



Department of
Conservation
Te Papa Atawhai

Mountain Bike Track Maintenance in the Craigieburn Basin

Purpose

To review the current maintenance of the multi-use trails in the Craigieburn Conservation area. Under a current Management Agreement between the Department and the Craigieburn Trails Committee (CTC) the tracks within this document (except for the Edge and Luge Tracks) are to be maintained by the CTC. As these tracks are on conservation estate the Department is to provide advice and direction where required, to ensure that the tracks within this agreement are maintained to an acceptable standard and continue to provide a safe experience for users.

Contents

- 1. Site Description**
- 2. Climate**
- 3. General Use Patterns**
- 4. Current Suite of Tracks**
- 5. Issues with the current trail network**
- 6. Recommended Track Maintenance and upgrades**
 - 6.1. Hogs Back Track**
 - 6.1.2. Issues
 - 6.1.3. Recommendations
 - 6.2. Easy Up**
 - 6.2.1. Issues
 - 6.2.2. Recommendations
 - 6.3. Dracophyllum Flat Track**
 - 6.3.1. Issues
 - 6.3.2. Recommendations
 - 6.4. Cockayne Alley**
 - 6.4.1. Issues
 - 6.4.2. Recommendations
 - 6.5. Cuckoo Creek**
 - 6.5.1. Issues
 - 6.5.2. Recommendations
 - 6.6. The Luge**
 - 6.6.1. Issues
 - 6.6.2. Recommendations
 - 6.7. The Edge**
 - 6.7.1. Issues
 - 6.7.2. Recommendations
 - 6.8. Hut Creek**
 - 6.8.1. Issues
 - 6.8.2. Recommendations
 - 6.9. Bridge Hill**
 - 6.9.1. Issues
 - 6.9.2. Recommendations
 - 6.10. Sidle 73**
 - 6.10.1. Issues
 - 6.10.2. Recommendations
 - 6.11. Coal Pit Spur Track**
 - 6.11.1. Issues
 - 6.11.2. Recommendations
- 7. Summary of Maintenance and Upgrade Requirements**
- 8. Implementation of Work**
- 9. Appendix**

1. Site Description

The Craigieburn Range, within the Waimakariri Basin, an iconic basin and range landscape, has been identified as an Outstanding Natural Feature and Landscape in the Canterbury Regional Landscape Study Review, and an outstanding landscape in the Selwyn District Plan. Within the basin and adjoining Craigieburn Forest Park, a largely community initiative has been developing mountain bike tracks that link existing ski field roads and other recreational facilities and assets. The current track network contains a mixture of pre-existing walking tracks adopted as MTB/multi-use tracks, and recently constructed tracks which, although designated as multi-use, are predominantly used by mountain bikers. Several tracks are located around, or start/finish at Castle Hill Village, the Cheeseman ski field road, and the Broken River/Craigieburn ski field roads. One of the more popular tracks is the Hogs Back Track, a linear multi-directional intermediate trail that has its start/finish point at the far north-western area of the village. This serves in part as a link between the Castle Hill Village and tracks located by adjoining ski field roads. The other track forming part of this linear connection is the Dracophyllum Flat Track.

2. Climate

The Craigieburn area has a cool, wet, mountain climate. Annual precipitation decreases from west to east because of the dominance of warm and moist north-west air flows which are intercepted by the Main Divide. However, rainfall from the north-west can extend over the whole Craigieburn area during some rainfall events. The other principle rain bearing direction is from the south to south-west. Annual rainfall in the Castle Hill village area in the last 10 years has ranged from 655mm to 1008mm, with a yearly average of 829mm.

During the summer months strong, dry and often persistent north-west winds cause low humidity and high evaporative demand resulting in drought conditions. Temperatures can reach lows of -11degrees in the coldest winter months, with highs in the lows 30's in the summer. November is often the wettest month and February often the driest. Frost can occur at any time of the year, and frost heave of exposed soil occurs widely.

3. General Use Patterns

The Craigieburn Forest Park and Public Conservation Land has a diverse range of recreation users and is highly accessible from SH73 for day trips from Christchurch and elsewhere, and from camping and accommodation bases from Springfield through to Arthurs Pass. The Canterbury Conservation Management Strategy (CMS) acknowledges and supports the key user groups use of the area. In the winter four ski fields provide intensive use recreational experiences for visitors, while in between these ski fields, snow fields provide an off-piste experience free of structures.

Out of the winter months, the Craigieburn area is popular for mountain bikers from both Christchurch and increasingly further afield. Christchurch has an extensive network of mountain bike tracks and a new mountain bike park in the Worsleys Valley close to Christchurch. Craigieburn is recognised as the place to go for easy access backcountry mountain biking. The Poulter Valley (Arthurs Pass National Park) and Wharfedale track (Mt Oxford Forest Park) are sites for more remote advanced mountain biking. Websites such as Tourism New Zealand - <https://www.newzealand.com/int/feature/top-mountain-biking-tracks-in-christchurch-and-canterbury/>, and singeltracks.com - <https://www.singletracks.com/mountain->

[bike/best_trails.php?new_state_id=464](#) list Craigieburn as one of the tops mountain bike venues, with singletrack.com listing it as 2nd in New Zealand, and the area has received increased visitation from mountain bikers over the past few years.

4. Current Suite of Tracks

Currently there are several mountain bike/multi-use tracks in the Craigieburn area –

Track	Grade	Location
Hogs Back	Intermediate	traverses from Texas Flat/Cheeseman skifield road to Castle Hill Village
Easy Up	Easy	starts at the Castle Hill end of the Hogs Back Track, gains approx. 200m before re-joining the Hogs Back
Cochayne Alley	Expert	starts 2/3 of the way up the Cheeseman Skifield Access Road and descends to Forest Lodge
Cuckoo Creek	Advanced	Starts off the Cheeseman skifield road, linking the road with Dracophyllum Flat Track
Dracophyllum Flat	Intermediate	traverses from Texas Flat/Cheeseman skifield road to Broken River Road
The Luge	Intermediate	descends from Lyndon Saddle to the Broken River Skifield Road
The Edge (DOC maintained)	Advanced	Traverses from Lyndon Saddle to the carpark of Craigieburn Skifield.
Hut Creek	Intermediate	connects the Broken River road and the end of the Luge Track with Bridge Hill Track
Bridge Hill	Intermediate	climbing trail to access Bridge Hill and the start of Dicksons Downhill Track
Sidle 73	Intermediate	linear trail connecting the Broken River road with the Craigieburn Road.
Coal Pit Spur	Intermediate	Linear trail connecting the Craigieburn skifield road with the bottom of the ‘cutting’, exiting on to SH73 opposite the entrance to Flock Hill station.

There are also several multi-use tracks around the Castle Hill Village which are generally used by local residents and which receive little use from visitors. These include Thomas Bush Track, Leith Hill Track, Water Intake Track and Terrace Links track.

5. Issues with the current trail network

A stakeholder meeting was held in June 2018 to bring interested parties together to discuss the current state of mountain bike track development in the Craigieburn area. Present were representatives from the local skifields, Craigieburn Trails Committee (CTC), local track contractors and DOC representatives. Of the items discussed and tabled, several key themes emerged regarding the track network in the area;

- There has been a noticeable increase in the number of users to the area, and this is evidenced in the deterioration of some of the tracks. Given the popularity of mountain biking, the constant improvement in equipment and trickle-down effect in terms of pricing of equipment, coupled with the projected increase in international visitors

(including cycle tourism), it is likely that user numbers will only continue to increase. The area is used on an annual basis for two 'enduro' style mountain bike races, and this has helped increase the areas visibility as a riding destination.

- That the CTC was under resourced to maintain the current network of tracks that it had responsibility for. This is encompassed within a wider theme of generating adequate funding to maintain the network, both to a DOC standard, and more generally to a standard that remains enjoyable for users.
- That there needs to be a well thought out and coherent plan to direct any further track development in the area, if indeed there is appetite for further tracks. Certainly, there appears to be a demand.
- The concept of an Epic Ride that would attract additional users to the area, would link up all the present riding 'zones' and would showcase outstanding landscape of the area. Additionally, this could help to utilise skifield accommodation in the area during the summer months.
- A focus on less desirable activities in the area such as scree riding and the building of 'pirate' tracks.

Of the issues raised, this report aims to provide advice and guidance to address maintenance issues raised, to help ensure that the tracks are maintained to an appropriate standard. Within this, suggestions are included to help improve the riding experience and sustainability on current tracks, including but not limited to track realignment.

This report does not provide advice or direction regarding funding for this maintenance

A separate report will aim to provide advice and direction regarding future track development, which can be further developed and scoped if these are considered to be acceptable solutions.

6. Recommended Track Maintenance and upgrades

Excepting the Luge and Edge Tracks, the tracks listed are maintained by the Castle Hill Community under a formal management agreement, with an implicit expectation that tracks will be maintained to the relevant DOC track standards. Presently all tracks listed meet the required DOC standards. However, this masks an underlying management issue in that all MTB tracks are designated as DOC easy tramping tracks within the DOC asset management system; currently there are no DOC standards for MTB tracks on public conservation land. The track requirements for walkers and mountain bikers are not wholly incompatible, but certain aspects such as gradient present issues, with steep gradients much less acceptable for mountain bikers. Thus, maintenance requirements are more difficult to determine for mountain bike tracks from standard DOC track inspections alone.

The current maintenance requirements for the suite of Craigieburn MTB tracks have been determined through discussion with the CTC and DOC recreation advisors with experience of mountain bike track building and maintenance. In general, the technical specifications are taken from the New Zealand Cycle Trail Design Guide which provides the current best practice for mountain bike track design and building. Where required, suggestions have been made which

may differ from this design guide to reflect specific local requirements, dictated by such things as weather and soil conditions.

6.1 Hogs Back Track

Constructed in 2009, the Hogs Back Track is the most well used mountain bike track in the area, providing a linear connection between the Cheeseman Skifield road and the Castle Hill Village. The track is 8km long, with approximately 90% in the alpine tussock and 10% in beech forest. Notably the track is closed during the winter months to prevent damage; however, visitor counter data indicates that use during the winter months remains.

Year	Total Visitor numbers (yr)	month	Total Visitor numbers (mths)
2012	4647	June-Sept(inclusive)	907
2013	8852	June-Sept(inclusive)	1765
2014	6637	June-Sept(inclusive)	1066
2015	6097	June-Sept(inclusive)	647
2016	6062	June-Sept(inclusive)	270
2017	5957	June-Sept(inclusive)	952

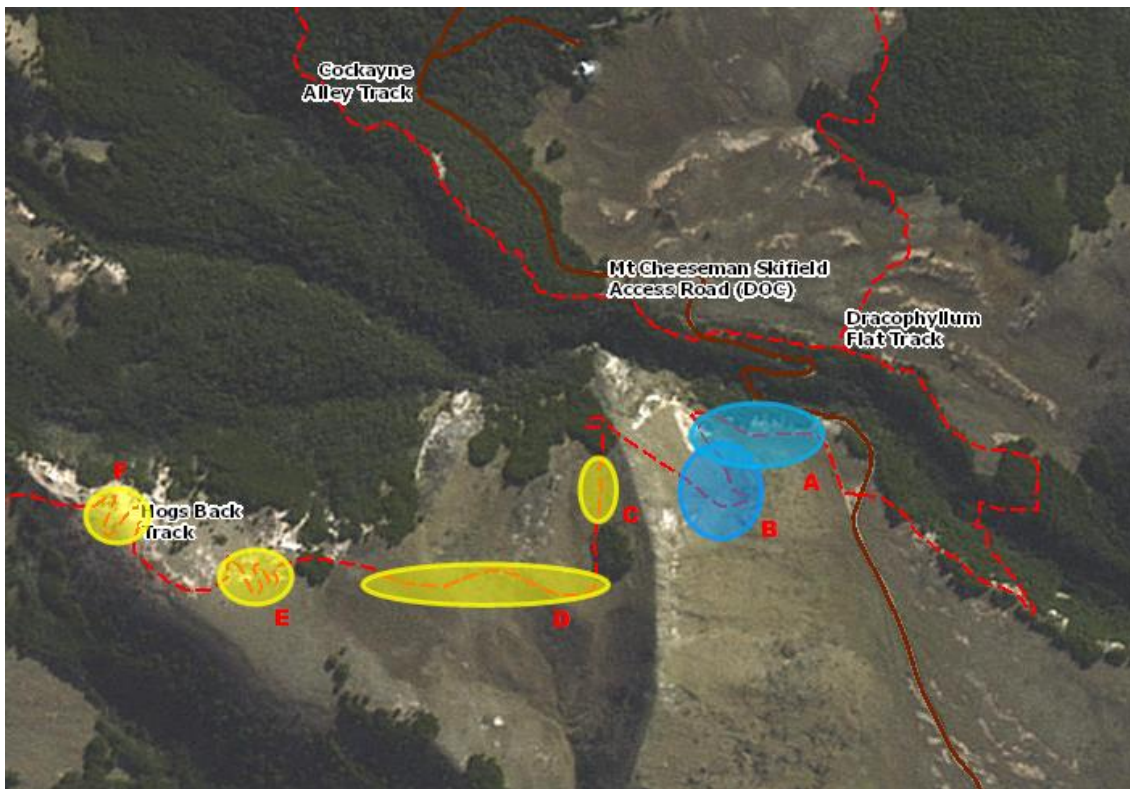
6.1.1 Issues

Within the beech forest areas, the track shows minimal wear and has coped well with the user numbers. Experience from previous track development has shown that, in general, mountain bike trails that have been developed in forests and under canopy are generally easier to maintain and have a longer life. During high rainfall events, the canopy generally proves effective in intercepting rainfall, so preventing erosion through soil particle displacement from water droplet impact. Less moisture in general reaches the trail, preventing water accumulation and erosion from rilling and gulleying.

However, in several areas of the alpine tussock zones, the track shows considerable deterioration with deep, U shaped ruts. In these areas water is unable to escape the track, further exacerbating the erosion. These areas are particularly prone to frost heave in the winter months which breaks up the hardened riding surface, making them more prone to erosion from either water or users. In these situations, winter riding will have a considerable impact over time, deepening pre-existing ruts. In these areas double tracking is now occurring – this presents a visual impact, but also indicates that the deep ruts are having a negative impact both on the riding and the walking experience. It is likely that walkers are creating desire lines as sections of the current track are unpleasant to walk along; additionally riders are also avoiding the main track.

Comparison of photographs taken at the time of construction, with photographs from the present day indicate just how worn sections of this track have become. In some cases, track design at the time of construction may have led to deterioration happening quicker than would be otherwise expected, for example excessive track gradient and a lack of cross slope and grade reversals in the trail surface. Existing track design notwithstanding, considerable intervention in the form of maintenance and repair is required to bring this track back to its original form and intermediate status.

6.1.2 Recommendations.



Proposed Hogs Back maintenance and realignments

➤ Section A, B (blue highlighted)

Section B - Exact MTB standards notwithstanding, the DOC website promotes the Hogs Back Track as an intermediate mountain bike track. With reference to the New Zealand Cycle Trail Design Guide, intermediate tracks should be 0-5 degrees for at least 90% of the trail, with an absolute maximum of 8 degrees for no more than 10m at a time. From the Hogs Back carpark for approximately 400m the trail has large sections that are between 10-12 degrees, which is steep for an intermediate trail. In practice, this means that intermediate riders expecting a certain level of challenge on the climb are faced with an extremely challenging climb, which provides an unpleasant rather than challenging experience, and for some, might simply feel beyond their ability. Further, this section of track is becoming deeply rutted and has developed a large sinkhole across part of the track. The present grade suggests that this section of track is unsustainable in the long term.

Recommendation.

- ~~That the first 400m of this track are realigned to create a better, more sustainable grade, following the specifications of the NZCTDG.~~
- ~~The abandoned section of trail is decommissioned and rehabilitated with material and turf from the newly created section of trail.~~ **COMPLETED**

Consideration

- Section A - A new starting point for the trail should be considered. Currently users park at the Hogs Back Carpark, before riding up a short multi tracked section of old 4wd track and then joining the actual mountain bike trail, which immediately starts at a steep grade in a 1m deep rut. It is suggested that a new section of mountain bike singletrack is created, starting at the Hogs Back Carpark. This would be sustainably designed at an intermediate grade. This would complement the new section of track above and would make the whole section a more pleasant riding experience and bring the whole section to intermediate standard. It is recommended that the old 4wd track is barriered off and left to naturalise.

➤ Sections C, D, E, F (Yellow highlighted)

These sections are in the alpine tussock and have become heavily eroded, with deep 'U' shaped ruts in many places. Water is unable to escape the track and in places double tracking is occurring. A mixture of winter use, soil and climatic conditions, track design and lack of maintenance has allowed these sections of track to deteriorate. Although there are some issues with track design, the overall grade for these sections of trail meet intermediate standard. Except for section C, major track realignment is not considered necessary, although minor realignment to incorporate such features as grade reversals should be considered.

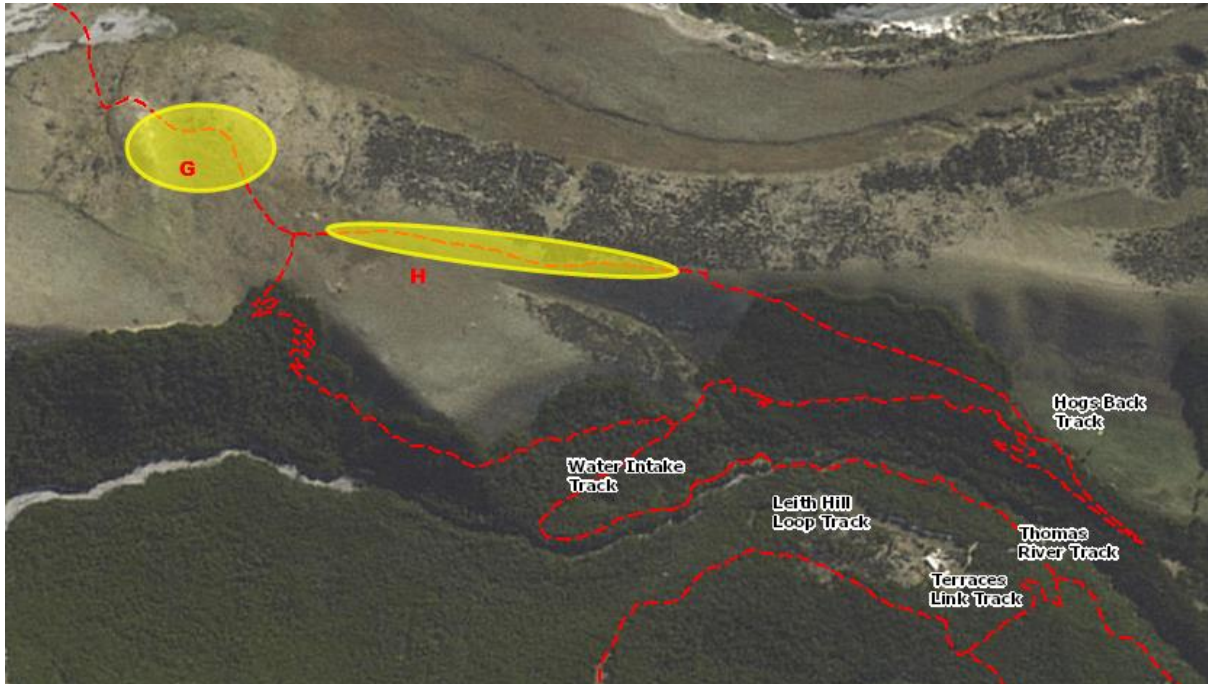
Recommendation

Sections C and E

- Given how susceptible these sections of trail are to erosion, imported material should be considered. The level and type of use, coupled with the soil and climatic conditions suggest that small scale maintenance work, such as patching up muddy spots, track widening, or cut and filling ruts, will not work in the long term. Imported material could be used to effectively 'fill in' the 'U' shaped ruts, harden the riding surface and recreate a level trail.
- Edges of the trail are to be removed to allow water to escape from the trail surface, rather than running down it.
- Each section requires the drainage to be assessed. Current track drainage is inadequate. Track features should include grade reversals, cross-sloping, and swales and may require some minor realignment to allow for better water management. Drainage points and track features are to be identified and flagged prior to any work proceeding.
- This work should be prioritised to prevent future deterioration and other developing issues such as double tracking.

Sections D and F

- Realigning these sections should be investigated.
- It is possible to move section D to a more northerly aspect which would help with drying and would move the track away from a problem wet area.
- It is possible to realign the corners of section F to both reduce the gradient and open up the radius of the corners. This would help with water control and reduce the entry speed of riders, thereby helping to reduce maintenance and erosion issues.



Proposed Hogs Back upgrades and realignments

➤ Section G and H (Yellow Highlighted)

Section G is the climb from the flats up to the lightning tree. This section follows an old 4wd track and is steep for the overall intermediate grade of the track. This section is also now showing signs of wear and water damage and is continuing to deepen as it erodes. Given the previous use and design of this track (old 4wd farm track) it is difficult to control water. Section H runs from the ‘Lighting Tree’ to the start of the final descent into the Castle Hill Village. This section utilised an old 4wd track when the Hogs Back was first constructed. A desire line has generally developed, although in a number of places the track is multi-tracked and wet sections can develop in the spring. The possibility for less experienced riders to get cross rutted is present although probably unlikely. More relevant is the diminished riding experience due to the multi-tracking and relatively straight nature of the track.

Recommendation

- That section G is realigned, and a purpose-built section of track is constructed to replace it. This will be constructed to intermediate grade and designed to be ridden in both directions. Realigning this track will both improve the experience for riders travelling in both directions and will reduce the long-term maintenance issues for the track.
- That section H is redesigned, utilising the general direction and line of the current trail, but adding features and flow to the trail to improve the riding experience and reduce any maintenance requirements on the track. Track construction and surfacing would be required.

6.2 Easy Up Climbing Trail

Constructed in 2017, this trail provides riders with an easy/intermediate grade climb from the Castle Hill Village, up to the top of the final descent on the Hogs Back Track. The track is

approximately 3km long and, apart from a short section at the top of the track where it joins the Hogs Back Track, is entirely within beech forest. The track has been constructed to a gradient of 0-5degrees over 90% of its length, with climbing corners of approximately 2.5m radius, and a bench width of 1m

6.2.1 Issues

This track has now had time to bed in and season, and as a result some issues have become apparent –

- As a general comment it appears that the diameter of culvert piping used for some of the drainage is too small – presenting a potential long-term issue with on-going maintenance (culverts blocking up with material) rather than their ability to cope with peak water flow.
- Untreated timber has been used in places as track edging, or as the edging to water diversion channels; in places this timber has only served to keep water on the track.
- Use of untreated timber (below a certain diameter) is generally not advisable as a long-term solution as it quickly rots down.
- In some shaded spots, or where there is little cross fall in the slope, water is pooling on the track and creating soft spots – here the track is already degrading and will continue to deteriorate if there is no intervention.
- In many areas water is unable to quickly leave the track, either as a result of inadequate drainage, ‘v’ing of the track surface, or no reversals or cross slope in the trail bench. This is exacerbating and accelerating track erosion

6.2.2 Recommendations

- That work is undertaken to correct issues with the track drainage – Drainage points along the track should be re-evaluated, with culvert pipes added and existing pipes replaced if they are below 200mm diameter.
- Beech timber edging should be removed and replaced with natural surface; where edging or culvert headwalls are still required, then the beech timber should be replaced with treated timber.
- A walk through with the DOC technical advisor and those undertaking the work should be undertaken prior to any work taking place, to ensure that problem areas are properly highlighted, and the correct solutions discussed and agreed upon.
- Where drainage work will not solve a particular wet spot, for example in a flat/low lying area, then material should be imported to rebuild and build up the level of the riding surface. Both a coarse base course and top coat should be used.
- An annual maintenance plan is required to ensure that, once this repair work is undertaken, the track is maintained to an acceptable standard. Annual maintenance should include clearing out culverts and side drains, monitoring the riding surface for ‘U’ing and repairing where possible, monitoring the riding surface for puddling and rectifying where possible, repairing any rutting, and reinstating camber and cross fall where this has visibly deteriorated or disappeared.

6.3 Dracophyllum Flat Track

This intermediate mountain bike track traverses from the Broken River skifield road to the Cheeseman skifield road and provides a link to and from the Hogs Back Track. This track originally existed in part, with some additions added by the Castle Hill Community to make it more usable for mountain bikers. This track crosses through a mixture of beech forest, open tussock and frost flats.

6.3.1 Issues

In the majority of open areas this track has withstood use well – its low gradient and good drainage in these areas a likely contributing factor. Within the beech forest areas, the track traverses some flattish ground which is shaded from both sun and wind, with difficult drainage. Here, problem wet areas have been evident, although good work has been undertaken to harden and raise the riding surface, as well as rectify drainage issues, and this appears to have largely solved the issue.

There are two notable areas where track realignment could be considered to rectify gradient issues, which would help both with the riding experience and with longer term maintenance;

- From Jacks Pass the track generally descends down to the Broken River. This descent has variable and generally acceptable grades. However, there are 2 notable pitches towards the bottom of the track before the river. Both these pitches are above 20% gradient and are quite straight – presenting a challenging climb for intermediate riders, and high speeds/heavy braking and long-term maintenance issues from descending riders.
- ~~The track climbs from a low drainage in the beech forest, before emerging into open tussock within site of the Forest Lodge accommodation building on the Cheeseman Skifield Road. This section of track from the low drainage up to the open tussock has a track gradient which is inconsistent with the track standards for an intermediate mountain bike track – presenting gradients of up to 20% over 350m. The existing climbing corners are particularly challenging for intermediate level riders due to their tight radius and steepness of gradient through the corner. This section of track also has considerable drainage issues on its lower portion, and as a result has become quite eroded and unrideable in places. Its gradient is a contributing factor both to the deterioration of the track and to the poor riding experience, relative to other sections of the track.~~ **ISSUE RECTIFIED**

6.3.2 Recommendations

- ~~That section A (highlighted in accompanying map) be re-routed if a better gradient route can be found. Alternatively, that the climbing corners are pushed out and radiuses opened up to reduce their gradient. The gradient of this section of track is not to standard, but more importantly this section presents a continuing maintenance issue and is becoming badly eroded on its lower section.~~ **COMPLETED**
- That an annual maintenance plan is developed which includes clearing out culverts and side drains, monitoring the riding surface for ‘U’ing and repairing where possible, monitoring the riding surface for puddling and rectifying where possible, repairing any rutting, and reinstating camber and cross fall where this has visibly deteriorated or disappeared.

- That a possible realignment of sections of the track (section B in accompanying map) descending from Jacks Pass to Broken River is investigated.



Proposed Dracophyllum Flat Track realignments

6.4 Cockayne DH Track

This is an expert level mountain bike track that descends from the midpoint of the Cheeseman Skifield road, and re-joins below the Forest Lodge accommodation. The Castle Hill Community have adopted the maintenance of this mountain bike track that was originally developed as an informal trail, before being formalised by DOC. This is a descending trail only and is the only track that can be shuttled – riders can drive to the top and get picked up at the bottom, therefore the track sees regular repeat usage by the same riders.

6.4.1 Issues

The nature of this track, and the riding experience expected by riders – steep gradient, rough riding surface with exposed roots and rocks, and conditions that challenge both the rider and bike – lends itself to minimal intervention. However, considerable rutting has developed in the first steep pitch where the track enters the beech forest to the point where riders are seeking alternate lines on the edge of the track, which is only serving to widen the ride line. This is an indication of the use which this track receives because of its shuttleable nature. An alternate, equally technical line exists which cuts out this first steep pitch and is at a much shallower gradient.

6.4.2 Recommendations

- That the steep pitch where the track enters the beech forest is reviewed and considered for closure. Riders to be directed onto the alternate, less steep technical line. The track will still remain an expert level track.
- That the open access of the Cheeseman road is considered. Reducing or preventing shuttling of this track would reduce damage considerably.
- That this track is monitored annually for additional signs of marked deterioration. Any intervention should consider the risk potential to riders – has the riding surface deteriorated to the point where it presents a danger to the level of rider expected on this level of track or is simply making the section of track unrideable for an expert level rider.

6.5 Cuckoo Creek Track

This is an advanced level mountain bike track that descends from the Cheeseman Skifield Road to the Dracophyllum Flat Track. The Castle Hill Community have adopted the maintenance of this mountain bike track that was originally developed as an informal trail, before being formalised by DOC. This is a descending only trail.

6.5.1 Issues

The nature of this track, and the riding experience expected by riders – steep gradient, rough riding surface with exposed roots and rocks, and conditions that challenge both the rider and bike – lends itself to minimal intervention. Presently there are no outstanding issues with this track. However, this is not to say that issues cannot develop, for example, if ruts develop in the riding surface that prevent a change of direction or can ‘grab’ wheels or pedals causing the rider to crash.

6.5.2 Recommendations

- That this track is monitored annually for signs of marked deterioration. Any intervention should consider the risk potential to riders – has the riding surface deteriorated to the point where it presents a danger to the level of rider expected on this level of track or is simply making the section of track unrideable for an advanced level rider.

6.6 The Luge Track

Labelled an intermediate level mountain bike track, this track ascends/descends between Broken River road and Lyndon Saddle. Originally created as a walking track, this multi-use track has seen increased mountain bike use over the last 5 years, as the areas in general has increased in popularity. The Luge track has an annual average use of 4601 passes with an upward trend over the years that the counter has been in place. Wholly in beech forest, the track has seen upgrade work in previous years to rectify regular wet and soft spots, and this work has largely solved most of these issues.

6.6.1 Issues

Some wet spots still exist on this track, notably at the mid-way point by the seating. There are now notable signs of wear on this track, especially in areas that receive heavy braking, and although the riding experience is not significantly diminished this track should be monitored annually to assess for additional wear. In general, the intermediate standards state that vertical drops of no more than 100mm should exist on track. To try and rectify this would significantly

reduce the riding experience that people have come to expect from this track; in reality this track, when also considering gradient, is a better fit for the advanced level mountain bike track grade and should be maintained to this standard.

6.6.2 Recommendations

- This track should be monitored annually for increased signs of wear.
- Where drops in the track are significantly over 200mm these should be rectified, ideally through the use of natural materials (for example creating a small discreet borrow pit nearby where fill material can be obtained), or if this is not possible, importing material such as rock or aggregate.
- Work to rectify remaining large wet spots should continue. These should be assessed to improve drainage, using channels or culverts where necessary. Areas should be raised, hardened and infilled using aggregate, or natural material obtained from a borrow pit or another local source.

6.7 The Edge Track

Note – this track is maintained by DOC. However, there are possible upgrades to the track that could be considered which would improve the overall riding experience and improve safety. As this track is a key track within the network it may be that the CTC would be able to consider taking on some of this work as part of a suite of network upgrades, if DOC do not have the time/resources.

Labelled an advanced level mountain bike track, this track ascends/descends between Lyndon Saddle and the Craigieburn Skifield. Originally created as a walking track, this multi-use track has seen increased mountain bike use over the last 5 years, as the area in general has increased in popularity. Wholly in beech forest, the track has seen upgrade work in previous years to rectify areas where the bench has become narrow due to fretting of the trail edge. In general, the track gradients are moderate, although there is one section of trail which crossed a scree slope, where riders are forced to dismount.

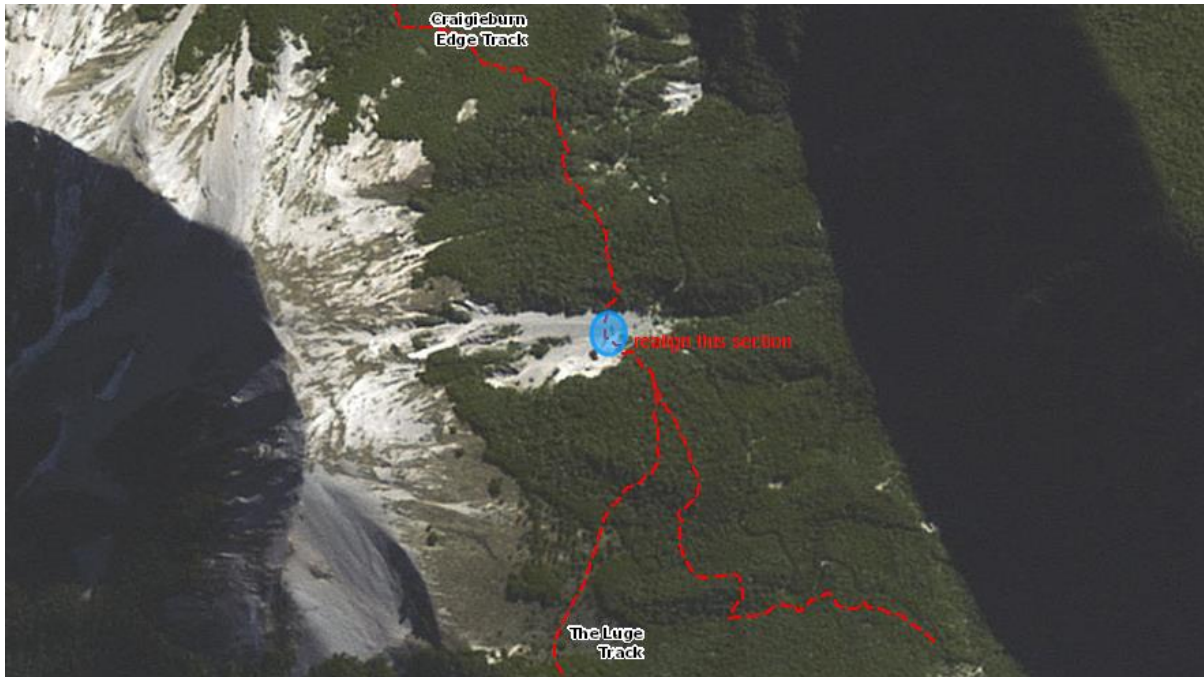
6.7.1 Issues.

The track displays less wear than the Luge Track, perhaps because as a combination of less use, and fewer areas of heavy braking. However, in places the track footprint is narrower than the standards given for an advanced level mountain bike track and combined with the significant fall to one side can feel intimidating for some riders used to more room for error. Considering this, there are several areas along the track which require work to re-establish a bench of acceptable width.

6.7.2 Recommendations

- This track should be monitored annually for signs of increased wear.
- There are a number of areas along this trail where the trail width is unacceptably narrow. These areas are to be highlighted and rebenched to a minimum width of 400mm and up to 600mm where possible.

- There are sections along this trail where horizontal widths appear marginal and could cause a rider to clip a bar and crash. These areas are to be highlighted with a DOC advisor and rectified.
- To improve the riding experience, it is recommended that one section of scree crossing is realigned to prevent riders from having to dismount (refer to following map).



Proposed The Edge Track realignment

6.8 Hut Creek Track

This trail ascends/descends from the saddle by Bridge Hill to the Broken River skifield road. It is a mixture of pre-existing walking track, and purpose-built mountain bike trail. Although there is no user data for this trail, evidence and use patterns suggest that it receives less use than other mountain bike trails in the area. Although multi-directional the general intention is for this trail to be used as a climbing track from the end of the Luge to the bottom of Bridge Hill.

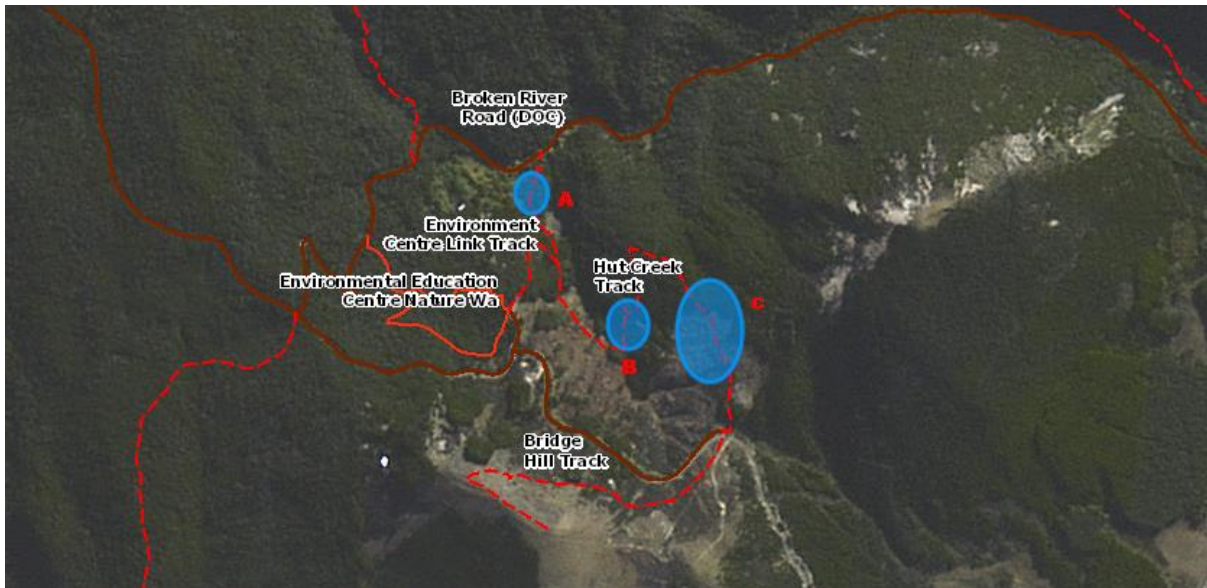
6.8.1 Issues

Anecdotal evidence suggests that riders generally choose to use the road to access bridge hill rather than Hut Creek Track. The Hut Creek Track has several steep pitches and steep corners and from use patterns would appear to provide the less appealing route. Having a singletrack climb linking Bridge Hill and the Luge should be a popular option, but if this track is to remain relevant it is suggested that sections of this track are reviewed and realigned to rectify the gradient issues.

6.8.2 Recommendations

- That several of the climbing corners on the section below the education centre are evaluated and work undertaken to reduce the gradient and open the radius of the turn (section A on accompanying map). This will allow lower intermediate riders to appreciate the trail more.

- That sections of the trail are realigned to reduce and rectify current gradient issues (sections B and C accompanying map).
- That this track is monitored annually for signs of wear and deterioration.



Proposed Hut Creek Track maintenance

6.9 Bridge Hill Track

This intermediate grade track climbs from the saddle at the end of the Hut Creek Track, to the top of Bridge Hill. This is a purpose-built mountain bike track.

6.9.1 Issues

There are no issues at present with this track

6.9.2 Recommendations

- That this track is monitored annually for signs of wear and deterioration.
- That minor annual maintenance work is undertaken to ensure drainage is adequate, ruts are removed, and cross fall is maintained.

6.10 Sidle 73 Track.

This intermediate track traverses from the Broken River Road to the Craigieburn Road and provides a popular link for riders starting at the Broken river campsite, who wish to ride either the Edge or Luge Track. This is a mixture of existing 4wd track and purpose-built mountain bike track.

6.10.1 Issues

There are no issues at present with this track

6.10.2 Recommendations

- That this track is monitored annually for signs of wear and deterioration.

- That minor annual maintenance work is undertaken to ensure drainage is adequate, ruts are removed, and cross fall is maintained.

6.11 Coal Pit Spur Track.

This intermediate track traverses from the Craigieburn Road to SH73 at the bottom of the ‘cutting’, near to the entrance of Flock Hill. The track is largely singletrack, with sections of 4wd at both the beginning and end.

6.11.1 Issues

The track requires a crossing of Craigieburn stream and this is currently unbridged. A bridge is recommended to enable riders to cross easily. There is evidence of pig rooting on the first section of singletrack below the Craigieburn skifield road, and this has damaged sections of the track bench, to the point where the track has noticeably narrowed.

6.11.2 Recommendations

- That this track is monitored annually for signs of wear and deterioration.
- That a bridge is considered for the Craigieburn Stream crossing
- That damaged sections of the singletrack bench are repaired, and the track is monitored for additional pig rooting.
- That minor annual maintenance work is undertaken to ensure drainage is adequate, ruts are removed, and cross fall is maintained.

7. Summary of Maintenance and Upgrade Recommendations

Track	Recommended One-off Work Tasks and Actions/Upgrades and Realignments	Priority (Low,Medium, High)
Hogs Back Track		
	<ul style="list-style-type: none"> • Re-align initial part of climb from Texas Flat 	COMPLETED
	<ul style="list-style-type: none"> • Create new section of trail from Texas Carpark to link in with re-aligned climb 	L
	<ul style="list-style-type: none"> • Block off old 4wd track (from Texas Flat to start of Hogs Back track, in conjunction with new start) 	L
	<ul style="list-style-type: none"> • Realign section c (see s6.1.2) from southern to northerly facing slope and away from wet area. 	M/H
	<ul style="list-style-type: none"> • If feasible and affordable, then import material (eg SAP20) to repair rutted sections of trail in the open tussock (climbing to the Lookout, and sections after this). • If not feasible, then repair and realign where appropriate. Recreate outslope and grade reversals and reinstate drainage. 	H
	<ul style="list-style-type: none"> • Realign descending corners after picnic rock (travelling towards Castle Hill). Push corners out several metres and open up radius. Use grade 	M/H

	reversals and outslope to ensure water control and to control speed.	
	<ul style="list-style-type: none"> • Realign climb/descent to/from the lightning tree to achieve an intermediate grade climb and control speeds on the descent. Realignment will also reduce the erosion and maintenance issues with the current alignment. 	M
	<ul style="list-style-type: none"> • Investigate and consider re-aligning straight section of old 4wd trail above the Castle Hill Village. 	L
	<ul style="list-style-type: none"> • Realign short section of trail approximately half way down the final descending trail into the village. This is a section of trail in the open. Several corners could be added to improve the experience and reduce speed. 	L/M
Easy Up		
	<ul style="list-style-type: none"> • Replace small diameter culverts with larger diameter (min 200mm) where required. If feasible then replace culverts with grade reversals and use material to harden area where water will run across track. 	M/H
	<ul style="list-style-type: none"> • Remove beech edging, especially where this is holding water on the track. If edging is essential, then use either large diameter native material (min 200mm) if around or use treated timber or rock. Ensure that this is flush and does not prevent water from running off the track. 	M
	<ul style="list-style-type: none"> • Identify and mark wet/damp or soft spots. Import material such as AP20 to raise up and harden these sections. Ensure drainage is adequate. 	M/H
	<ul style="list-style-type: none"> • Re-evaluate and rectify drainage issues 	M/H
	<ul style="list-style-type: none"> • General tidy of trail edge and immediate work site (from initial trail construction) 	L/M
Dracophyllum Flat		
	<ul style="list-style-type: none"> • Re-align final climb up to flats by Forest Lodge 	COMPLETED
	<ul style="list-style-type: none"> • Investigate possibility of realigning sections of track from the bridge crossing of Broken River up to Jacks Pass to remove two of the steepest pitches. 	M
	<ul style="list-style-type: none"> • Install bridge to cross Tim's Stream 	L/M
Cockayne Alley		
	<ul style="list-style-type: none"> • Consider closing steepest section of descending track (where the track first enters the beech forest). Redirect main track onto the alternate zigzags. 	H
	<ul style="list-style-type: none"> • Investigate possibility of preventing riders shuttling this track 	M
Cuckoo Creek		
	<ul style="list-style-type: none"> • No outstanding one-off work 	

The Luge		
	<ul style="list-style-type: none"> • Check and rectify drops greater than 200mm 	L
	<ul style="list-style-type: none"> • Reclassify trail category 	M
The Edge		
	<ul style="list-style-type: none"> • Rebenching sections to widen trail 	M
	<ul style="list-style-type: none"> • Re-align lower scree crossing 	M
Hut Creek		
	<ul style="list-style-type: none"> • Re-evaluate lower climbing corners 	M
	<ul style="list-style-type: none"> • Realign sections of track to remove steep grades 	M/H
Bridge Hill		
	<ul style="list-style-type: none"> • No outstanding one-off work 	
Side 73		
	<ul style="list-style-type: none"> • No outstanding on-off work 	
Coal Pit Spur		
	<ul style="list-style-type: none"> • Install bridge across Craigieburn Stream 	M
	<ul style="list-style-type: none"> • Repair pig rooting damage to trail bench 	H

It should be noted that where major realignments have been recommended the required Assessment of Environmental Effects should be completed, and approval sought from the accountable area manager, before any work is undertaken.

Track	Recommended Annual/Ongoing Maintenance Work	Completed....
All Tracks		
	<ul style="list-style-type: none"> • Annual monitoring of track conditions 	
	<ul style="list-style-type: none"> • Annual general drainage and track surface work 	
	<ul style="list-style-type: none"> • Maintain any culverts 	
	<ul style="list-style-type: none"> • Clear vegetation back from tracks to maintain sightlines (esp Hut Creek Track and Coal Pit Spur) 	
	<ul style="list-style-type: none"> • Fill in/ rectify any rutting in the tracks 	
	<ul style="list-style-type: none"> • Fix drainage where any ponding occurs 	
	<ul style="list-style-type: none"> • Block off any shortcutting 	
	<ul style="list-style-type: none"> • Fix drainage/create swales where there is evidence of water flowing down the track 	
	<ul style="list-style-type: none"> • Maintain outsoles where possible 	
	<ul style="list-style-type: none"> • Remove track 'edge' to allow water to escape tracks where appropriate. 	
	<ul style="list-style-type: none"> • Maintain cambers where appropriate, for example on corners that have been cambered. 	

8. Implementation of work

There are essentially two streams of work required for the maintenance of mountain bike tracks in the Craigieburn Valley;

- General monitoring and maintenance
- Upgrades and realignments/one-off work tasks

8.1 General Monitoring and Maintenance

Regarding general monitoring and maintenance, given the expanding nature of the track network and the increasing pressures on the tracks year on year, it is recommended that:

- The track network is allocated a dedicated resource to monitor the tracks, undertake repairs and maintenance and monitor and improve drainage where required. It is suggested that the CCTC investigate how this could be funded.
- This resource would cover the months from November to May when the tracks are being used the most. The winter track closure status should remain.

The purpose would be to proactively manage the track network to help prevent tracks getting to a stage where major intervention and repair is required – which on some of the tracks is the current state. Presently neither the department nor the Castle Hill Community is able to give the tracks the due diligence they require, and the track network will continue to deteriorate. Whether this resource is provided from within the department or externally is beyond the scope of this report.

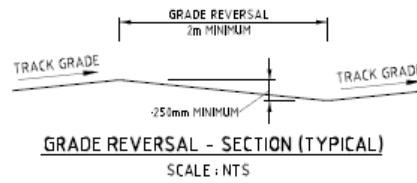
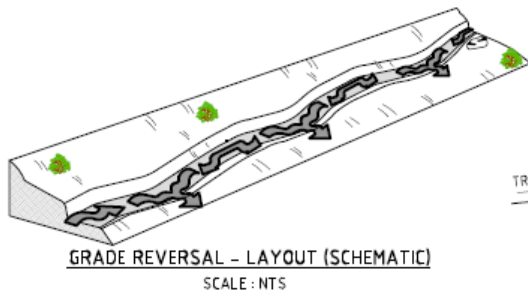
8.2 Upgrades and Realignments.

The listed work has been prioritised from low to high priority. The priority of the work reflects the popularity of the track and therefore the effect on the current issue to the user and also the effect on ongoing maintenance. However, it is expected that all this work should be actioned; therefore, if it is more efficient to move work tasks around or bundle work up then it acceptable to effectively reprioritise some of this work.

Given the amount of work required it is recommended that larger tasks are contracted out to a reputable trail contractor, although volunteer days and builds are also encouraged and should not be discounted. Any realignment work will need to be marked on conjunction with a DOC representative before construction can commence, and the department will provide guidance on the quality of work required, both in the finalised track work, the environmental standards including site remediation and site health and safety.

9. Appendix.

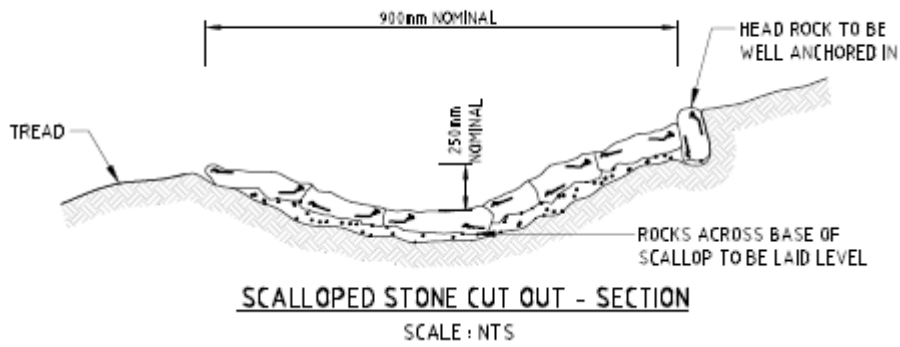
- Suggested grade reversal layout



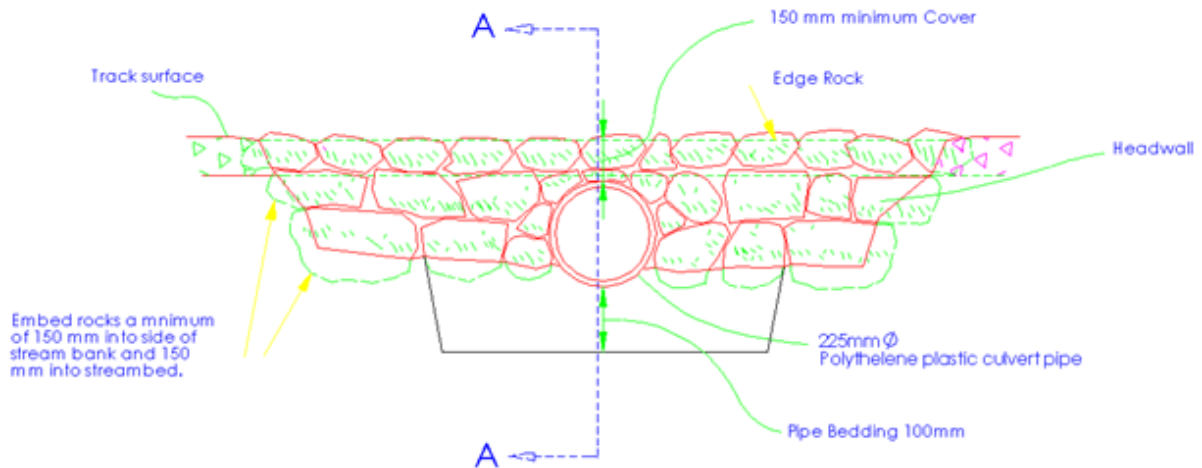
**GRADE REVERSAL SPACING
(NOMINAL TARGET):**

TRACK GRADE (%)	SPACING OF GRADE REVERSALS (m)
< 4	25
4 to 7	20
7 to 10	15
> 10	10

- Suggested hardened swale. This could also be done using a compacted aggregate

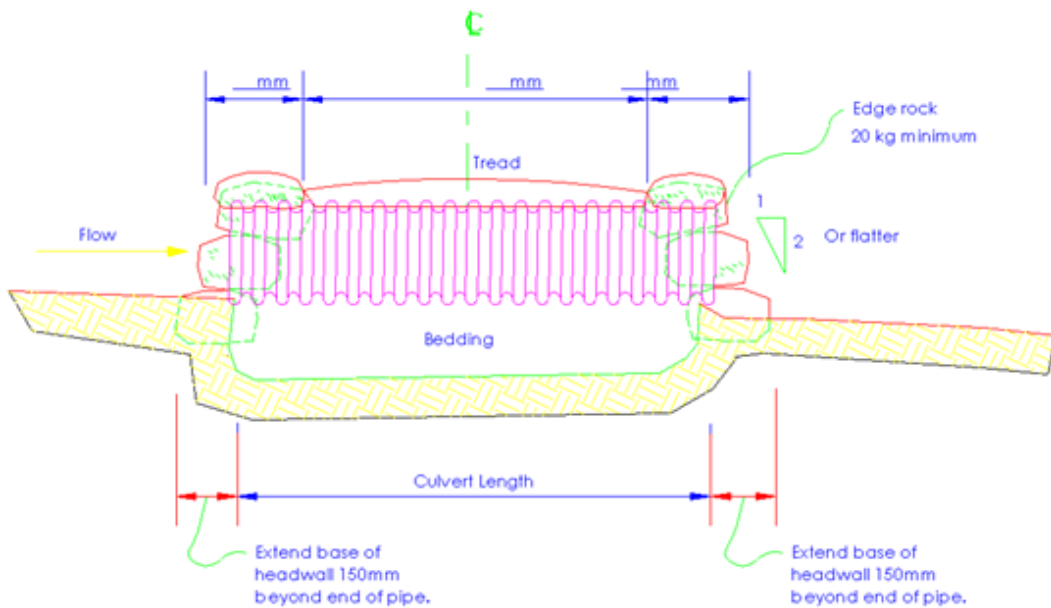


- Example of culverting with rock headwall



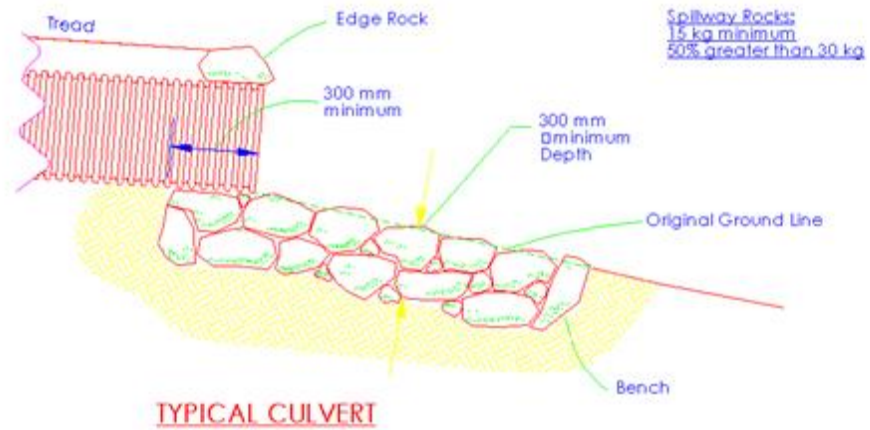
END VIEW

Headwall rocks:
20 kg minimum,
50% larger than
30 kg



Note -this example used ribbed piping, which is not recommended in the Craigieburns. The ribbing will catch material such as beech leaves causing the to clog. Smooth pipes should be used

- Example culvert with rock spillway to prevent scouring



- NZCT Design Guide relationship between track difficulty grade and track gradient

Table 4: Relationship between off-road grade, degrees, percent and slope

Indicative off-road trail grade	Degrees	Percent	Slope
Grade 1	0°	0%	NA
Grade 2	1°	1.7%	1:57
Grade 3	2°	3.5%	1:29
Grade 4	3°	5.2%	1:19
Grade 5	4°	7.0%	1:14
Grade 6	5°	8.7%	1:11
	6°	10.5%	1:10
	7°	12%	1:8
	8°	14%	1:7
	9°	16%	1:6
	10°	18%	1:6
	12°	21%	1:5
	15°	27%	1:4
	20°	36%	1:3
	30°	58%	1:2