

Glen Croe, Rest & Be Thankful LMP 2019-2029

Cowal and Trossachs Forest District

Glen Croe, Rest & Be Thankful Land Management Plan (LMP)

Woodland Creation Project



Approval date:

Plan Reference No:

Plan Approval Date:

Plan Expiry Date:

FOREST ENTERPRISE - Application for Land Management Plan Approvals in Scotland

Forest Enterprise - Property

Forest District:	Cowal & Trossachs
Woodland or property name:	Glen Croe, Rest & Be Thankful
Nearest town, village or locality:	Arrochar
OS Grid reference:	NN 240 070
Local Authority district/unitary Authority:	Argyll & Bute Council / LLTNP

Areas for approval

	Conifer	Broadleaf
Clear felling		
Selective felling		
Restocking		
New planting (complete appendix 4)		200.83Ha

1. I apply for Land Management Plan approval for the property described above and in the enclosed Land Management Plan.
2. I apply for an opinion under the terms of the Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999 for roads, tracks and quarries and afforestation as detailed in my application.
3. I confirm that the initial scoping of the plan was carried out with FC staff on 23rd October 2015.
4. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.
5. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which the FC agreed must be included.
6. I confirm that consultation and scoping has been carried out with all relevant stakeholders over the content of the of the land management plan. Consideration of all of the issues raised by stakeholders has been included in the process of plan preparation and the outcome recorded on the attached consultation record. I confirm that we have informed all stakeholders about the extent to which we have been able to address their concerns and, where it has not been possible to fully address their concerns, we have reminded them of the opportunity to make further comment during the public consultation process.
7. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed



Signed.....

Forest District Manager

Conservator

District ...Cowal & Trossachs FD

Conservancy.....

Date

Date of Approval.....

Date approval ends

FOREST ENTERPRISE - Application for Approval of New Planting

1. Forest Enterprise – Property

Forest District:	Cowal & Trossachs
Woodland or property name:	Glen Croe, Rest & Be Thankful
Nearest town, village or locality:	Arrochar
OS Grid reference:	NN 240 070
Local Authority district/unitary	Argyll & Bute Council / LLTNP

2. Proposed areas to nearest tenth of a hectare

New Planting	200.8
Open Ground	
Existing woodland	
Total	

3. Special areas and protected land

Designation	Area Name or Number	Comments

4. Proposed details of new planting

Area Name or number	Gross Area (Ha)	P Year	Spp	Area (Ha)	Open Ground (Ha)	Comments
Acquisition Area	161.5	2020	NBL	161.5	0	See Map M6 in the LMP. High density continuous planting required for slope stability. Rock outcrops will be left unplanted. Wider area of open hill land that will be unplanted but may regenerate extends to 562Ha.
FES Holding: Glen Croe	39.3	2023	NBL	31.5	7.8	See Map M6 in the LMP. Slope stability is still important but 20% OG

Glen Croe, Rest & Be Thankful LMP 2019-2029

Area Name or number	Gross Area (Ha)	P Year	Spp	Area (Ha)	Open Ground (Ha)	Comments
						will be used to buffer paths, archaeology and features of ecological interest. Area forms part of the open ground on the Glen Croe FES unit.

I apply for Authority to plant as above and as shown on the attached map.

I undertake to obtain the necessary permissions from the appropriate statutory body before commencing work under any approval which is granted.

Signed



Signed

Forest District Manager

Conservator

District Cowal & Trossachs FD

Date

Date approval ends:

Contents

Summary of Proposals

1.0 Introduction:

- 1.1 The existing land holding
- 1.2 Setting and context

2.0 Plan objectives

3.0 Analysis

4.0 Concept

5.0 Plan Proposals

- 5.1 New Planting – slope stability
- 5.2 New Planting – native & riparian woodland
- 5.3 Fencing
- 5.4 Management of open land
- 5.5 Deer management
- 5.6 Critical success factors

Support documents: Maps & Visualisations

- Map 1 Location Map
- Map 2 Opportunities & Constraints
- Map 3 Slope & Stability
- Map 4 Landscape Analysis & Character
- Map 5 Design Concept
- Map 6 Planting Design
- Map 7 Planting Infrastructure
- Map 8 Planting Timescales

- 3D Visualisations

Appendix 1. Background information survey and analysis

- 1 Analysis of physical site factors
 - 1.1 Geology landform & soils
 - 1.2 Climate
 - 1.3 Water & riparian woodland
- 2 Analysis of current land use & management
 - 2.1 The existing vegetation & land use
 - 2.2 Site access
 - 2.3 Landscape, landscape designation & visibility
 - 2.4 Biodiversity
 - 2.5 Social Factors

Appendix 2. Consultation Record

Appendix 3. Deer Management Plan

Appendix 4. Golden Eagle Report

Appendix 5. Skylark & Curlew Report

Appendix 6. Archaeology Walkover Survey Report

Appendix 7. Forest Research Report: Potential for woodland restoration above the A83 in Glen Croe to reduce the incidence of water erosion and debris flows

Appendix 8. Transport Research Laboratory Report. A83 Rest & Be Thankful: ecological and related Landslide Mitigation Options

Appendix 9. Supplementary Report on Preparation & Planting of Hill Ground along the North Side of Upper Glen Croe, Argyll (above the A83)

Appendix 10. ATV Track Specification

Appendix 11. Protected Species Survey Report

Appendix 12. Bibliography

Summary of Proposals

It is proposed to establish a Native Woodland on the steep grazed slopes above the A83 at the Rest & Be Thankful.

The steep slopes here have a history of land slippage resulting in periods of road closure, and the project aims to establish a self-sustaining and resilient protection forest with the objective of improving slope stability.

Slope stability will be further enhanced by the removal of all stock and deer grazing from the site.

The woodland creation will complement present and future hard engineering infrastructure, which is designed to reduce debris flows reaching the road.

It is proposed to minimise activity on the steep slopes above the A83 with no machine access for ground preparation or track formation. Hand screefing and flat planting are proposed.

The proposals are evidence based with design support from Forest Research.

The removal of stock is anticipated to create a better soil structure and a more robust flora, and the new woodland will consist of a diverse mix of Native Broadleaves with varying rooting characteristics. Species and provenance selection will choose trees that are adapted to the site. The species used will vary as elevation increases, with increasing altitude progressively narrowing the species options.

The New Woodland will be essentially a non-intervention area with the potential to deliver ecological and landscape benefits into the future as well as enhanced slope stability.

Rapid establishment is essential and deer fencing is required to ensure this occurs.

Slope stability is also an issue outside the steep slopes above the A83 and this has impacts on water quality, fencing and recreational paths. It is proposed to expand the area of core protection forest above the A83 to the north to link with the Butterbridge Woodland, and to the south along the Croe Water. Within these additional areas a more standard approach to Native Woodland creation will be

followed. This expanded woodland area will provide essential landscape and ecological linkages for the core protection forest.

This LMP area covers 724 ha of which 162Ha is proposed for planting. Around 377Ha of the total area is proposed to be deer fenced. In addition a further 39Ha is proposed for linked woodland creation on the National Forest Estate to the South of the Croe Water.

The primary aim of future management is to:

- **Establish woodland and open ground vegetation that has the potential to reduce the incidence of water erosion and debris flows from the ground above the A83.**

To meet the above aim, proposals for land management will:

- Remove grazing, to consolidate existing vegetation and encourage the development of grasses and woody shrubs that may have the ability to reduce the incidence of water erosion and debris flow;
- Establish, through hand planting and natural regeneration of woodland, a mixed broadleaved tree and shrub woodland made up of native species that can thrive in the soils and climate, and that have varied rooting structures and depths which are most likely to assist in improving soil stability;
- Establish, through hand planting and regenerating woodland, riparian and native broadleaved woodland within the upper catchment of the Croe Water, to enhance water quality and reduce the incidence and impacts of sudden run off into the catchment after heavy rain fall;
- Fence the area to be planted, and adjacent land, to assist in rapid consolidation of the existing vegetation cover and the establishment of the planted woodland, by immediately reducing grazing;
- Mitigate any potential **impacts on 'wildland' character and visual amenity** associated with fencing by locating the fenceline to limit the number of walking route crossing points, locate the fenceline away from the skyline and crossing ridges on low points, and by planting trees and shrubs in groups to screen the fenceline from the A83;
- Maximise positive ecological impacts by providing habitat for prey species and providing where possible a mosaic of open ground, woodland and shrub habitat.

The planting design approach is based on three zones linked to altitude and site characteristics, these being defined in terms of potential species choice as Wide

Glen Croe, Rest & Be Thankful LMP 2019-2029

Range of Native Broadleaves (NBL); Restricted Range of NBL, Very restricted Range of NBL.

Location	Planting Zone	Area Ha	Woodland Creation Areas Ha
Acquisition	Existing NBL	0.69	(Not incl)
Acquisition	Restricted NBL	45.69	
Acquisition	Very Restricted NBL	75.59	
Acquisition	Wide Range NBL	40.24	161.51
Current National Forest Estate	Existing NBL	0.96	(Not incl)
Current National Forest Estate	Restricted NBL	24.83	
Current National Forest Estate	Very Restricted NBL	14.49	39.32

Table 1 – Areas of proposed planting

Potential Species to be included in each zone include:

Wide Range of NBL (Native Broadleaves): Based on vegetation mapping of bracken areas. Potential Species: Aspen, Bird Cherry, Blackthorn, Common Alder, Downy Birch, Willow Species, Hawthorn, Hazel, Holly, Rowan, Sessile Oak, Juniper.

Restricted Range of NBL (Native Broadleaves): Based on elevation and terrain. Aspen, Common Alder, Downy Birch, Willow Species, Rowan, Juniper.

Very Restricted Range of NBL (Native Broadleaves): Based on elevation. Downy Birch, Willow Species, Rowan, Juniper.

Site	Phasing	Area Ha/Length m
Deer fencing (See Map M8)	2019	8178m
Area A (See Map M8)	2020/21	152.41Ha
Area B (See Map M8)	2022/23	48.42 Ha

Table 2 – Operational Timetable.

1.0 Introduction

1.1 The existing land holding



View of site from Beinn an Lochain

The LMP area covers 724 ha and lies to the immediate east of the Rest and Be Thankful viewpoint, adjoining the current Glen Croe FDP (See location Map 1: Location Plan). The land is open and grazed by livestock, it has been acquired to establish woodland that may have the potential to assist in reducing the incidence of water erosion and debris flows from the ground above the A83, which is subject to landslip.

The land lies within the Loch Lomond and The Trossachs National Park (LLTNP) and is of high landscape and visual significance.

The open ground is potentially part of a Golden Eagle range although modelling and local expert knowledge suggests that the project area may fall between ranges. The river systems in Glen Croe support spawning salmonids. The Croe Water that forms the boundary between the core project area and the current National Forest Estate is modified by abstraction for HEP generation. There are a small number of unscheduled shieling sites along the Croe Water, but steep and unstable slopes limit the potential for more widespread archaeology.

The wider area is very important for tourism and informal recreation. The **viewpoint at the 'Rest and Be Thankful' is a popular** visitor viewpoint, and several of the nearby hills, including the adjacent Cobbler and Bein Ime, are popular hill walks.

Soils on site are generally rich and fertile and suitable for a wide range of species on the lower and middle slopes. Exposure at higher altitudes is the main constraint to tree growth and species choice. Drainage is generally good across the site and on the core project area there are no deep peats. Areas of mixed peaty/mineral soils occur on the lower slopes in pockets along the Croe Water.

More detail on the existing physical characteristics, survey information and background to the site can be found in the Appendices.



Landslips along the Croe Water

1.2 Setting and context

The proposed new planting lies within the Loch Lomond and The Trossachs National Park (LLTNP). The land to be planted can be seen at an oblique angle from the Rest and Be Thankful Viewpoint on the A82, and from fore-

Glen Croe, Rest & Be Thankful LMP 2019-2029

shortened, higher level viewpoints on the Cobbler and Beinn Luibhean (see Map 1: Location Map and Viewpoints).

Key features in the surrounding area include (see Map 2: Opportunities & Constraints):

- The A83 extends through Glen Croe and around the head of Loch Long, and is the main route into West Argyll.
- The Beinn an Lochain SSSI lies to the west of the project area. The site is designated due to its Siliceous Scree, Tall herb ledge & Upland assemblage. The opinion of SNH is that the broadleaved woodland creation proposal is unlikely to have any impact on these key features.
- The Rest and Be Thankful viewpoint is a well-promoted viewpoint that attracts a large number of visitors.
- Very popular mountain walking area.
- There is a small amount of neighbouring grazing land along the floor of Glen Croe.
- Much of Glen Croe is forested, with Sitka Spruce the most dominant species. Draft proposals for the next iteration of the LMP illustrate that some of these conifers will be replaced with mixed woodland that aims to assist in slope stabilisation.
- Modelling suggests the area falls between Golden Eagle ranges, although it is likely that eagles will range over the upper slopes. The south end of Glen Croe is identified as a buffer to prevent Grey Squirrel expanding north towards Cowal.

2.0 Plan Objectives

The primary aim of the plan is to:

- **Establish woodland and open ground vegetation that has the potential to reduce the incidence of water erosion and debris flows from the ground above the A83.**

To achieve this, the plan will need to address the following land management objectives:

Table 3 Plan Objectives

Plan objectives	Priority		
	High	Medium	Low
1. Contribute to improving slope stability through the establishment of appropriate species in a pattern and density that is likely to assist in reducing the incidence of water erosion and debris flow over time	✓		
2. Ensure rapid establishment of woodland and vegetation growth, by providing suitable protection from deer and other mammal grazing, to maximise potential stability benefits	✓		
3. Enhance the landscape and contribute to the scenic value of the National Park, while minimising impacts on the experience of perceived wildness and visual amenity	✓		
4. Develop a woodland which will withstand events associated with predicted climate change, particularly those associated with sudden heavy rain fall incidents	✓		
5. Create a woodland that will minimise impacts on Golden Eagles, and provide cover for likely prey species as well as Black Grouse		✓	
6. Protect water quality and riparian habitats, especially those associated with spawning salmonids in the Croe Water.		✓	

3.0 Analysis

The record and analysis of background survey information can be found in Appendix 1. This information is accompanied by maps and supporting documentation as appropriate.

The analysis has informed the assessment of opportunities and constraints which has then in turn informed the design concept, as described in Table 4 below.

Table 4: Analysis of opportunities, constraints and concept relative to plan objectives

Objective	Opportunity	Constraint	Concept
1. Contribute to improving slope stability through the establishment of appropriate species in a pattern and density that is likely to assist in reducing the incidence of water erosion and debris flow over time.	Use an evidence based approach in the design. Reduced grazing could allow more ground vegetation and naturally occurring woody shrubs to establish a vegetation cover that is better able to bind soil and has vigour. Planting trees of different rooting types and depths in key locations where landslips are likely to be initiated may contribute to slope stabilisation by reducing the likelihood of slips starting, and constraining debris flows.	Steep terrain makes access difficult for planting operations. Steep terrain and risk of landslip severely limits use of machinery on these slopes.	Remove grazing to quickly establish vigorous ground vegetation that will increase interception of rainfall and reduce exposed soil areas. Hand plant to establish permanent woodland cover of different rooting depths to potentially assist in binding soil material susceptible to slippage. Establish most dense woodland in gullies and upper reaches which are the locations where slippage is initiated on the slope. Wet flushes require stabilisation on these slopes with dense planting. Target open ground on stable rock outcrops. Plants & fencing materials to be airlifted to the site in order to minimise the need for access routes.

Glen Croe, Rest & Be Thankful LMP 2019-2029

Table 4 continued:

Objective	Opportunity	Constraint	Concept
2. Ensure rapid establishment of woodland and vegetation growth, by providing suitable protection from deer and other mammal grazing, to maximise potential stability benefits.	<p>Fencing will assist in reducing grazing of ground vegetation, as well as grazing on planted woodland.</p> <p>Reduced grazing pressure will also encourage natural regeneration and allow planted woodland to establish rapidly.</p>	<p>Steep terrain, difficult access, high public use of hilltops and proximity of public road, as well as lack of 'backstop' limit opportunities to cull deer.</p> <p>Steep terrain makes access difficult and even possibly dangerous for wildlife management.</p> <p>Steep terrain makes access difficult for fencing contractors.</p> <p>Fencing, if poorly aligned, may be visually intrusive from important viewpoints and areas of high public access. Fence line options at high elevations are often constrained by snow, rock, deep gullies and exposure.</p>	<p>Fence off proposed planting areas in advance of planting to assist in rapid establishment.</p> <p>Align fence to avoid visual intrusion as viewed from footpaths, accessible ridges and summits.</p> <p>Other forms of physical protection may also be required.</p> <p>Fencing materials to be airlifted to site to minimise the need for access routes.</p>

Glen Croe, Rest & Be Thankful LMP 2019-2029

Table 4 continued:

Objective	Opportunity	Constraint	Concept
3. Enhance the landscape and contribute to the scenic value of the National Park, while minimising impacts on the experience of perceived wildness and visual amenity	There is an opportunity to enhance the relative wildness of this part of the LLTNP, by establishing semi-natural woodland and encouraging natural vegetation. This can help to screen existing stock fences and HEP infrastructure along the Croe Water.	Fencing required to assist woodland establishment and vegetation growth may be visually intrusive, with potentially cumulative visual intrusion created by the interaction of existing catch fencing and proposed deer fencing along the A83. Fencing, and any access routes, across upper reaches of the hill slopes, summits and ridges may intrude into the perception of relative wildness experienced at these higher elevations.	The transition between woodland and the adjacent open ground should appear as natural as possible. Fencing should be aligned where possible to minimise visual intrusion from key access routes, especially those linking The Cobbler, Beinn Ime and Beinn Luibhan, by keeping fences away from the summits and access routes and locating fences so that natural outcrops and knolls provide local screening where available. Deer fencing adjacent to the A83 should be set back from the immediate road corridor and needs to facilitate monitoring and access for site engineering. Some scattered groups of planting between the A83 and the fence will reduce visual impacts, although it is noted that regeneration is likely to occur in this area. Fencing and plant materials will be delivered by helicopter drop-off to limit ground damage and reduce impacts on the perception of wildness. Any on ground access should be limited to ATV tracks only.

Glen Croe, Rest & Be Thankful LMP 2019-2029

Table 4 continued:

Objective	Opportunity	Constraint	Concept
4. Establish a woodland which will withstand events associated with predicted climate change, particularly those associated with sudden heavy rain fall incidents	There is an opportunity to establish a diversity of species to ensure that the woodland is as resilient as possible relative to predicted increases in heavy rainfall, wind or drought conditions, as well as the predicted increase in negative impacts associated with pests and diseases	Local climate change events, and specific consequences, such as a rise in particular pests and diseases, remain unpredictable.	Establish a diversity of species, with different growth rates, rooting depths and densities, as well as to encourage natural regeneration, to ensure that the woodland is as resilient as possible to predicted climate change events within this local area, which include sudden high rainfall. Ensure that riparian woodland is expanded, to intercept heavy rainfall in upper catchment of the Croe Water, and to provide essential landscape & ecological linkages.

Glen Croe, Rest & Be Thankful LMP 2019-2029

Table 4 continued:

Objective	Opportunity	Constraint	Concept
5. Create a woodland that will minimise impacts on the raptors including Golden Eagle and provide cover for prey species and Black Grouse	Opportunity to create a diverse mosaic of woodland, shrub and open space that will increase habitat for raptor prey species and create a woodland fringe suitable for Black Grouse.	Natural regeneration will take its course and may reduce the amount of open ground over time, as the primary aim of future land management is to assist in slope stabilisation	<p>Retaining exposed ridges as open ground where exposure will tend to suppress regeneration and the establishment of an upper margin with variable densities and structure will enhance Golden Eagle habitat in terms of prey availability and hunting opportunity.</p> <p>The default result of the proposals to plant across a wide altitudinal range with mixed Native Broadleaves is to create ecological and landscape diversity.</p>

Glen Croe, Rest & Be Thankful LMP 2019-2029

Table 4 continued:

Objective	Opportunity	Constraint	Concept
6. Protect water quality and riparian habitats, especially those associated with spawning salmonids	Increased woodland cover will intercept rainfall, increase transpiration, increase the filtration of surface water and slow the flow of water within the upper catchment of the Croe Water. Slope stabilisation will reduce the sediment loading on the riparian system associated with landslips across the catchment.	Fencing location may create problems for establishing riparian woodland along the Croe Water.	Subject to the location of deer fencing, significantly expand riparian woodland and native woodland within the upper catchment of the Croe Water, to intercept potential high rainfall events and mitigate against the potential downstream impacts. Riparian linkages are essential for landscape and ecology and can mitigate scale issues from planting smaller blocks.

4.0 Concept

To meet the plan objectives, proposals for land management will:

Establish permanent, diversely rooted woodland that will assist in reducing the incidents of water erosion and debris flow above the A83.

A key feature of this plan will be to establish new woodland that includes trees and shrubs that will root at a variety of depths, and be planted in locations and at a density that is most likely to improve site stability (Plan objectives 1 and 4).

Ensure that the new planting and associated open land is not subject to grazing pressure.

Planting will be difficult on these unstable slopes, and for the proposals to be successful, establishment should happen quickly. There is a constant danger of land slippage during the establishment phase, and therefore rapid and successful establishment is important. In addition, it is desirable that grazing is removed on unplanted ground to improve the chances of establishing appropriate ground vegetation and woody shrub species and where possible natural regeneration of woodland, to further enhance the prospects of improved slope stabilisation. This will require fencing (Plan objectives 1, 2 and 6).

Minimise disturbance to the soil, drainage and existing ground conditions.

The terrain and soil conditions severely limit the use of access roads and machinery. All materials and plants will be airlifted onto site. Ground preparation and planting will be carried out by hand. (Plan objectives 1, 2 and 4).

Develop proposals that reflect landscape character, enhance the view from the Rest and Be Thankful viewpoint, the A83 and hill top viewpoints and paths.

The new planting will be visible from the popular viewpoint of the Rest and Be Thankful. The viewpoint offers a 'static, panoramic' view looking south west down Glen Croe, and the proposed woodland will be visually foreshortened, visible at an oblique angle of view. Similar foreshortened views of the woodland will be evident from hill tops and higher ridges. Planting should aim to appear as natural as possible. The addition of native broadleaved woodland should increase visual diversity and perceived wildness. Use the existing vegetation pattern to guide species choice to create a more visually diverse woodland that reflect landform.

Mitigate the potential visual impacts of fencing on views from the A83, the Rest and Be Thankful viewpoint and from high level paths.

The proposals will also address the likely cumulative visual impact of combined catch fencing and deer fencing visible from traffic passing along the A83 by considering establishing targeted areas of broadleaves between the road and the fences that will provide visual screening. In addition, the fence alignment will seek to avoid visual intrusion from key viewpoints and access routes on the hill land by avoiding extensive skylining of the fence and making the most of screening provided by local topographical features. (Plan objective 3).

Enhance the habitat for Golden Eagle, Black Grouse and other wildlife. The plan offers the opportunity to establish links with adjacent woodland habitats, to consolidate this habitat network. Establishing a gentle transition between forest and open ground would benefit Black Grouse and landscape. In addition, the project offers opportunities to provide cover that in turn could increase raptor prey species. (Plan objectives 2 and 5)

Increase and expand riparian woodland with a view to enhancing water quality. The plan includes the upper catchment of the Croe Water, and offers the opportunity to extend existing riparian woodland which will intercept rainfall and is likely to reduce the downstream impacts of sudden heavy rainfall (Plan objective 6).

Mitigate any potential impacts on hill access and walking routes. The proposed planting layout and the associated fencing should be designed to avoid obstructing established walking routes and minimise the number of crossing points. (Plan objective 3). Detailed track design will follow SNH Guidance "Constructed tracks in the Scottish Uplands" 2013.

5.0 Proposals

See maps M6 & M7 for the proposed planting layout and infrastructure requirements, and map M8 Planting Schedule for indicative operational timescales.

5.1 New planting- slope stability

Following a series of landslips and road closures Forest Research were commissioned to produce a report exploring the potential for woodland creation to improve slope stability along Glen Croe (Rest & Be Thankful) See Appendix 7 for this report: *Potential for woodland restoration above the A83*

in Glen Croe to reduce the incidence of water erosion & debris flows. Bill Raynor & Bruce Nicoll. Sept 2012. The report was focussed on creating fairly modest areas of woodland while maintaining a farming enterprise.

Note that Appendices 7, 8 & 9 are included in this Land Management Plan to support the concept that tree cover has the potential to enhance slope stability. These appendices consider a range of different planting options/models. The inclusion of these reports is not intended to provide a precise operational prescription for the woodland creation area considered in this Land Management Plan. The proposed approach with regard to planting is indicated within the LMP, and the operational fine detail will be provided by Forest Research prior to planting.

The current proposal is to establish a wider area of Native Woodland with no grazing on the site, and this new approach is also considered in a report by the Transport Research Laboratory entitled "*A83 Rest & be Thankful: Ecological and Related Landslide Mitigation Options*" 2012 (see Appendix 8). A supplementary report is included in Appendix 9 titled, "*Supplementary Report on Preparation & Planting of Hill Ground along the North Side of Upper Glen Croe, Argyll (above the A83)*" Ian Sinclair & Alan Bennell. 2012.

The supplementary report referred to above recommends Native Broadleaves and Bracken control to facilitate fast establishment. Sea Buckthorn is also recommended as a key species for stabilising the upper slopes. A further consideration of these recommendations as part of the LMP process suggests that native species appropriate to the area can deliver both ecological benefits and slope stability. Sea Buckthorn is not an appropriate species for the site in terms of meeting multiple objectives. Bracken control has the potential to cause slope destabilisation during the establishment interval, which is the period when the Bracken rhizomes die and decay but the tree roots have yet to fully develop to bind the soil. The report recommends protection of the site using fencing to remove grazing pressure, and this is the approach adopted in the LMP.

The 2012 Forest Research report (Appendix 7) highlights research showing the negative impacts on slope stability arising from grazing of both stock & deer (P9). On the Rest & Be Thankful project area cattle grazing in particular currently causes extensive ground damage, erosion and the creation of deep water filled poach marks.

The report then goes on to detail research that indicates the potentially positive effects that tree cover can have on slope stability (P12).

The proposed creation of a self sustaining protection forest is intended to complement hard engineering solutions and provide a resilient and long term option to increase slope stability.

The project will follow the principles laid out in the above reports, as this provides a clear scientific evidence base for the project. The operational specification for the planting will be drawn up by Forest Research following on from the site soil survey to be undertaken prior to planting.

In summary slope stability is anticipated to be enhanced by the following actions:

- Removal of grazing pressure leading to reduced soil damage and an increase in the vigour and diversity of the current ground flora.
- Establishing Native Woodland appropriate to the site by planting and natural regeneration to bind the soil and improve water infiltration.
- Limiting machine access (linked to the woodland creation) to the unstable areas above the A83 to zero.
- Using minimal hand ground preparation and weeding in order to establish a vigorous tree cover rapidly, while maintaining the ground flora.

While the proposed new Native Woodland above the A83 will deliver multiple benefits for landscape and ecology the overriding requirement to stabilise the slope will require some departure from the UKFS and standard practice. For instance wet flushes are usually left unplanted in Native Woodland creation projects, however to achieve slope stabilisation these areas are key areas for rapid woodland establishment, as these areas are often the catalyst for landslips. As mentioned above because the ground flora will be retained and potentially diversified then adverse ecological impacts are likely to be minimal.

Proposed planting densities will generally vary between 3000 stems/Ha to 1200 stems/Ha, but planting outside of these ranges may be appropriate with higher densities on wet flushes and lower densities on rankers and rock outcrops. Outwith unstable slopes open ground is likely to be in the region of 20% of the planting area.

No mechanised ground prep will be used, and the site will be flat planted or hand screefed. Spot herbicide application may increase the speed of establishment and reduce vole impacts, but the potential impacts of this approach on slope stability should be assessed as part of the Forest Research input in terms of operational detail. Overall Bracken spraying is not proposed but hand control or spot herbicide applications may be required around individual trees. The planting should ideally follow on quickly post stock removal in order to establish trees before the vegetation becomes rank. It is not envisaged that fertiliser will be required.

A soil survey will be undertaken by Forest Research six months prior to planting to inform the fine tuning of the species layout. This will be undertaken as part of the monitoring process to establish baseline conditions across the site generally. The main factors determining species choice will be elevation, soil depth and soil moisture factors. Soil type is clearly determined by these three factors, and the soil types range from brown earths and gleys on the lower slopes to peaty upland brown earths and peaty rankers on the upper slopes. The fine grain of the site would suggest that it is difficult to provide a mappable prescription based on soil types and that operational guidance detailing species and spacing based by microsite features is more appropriate. A general selection of species options based on elevation is feasible and this has been the approach adopted within the LMP. During planting operations good site supervision and clear instructions to the planters will be essential to get the right tree in the right place on the microsite level. Forest research will provide a planting prescription to guide planters and supervisors in relation to species choice and planting density, and this will be shared with Forestry Commission Scotland.

Due to slope steepness the areas of deep peat within the site are limited and have been excluded from the planting area. No deep peats occur within the core planting area. Areas where slopes have slumped along the Croe Burn frequently comprise deep soils with an intimate mix of mineral and peat soils derived from the physical movement of soil down the slope.

An extended Phase 1 Survey will be undertaken prior to planting and the approach taken with regard to any identified priority habitats will be discussed with Forestry Commission Scotland prior to planting taking place.

The Phase 1 survey will also identify any Ground Water Dependent Terrestrial Ecosystems (GWDTE) on site. The minimal level of quad bike access tracks on site and the route line along the drier shoulders would

suggest minimal impacts on GWDTE. The broadleaved species choice and no ground preparation would also indicate that impacts on GWDTE are likely to be insignificant across the site as a whole in the short term. In the longer term the creation of native woodland will affect the hydrology of the site, and this is an essential part of the process of stabilising the slopes.

The 2012 Forest Research Report identifies the primary target National Vegetation Classification (NVC) Types as W11 Oak-Birch, with Wood Sorrel and Bluebell dominated ground vegetation on the lower/mid slopes, phasing to W17 Oak-Birch, with Blaeberry dominated ground vegetation on the upper slopes. Areas of W4 Birch woodland may be appropriate on some areas, particularly along the Croe Water.

These NVC types can contain a diverse range of tree species, and the potential attributes of these species in terms of slope stability are discussed in the 2012 Report. Matching tree species to the NVC and Ecological Site Classification (ESC) ensures not only a good ecological fit with the current ground flora, but also increases the likelihood that the trees are well suited to the site, will establish rapidly and thrive.

Creating a diverse and intimate mix of species, while altering species proportions to the microsite, is anticipated to achieve rapid site capture by tree cover and to promote long term stability.

The planting design shown in map M6 divides the area into three zones based on the palette of species that might be suited to each zone. These are based on current vegetation cover and terrain which has the advantage that it tends to reflect landform and create natural internal margins. It also means that following the general theme in a practical sense is possible on the ground. Within each zone planters and managers need to use their experience and site guidelines drawn up by Forest Research to select tree species appropriate to the microsite.

The proposed zones are as follows:

Wide Range of NBL (Native Broadleaves): Based on vegetation mapping of bracken areas. Potential Species: Aspen, Bird Cherry, Blackthorn, Common Alder, Downy Birch, Willow Species, Hawthorn, Hazel, Holly, Rowan, Sessile Oak, Juniper.

Restricted Range of NBL (Native Broadleaves): Based on elevation, soils and terrain. Aspen, Common Alder, Downy Birch, Willow Species, Rowan, Juniper.

Very Restricted Range of NBL (Native Broadleaves): Based on elevation and soil depth (Rock). Downy Birch, Willow Species, Rowan, Juniper.

In landscape terms Native Woodland particularly in winter can lack diversity. Visual diversity can be increased by the transition from Oak to Birch and Rowan on the upper slopes, with species distribution reflecting landform. Aspen would play a key role in terms of landscape with its distinctive visual impact across the seasons. From many key viewpoints the rock outcrops with their inevitably sparse tree cover could become more distinctive features framed by the woodland.

It is anticipated that the woodland creation area would be minimal intervention protection forest. However monitoring of succession and species interactions may suggest interventions in the future as the forest matures to perhaps favour specific species, maintain site diversity or prevent excessive height growth to reduce the risk of windblow. For instance Oak is considered a key species in terms of the positive impacts from its deep rooting, but in the long term coppicing this species may be required in order to avoid the risk of windblow. The importance of oak as a part of the species mix is considered to outweigh any marginal impacts that may occur from planting large seeded broadleaves in the Grey Squirrel buffer zone.

The project area has the potential to provide a research resource in terms of the impacts of woodland creation on slope stability. The montane area above the proposed tree line is anticipated to develop a more resilient flora with the removal of grazing pressure, and these areas may well be suitable for the development of montane scrub, which again could benefit slope stability and ecology. The establishment of montane scrub woodland and associated research that could potentially guide methodology could have a wider application across Scotland. Montane treeline scrub has a very high ecological significance but is largely unrepresented in Scottish forests.

An expansion of the restricted range of many of the montane scrub species in the low alpine & subalpine zones could have considerable ecological advantages and increase the resilience of this scarce resource in Scotland. Montane scrub species include specialists and trees with a wide altitudinal ecocline. Specialists include a range of willow species (*Salix arbuscular*, *S*

lanata, *S lapponum*, *S myrsinifolia*, *S myrsinites*, *S phylicifolia*, *S reticulate*; Juniper (*Juniperus communis* spp communis & spp alpine; Dwarf Birch (*Betula nana*). More generalist species would include eared Willow, Downy Birch and Rowan may also be present. Given the nature of the existing seed source then establishment of the montane flora by planting would be best carried out as small trial plots and could provide useful information to inform other projects. The pre planting extended Phase 1 survey will seek to identify any of the above montane species on site as part of the baseline monitoring. The first 5 years post fencing may offer the best opportunity for identifying montane shrubs as current grazing levels are likely to have a strong suppressant effect.

Where slippages occur these areas will be replanted. Observation suggests that slippage areas can enjoy periods of relative stability post slippage, which can enable trees to establish themselves.

5.2 New planting – native and riparian woodland

The core project area has been chosen to target areas where landslips may affect the A83, but outwith this area slope stability is poor in many places with landslips being common. While the strategic importance of these areas is less there are still potentially adverse impacts on path routes, ATV routes (once built), HEP infrastructure, fence lines and water quality. Consequently a wider area of Native Woodland creation is proposed.

This wider area of Native Woodland creation will also deliver a range of ecological, aesthetic and landscape benefits, and will contribute to the Scottish Government's targets in relation to woodland creation.

The general approach in these areas will be similar to that adopted for the core project area, but because the impacts of landslips within these areas is less strategically onerous, then these areas will follow standard UKFS practice and guidance in relation to Native Woodland creation, with wet flushes on more stable areas left unplanted and so on.

The riparian areas are important to create ecological and landscape linkages that anchor any woodland creation and avoids the creation of isolated and out of scale blocks of woodland.

Along the south bank of the Croe Water there are areas of deeper soils which are a complex of organic and mineral elements derived from continuous soil movement down the slopes. These areas are well suited to broadleaved woodland and are nutrient rich but in many areas contain a high proportion of peat, but within a matrix of mineral soil. The complexity and dynamic nature (in geological terms) of these soils creates some difficulty in defining them and this may impact on if and how these areas are planted in relation to peat policy. A W4 type woodland phasing to W11 on these site would be the natural climax community. These areas are proposed for woodland creation at a later date, and the careful micro siting of tree species based on soils and peat distribution could be handled at the operational level.

5.3 Fencing

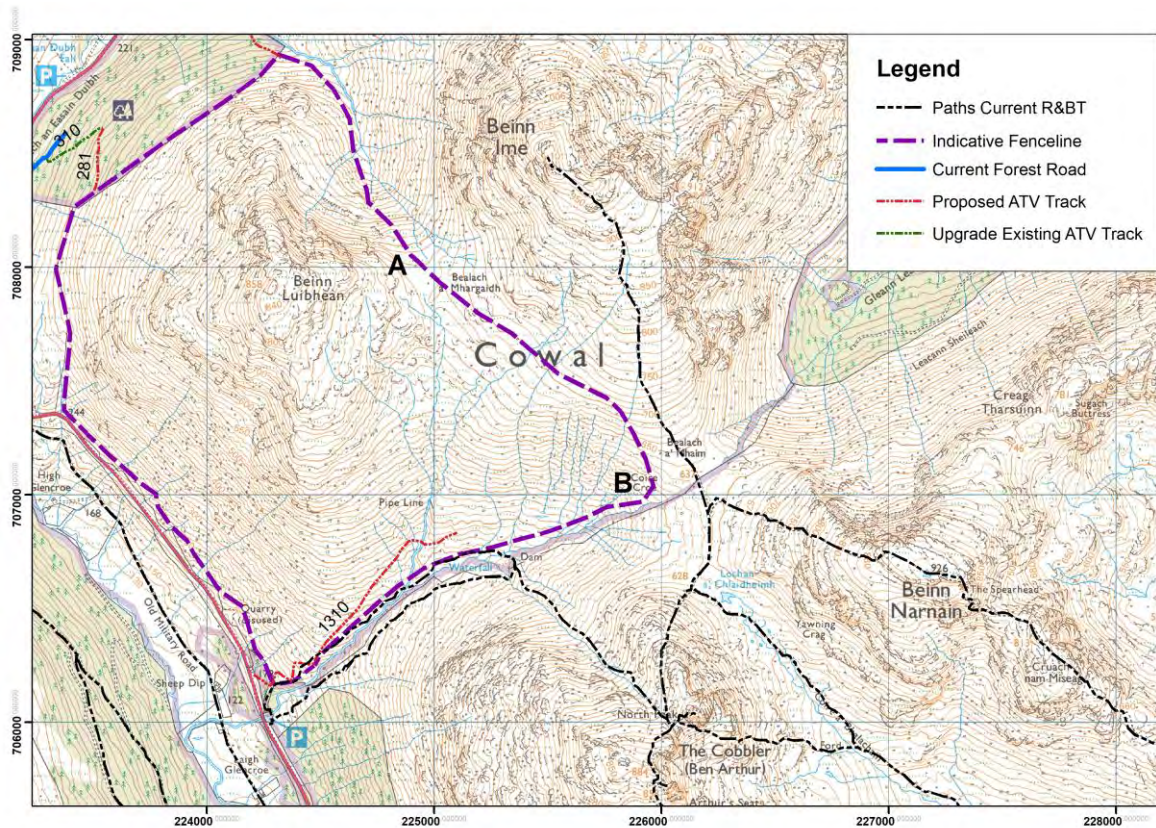
Deer fencing is essential for the success of the project, but it is also arguably the only proposed operation with potentially negative consequences for landscape and recreation.

Deer fencing has a direct visual impact by its presence, but it can also have a more significant impact over time by creating contrasting vegetation patterns and colours where grazing pressure on each side of the fence is very different. On the project area this more long term impact is likely to be greatly reduced because the surrounding area outwith the deer fence will only be lightly grazed by deer and growth rates at higher altitudes are much slower and this reduces the rate of change in vegetation pattern.

A number of fence options were considered, but the present option which takes in a wider area was considered the best option on balance. In relation to fencing off just the core project area, the practicalities of erecting and maintaining a deer fence across rock slabs at high elevations, and the landscape impacts of running fence lines along skylines and close to hill summits were considered to be detrimental. The proposed fence line has ecological benefits across a wider area by reducing grazing pressure and facilitates the development of a landscape scale and networked native woodland.

Interpretation boards to explain the purpose of the fence would play a key role in mitigating adverse aesthetic impacts for walkers.

Glen Croe, Rest & Be Thankful LMP 2019-2029



Map showing indicative fenceline.



The terrain at the head of the Croe Water reduces fence line options.

Fencing at high elevations is constrained by the need where possible to avoid gullies where drifting snow can both allow deer in over the fence and destroy fence sections on an annual basis. Rocks, rock outcrops and peat hags can all reduce the options available in terms of lines chosen.

The eastern section of the proposed fence line runs between the summits of Beinn Ime and Beinn Luibhean, and this section (A to B on above map) has potentially adverse impacts for walkers in terms of the wildness aesthetics. There is however an existing stock fence that crosses the coll at Bealach a Mhaim, so fences are already a familiar landscape feature.

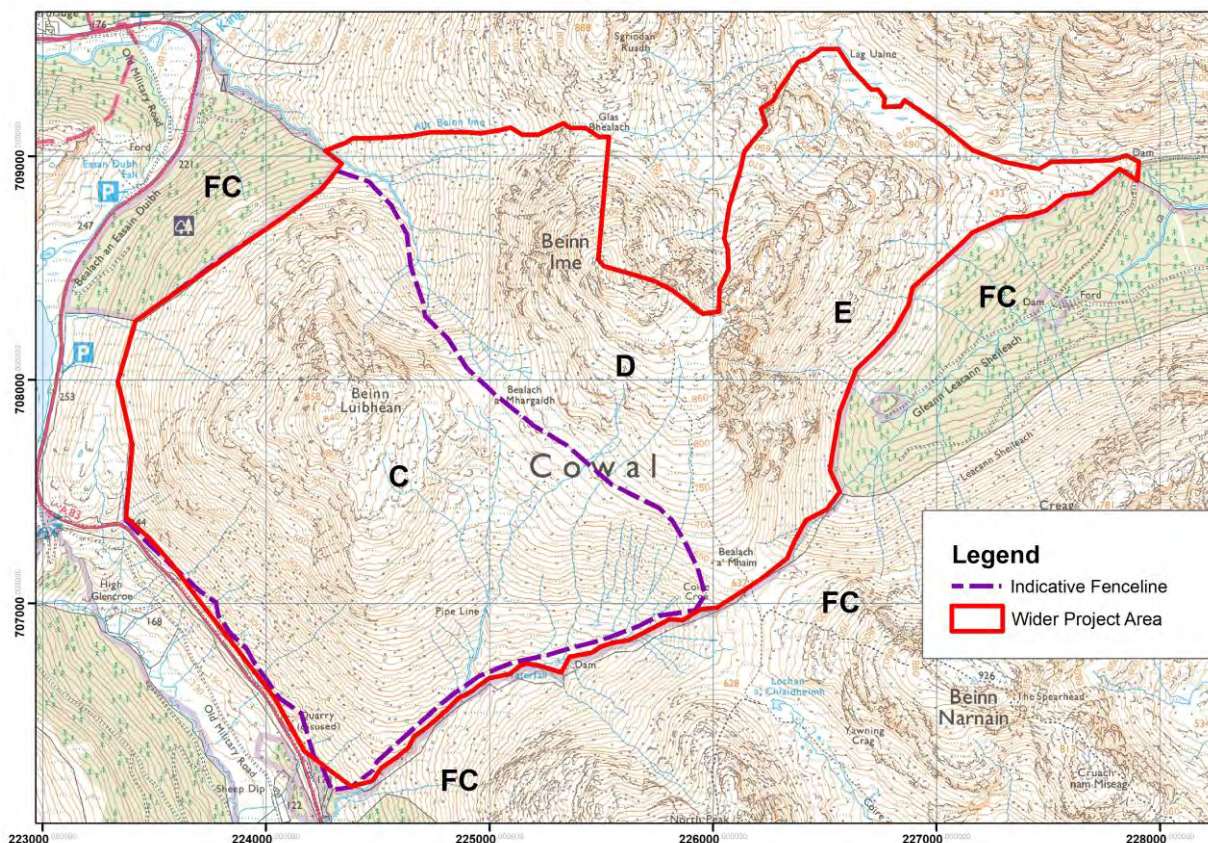
The terrain in this sensitive area is difficult in practical terms because on the approach to the coll from the west the ground is broken by a fan of deep gullies through which fence construction is impossible. This tends to push the fence line up the slope. Once on the easier ground at the top of the broken ground then the fence line becomes visible from the main Beinn Ime path, and the route to the coll between Beinn Luibhean and Beinn Ime (A on map above) is fairly featureless, so opportunities to use terrain to screen the fence are limited.

The precise layout of fences, gates, interpretation boards and access tracks has been considered via onsite consultation with both the National Park & Mountaineering Scotland. See Map M7 for details of gate location and fence layout.

The deer fence is proposed to be located above any catch fencing, and fencing will need to be repaired or replaced as slippages occur. It is anticipated that regeneration will develop between the deer fence and the A83 post stock removal as this marginal area will be unattractive to deer. The exact location of the deer fence in relation to the catch fencing will be determined in discussion with Transport Scotland prior to fence construction as site conditions may change.

Deer fence lines for the 2022/23 planting on the current National Forest Estate will be established prior to planting in consultation with the LLTNP.

5.4 Management of open land



Map showing open ground across wider project area.

The management of open ground outwith the woodland creation areas is an important consideration. As with most hill land the management of grazing by livestock and deer are amongst the most important factors to consider.

The wider project area shares a march with the current National Forest Estate (shown as FC on the above map) for much of its length with Butterbridge forest to the North and Glen Croe Forest to the south.

Glen Croe Forest (FC) takes in a considerable area of open ground which is managed with recreation as a priority. Deer management is also undertaken across the open hill and forest margin in Glen Croe & it is proposed to extend this management approach to the wider areas of open ground (Areas D & E on the above map). Glen Leacann is proposed for conversion to woodland with a strong Native element over time and area E on the above map represents a potential opportunity to expand this area of

proposed Native Woodland further up the slope to create a more natural upper margin over time.

The management and control of feral & marauding sheep is also a management issue that requires constant attention.

The removal of stock and deer culling are likely to result in wider environmental benefits across the unfenced open hill including the creation over time of a more diverse and robust ground flora. Regeneration of Native tree species could also be anticipated to occur in sheltered areas as suppressed tree regeneration, where the seed bank and wind borne seeds have the opportunity to develop. While much of the area is at high altitude, Sitka Spruce (SS) regeneration should be monitored across the area. Regeneration of SS at high altitude across the current FC holding is not significant at present.

Area C on the above map lies within the proposed deer fence and it is anticipated that this area will develop a more robust and diverse native flora with scattered Native Broadleaved regeneration. Management of these areas would consist of fence maintenance, deer control and the monitoring of SS regeneration.

As mentioned previously this fenced area offers the potential to trial the regeneration of treeline montane scrub and could form a useful research area.

5.5 Deer management

Deer management is considered in Appendix 3.

The area falls within the Inveraray & Tyndrum Deer Management Group area, and Forest Enterprise Scotland is an active participant in the group. The group members are aware of the proposal and no issues have been raised.

Deer numbers on the site are not currently high, probably due to control, the proximity of shelter in adjacent woodland, high recreational use and full use of the site by livestock.

Impacts on the Beinn an Lochain SSSI to the west are anticipated to be negligible or positive.

As discussed above deer management will largely be an extension of existing control carried out within the Forest Enterprise Scotland Glen Croe Forest area. Access tracks required to facilitate woodland creation will also aid deer control across the open hill.

Within the fenced area all deer will be culled during the establishment period. Target populations here will be reviewed post forest establishment.

5.6 Critical success factors

Stock Removal

This will reduce adverse soil impacts, improve the vigour & diversity of the ground flora and enable tree establishment to occur.

While the removal of stock has the potential to deliver the above benefits in a very short space of time, in practical terms planting close on behind the moment the sheep and cattle come off, will aid hand planting and screefing as rank vegetation can create problems and slow establishment.

Tree Protection

Broadleaved trees are very vulnerable to browsing and require full protection in order to establish successfully. Browsing can also slow establishment as well as killing trees. Given the desirability of achieving rapid establishment at the target densities then deer fencing is an absolutely essential element.

Because the area will be hand planted without mechanical ground preparation, then establishment may take longer than would normally be the case on a site with this level of fertility. Protection is therefore vital.

The intention is to take the planting on the core project area as high up the hill as possible to improve slope stability. In these challenging environments the establishment period will be prolonged and protection will be vital.

The lack of mechanised ground preparation (mounding) and the current vegetation type suggests that vole damage could be an issue, particularly over a prolonged establishment period. Vole impacts should be monitored and beating up, spot spraying of herbicide & vole guards are potential remedies.

By its nature the planting site is vulnerable to landslips. These tend not to be progressive but occur sporadically across the unstable area. Replacing lost trees on landslip areas that occur post planting will be an essential operation to consider. Once the trees become established then many species to be used in the planting are adapted to these unstable areas and have the potential to re-establish themselves when partially buried.

The right tree in the right place.

Correct species choice will aid rapid establishment and reduce costs. It will also facilitate the restoration of an appropriate woodland for the site in ecological terms, and further create a woodland that is self sustaining.

While the site is not a productive woodland, good growth is required to achieve slope stabilisation rapidly. Choice of tree provenance is important. Research indicates that as a possible impact of climate change the provenances currently best suited to a site are located around 120 miles to the south, however a further complication on this site is that the site conditions change dramatically over a short distance due to the length and steepness of the slope. Where available different provenances of the same species may be appropriate at the bottom of the slope vs the upper margin.

Tree planters and site managers need the discretion to plant the correct tree in the correct place at the microsite level, so overly prescriptive species guidance is inappropriate.

Access for operations & monitoring

Low key but safe and adequate access is an essential element of the proposal. Ongoing research and monitoring may require higher levels of access than the first stage establishment operations.

It is essential that any access tracks do not create any potential slope instability that might impact on the A83. Landscaping of tracks is desirable to limit adverse impacts.

Complementing hard engineering options.

Fence lines and planting operations need to be coordinated with the hard engineering options and slope monitoring to avoid any adverse impacts on these essential structures/operations. Screening of debris nets could be achieved to some extent by tree planting or natural regeneration, but with the proviso of no adverse impacts.

Recreation and Landscape

Evaluate planting design proposals in landscape terms, link planting and species to natural site features. Seek to minimise fence line impacts where possible. Ensure adequate/generous provision of gates to provide the minimum obstruction to walking routes.

The 'dramatic' mountain pass through Glen Croe to the Rest and Be Thankful viewpoint, and the perceived relative naturalness of the area could be enhanced by the establishment of semi-**natural woodland**. **The 'framing' of the view created** by the landform would not be compromised by woodland. Poorly located fencing would compromise the perception of relative wildness, identified as being at its most sensitive on the upper hill tops and hinterland summits of Beinn Luibhan, Beinn Ime and the Cobbler.