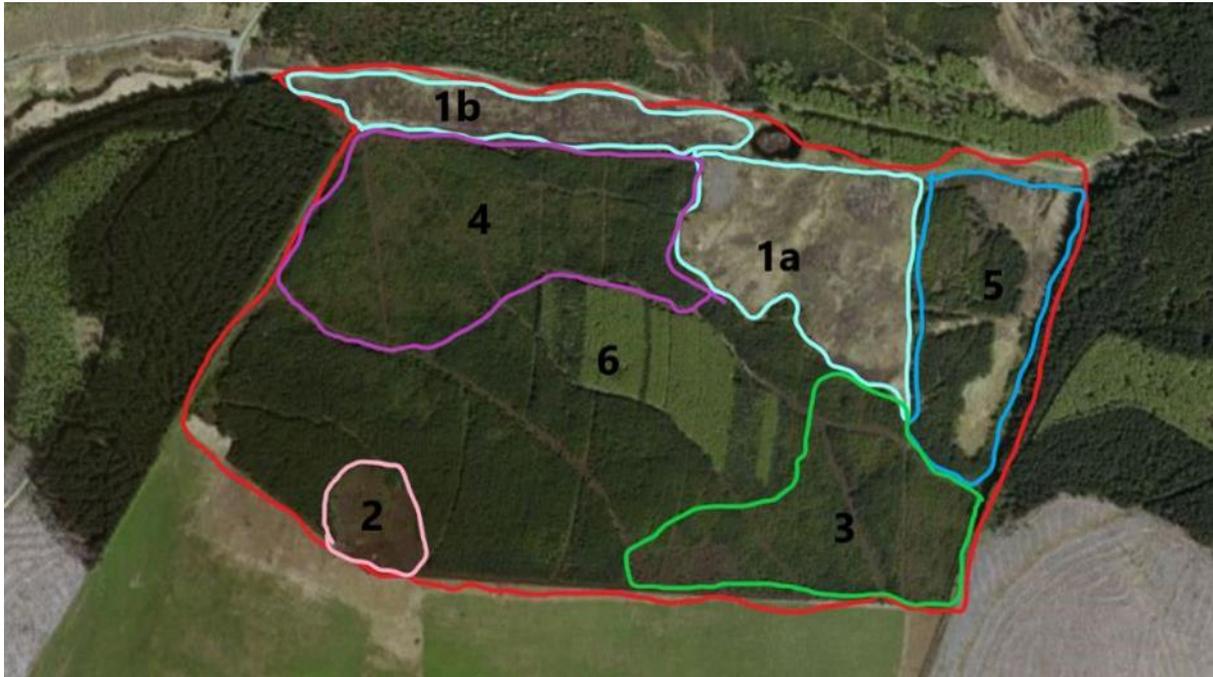


Knockandy Hill

Mulching and Rewetting



Compartment Map

Specification and Methods

The following specifications and methods are those generally practiced for peatland restoration on the National Estate, however methods and specifications may be amended or developed for any individual site and if this is the case details will be given in mini competition specifications.

General

- **Mechanical Mulching**

The purpose of this treatment is to mulch unharvestable or failed crops and natural regeneration that cannot be harvested by conventional means, such that it is reduced to fragmented material that functions as an impediment to drainage or evaporation, as a growing medium for early colonisation by sphagnum moss species and as an impediment to sward vigour. The aim is to create a level ground profile similar to active bog surfaces.

All woody vegetation whether actively growing, dead or dormant is to be reduced to ground level leaving a clean and open site. Vegetation includes all tree species (both broadleaf and conifer), and native & exotic weeds. Material is to be spread evenly over site, not in piles, with no large woody debris being left following the operation. If brash mats are required for access to the site these must be mulched as part of the completion of the operation.

All trees (other than any of those specifically identified by FC) will be mulched by low ground pressure excavator (on Peatland) based rotary mulching head equipped with fixed teeth. All mulching will be to a level that will successfully prevent regrowth of trees, to below the lowest living whorl of branches with all stumps mulched down to the level of the original peat surface. Where indicated

by FC the organic plough ridge or associated growth will also be mulched to disperse material into plough furrows.

Where permitted by FC larger stems (total height of 8m or otherwise agreed) may be mulched into plough furrows and all further branches and tops will then be mulched over the top of that material to cover it.

All debris to be kept clear from all natural watercourses and roadside drains in compliance with Forest and Water Guidelines (5th Ed.) All 'in forest' drains to be kept clear of debris unless agreed with FWM prior to commencement of operation.

Specific to Mulching Knockandy Hill Compartments 1a, 1b, and 2

Description Compartment 1a (4.2ha)

This Compartment consists of dry bog prepared for forestry, separated by 4 drains (50 to 60cm wide). Around the drained areas are wetter areas of fen which require minor intervention. In the North West of the compartment is an area of brash from previous felling.



Key areas of bog (purple) requiring surface smoothing and blocking of previously ploughed areas. These areas approximate to 1.2 ha and 3.0 ha. Ditch blocking shown in blue. Mulching within the red lines.



Compartment 1 Overview



Compartment 1a: Consists of very diffuse Sitka Spruce and Birch

- Mulch all trees in the area with the exception of willows. The organic plough ridge or associated growth around the stump will also be mulched to disperse material into plough furrows
- During tracking between trees, use the opportunity to mulch any dead stumps or grassy tussocks.
- Mulch brash and stumps in north west of Compartment. (0.3ha)



Brush in NW of Compartment 1a

Description Compartment 1b (4.6ha)

This compartment lies in the valley bottom and gently slopes to the south-east and drains into the constructed pond. The area has been previously planted with conifers and the remnant trunks and regeneration suggest they were felled some 12 to 15 years ago. The tree regeneration is mainly Sitka spruce, with a few lodgepole pine and rowan interspersed. The ground vegetation is dry heath dominated by heather (*Calluna vulgaris*) with Hypnoid and mat forming mosses. Sphagnum occurs in the bottom of the deeper ditches and where drainage is impeded. The soils of the area comprise of peat, peaty gleys and podzol. The organic horizon (Peat) is highly variable and very disturbed due to the forestry ploughing and ranges from 15 cm to 30cm. Ground conditions; dry



Compartment 1b consists of diffuse Sitka Spruce 3 m to 6 metres high



Compartment 1b Trees in foreground to be mulched.



Trees to right of photo for mulching (Density 125 to 200 stems per ha)

Compartment 1b: Variable diffuse Sitka Spruce regeneration

- Mulch all trees in the area with the exception of willows and rowan. The organic plough ridge or associated growth will also be mulched to disperse material into plough furrows
- During tracking between trees, use the opportunity to mulch any dead stumps or grassy tussocks.

Compartment 2 1.5ha

Description

Compartment 2 is an area of dry heath at the summit of Knockandy Hill, colonised by mainly stunted Sitka spruce regeneration. The area was not previously prepared for tree planting, so the surface remains in original condition. The peat on this part of the hill is very thin often only 10 cm deep. Ground conditions: Very dry. Trees diffuse and stunted 0.5m to 4m.





Diffuse regeneration at the summit of Knockandy Hill

- There are no forest drains so mulch to ground level.

Specifications and Methods: Rewetting

The following specifications and methods are those generally practiced for mire restoration on the National Estate, however methods and specifications may be amended or developed for any individual site and if this is the case details will be given in mini competition specifications.

Drain Blocking

The purpose of drain blocking operations is to reduce surface and ground water flow and flow energy and to retain the maximum amount of ground and surface water on site. An additional aim is to redistribute that water more evenly across the site by way of cut offlets running onto adjacent furrows and surfaces. Main drains and cross drains will be filled in systematically using peat dams.

Each drain will be blocked by creating a large peat dam at intervals that equate to a 25 cm drop in height but no greater than ten metres apart. Three pile dams at five metre centres must be created at the exit end of the drains, to act as sediment traps to prevent siltation of watercourses.

The drains will be blocked from the highest point working down slope. This will minimise the quantity of water in lower sections of the drain.

The material to form the blockage should be taken from the up-hill side of the drain, local "borrow pits" can be created but should be kept as small as possible, shallow and on flat ground for maximum water retention for the benefit of wading birds. They should be randomly located, not in a line as this can form a new drain. Surface vegetation can be removed, wet peat used and the vegetation placed back in the original position.

All dams should have un-oxidised peat built to a height 100mm above the original soil surface and then be capped with a further 200mm vegetated turf, or intact plough-throw material to reduce the impact of trampling by deer on the dam integrity. Peat is to be borrowed ideally from the original peat surface between the plough throws, but if this is likely to jeopardise other borrow pits or newly-created dams, or be composed of partly dried (oxidised) peat, it is permissible to take the peat from an adjacent ridge. Surface turves, timber, brash, stumps and oxidised dry peat must not be included within the peat dam structure.

To comply with Water Guidelines and SEPA Controlled Activities Regulation, the contractor will provide and transport temporary water course crossings at their expense.

Furrow Blocking

Where the original pattern of plough furrows and ridges are visible and furrows are still carrying water from site it will be necessary to block these furrows using peat dams. The purpose of this operation is to reduce surface and ground water flow and flow energy across the site and to retain ground and surface water in a more evenly distributed pattern across the site.

Furrow dams will be created at intervals of no greater than 20 metre centres along the length of the furrows with the vertical drop between dams no greater than 30 centimetres unless agreed on site with FC. Dams will be created in a staggered pattern to vary flow of water across the site so that no more than five adjacent

furrows will be blocked before moving ten metres up the furrows to block the next row of furrows.

Furrows will be blocked by excavating to un-oxidised peat and pulling a wave of peat up the furrow until this is level with the original ground level (not the height of the ridge). Where plough ridges can simultaneously be knocked into the furrows around the dams this will be done. The depth of this excavation must be sufficient to include un-oxidised (wet) peat and disturb any peat cracking within the furrow. Stumps, brash and surface turves must not be included in the dam structure.

Ground Smoothing

The aim of this operation is to create a level ground profile similar to intact mire surfaces, reducing the variation created by forestry ground preparation techniques and to rapidly increase and consolidate the water table by virtually eliminating surface and ground water flow associated with any artificial modification or drainage feature. An additional benefit will be that the surface is more suitable for rapid vegetation regeneration.

This method will also treat tree regeneration by flipping it upside down and burying it beneath the peat surface entirely such that it will not regrow.

The technique involves using the excavator to travel along furrows; a toothed bucket is then used to flip any stumps and regeneration sideways into the adjacent furrow before cross-tracking the furrow, with the aim of levelling the ridged ground. This will flatten the whole surface, bringing the water table and surface peat up to the surface right across the site. The excavator will use its tracks and where necessary bucket to crush down the remaining brash into the furrow bottoms, pressing it below the original bog surface to help fill the void of the furrow. This will help to create a flatter, more natural peatland landscape. It is however considered important that no damage is done to the underlying peat structure during the operations so ground pressure has to be sufficient to flatten the ridge down by around 100mm. It is intended that reducing the brash height will have the additional benefit of allowing native plants to recover and where possible sphagnum vegetation can be spread in wetter hollows from adjacent areas to speed this process up.

Specific to rewetting Knockandy Hill Compartments 1a and 1b.



Key areas of bog (purple) requiring surface smoothing and blocking of previously ploughed areas. These areas approximate to 1.2 ha and 3.0 ha. Ditch blocking shown in blue. Potential areas of furrow eradication within the red lines. The main ditches are 1 to 2 m wide.



Lower end of main ditch

- A combination of furrow blocking and surface smoothing is required. In some cases, it will be sufficient to just drive the excavator over tussocks to compact and smooth the surface.
- Where the forest furrow is pronounced, the ridge will be pushed into the furrow. To reduce the continued water flow through the furrow, create a sub surface peat dam at intervals of 20 metres.
- Wider defined ditches (Blue on map 450m) will require peat dams and movement of the spoil into the ditch. As the site is mainly level, where appropriate dams can extend to 20 m apart, if this still equates to a 25cm drop in height.
- The two ditches flowing to the North East and directly entering the Malsach Burn require three pile dams (timber or plastic) at five

metre centres at the exit end of the drains, to act as sediment traps to prevent siltation of watercourses. These should be installed at an early stage of working.

- In addition, minor works/modifications to flows will be required, where accessible, outwith the red line. These will be done as and when required.