optional lines Cross country, downhill or trials	Likely to be a challenging single trail with steep gradients, variable surface and many obstacles	Suitable for highly experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Severe constructed trails and/or natural features, all sections are challenging Includes extreme levels of exposure and / or risk Expect large and unavoidable jumps, obstacles and features Some sections will be easier to walk.	For highly experienced mountain bikers All sections extremely challenging Large, unavoidable jumps, obstacles and severe features
Guiding Criteria	**Trail Width**	150 mm plus or minus 100 mm for tread and bridges Structures can vary	Can be less than handlebar width		
Guiding Criteria	**Trail Surface**	Widely variable and challenging	Widely variable and challenging		
Guiding Criteria	**Trail Gradient**	Expect prolonged steep, loose and rocky descents or climbs Average trail grade – 20% Max. trail grade – 40% Short sections may exceed these criteria	Expect prolonged steep, loose and rocky descents or climbs		
Guiding Criteria	**Quality of Markings**	Trailhead signs and route markers may be limited	Limited signs		
Risk Assessable Criteria	**Level of Trail Exposure**	Exposure to either side of the trail corridor includes steep downward slopes or freefall	Exposure to either side of the trail corridor includes steep downward slopes or freefall		
Risk Assessable Criteria	**Natural Obstacles and Technical Trail Features (TTFs)**	Unavoidable obstacles over 1000mm Avoidable, obstacles may be present Unavoidable gap jumps and doubles Unavoidable bridges 600mm or narrower Width of bridges is unpredictable Short sections may exceed these criteria	Unavoidable obstacles such as gap jumps, logs, roots, drop off's or constructed obstacles		
	Experience Required	Suitable for highly experienced mountain bikers with excellent skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for quality mountain bikes	Suitable for highly experienced mountain bikers with excellent skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for quality mountain bikes		

6.2 TRAIL STYLES

ADVENTURE
One of the world's most prolific trail styles, traditionally referred to as cross-country, Adventure Trails are the most popular gateway trail for all levels of mountain bike riders. They have a free-flowing style and maximise use of the natural terrain with contour-hugging designs that allow riders to feel confident, while also providing options and features for extra challenge.

WILDERNESS
Located in remote settings, Wilderness Trails take advantage of the raw natural beauty of diverse landscapes giving riders a unique, immersive and memorable experience. They are generally narrow, longer-distance trails with a focus on ensuring the trail provides an opportunity for riders to challenge themselves over an endurance distance while finishing with a huge smile and desire to do it all over again.

FLOW
A descending trail style, Flow Trails offer a constant undulation of groomed rollers, berms, and achievable obstacles. The tyre-hugging trajectory sending riders on a sculptured luge ride through the bush. They create a sensation of speed and rhythm, require minimal decision-making and maximise the ability to feel in control and have fun.

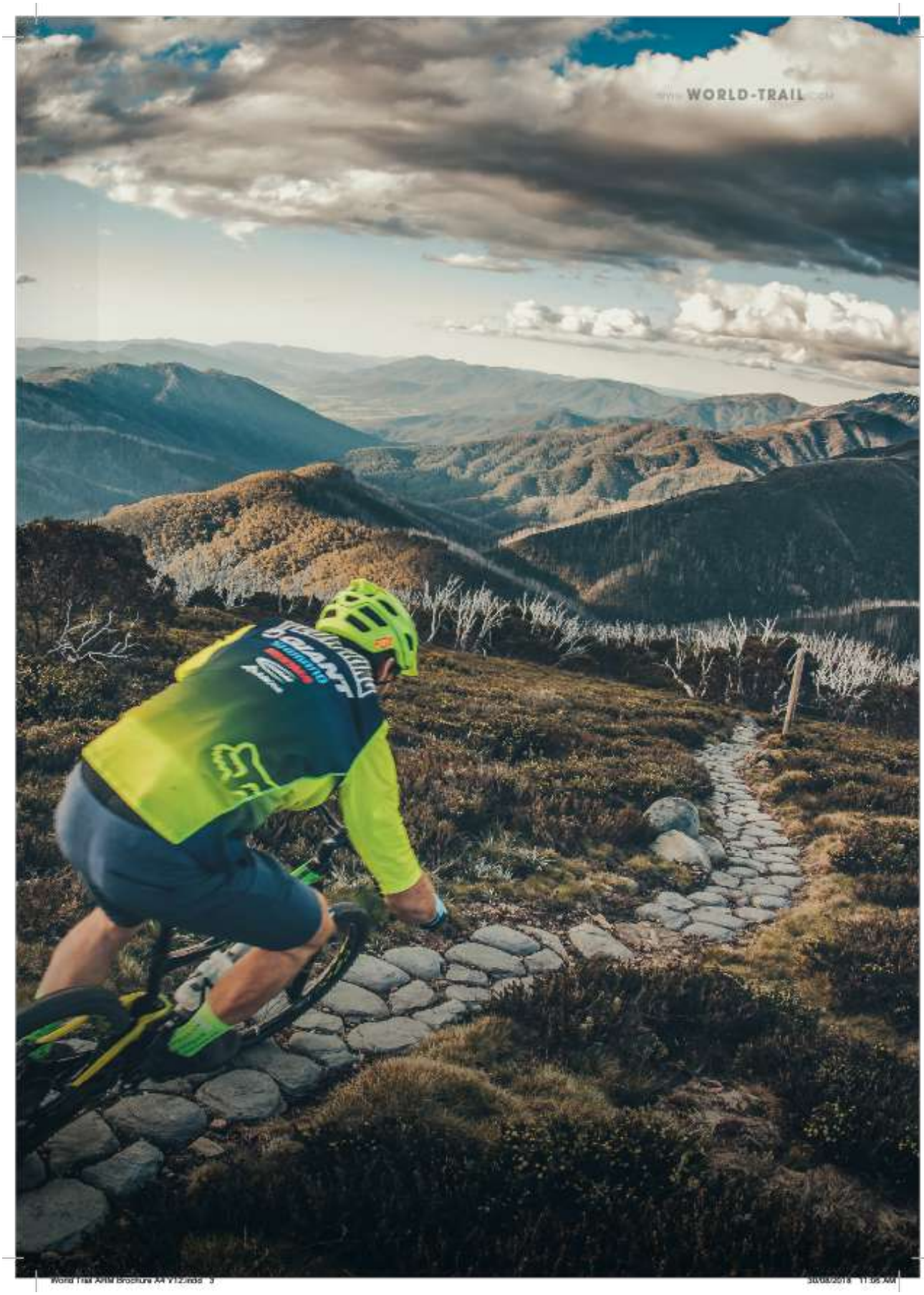
AIR FLOW
Developed by World Trail, Air Flow Trails combine everything we love about Enduro and Gravity Trails – magnifying pure flow, creating exciting line choices, transfers and safe jumping options. Sculptured jumps, berms, rollers abound, but obstacles are usually rollable, putting the emphasis on rider safety, skill progression and undeniable fun.

GRAVITY
Offering a mix of Flow, Air Flow and Downhill, Gravity Trails embrace the raw beauty of the terrain in an exciting and challenging descent. They will often provide multiple line choices and a variety of features, and may include occasional short uphill sections.

DOWNHILL
Of all the trail styles, Downhill Trails are generally the steepest, most raw and challenging. They are the domain of long-travel, design-specific mountain bikes and UCI sanctioned racing. With minimal benching, steep erratic features, off-camber, large transfer and high-risk options, these trails are generally shorter, more aggressive and suited to the more experienced riding.

6.3 ADJUSTABLE ROCK MATTING


THE
HISTORY
World Trail developed the idea of an artificial rock armouring solution after years of strenuous manual handling to harvest boulders and install rock armour, a challenging and often dangerous task in remote terrain.
Different prototypes were successfully trialed including individual rocks carved from lightweight Hebel in Mt Buller, Victoria in 2011. These products have been tested over many years on the popular Copperhead flow trail, withstanding the harsh climate and heavy usage by mountain bikers.
The idea of a flexible, linked artificial rock mat was brought to life in Tasmania with the help of local fabricator Richard Goodsell in 2015.
The initial products performed very well in the field, yet needed some refining to suit World Trail's high performance standard. The new redesigned units were installed at Falls Creek in Victoria, Smithfield's World Championship 2017 course in Queensland and the highly successful Blue Derby trail network in Tasmania. Ongoing monitoring of these units have proven their longevity, durability and strength under the pressure of thousands of riders a month on these trails.
ARM
ADJUSTABLE ROCK MATTING
ARM is a strong, natural looking, flexible, cost effective and consistent product for hardening trail surfaces successfully in all conditions.
WORLDTRAIL


WORLD-TRAIL

THE PRODUCT

WHAT IS ARM?

ARM is a modular, natural looking, multi-boulder solution, interconnected via a strong linked mesh which can be interlaced with other units resulting in a hardened surface anchored to the ground.

The product allows treatment within fragile or sensitive environments or high use impact zones, resulting in a long-lasting and sustainable trail surface.

ARM is easily transportable, manageable, cost-effective and is extremely efficient as an alternative in areas where water is an ongoing problem and useable natural rock is sparse.

The unique design allows for flexibility over undulating terrain, including berms, rollers and drops while imitating and adapting to the existing ride surface.

HOW STRONG IS ARM?

Our product is made from a unique concrete mix, rated in excess of 50MPa compressive strength at 28 days, which is well above the industry standard, plus the tensile strength (breaking load) rating is in excess of 7.2 KN at 40mm thickness.

WHAT DOES THE MESH ACHIEVE?

The mesh acts as reinforcement and allows the sheets to be easily handled and fixed into the ground. The commercial marine grade Nylon mesh provides maximum flexibility over undulating terrain and is incredibly durable.

Over the years different mesh materials were trialed to find the perfect combination of strength, durability and flexibility.

The mesh sits 15mm from the base of the unit. The unit's maximum thickness is 60mm. The commercial marine grade 4mm Nylon 100mm x100mm mesh adds reinforced strength and allows the sheets to be flexible.

WORLDTRAIL

WHY THE SHAPE?

The shape has evolved to its current pattern after trialing different styles and sizes while refining the pattern to offer an ideal mix of natural look and ride texture.

The pattern allows the sheets to seamlessly interlock with each other but also allows an amount of flexibility for arcs and direction changes.

WHAT IS THE WEIGHT?

Each sheet weighs in at approximately 36kg.

It was important to keep the weight down, yet ensure each unit is sturdy enough to maintain its structural integrity in the field. When interlocked together, this amplifies the total weight and strength on the ground.

The 36kg weight helps with transport and installation. The lightweight design is due to the unique mix of raw materials and superior cement type used.

WHY THE SIZE?

The size was determined for ease of transport – two sheets fit side by side on a regular hardwood pallet making it cost-effective to transport and handle. Each pallet can hold 26 units of ARM weighing in at 970kg per pallet.

The shape is an evolution of designs tried and tested by World Trail to provide ideal rider feel, durability and a natural look.

HOW IS ARM SECURED?

Depending on the soil in which the product is installed, there are a few options for securing. Soft sandy or moist muddy areas require small pegs such as sand pegs, 100-250mm long. Areas with a firmer base requires a hook peg 250-400mm long. Heavy-duty ties are ideal for fixing sheets together via the nylon mesh matting.

PROS & CONS

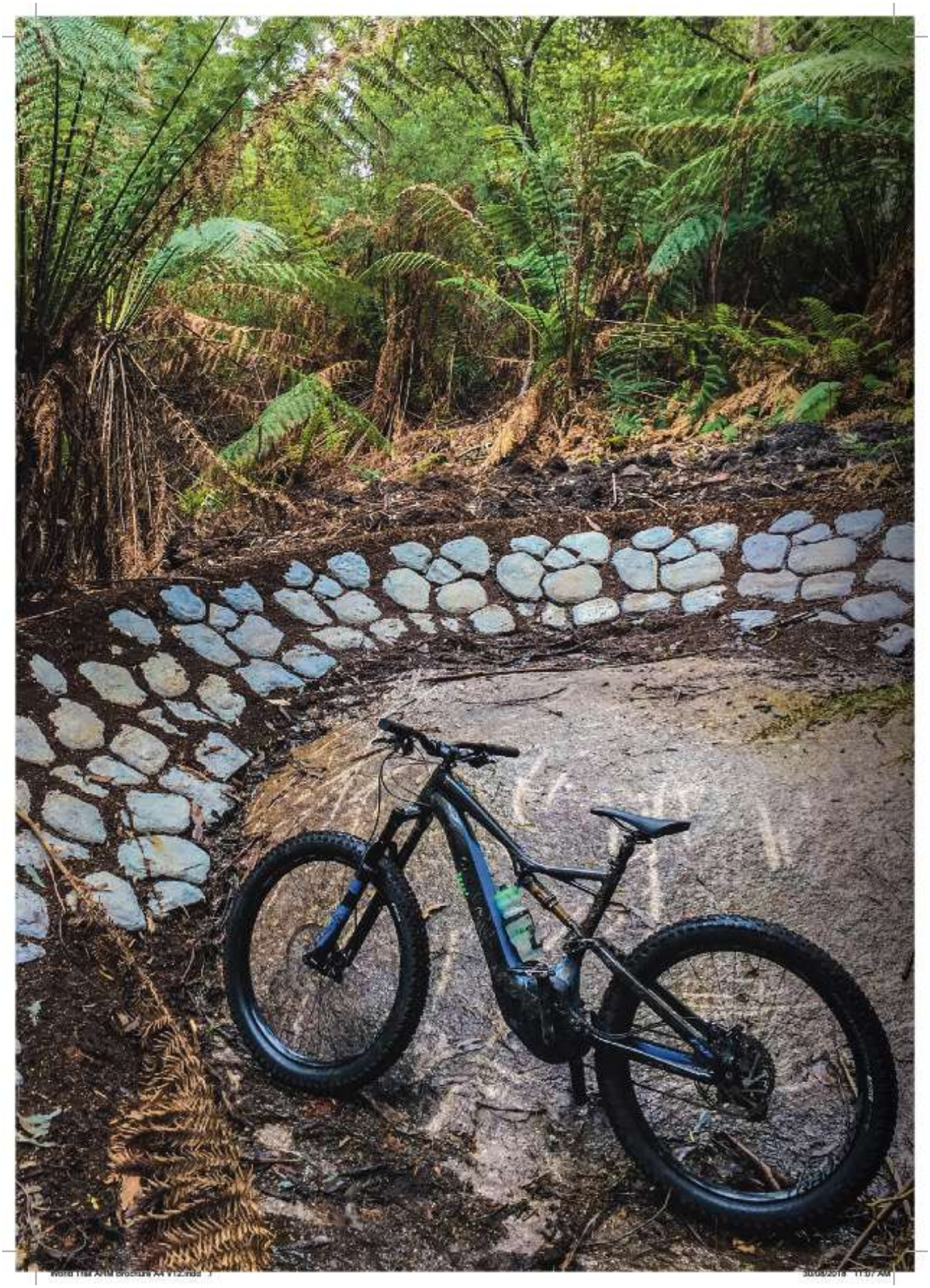
PROS

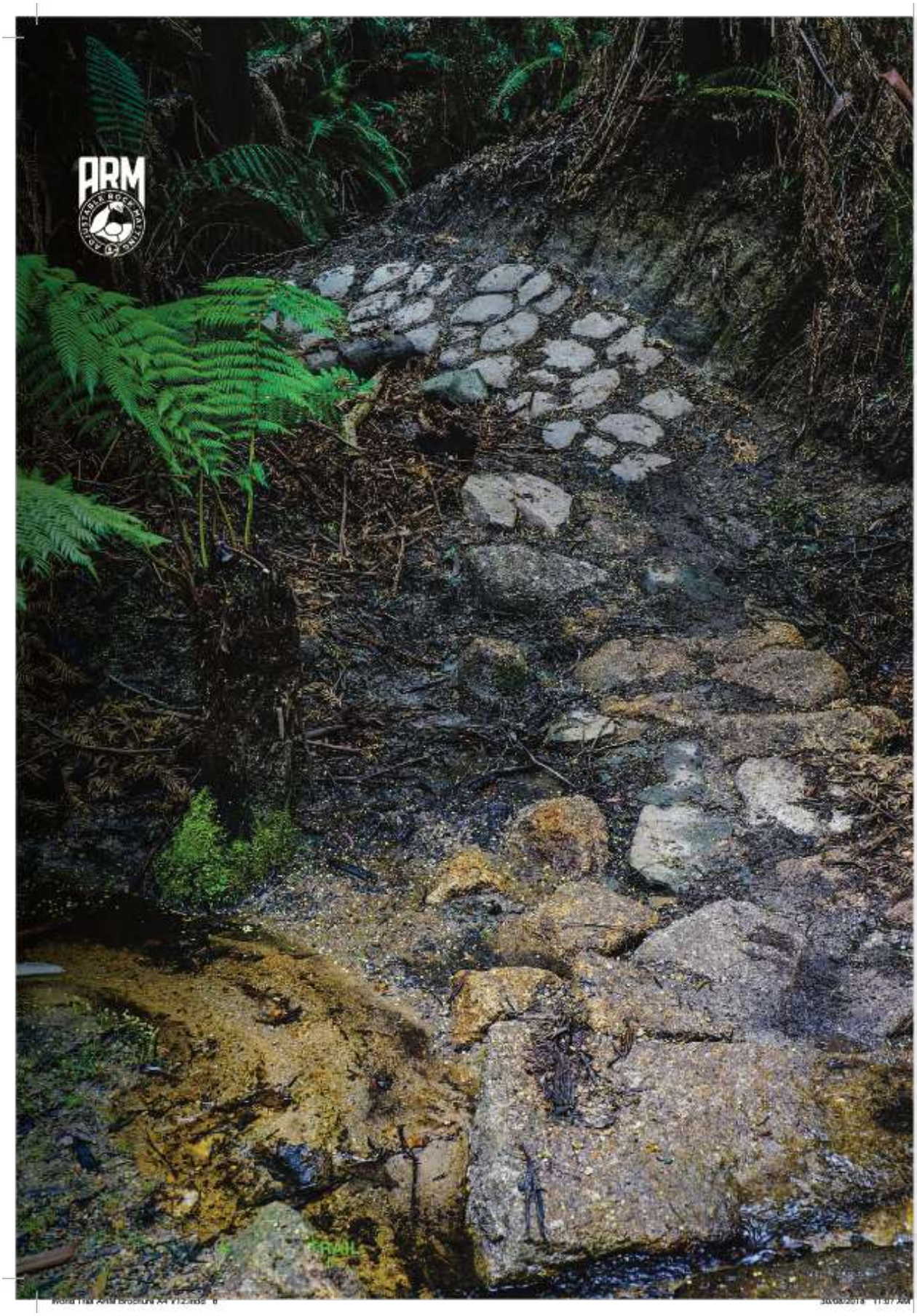
- Lightweight
- Easy install
- Does not require skilled tradesman to install
- Sizing allows for accurate quoting
- Transportable
- Durable
- Bendable, moulds over rollers, berms etc
- Abrasion resistant
- Soft ground solution
- Boggy area solution
- Textured tread
- Cut to fit

CONS

- Not suitable for flowing streams

WORLDTRAIL




ARM

www.WORLD-TRAIL.com

WHY ARM?

TRANSPORTATION

- ARM has been developed to allow 26 sheets at 900mm x 600mm per pallet, at 970kg
- Transportation on to the trail can be done via a wheel barrow or power carrier

TOOLS/ITEMS REQUIRED

- Shovel, rake hoes, plastic rake, hammer, scissors, snips
- Metal or plastic pegs
- Metal or Plastic cable ties

WHERE TO INSTALL

- Soft unstable ground, sand or problematic soils
- Boggy areas
- Unavoidable steep declines
- Creative steep inclines
- Problematic abrasive braking sections
- Water seepage or soakage areas
- Braking bumps or whoops
- Ruts and unavoidable fall-line sections
- Stabilising entry/exit of rock armoured water crossings

STEP 1

SET UP

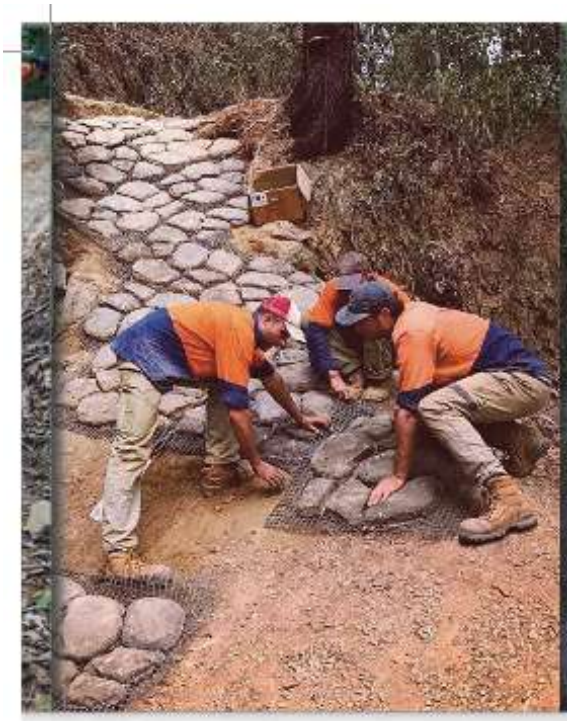
- Determine the size of the area to be treated. Ensure correct measuring of the area for installation, allowing for extra moisture seepage at the entry and exit of the required area
- Determine layout pattern for the sheets of ARM – i.e. either landscape or portrait
- Calculate ARM sheet quantities
- Determine required mounting system – i.e. pegs, cable ties
- Never install in flowing streams or potential high-flow water courses
- Advise public when and how long the trail is closed
- Close trail with bunting and signage during installation process
- Transport ARM via safe and manageable means to ensure no damage to ARM during transport
- Stockpile sheets close to the area to be treated at a safe height
- Ensure there is no damage to surrounding vegetation
- PPE required - gloves, glasses, steel cap boots

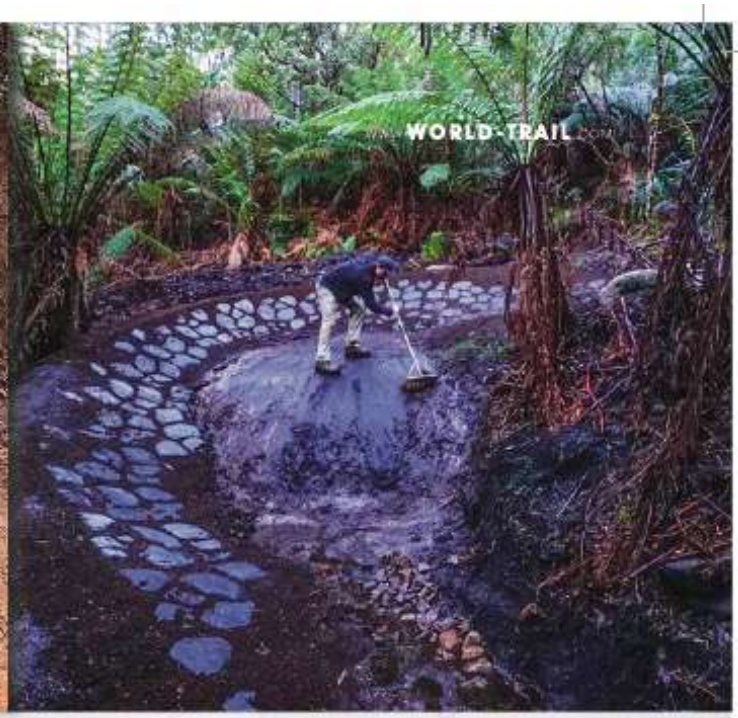
STEP 2

PREPARE TRAIL SURFACE

- Use excavator or rake hoe to level the area to be treated
- Shape the base trail to mimic the natural trail shape, taking into account grade reversals and berms
- Any soil removed should be stockpiled nearby for a coating surface after the ARM has been installed
- Trail surface must be free of protruding rocks or roots. Protruding rocks or roots will result in unstable installation and potential future failure
- If required, install a base layer of imported soil to improve stability
- Check the depth of the cut is suitable for ARM installation
- Adjust the ride line using chokes to align riders in the centre of the ARM, to prevent short-cutting or riding off the edge
- Portions of the ARM sheet can be removed to fit around large unmovable roots or rocks

WORLDTRAIL





STEP 3

INSTALLATION

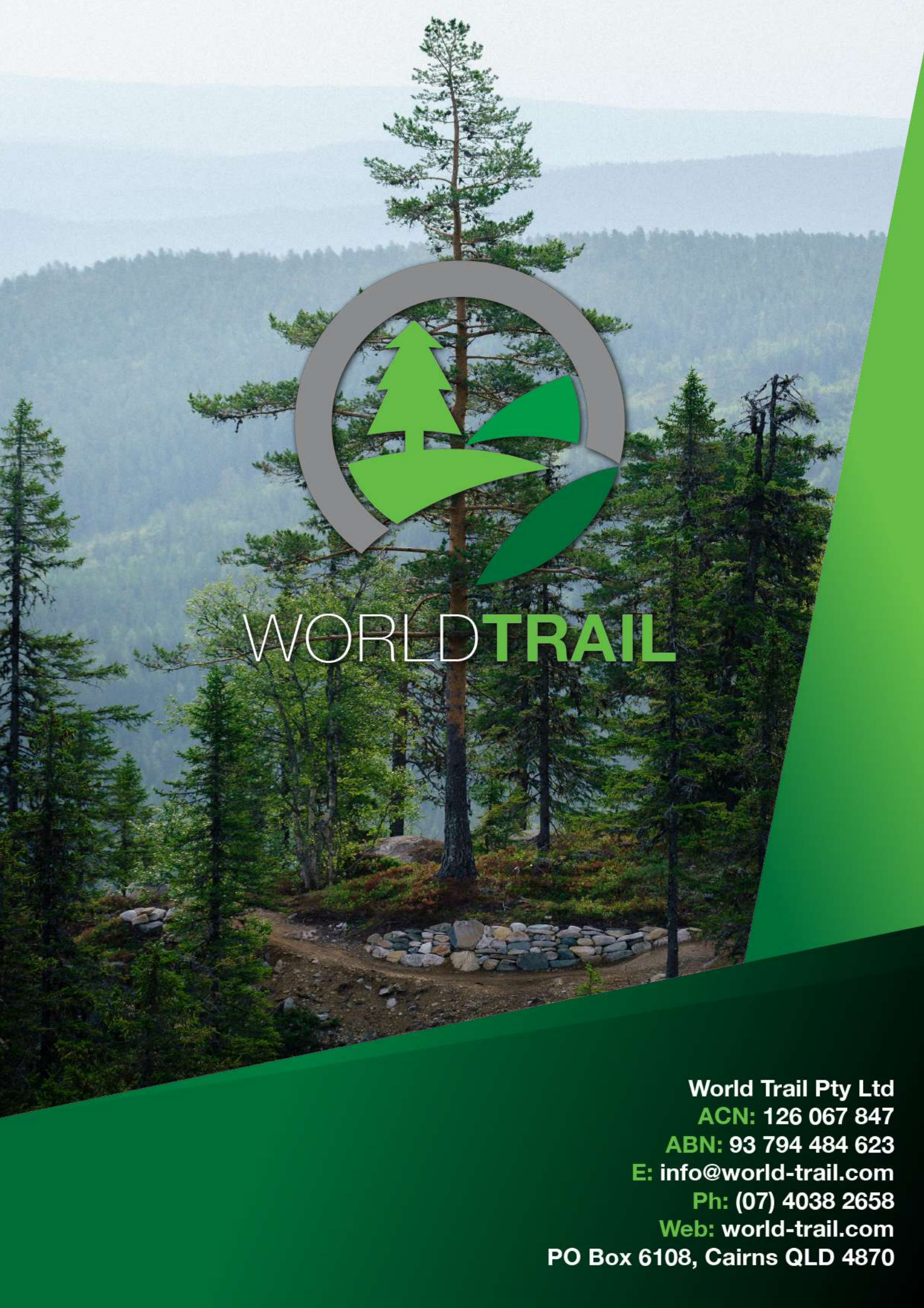
- Install first sheet, starting from the lowest point and working uphill
- Once the sheet is in place on the ground, stand back and check the trajectory and alignment with the rest of the trail
- Check ARM is sitting evenly and solidly on the ground without rocking or movement under pressure
- Before securing the first sheet lay the second sheet and line them both up
- Join the sheets with cable ties
- Trim off excess matting
- Secure ARM to the ground by placing the pegs through the matting
- Repeat the process of placing the next ARM sheet, lining up, cable tying, trimming and pegging

STEP 4

FINISHING TOUCHES

- Spread stockpiled topsoil over ARM product, raking or sweeping it into the gaps between the individual rocks
- Compact soil in the gaps between the rocks


ARM
ADJUSTABLE ROCK MATTING
SOLD IN PACKS OF 26
Various sizes and models available.
NOTE: Size, colour & style of ARM represented in images may differ.
WORLDTRAIL
P.O. Box 6108
Cairns, Queensland 4870
www.WORLD-TRAIL.COM



WORLDTRAIL

World Trail Pty Ltd
ACN: 126 067 847
ABN: 93 794 484 623
E: info@world-trail.com
Ph: (07) 4038 2658
Web: world-trail.com
PO Box 6108, Cairns QLD 4870