Section 3 - Scree and boulder mid section - BC figure 1.

This section of the route is characterised by loose scree and boulders. (See Figure 4). This makes the route particularly unstable and the average user may experience difficulty in choosing a safe route, especially when tired and descending. The route gets considerably steeper approximately 2/3 of the way up.[1] Route finding becomes increasingly difficult. There are a few places in this area that require the walker to use their hands as well to ascend or descend the path. Route definition in this area with scree walls[2] would aid the average user and improve the safety of the route considerably. The area also requires "soil" stabilisation and water management.

Figure 1. Typical conditions on Section 3 with loose scree and boulders.

RECOMMENDATIONS:

- **Path definition:**

With the amount of scree available on site, the trail definition could be accomplished by the strategic construction of trail cairns 2-3 feet high along the chosen route. Scree walls are also recommended as an additional method to define the path where necessary.

[1] The gradient of paths is critical on routes such as encountered here. We see (**Appendix V**) that 40 degrees is the angel of repose of rock and that 35 degrees requires use of hands in ascent. The gradient of any route can be changed by using a zig zag route. This will allow increased stability on the treadway and adjacent to the treadway and will allow better water management.

[2] See "Passive trail management in northeastern alpine zones: a case study." Doucette, JE and Kimball KD, AMC Research Dept, Gorham NH 03581.

RECOMMENDATIONS:contd.

- **Zig Zag Route**.
  The route should follow a zig zag route of ascent, this will increase the stablility of the route and limit soil and rock movement.

- **Path Stabilizing**
  Along with path definition we recommend that a series of trail stabilizers be installed. On site materials could be used to construct such features as

  - **stone stairs/steps** - to stabilize the tread way,

  - **crib walls** - to stabilize the tread way linearly and prevent the tread way from creeping downhill and

  - **scree walls** - to keep users on the intended path.

Path definition - Cairns, posts or paint?

A number of possibilities are possible – the use of **standard way marking posts**, however these are thought to be too intrusive and out of keeping with this mountain environment.

Paint marks are sometimes used to define paths however it is felt that these will be difficult to see particularly on descent and when visibility is poor.

Cairns are considered here as the most suitable as they are a "historical artefact" along this route already. Furthermore they are sustainable and can be easily removed in future if required and are built from natural material.

Note: In general Mountain Meitheal is opposed to the construction of cairns as it reduces the need for self reliance in the mountains, tends to encourage point to point walking with associated erosion and in general reduces the wildness of the mountain environment.
However as cairns are a historic structure on this route the use can be argued to be acceptable. There is a real need to mark the most suitable route (to limit erosion) and stone cairns are in our view the least impacting solution when compared to paint marks or way mark signs.

Figure 2

Constructed cairn a possibility for defining the route.

Section 4 - The Upper 30 Metres:

The most serious case of route and natural resource degradation in the form of soil erosion occurs in the top 30 metre section of path below where it intersects with the saddle between Corran Tuathail and Cnoc na Toinne.

The clinometer reading measured the gradient on this section at 37 percent.

In this section, we measured soil loss in places of up to 2 metres deep and 2 metres wide. The uppermost section before the saddle the path is braided into 3 major sections. Rock boulders have and continue to become more exposed with the increase in erosion and some hang precipitously suspended in the surrounding soils. With increased erosion these and more rocks will inevitably be dislodged.

There is a real possibility that hikers will unintentionally knock some of these rocks loose as they grab onto them for handholds. The grade is such that there is

Figure 3

Severe erosion occurring at the top of the Devils Ladder.

RECOMMEDATIONS

- **Relocation**.
  The team recommend that this upper 30 metre section of trail **be relocated.** This is necessary to keep users from adding to the soil erosion in this section while rehabilitation efforts are taking place.
  The relocation of the upper section onto the grassy slope on the right side of the path (ascending) is expected to be temporary as it is doubted that this section can sustain heavy continued use over the many years without eroding.

- **Bench cut path**
  The relocated path should be constructed as a bench cut construction and have a gradient of no more than 10 to 12 degrees.

- **Ladder rungs** should be constructed at the approach to the gully to give access to the relocated path (See point X figure 7)

RECOMMEDATIONS contd.

- **Check dams**
  The upper 30 metres of path require a series of rock check dams installed to stabilize the existing path. The area should be rubbled to prevent further erosion from occurring.

- **Soil stabilization**
  The upper reaches of the path should have geofabric installed as well to encourage and accelerate re vegetation in this area.

- **Signage**
  Signs should be installed to educate users to stay of this area as re vegetation requires their cooperation. A sign should also be installed to direct walkers to the relocation. To keep users from straying onto the re vegetation/closed area, a type of temporary fencing should be considered.

Figure 7 The dashed line shows a typical layout for the re routed upper section. This should be a bench cut method. Ladder rungs should be installed in the rock below X

Figure 8. Well constructed rock steps at this type of location will improve route finding and assist soil stabilisation.

Figure 9
A rock crib constructed along the dashed line will limit soil and scree movement. Stone steps could be constructed where solid lines are marked.

This route rises at a more suitable gradient.
(note the marking flags.)

4.1 COST ESTIMATES

The estimate of work man hours and costs was compiled by Andrew Norkin based on the log of work required for the selected route and is detailed in Table 2.

The cost and time element is based on the considerable experience of Andrew Norkin in designing, costing and managing similar projects in the north eastern United States. The cost element was calculated using an hourly rate and applying US time requirements. It was also checked against costings used by the AMC when subcontracting work for agencies such as the US Forest Service.

Item	Cost per item	Units required	Total cost per item
Rock step	€133. each	70	€9,310
Rock cribbing	€24 sq. ft.	650	€15,600
Rock cairns	€100 each	60	€6,000
Steel rungs	€40 each	15	€600
Rubbling	€20 sq. ft.	400	€8,000
Check dams	€400 each	8	€3,200
Scree wall	€3 per foot	250	€750
Tread way	€5 linear ft	100	€500
Total Labour			€43,960
Geofabric and installation			€1500
Tools, signs etc			€5000
Supervision			€15000
Surveying			€3500
Contingency			€10000
Total Project Cost Estimate*			**€78,960**

Table 2. Estimated Costs For Devils Ladder Project

The path requires the following structures to be installed to establish a sustainable and safe route:

- **70 rock steps**
- **650 square feet of rock cribbing**
- **400 square feet of rubbling**
- **8 large (2-3 meter) check dams**

- **60 rock cairns**
- **250 feet of scree wall**
- **15-3/4 inch diameter steel rungs**
- **100 linear feet of new tread way**
- **Installation of 800 square feet of geofabric.**

4.2 LABOUR REQUIREMENTS

It is estimated that this will require a total of **2000 hours** (approximate 10 weeks for a five man crew) of professional trail crew labour and for 500 hours of volunteer labour.

The professional path crew should be primarily used for rock step construction, rubbling, cribbing, trail relocation, and check dam installation.[3]

Volunteer trail workers would be used for the installation of scree walls and rock cairns.

In addition, construction of the path on the Devil's Ladder section will be accompanied by the disguising and dismantling of numerous " bootleg" trails, a number which are poorly located and are causing unnecessary erosion to occur.

4.3 PROJECT MANAGEMENT

Given the capital cost of the project, the landownership issues, the importance of the walking route in natural heritage and tourism terms this report recommends that a project management group should be established under the leadership of a competent authority, for example Kerry County Councils Walking committee. The group should draw together interested parties to consider the report, raise necessary funding and oversee and implement the report. The model already exists for such a development in Donegal where Donegal County Council and Udaras na Gaeltacht cooperated to implement a path restoration project on Slieve League in west Donegal.

[3] We are aware that a crew from the Kerry region is been trained by Coillte for a project on Torc Mounatin, Killarney National Park.

The group should consist of the following:

- Representatives of the landowners
- Kerry County Council
- National Parks and Wildlife Service
- Representatives of the walking and volunteer path groups
- Heritage Council
- Kerry Tourism
- National Way Marked Ways Advisory Group

In our view it is essential that all keyholders and stakeholders are involved to ensure the project is delivered to the highest quality.

4.4 FUNDING

Funding is the key issue for this project. However we consider the sum to be good value for money. Most materials are already on site which excludes expensive helicopter flying of materials – always a large element in any such project. We suggest that funding could be sourced from the following sources.

- **Kerry County council**
- **Heritage Council –** The heritage council have facilitated and funded this project appraisal and maybe in a position to co fund actual reconstruction work on this important national route.
- **National Lottery**
- **Tourism organisations –** This route is hugely important to the tourism product of the Kerry and in particular Killarney region.
- **ACT** Access and Conservation Trust. The Mountainieering Council of Ireland are members of this organisation which distributes funds to aid such project.

Mountain Meitheal are available to contribute whatever technical expertise is required.

APPENDIX I
Land Ownership

Folio Number: KY2463 Application Number: P2003PS219216D

Land Registry

County Kerry Folio 2463

Part 2 - Ownership

Title ABSOLUTE

No.	The devolution of the property is subject to the provisions of Part II of the Succession Act, 1965	
1	21-MAR-1988 D 2564/88	JOHN T. SHEA (Farmer) of Cooleanig, Beaufort, County Kerry is full owner as tenant-in-common of 1 undivided 1/3 share(s).
2	21-MAR-1988 D 412/87	JAMES SULLIVAN (Farmer) of Ballyledder, Beaufort, County Kerry is full owner as tenant-in-common of 1 undivided 1/3 share(s).
3	24-AUG-1990 D 2988/90	JOHN H. DOONA (Farmer) of Coornamona, Kilgobnet, Beaufort, County Kerry is full owner as tenant-in-common of 1 undivided 1/6 share(s).
4	24-AUG-1990 D 2988/90	DONAL DOONA (Farmer) of Coornamona, Kilgobnet, Beaufort, County Kerry is full owner as tenant-in-common of 1 undivided 1/6 share(s).

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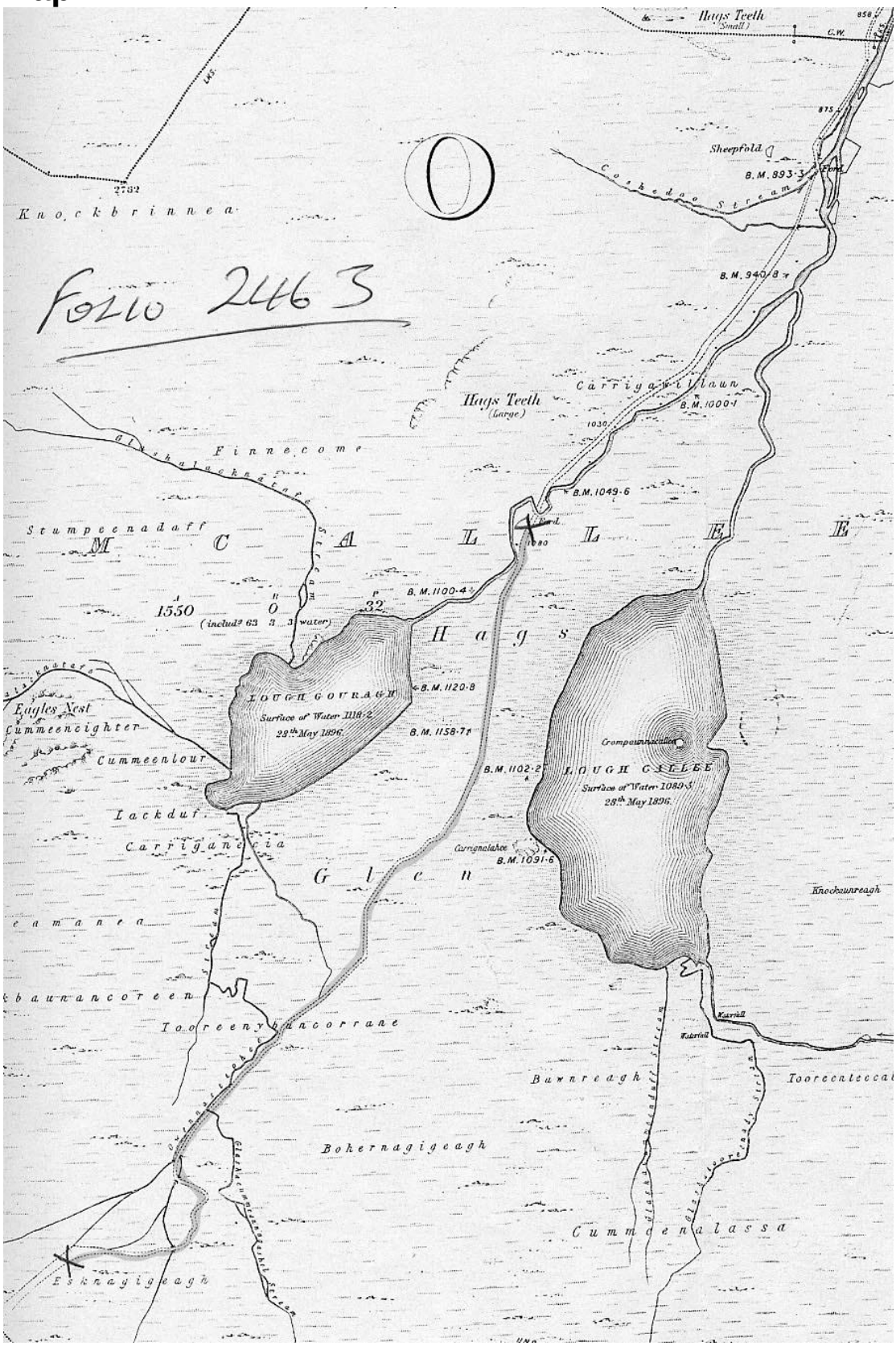
APPENDIX II
1906 0rdnance Survey

Map



APPENDIX III

Non-motorized Trail Type Summary

The following guidelines describe the standards used by the BC Forest Service for trail types I to V for non-motorized users, and for level-of-difficulty for motorized users.

ROS Class	Type I	Type II	Type III	Type IV	Type V
Rural					
Roaded					
Semi-primitive					
Primitive					

Standard	Type I	Type II	Type III	Type IV	Type V
Highest standard	→	→	→	→	Lowest
Maximum users	→	→	→	→	Least
Highest impact	→	→	→	→	Lowest
Highest cost	→	→	→	→	Lowest
Highest maintenance	→	→	→	→	Lowest

Trail Activity	Type I	Type II	Type III	Type IV	Type V
Hiking	✓	✓	✓	✓	✓
Bicycle	✖	✓	✓	✓	✓
Equestrian	✖	✓	✓	✖	✖
XC Ski	✖	✓	✓	✖	✖
Ski Touring	✖	✖	✖	✓	✓
Special Use	✓	✓	✖	✖	✖

✓ Usually provided by Forest Service

✗ Not usually provided

Foot Trail Guidelines

Foot Trail Guidelines

Trail Types	Uses	Tread Width	Grade
Type I	· High standard, short walks · 5-30 minute duration · Steady two-way traffic	2.0 m	<= 8% Average <= 5%
Type II	· Walking trails · Minutes to 2 hours duration · 1 - 6 km	1.25 m	<= 10% Average 5 - 8 %
Type III	· Single file, hiking trails · 1-7 hour day use, overnight and multi-day · 3-20 km or more	0.75 m	<= 10-12%
Type IV	· Backcountry hiking trails · Multi-day · Light use	0.50 m	N/A
Type V	· Backcountry routes over difficult terrain · Overnight to multi-day	N/A	N/A

Type I Foot Trails

Type I trails are typically used in day-use areas, to access vistas and viewpoints located a short distance from vehicle access, and in the vicinity of campgrounds. The high-use nature of these locations usually requires structures, such as toilets. They may also be used as ski trails in winter if the criteria for those trails are met.

Type II Foot Trails

Type II trails are commonly used in conjunction with day-use areas, viewpoints, campgrounds, interpretive areas, or as access to back country trails. Many such trails serve dual functions in that they access specific points of interest that may have moderately high use, and provide access to back country trails that have much lower levels of use. Type II trails may also be used as ski touring trails in winter if the appropriate criteria are met.

Type III Foot Trails

While Type I and Type II trails best fit the category of walking trails, Type III trails serve as hiking trails, for people travelling single file. Type III trail lengths may be 3-20 km or more. Support structures,

such as developed campsites and pit toilets, may also be appropriate depending on the length and use of the trail.

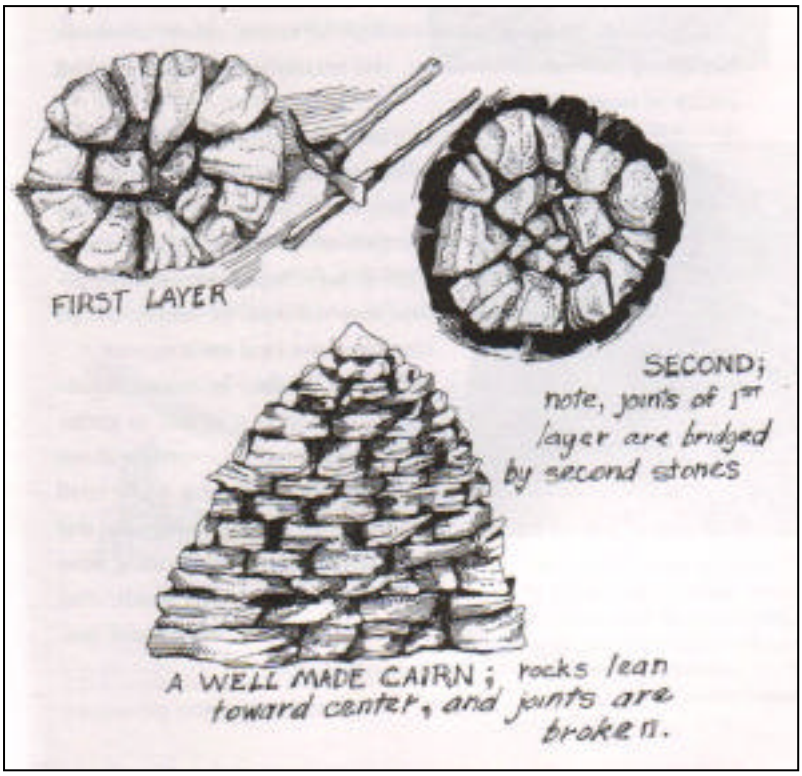
Type IV Foot Trails

Type IV trails are planned as lightly used wilderness hiking trails, for overnight or multi-day duration. Tread widths are only 0.50 metres, and grades are constructed as appropriate to the terrain being accessed. Type IV trails would not normally have support structures, such as developed campsites, but may have pit toilets as required.

Type V Foot Trails

Type V trails are usually wilderness hiking ***routes*** and specific trail development is avoided. Wilderness hiking routes are typically used for overnight or multi-day trips, and may cross very difficult terrain. Signing, campsites, or other structures are not generally developed, although restrictions may be imposed on camping locations for environmental reasons.

APPENDIX IV
Cairns, Rock Steps, Rock Cribs



Cairns should be well constructed using the approach detailed in the attached diagramme, this avoids walkers adding to the cairn and increasing the size beyond the required dimensions.

APPENDIX V
Gradient and its impact on soil and rock movement and path design.

APPENDIX VI