

Management Options for Portmoak Moss



Oblique aerial view looking eastwards with Portmoak Moss in the centre and Kilmagad Wood beyond

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A report for Portmoak Community Woodland Group

by

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Summary

Background

Portmoak Moss is a 43ha remnant of a much more extensive raised bog and fen wetland complex which once covered around 300ha before land drainage and peat cutting reduced it to its present size. The core of the site, a raised bog, is surrounded by mixed woodland and conifer plantation. The raised bog stores around 57,000 tonnes of carbon, equivalent to the annual carbon footprint of 47,000 people. Portmoak Moss is owned by the Woodland Trust Scotland and managed jointly by the Trust and Portmoak Community Woodland Steering Group (PCWSG). This report was commissioned by PCWSG to inform discussion both within the local community and with the Woodland Trust about the future management of the Moss.

The study considered four scenarios for the future of the Moss: abandoning all management, maintaining a similar level of management as present, a significant increase in effort and expenditure and finally a 'big vision' in which major ecological restoration and increased use of the site would take place.

Main Findings

Peatland management

Extensive tree removal, drain blocking and removal of tree regeneration along with more recent surface mulching has made significant progress to restoring the hydrology and vegetation cover of the raised bog. If left un-managed, Scots pine and birch will re-establish on all but the wettest parts of the bog surface. The vertical bare peat face on two sides of the raised bog, desiccation cracking into the peat mass and remaining mature woodland all continues to cause the peat mass to dry out.

Re-profiling of the bare peat faces will help to further raise water levels within the moss, heal desiccation cracking and allow the creation of a marginal lagg fen wetland around the raised bog which, in turn, will help to control flooding and create new wetland habitat. Mature pine and birch still cover significant areas of the main peat mass and if left in place will continue to dry and crack the peat. New wetlands with areas of open water, swamp and fen could be created in parts of the site, particularly the south-east corner. Stock grazing could be re-instated on the site as a habitat management tool.

Woodland Management

The main tree species on the site are native Scots pine and birch along with a range of non-native conifers growing on a combination of poorly drained soils, including deep peat. Conifers planted in the early 1960s on 1 to 2 metres peat depth are unstable and have been affected by windblow, increasing the vulnerability of these un-thinned plantations to large scale wind damage in the coming years. A significant area of birch and Scots pine regeneration remains on part of the bog surface cleared of mature trees along with woodland on deep peat which was not included in the original clearance. Large areas of the conifer plantations have reached their economic maturity. A 'big vision' of 'the Right Tree in the Right Place' is set out, including a restored tree-free peat

dome and surrounding fen with diverse native woodland located in areas which complement and contribute to the biodiversity of the wider area.

Access and Path Network

The main path system is well used and currently maintained by the Woodland Trust. Existing paths are also used by cyclists and sporadically by horses and this causes occasional problems. One of the most important issues is the lack of disabled access beyond the first 200 metres from the main eastern entrance. Ramps could be installed to replace the three sets of steps to allow all abilities access to the raised bog and main circular path. A boardwalk, constructed across the raised bog to replace the existing aggregate path, will bring access and peatland hydrology improvements. The minor path which runs along the base of the eastern peat face, currently blocked by wind-blown trees could be re-opened.

Site Interpretation

At present site interpretation at Portmoak is through two identical panels on the raised bog surface adjacent to the main path along with wooden site signs at two main entrances to the site as well as Woodland Trust welcome and safety information. At the community consultation there was support for a planned approach to interpretation and a wish that a “clutter” of too many panels and signs should be avoided in such a wild place. Restricting interpretation mainly to a central location on the raised bog surface is recommended with potential for a more subtle interpretation trail along minor paths, a viewing tower and a ‘window into time’ retained on the re-profiled peat face.

Community Engagement

PCWSG and the Woodland Trust have built a strong and effective partnership together to develop community participation at Portmoak Moss. To further develop this, the most immediate priority is building a wider base of community understanding and support for management of the Moss, particularly peatland restoration and woodland restructuring. The second stage is to build community involvement in the site and its restoration across age groups and generations. PCWSG and Woodland Trust staff have limited time to devote to achieve this. Developing a small project which employs a community officer with specialist community engagement skills is recommended.

Conclusion

The report concludes that a ‘big vision’ for the site comprising major peatland and wetland restoration, transformation of the woodlands to native species combined with access and interpretation improvements as well as enhanced community participation is feasible both technically and in terms of funding given sufficient support and backing.

Annexes to the report contain detailed specifications and costings for access improvements, peatland management and interpretation as well as guidance on likely sources of funding for site management.

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Introduction

Portmoak Moss is woodland and raised bog peatland close to Scotlandwell, Kinross-shire. This 43 hectare site is owned by The Woodland Trust, and managed in conjunction with the Portmoak Community Woodland Steering Group (PCWSG). About 31.6 ha of the site is woodland growing on peat and peat-based soils of a range of depths and 11.4ha is open bog and heathland vegetation on deep peat.

Since acquiring the site in 1996, the Woodland Trust has carried out an extensive programme of tree removal and drain blocking to restore the peatland vegetation and hydrology. In 2013 and 2014 Scottish Natural Heritage funded additional work through the Peatland Action Programme to restore the lowland raised peat bog section of the site including drain blocking, the removal of birch regeneration, surface mulching and a peatland stability/hydrology report.



Main area of peatland taken from the NE, December 2014

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The WT produces management plans for the Portmoak Moss every five years. The current plan is due for review during 2015 with the new plan to be implemented in 2016.

The Portmoak Community Woodland Steering Group considers that the management strategy for the Moss is at a cross roads:

- Can the hydrological integrity of the moss continue to be restored to a point at which active accumulation of peat is re-started and tree regeneration reduced to zero or very low levels?
- Will birch and pine regeneration be a continuing threat to the restoration work and an ongoing cost for years to come?
- Is re-profiling of the peat edge and creation of lagg fen technically feasible and fundable?
- How can the woodlands, especially the aging conifer plantations be re-structured and replaced with native species?
- Can new habitats be created on site and how will the interests of different species groups feature in management decisions?
- Can community enjoyment of Portmoak Moss be enhanced and participation in its management taken to a new level?

The aim of this report is to develop, describe and where possible provide outline costs for a range of management options for the raised bog and the surrounding woodland to inform both the Portmoak Community Woodland Steering Group and the Woodland Trust in the process which will see the development of a new management plan.

The overarching objective of the study is to help secure the long-term sustainability of the raised peat bog and immediate surrounding area including economically viable access for all abilities.

Methodology

The study team was composed of three members with ecological, woodland management and access skills.

The study drew on a range of advice (published or online) as well as previous reports and plans for Portmoak Moss, the most important amongst these being:

- Boginar: Report of the 16 November 2012 seminar on the future of Portmoak Moss
- Mouchel 2013. Portmoak Moss : Investigation into peat stability, management, and appropriate methods to stabilise peat faces, Scottish Natural Heritage Commissioned Report
- Portmoak Moss Management Plan 2011-2016, Woodland Trust

Several field survey visits were made to the Moss including one with Gary Bolton the Woodland Trust Site Manager for Portmoak Moss.

A range of key experts and specialists (listed in the Acknowledgement section) were consulted for ideas and advice either by phone, email or in person.

A community consultation event was held at Scotlandwell on 5 December 2014. This was well attended by a range of Community Councillors, local residents and landowners. One of the study team (Robin Payne) gave a series of informal presentations on the options for managing peatland, woodland and access. Members of the Portmoak Community Woodland Steering Group also drew views and comments from attendees.

The Four Management Options

This study has investigated four potential scenarios for the future of Portmoak Moss

1) Do Nothing

This is the minimal option. If no money was spent, no management work was undertaken, leaving the land to revert to whatever happens naturally how would Portmoak Moss change over the coming years?

2) Preservation of the status quo

If Portmoak Moss were to be maintained to keep it looking just like it is today, what would be the ongoing maintenance work and costs over the coming years.

3) Slow but significant progress

A 'Slow and Steady Progress' option reflecting the minimum required to continue the work restoring the moss and maintaining access and community use over the next ten years. This would be a higher degree of activity than the present (and possibly the future) Woodland Trust Management Plans would specify and fund, but would be a smaller project and less ambitious vision than option 4.

4) A bold and ambitious approach

The 'Big Vision' option, painted against a 50 year vision for the future of Portmoak Moss. This will be an exciting, ambitious, challenging and exemplary project to protect, restore and develop the moss as an active carbon store, living wetland, native woodland and community resource.

Peatland Management

The raised bog we see today is what remains of a much larger peatland which included raised bog, fen and swamp habitats formed over several thousand years. In the late 1700s the original wetland was largely intact. The map of 1796 shows a triangular heath-covered peatland (the raised bog) extending from the location of the present day Grahamstone Farm across to Scotlandwell and down to Lochend.



John Bell, The County of Kinross, 1796 (detail) - Reproduced with the permission of the National Library of Scotland

To the east of the road between Scotlandwell and Lochend ('the Causeway', the name itself giving a strong clue to a deep wetland) an extensive area of swamp and open water is mapped extending to beyond East Bowhouse.



Greenwood, Fowler and Sharp, Map of the Counties of Fife and Kinross, 1828 (detail) - Reproduced with the permission of the National Library of Scotland

Just 32 years later, the map of 1828 shows an area transformed by land improvement and drainage with the swamp and fen to the east of the Causeway replaced by fields and a reduced area of raised bog west of the Causeway. Pumping mills and major drains give further clues to the engineering works taking place. By the time the 1895 Ordnance Survey 25" map was published the raised bog was further reduced by peat cutting and drainage to the size we see today, with some of the woodland around margins of the deep peat and a section of plantation on the deep peat itself. An air photo from 1950 <http://maps.nls.uk/view/75220086> shows a similar layout with heathland covering any areas cut out for peat which hadn't developed into woodland.



Portmoak Moss as it looks today with the extent of Woodland Trust ownership (red), area of deep peat (purple) and principal drainage (blue) indicated. Reproduced from the 2012 Commissioned Report with the permission of Scottish Natural Heritage.

Peatland Management Actions

The 2012 SNH Commissioned Report (Mouchel) reports on a detailed investigation of the raised bog, particularly the size and depth of the peat mass, its hydrology, vegetation and the stability of the vertical faces on the west and east sides. The 2012 Report also includes detailed technical information on possible management actions for the peatland. This section of this report summarises the most important conclusions of the 2012 Report and also includes wider advice and up to date information of peatland management obtained from a number of sources.

a) Surface Mulching

Surface mulching to flatten the ridges created by the deep ploughing which preceded afforestation of the raised bog was carried out over most of the peat dome in August 2014. One area, part of Compartment 3c to the south of the main path crossing the peat dome wasn't covered by this operation and mulching of this area, once tree regeneration has been cleared, is a priority. So far, the surface mulching appears to be working well and creating a wetter more even surface to the bog but long term monitoring, especially over a dry summer will reveal its impact more accurately.



Flattened bog surface following mulching in the north-west corner of the Moss

b) Drain blocking and Dams

Following the recent surface mulching work it may not be necessary to add to the extensive set of dams already in place until further monitoring has taken place. Other management actions such as re-profiling (see below) will involve excavating large volumes of peat, some of which can be used to infill adjacent drains and accelerate healing of the bog surface. Open drains currently provide habitat for dragonfly and damselfly species. On the whole these are mobile species and most will colonise newly created water bodies. Some sections of open drains could be retained as habitat for those species which require the most acid, nutrient poor water.



Sphagnum moss

c) Removal of tree regeneration from the bog surface

Following the removal of regeneration and surface mulching the main area of the peat dome is now relatively free of young trees. Despite the surface mulching and a rising water level it remains very likely that further clearance of regeneration will be required. There is extensive birch and pine regeneration in part of Compartment 3c to the south of the main path crossing the peat dome, removal of this is a priority.

d) Mature tree removal from the bog surface

Sizeable areas of mature woodland remain on the deep peat of the western edge of the raised bog, mainly in Compartments 5a, 5b, 5c and 6a. To remove the bulk of these trees, and thus complete the work originally carried out by the Woodland Trust to clear the plantations from the core area of the raised bog, will be expensive and technically challenging. If this work isn't undertaken these trees will continue to dry this edge of the bog causing further desiccation cracks to develop and depression of the water table. Many of these are attractive Scots pines; those who visit and enjoy the site will need to be convinced of the purpose of their removal.



Vertical and slumped bare peat face on the eastern side of Portmoak Moss

e) Re-profiling the vertical peat faces

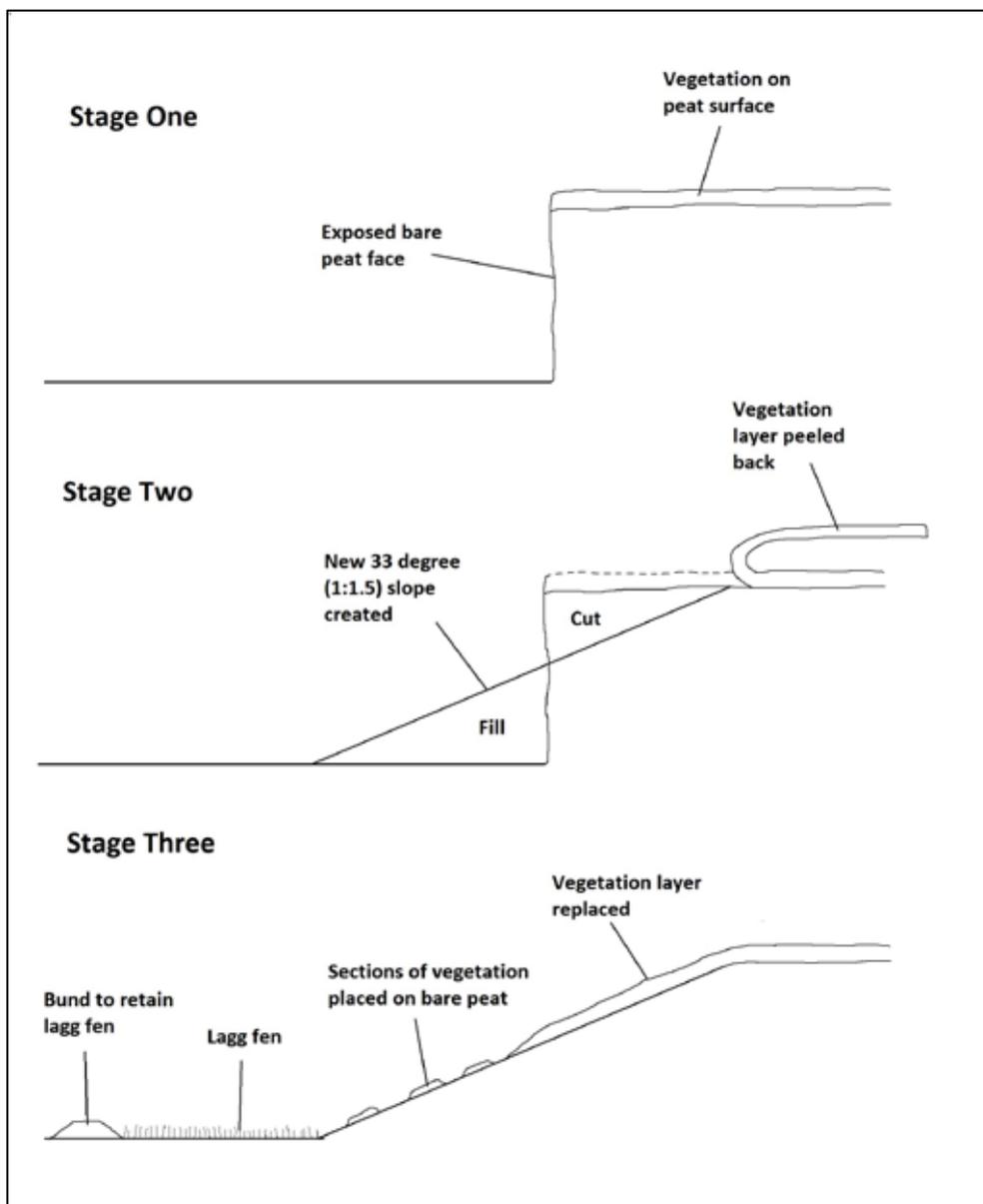
The vertical bare peat faces on the west and east sides of the raised bog are a relic of centuries of peat cutting. In places these faces have slumped and tension cracks suggest further slumping will take place. Desiccation cracks and general seepage have depressed the water table within the peat mass along these faces.

Re-profiling these faces to a gentler slope and re-vegetating the bare peat will have multiple benefits including:

- greatly increased stability,
- eradication of some of the tension and desiccation cracks,
- a higher water table at the edge of the peat dome will encourage growth of more typical plant and discourage tree regeneration and,
- a gentle slope created will form the base for a new all abilities access path ramp to gain access onto the bog surface.

Re-profiling work will require a significant budget and should first be attempted on a trial/experimental basis to determine the best methods and accurately cost the work. The trial area should be the section of eastern peat face to the south of the steps which take the main path onto the bog surface as:

- this is accessible for plant and machinery,
- has the longest section of vertical face at risk of slumping,
- can easily be viewed for demonstration purposes,
- would remove windblown trees currently blocking a path route,
- the work could be combined with ramp creation to replace the steps,
- there is plenty of space (if the plantation is felled) to create a lagg fen and,
- the lower ground surface in this area appears to already be quite wet and has greater potential for lagg fen creation.



Re-profiling and lagg fen creation (not to scale)

Ideally, once the trial is found to be successful, the entire eastern and western faces would also be re-profiled.

f) Lagg fen creation

As raised bogs develop a strip of fen wetland forms around their margins. In this area, water coming from the soil and rock carries minerals and nutrients creating a different vegetation type to the rainwater-fed raised bog. The lagg fen acts as a water storage area when rainwater floods off the dome surface and helps to maintain water levels around the edge of the dome. The lagg fen at Portmoak was lost when peat cutting started but restoring this feature, at the same time as re-profiling the peat edge, will restore those hydrological functions and create valuable new wetland habitat for plants and invertebrates.

Peat material excavated as part of the re-profiling can be used to create a bund at the toe of the slope as shown in the diagram above. The lagg fen will develop in the area between the bund and the base of the re-profiled slope. An additional benefit of lagg fen creation is that the bund can be adapted as a path base. Lagg fen creation at the base of a re-profiled western face will be more challenging as there is less space here, especially where the peat dome comes close to boundary of the Woodland Trust landholding.

g) Tree felling on faces

Mature trees growing adjacent to the vertical peat faces were not felled when the dome of the raised bog was cleared, mainly due to concerns about de-stabilising the peat edge. Trees remain on the edge of the peat dome above the peat face, at the base of the face and on the slumped peat. The 2012 Report states:

“On balance it is considered that if the budget is available the felling of the trees on the western face could be undertaken cautiously without significantly increasing the risk of instability. It is recommended, however, that this is done gradually, with a short section cleared initially and monitored closely to determine the impact on bank stability, before proceeding to fell the entire face.”

Trial tree-removal should take place at a location away from the path network such as the northern section of the western peat face.

h) Monitoring

Water table monitoring using dip wells has demonstrated that water levels on the raised bog have been rising and that tree removal and dam blocking has been successful. Most dip wells were removed before the mulching work was undertaken and it is a priority to re-instate these and consider increasing the extent of the dip well network to better understand the draw-down of the water table around the

margins of the raised bog and to monitor any future new peatland management actions e.g. re-profiling.

i) Creation of open waters and marginal wetlands

There is considerable potential to create a range of open water and wetland features in areas of the Portmoak Moss landholding surrounding the raised bog, particularly to the south-east. High water tables exist in areas of the conifer plantation (Compartment 2a) and the birch woodland (Compartment 1b). Excavating here to the correct depth profiles would create open water bodies with swamp and fen margins. These new habitats would attract a range of new plant and animal species including dragonflies, damselflies and water birds. Excavated peat material could be used for other management actions such as filling in drains.



Compartment 1b – possible site for new open water and wetland habitats © John Williams

j) Grazing

At the community consultation event in Scotlandwell some interest was expressed in the potential for grazing the raised bog and surrounding areas as a management tool. It is likely that the raised bog and the heather dominated heathland which surrounded it were grazed for at least part of the year up until the time the bog was afforested. Historically, lowland raised bogs were grazed in this way (with both sheep and cattle) to remove stock from hay or other winter fodder fields during the summer or to keep higher quality grazing or fodder for the better stock with other relatively unproductive animals (dry cows and cast ewes) turned out onto the bog during the summer months or even for the whole year. Loss of stock through ‘bogging’,

drowning in ditches and mires, was a constant problem and required herding of the stock, removal during wet weather, bridging of ditches and fencing.

Grazing of raised bogs and the surrounding habitats can be used to control scrub and create an open vegetation structure to allow development of diverse plant communities. At Portmoak, grazing could become an important tool to maintain the open structure of the margins of the Moss, particularly if re-profiling and lagg fen creation takes place, as well as keeping other open habitats (heathland and grassland) free of scrub and tree regeneration. Obtaining the correct breed of stock and fencing them within the grazing areas, along with the welfare and health of the stock are challenges to be overcome to achieve effective grazing but there are examples across Scotland (e.g. Flanders Moss) and more widely to learn from.



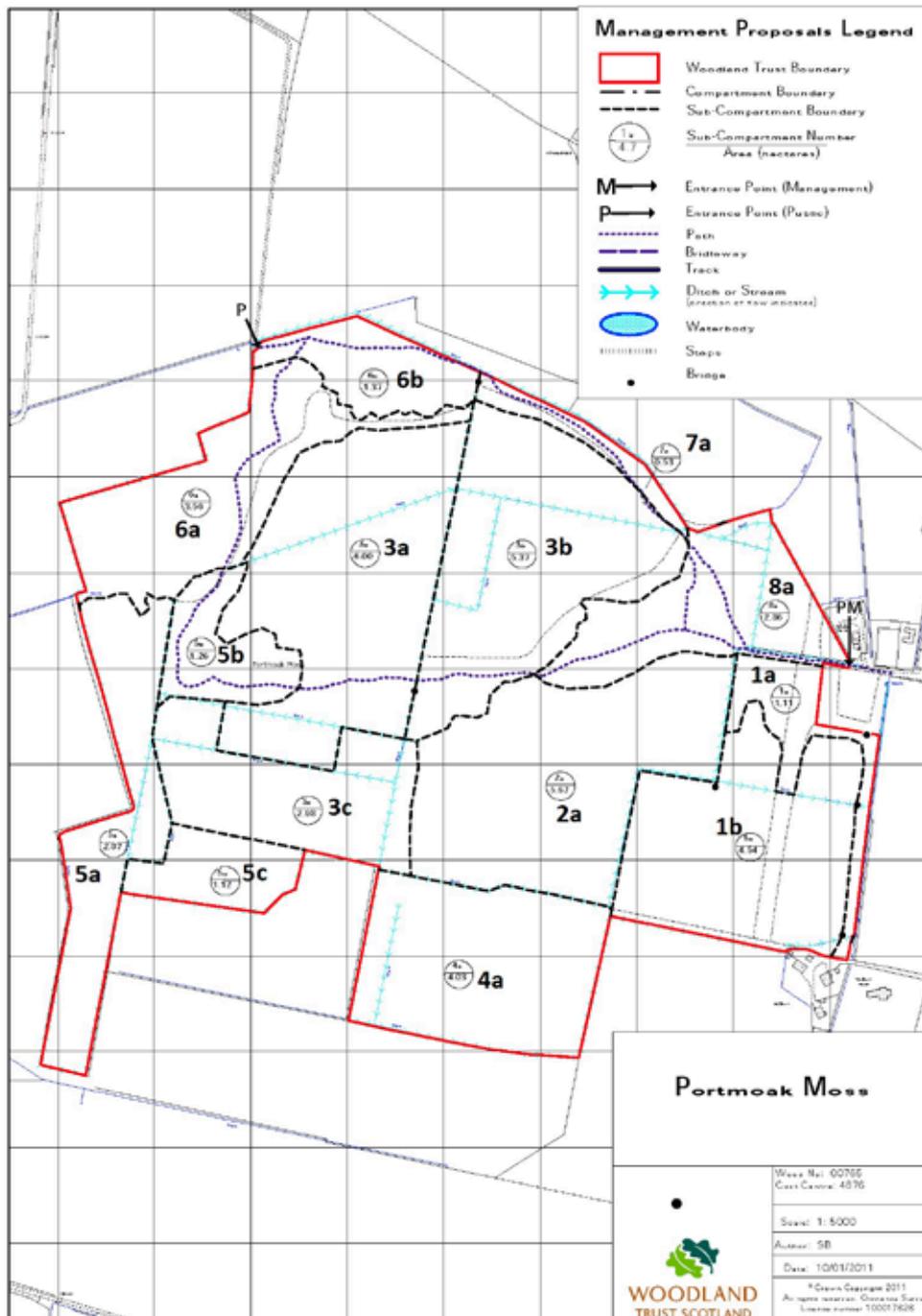
The 'big vision' for Portmoak Moss – how it could appear in 50 years

Peatland Management Options				
Peatland Management Action	Option			
	Do nothing	Status Quo/Minimum	Slow and Steady	The Big Vision
Surface mulching	No further mulching	No further mulching	Mulching extended to remaining (un-mulched) area when funding can be secured	Mulching extended to remaining (un-mulched) area immediately after removal of tree regeneration.
Removal of tree regeneration	None: extensive regeneration on un-mulched area develops into pine-birch woodland further drying out the peatland, and desiccation cracking is exacerbated. Tree regeneration on mulched area will develop into woodland	Removal of regeneration limited by budgets and focussed on keeping mulched area open and tree-free. Un-mulched area allowed to develop into birch/pine woodland (N.B. this is not a wet woodland type)	Regeneration removed from un-mulched area as a priority. Ongoing regular follow-up treatment over entire open bog area. Partial re-wetting reduces need over time	Regeneration removed from un-mulched area as a priority. Regular follow up treatment over entire open bog area until re-wetting makes this unnecessary
Removal of mature trees from peatland edge	None: existing mature trees on peatland continue to grow and dry the peat, any windblow left in place	Existing mature trees on peatland retained continuing to grow and dry the peat, any windblow across paths or onto open peatland removed	Trial removal of mature trees growing on the peatland edge in (north-west corner) to see how this affects stability and rewetting	Tree removal from entire western and eastern peat face edges as a part of re-profiling. Stumps left in place where this aids stability of re-profiling
Removal of woodland from deep peat	No further woodland felling. woodland continues to dry out deep peat	No further woodland felling. woodland continues to dry out deep peat	No short-term felling of remaining woodland on deep peat but continues to be a long term aspiration	All trees on deep peat areas indicated on plan to be felled and extracted.
Drain Blocking	Existing dams not maintained and while most continue to function leaks and by-pass channels will develop	Existing dams maintained	Existing dams maintained. Additional dams installed if required. Some sections of drains in-filled with peat (issue re. dragonflies and damselflies to be resolved)	Existing dams maintained. Additional dams installed if required. Some open sections of drains in-filled with peat (issue re. dragonflies and damselflies to be resolved)

Peatland Management Action	Option			
	Do nothing	Status Quo/Minimum	Slow and Steady	The Big Vision
Re-profiling	Not carried out, further erosion and slumping particularly on the southern part of the eastern face. Elsewhere, the tree cover continues to both stabilise and also dry out the peat face	No re-profiling	Trial re-profiling of 250 m section of eastern peat edge south of the central path	Re-profiling of entire eastern and western peat faces
Lagg fen creation	None, water continues to seep from peat faces	None, water continues to seep from peat faces	Lagg fen (5-20 m variable width) and retaining bund (0.5 m high x 2m width) created along trial re-profiling section.	Lagg fen (5-20 m variable width) and retaining bund (0.5 m high x 2m width) created along all re-profiled sections
Monitoring	Ceases	Existing level continues	Enhanced monitoring	Enhanced monitoring
Additional wetland creation	None	None	Trial wetland creation in SE corner of site if funding is available	Wetland (reed bed, fen and swamp) created around open water areas in SE corner of site
Open water creation	None	None	Trial wetland creation in SE corner of site if funding is available	Open water areas created in SE corner of site
Grazing	No grazing	No grazing	Trial grazing of lagg fen and moss margin.	Grazing with sheep and cattle regularly used as a tool to remove tree and scrub regeneration from the moss margins and lagg fen. Stock grazing also used to maintain other open habitats (grassland and heath).

Woodland Management

At present 70% (31.59ha) of the site is wooded, the majority of which is mainly un-thinned conifer stands planted between 1960 and 1963. The main canopy species are Sitka spruce and Scots pine, with some Norway spruce, lodge pole pine, hybrid larch, scattered self-sown birch and occasional specimens of grand and noble fir. A combination of poorly drained soils, including deep peat, combined with lack of thinning has produced poor stands which are susceptible to wind damage.



Portmoak Moss Compartment Map – reproduced with permission of the Woodland Trust

The north and western parts of the woodland are classed as Long Established Woodland of Plantation Origin, as they appear on a map dated 1856. Present within these areas are scattered mature conifer and broadleaf trees which predate the plantation. The woodland ground flora and associated understorey are poor to non-existent in areas of dense conifer.

Downy birch forms the broadleaved woodland on the site which has regenerated in open areas in the conifers resulting from windblow and subsequent clearance, as well as along the edges. Occasional oak, rowan, willow, sycamore and ash trees also occur. Under the resulting open canopy a woodland ground flora is present dominated by broad-buckler fern and bracken.



Un-thinned conifer plantation, Compartment 2a

“Do Nothing” – what will happen to the woodland if all management ceases

The woodland encircling the open peat dome includes tree species such as birch and Scots pine which are adapted to colonising open ground. These mature trees will continue to produce a regular seed rain onto the site.

In the absence of management or grazing/ browsing activity, the resulting tree regeneration will develop and establish as woodland on the drier areas of the cleared peatland with a low water-table; as can currently be seen in Compartment 3c.

As these trees mature, they will contribute to an ongoing drying of the peat surface through a combination of interception of rainfall, evaporation by the canopy as well as transpiration. This process also stimulates the oxidation and release of nutrients from the peat encouraging further drying of the surface and tree colonisation on the dome leading eventually to the return of closed canopy woodland.



Birch and pine regeneration in Compartment 3 (view northwards)

Areas within the unstable conifer plantation, particularly Compartments 2a, 4a and part of 8a, planted in the early 1960s on 1 to 2 metres peat depth have been affected by windblow. The occurrence of windblow increases the likelihood and vulnerability of these un-thinned plantations to large scale wind damage in the coming years. Such events result in a dense tangle of up turned root plates as well as fallen and hung-up stems, blocking footpaths and restricting movement of the public along those affected routes. The edges of the peat dome will be further compromised as a result of the leverage of the root plates.



Windblow close to the peat face, Compartment 2a

Scattered broadleaves such as birch will seed and establish within the fallen trees in response to the increased light conditions creating impenetrable woodland.

The Status Quo

In the absence of mulching, the birch and Scots pine regeneration which has established on the drier peat of compartment 3c will develop into a closed canopy upland oak-birch woodland (NVC type W17) with a predominantly heath ground flora. The woodland will shade the open ditches and pools of importance to invertebrates and especially dragonflies.

Large areas of the conifer plantations have reached their economic maturity. Due to a lack of past management and the unstable ground conditions, the peat face and public footpaths will become increasingly vulnerable to windblow damage in the coming years. Under the current management approach, ongoing access to clear windblown trees has the potential to cause repeated damage to the peat surface as well as the mature pre-plantation trees present within these plantations.

Restocking of the open areas cleared of windblown timber will occur through natural regeneration of locally invasive species principally birch and willow, as can currently be seen in Compartments 1a & 1b, but also spruce and Scots pine on drier areas.

Ongoing control of regenerating invasive non-natives such as *Rhododendron* will be required.

The review of the Woodland Trust's current site management plan in 2015 along with Kilmagad Wood, provides an opportunity to agree a detailed programme of management over the next 5 years to ensure the site meets the requirements of current government policies.

'Slow and Steady Progress' over the next 10 years?

This option sets out an accelerated process of conversion of mature conifer plantations to native woodland species and the gradual removal of trees from the margins of the areas of deep peat.

The mixed conifer plantations, planted between 1960 to 1963 on deep peat in Compartments 2a, 4a, 5b, 6a and 8a adjacent to the peat dome, have reached economic maturity and will be increasingly vulnerable to large-scale windblow over the coming years. The Woodland Trust's current Management Plan 2011 – 2016 estimates standing timber volumes of 200 tonne/ha in Compartment 2, which covers an area of 5.67 hectares (ha) and is located on the eastern edge of the peat dome. Subject to clarification of timber extraction costs, there is potential to generate a financial return from clear-felling those compartments with reasonable tree form and access (e.g. Compartments 8a and 2a) over the next 10 years if current high timber prices are maintained.

As an indication of outline income and costs; selling the timber standing could potentially generate an income of around £25/tonne. In a standing sale, the purchaser would be responsible for the costs of extraction (approx. £15/tonne) and haulage to the mill (approx. £10/tonne). Assuming £25/tonne income and 200 tonne/ha yield then compartments 8a and 2a could, potentially, generate incomes of £14,300 and £28,350 respectively.

Any income from timber sales may offset any costs incurred in felling areas with poor access, such as Compartments 5b, 6a. Brash mats will be used during operations to limit damage to the peat surface followed by mulching to break-up mat and prevent shading of the peat surface.

Restocking of part of these clear-felled areas would continue to focus on allowing the process of natural regeneration of native species, such as birch and willow (grey, bay and goat) to achieve a minimum stocking of 1,100 stems/ hectare. Up to 25% open ground could be retained through active management such as rotational cutting adjacent to footpaths and ditches to create a varied woodland structure. Under current government regulations there is a presumption against planting on peat >50 cm deep. However on drier, shallower peat pockets, Scots pine could be planted in small groups to develop as habitat for red squirrels in the future (although there may be a reduction of value of the woodland habitat for red squirrels until new Scots pine

plantings produce cones). In addition, planting with common alder in flushed areas and occasional oak on selected drier sites would diversify the species mix. The programme to control non-native regeneration of spruce and *Rhododendron* as currently undertaken by the Woodland Trust should continue.

Due to the close proximity and scale of Kilmagad Wood and the neighbouring conifer plantation, specific work to enhance these woodland areas for red squirrels could also expand the potential habitat for this UK Priority species in the future. This should include collaboration with neighbouring landowners and residencies to create a habitat network to enhance the safe movement of the species between these areas.

Areas which are clear-felled adjacent to the peat dome and on deeper peat (1m plus) should be retained as open ground and where possible re-profiled and rewetted to reduce the likelihood of tree regeneration on these areas.

Scattered pre-plantation trees of oak, birch and Scots pine as well as standing deadwood of pine are present within Compartments 5a, 6b and 7a as well as 2a and along the eastern edge of 1b. These features correspond with areas of woodland cover shown on the 1st edition 1885 map of the area. A number of these pre-plantation trees in compartments 5a & 6b would benefit from halo thinning of the surrounding plantation conifers, in line with the Woodland Trust's management approach to Plantation on Ancient Woodland Sites (PAWS) and assist the development of a woodland ground flora.



Remnant birch within conifer plantation, Compartment 6b

The review of the Woodland Trust's current site management plan in 2015 along with Kilmagad Wood, provides an opportunity to agree a detailed programme of management over the next 5 years to ensure the site meets the requirements of current government policies.

Woodland Grants and Licences:

Under the Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999 [SI 1999/43], projects are likely to require an EIA (costing approximately £2,000 to £4,000 to prepare) if they fall within specific listed categories and the work proposed is likely to have a significant effect on the environment. One of those categories is Deforestation, the removal of woodland to convert land to another type of land-use (e.g. heath or bog).

To ascertain whether an EIA is required for deforestation proposals you must submit an EIA determination form (available on the FCS website) with supporting information on your proposal to the local Forestry Commission Scotland (FCS) office. FCS will give their opinion within 28 days of receiving the information.

Further information can be found via link:

[http://www.forestry.gov.uk/pdf/EIAGeneral09.pdf/\\$FILE/EIAGeneral09.pdf](http://www.forestry.gov.uk/pdf/EIAGeneral09.pdf/$FILE/EIAGeneral09.pdf)

To help protect Scotland's forests, a felling licence from Forestry Commission Scotland (FCS) is required to fell trees. **It is an offence to fell without a licence, unless an exemption applies.** Further information can be found via link:

<http://scotland.forestry.gov.uk/supporting/grants-and-regulations/felling-licences>

In 2015, the new Scottish Rural Development Programme (SRDP) the Forestry Grant Scheme (FGS) is scheduled to open for applications in late March/early April 2015. Grant options under the new SRDP 2015 Forestry Grant Scheme have been announced, such as an option for restructuring regeneration for restocking of woodlands as well as support for collaborative projects across ownership boundaries. Further detailed information on forestry grants will be available on the new SRDP web site - <https://www.ruralpayments.org>

Detailed below is an example of a relevant option available under the old SRDP and it is hoped that support options delivering similar outcomes will be available under the new scheme. For example:

· Management/ Restoration of Lowland Raised Bogs:

An application to this Option must be supported by a specialist management plan to identify any management required to protect and enhance your site, with lowland bog conservation as the key management priority.

Requirements of the support are:

- To keep the peat and vegetation of the bog surface intact.
- Undertake annual monitoring of the site condition.
- Identify any ditch blocking work.

The plan should also identify any additional management operations such as woodland clearance, seedling tree removal and scrub clearance.

Grant rate of £40/ha for a 5 year period plus individual standard costs toward management work such as scrub clearance. The income from the area payment for 11.4 hectares of raised bog could, over the five year period, be £2,280.

‘The BIG Vision’ - what the site could look like in 50 years

“The Right Tree in the Right Place” - a restored peat dome and surrounding fen with diverse native woodland located in areas which complement and contribute to the biodiversity of the wider area.

With grant support through SRDP, an active management programme of clear-felling and thinning work of the unstable, mature conifer plantations during the first 15 years has created opportunities for the establishment of native woodland and a woodland

ground flora on areas of shallower peat. The pre-plantation trees of birch, oak and Scots pine, marked during management operations, have been retained.

Conversion to native woodland has focused primarily on the establishment of regeneration of native trees and shrubs, seeding in from adjacent semi-natural areas. The diverse native woodland includes wet woodland with downy birch (*Betula pubescens*), and willows (including grey sallow *Salix cinerea*, bay willow *S. pentandra* and goat willow *S. caprea*) as well as drier birch woodland with rowan (*Sorbus aucuparia*) and occasional oak (*Quercus petraea*). Enrichment planting of small groups of common alder (*Alnus glutinosa*) on flushed areas and Scots pine (*Pinus sylvestris*) and hawthorn (*Crataegus monogyna*) at low density (500 to 1,100 trees/ hectare) on shallower peat areas has helped diversify the species mixture.

Natural regeneration has established to form dense thickets creating valuable cover for birds such as tits and warblers as well as mammals. Rides are cut through these areas on rotation to create sheltered, sunlit glades adjacent to ditches and pools to provide niches for invertebrates, particularly dragonflies, to hunt. A few of these glades are important points to relax, explore and enjoy the wider view along the network of traditional paths in the area.

In contrast the mature, more open crowned trees punctuate the younger woodland. Their cavities and crown deadwood home to woodpeckers and roosting bats. Under the enhanced light conditions, following thinning of more stable conifers a diverse ground flora has flourished including the spread of wood sorrel.

This new native woodland is located within an extended semi-natural network in the agricultural landscape, connecting the previously isolated pockets of woodland in the wider landscape including Kilmagad Wood and the adjacent conifer woodland as well as other semi-natural features such as Loch Leven.

The realisation of this BIG Vision is the result of collaboration across local ownership and residential boundaries as well as Agency responsibilities, building on the partnership work undertaken as part of the Loch Leven Catchment Area. Working together on a landscape scale project has also realised the potential of delivering wider community benefits in addition to the environmental improvements.

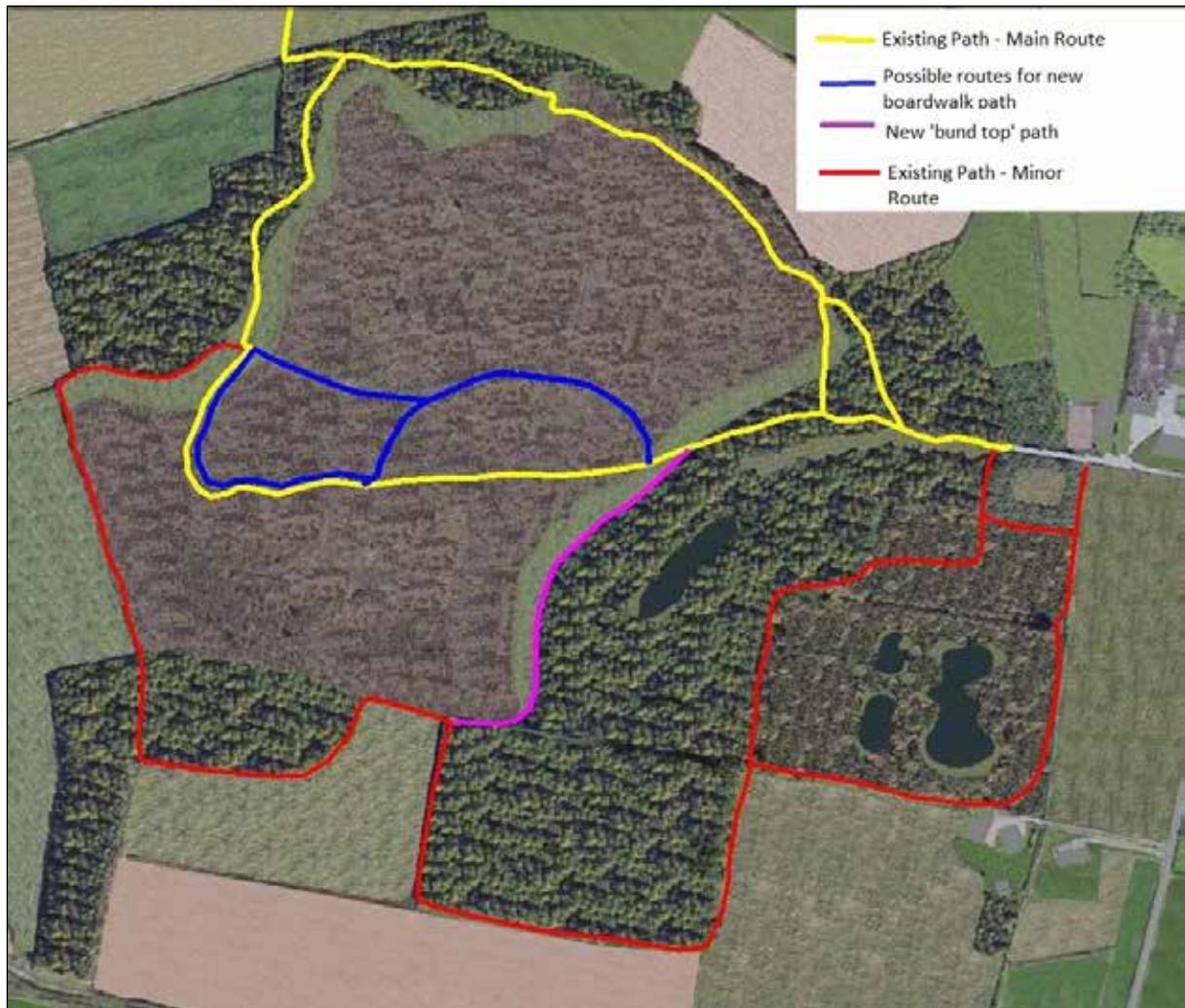
Woodland Management Options				
Woodland Management Action	Option			
	Do nothing	Status Quo/Minimum	Slow and Steady	The Big Vision
Removal of tree regeneration.	None : extensive regeneration on un-mulched area develops into birch/ pine woodland further drying out the peatland, desiccation cracking exacerbated.	Removal of regen. limited by small budget and focussed on keeping mulched areas (Compartments 3a and 3b) open and tree-free. Un-mulched area (Compartment 3c) allowed to develop into birch/pine woodland (N.B. this is not wet woodland)	Regen removed from un-mulched area (compartment 3c) as a priority. Ongoing regular follow up treatment over entire open bog area (Cpts 3a, b & c). Partial re-wetting reduces need over time	Regen removed from un-mulched area as a priority. Regular follow up treatment over entire open bog area continues until re-wetting makes this unnecessary.
Removal of mature trees from peatland edge	None: existing mature trees on the peatland continue to grow and dry the peat and seeding onto peat dome. Windblow damage through leverage of root plates continues and left in place	Existing mature trees retained on the peatland continuing to grow and dry the peat and produce seed rain onto the dome. Wind-blown trees across footpaths removed and within conifer plantations cleared as budget allows.	Trial removal of mature trees growing on the peatland edge in (north-west corner) to see how this affects stability and trial rewetting	Tree removal from entire western and eastern peat face edges as a part of re-profiling. Stumps left in place where this aids stability of re-profiling
Removal of woodland from deep peat	No further woodland felling. Woodland continues to dry out deep peat and rain seed onto peat dome.	No further woodland felling. Woodland continues to dry out deep peat and rain seed onto peat dome. Wind-blown trees across footpaths removed and within conifer plantations cleared as budget allows.	Programme of clear-felling and extraction of unstable conifers on deep peat undertaken initially in Compartments 2a & 8a. Use of brash mats to limit damage to peat surface followed by mulching to break-up mat. Pre-plantation trees are marked prior to operations and retained.	Completion of programme of clear-felling and extraction of unstable conifers on deep peat, in Compartments 2a, 4a, 5b, 6a and 8a. Use of brash mats to limit damage to peat surface followed by mulching to break-up mat. All pre-plantation trees marked prior to operations are retained and their

				crowns recovering
Thinning of woodland on shallower peat	No further woodland felling. Over shading of pre-plantation trees continues.	No further woodland felling. Over shading of pre-plantation trees continues. Windblown trees across footpaths removed and within conifer plantations cleared as budget allows.	Halo thinning of Threatened and Critical shaded pre-plantation trees in Compartments 5a & 6b undertaken. Windblown trees across footpaths removed and within conifer plantations cleared as budget allows.	Completion of thinning programme to release pre-plantation trees and enhance light conditions to assist the development of the woodland ground flora in Compartments 5a, 5c and 6b.
Restocking with native species	No further woodland felling. Scattered regeneration established through windblown trees.	No further woodland felling. Subject to funding: In areas of cleared windblow regeneration of locally invasive species principally birch & willow but also spruce and Scots pine. Control of regenerating invasive non-natives such as <i>Rhododendron</i> ongoing as required.	Open areas following initiation of programme of clearfell and extraction in Compartments 2a & 8a regenerating to form thickets, dense in places, of willow and birch. Small-scale enrichment planting of Scots pine, oak and alder undertaken. Areas of deeper peat (1m plus) retained as open ground and re-profiled and rewetted. Control of regenerating invasive non-natives such as <i>Rhododendron</i> ongoing as required.	Areas of deeper peat (1m plus) open ground and re-profiled and rewetted to restore dome and adjacent fen. Native tree regeneration and planted native species established on clear felled and thinned plantation areas on shallower peat, linked to surrounding semi-natural network.

Access and Path Network

Introduction

The footpaths at Portmoak Moss were upgraded after the Woodland Trust acquired the site in 1996. These paths have lasted better than expected considering the underlying soil types and topography. However, the nature of the path surface and possible future uses of the site will require a reconsideration of the whole path network.



Path network

The path on the north side of the site is classified as part of the Michael Bruce Way, is a right of way and Core Path and will need to be retained in some form whichever management option on the site is pursued. One of the most important issues with the paths on the site is the lack of disabled access beyond the first 200 metres from the main eastern entrance. The existing footpaths are also used by cyclists and sporadically by horses and this causes occasional problems.

Existing Path Network

There is currently one main circular path that gives access to Portmoak Moss. Constructed mainly of coarse aggregate on geotextile, the path includes three sets of timber steps and several timber bridges. Short sections are muddy and tree roots are protruding through the path surface.



Path between PM1 and PM2

The northern part of the route is a long-standing right of way, forming part of the Michael Bruce Way and both paths (i.e. the MB way section and the remainder) are Core Paths PTMK/117 and PTMK/7. The path is well used and currently maintained by the Woodland Trust. Details of the management objectives for the paths are contained in the Portmoak Moss Management Plan 2011-2016 (Woodland Trust Scotland). In terms of access to the site, the Management Plan states that

“The site will provide quiet informal access to local users as well as visitors accessing the Michael Bruce Way in accordance with the Scottish Outdoor Access Code, although the raised bog will attract visitors from further afield with a conservation interest. The managed path network will provide access to woodland and raised bog habitats and will be maintained and kept clear of vegetation and obstructions. Regular inspections will be undertaken with regard to tree safety and other access features. Remedial work will be carried out as needed.The paths will link well into the surrounding path network”.

“Surfaced paths will be maintained in good condition and kept well-drained. Managed paths will be kept free from vegetation, obstacles and over-hanging branches, and bridges & boardwalks maintained in good condition by annual inspection and maintenance”.

The Woodland Trust has recently received funding from the Gannochy Trust to carry out some path improvements. This has included the replacement of 3 bridges (on the minor paths) and the improvement to the linking path at the eastern side of the raised bog that completes the circuit around the bog. Birch regeneration has also been cut back on the approach to one of the bridges in order to open up the access. Future proposals include the potential removal of the gate at the main entrance at the eastern end of the site to improve access for all and its replacement with bollards. The Woodland Trust is also proposing to install an Information Panel near the entrance. Both of these proposals are subject to funding being available.

Path Network Management Options

The four future management options for Portmoak Moss considered by this study and hence the path network are:

1. Do nothing – withdrawing any further maintenance or intervention in the management of access on the site;
2. Status Quo – Maintain the site and the paths as they are today;
3. Slow and Steady – gradual and sustained progress in developing access and community use;
4. Optimum vision for the site – including a well-constructed and maintained path network which is accessible to all.

Future Management of the Path Network

The four future management options need to be considered in terms of the path network. The paths are currently well used by walkers and runners but there is less evidence of use by cyclists, horse riders or those with mobility difficulties. Any change in the management of the paths will affect those who currently take access and will potentially increase the range of users who can visit the Moss.



Existing steps at Waypoint PM3 (Autumn 2014)

The management options and the potential effects on the paths are considered as follows:

1. Do nothing – if all current management, maintenance and other intervention is withdrawn, the paths will gradually become muddy as ditches become blocked. Fallen trees will obstruct the paths and walkers will find ways over the trees and around the muddy sections. Braided paths will develop as users spread across a path to find the driest section. Eventually, the paths will become more-or-less unusable without boots and an obstacle course that is only accessible to the fittest members of society.
2. Status quo – maintain the paths as they are now. No improvements or widening of access opportunities to a greater cross-section of the population.
3. Slow and Steady – this option would carry out a programme of gradual path and access improvements. This may involve minor improvements to the muddy sections and top-dressing of the main path where tree roots are evident. Ramps could be installed at the three sets of steps and this would increase the level of access by those with mobility difficulties. The existing aggregate paths would continue to follow their current routes. Key bridges on the minor path network will be maintained and the minor path which runs along the base of the eastern peat face, currently blocked by wind-blown trees

will be re-opened. Low key path signage will be undertaken, especially on the minor paths.



Location of Ramp at Waypoint PM3

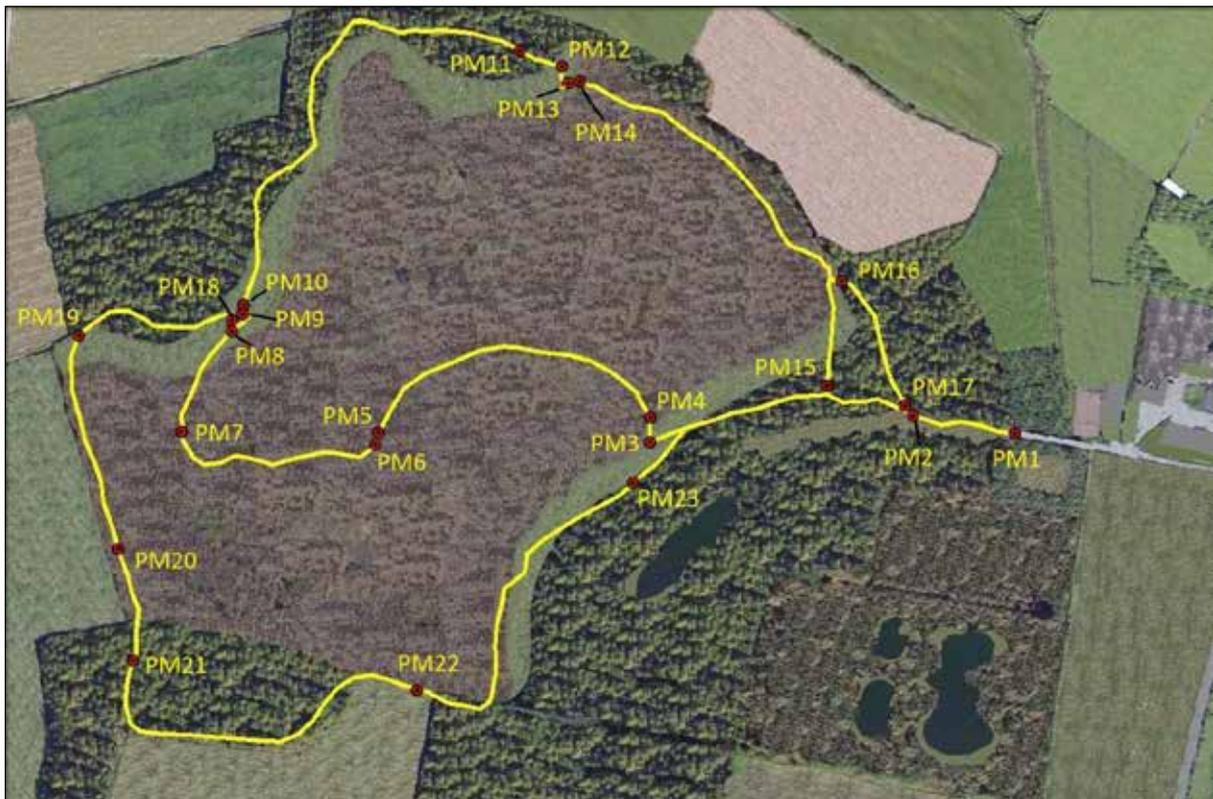
4. Optimum vision – this option would allow a far wider range of the population to access the site. Ramps would be constructed to replace each set of three steps with a boardwalk across the raised bog to replace the existing path. The construction of the boardwalk would allow for the removal of the southern section of the aggregate path hence contributing to the restoration of this section of the peat dome. Giving the public access to the main section of the peat dome would also give opportunities for increased interpretation. The boardwalk would be constructed to allow for access by those with mobility difficulties, in wheelchairs, mobility scooters and pushchairs.

The remainder of the main circular path would be improved by top-dressing with whin dust surfacing. In addition to the existing circular path, the network of minor walked routes on the site would also be improved. Drainage, surfacing, culverts and bridges would be added as required to increase the accessibility throughout the site. Not all of the minor path network is currently recognised at present on maps and leaflets and the aim would be to formalise more of them in order to encourage a wider use of the whole site. Path signage would be undertaken.

If peat face re-profiling with associated lagg fen creation takes place along the eastern peat face then the minor path running south from the steps/ramp location can be constructed on top of the bund which retains the lagg fen.

This work could be carried out as a number of stages although it should be noted that contractor mobilisation costs mean that it will be more cost efficient to carry out all the path works as one contract.

In opening up the paths for a wider range of the population, there is a possibility that horse riders may try to take access. The width of the paths and the land which they cross (the raised bog) do not make this area suitable for horses. Under the terms of the Scottish Outdoor Access Code it could not be considered to be 'responsible' for equestrian users to take access via these paths. It would also be inappropriate to provide a separate path for horses in such a sensitive environment. It is therefore recommended that the Community Woodland Group should engage with the local horse riders and stables to discuss the issues and those of responsible access.



Waypoints for path works

Optimum Vision – Proposed Work, Specifications and Costings

The existing paths were surveyed in order to produce proposals for the optimum vision. This work was done using a calibrated measuring wheel and a Garmin Oregon 300 GPS which allowed for accurate plotting of exact locations where work is required. A layout plan (diagram above) shows exact locations of the “waypoints” where work is required and this is detailed in Annex 1.

Typical specifications for the work are included as Annex 1 and the costings (also in the table in Annex 1) are based on these typical specifications. All work should be carried out using best practice guidance including those published by Paths for All, SNH and BT Countryside for All.

Access Management Options				
Access Management Action	Option			
	Do nothing	Status Quo/Minimum	Slow and Steady	The Big Vision
Michael Bruce Way	No maintenance, path becomes muddy and is used less or the walked route spreads out.	Basic work done as and when required	Path improvements including resurfacing, replacement bridges etc.	Path improvements including resurfacing, replacement bridges etc.
Main path circuit	No maintenance, path becomes muddy and is used less or the walked route spreads out.	Basic work done as and when required	Path improvements including resurfacing, replacement bridges etc.	Path improvements including resurfacing, replacement bridges etc.
Three main sets of steps	No maintenance, steps become dangerous and unusable	Steps repaired when necessary	All three sets replaced with ramps	All three sets replaced with ramps
Path Across deep peat	No maintenance path slowly breaks up	Basic work done to drainage to protect path	Gradually replace path with improved surfaces.	Existing path and mineral base removed and replaced with a boardwalk
Minor path network	No maintenance, bridges fall into disrepair and collapse.	Key bridges maintained/replaced as necessary – no other path work	Occasional repair to worst muddy sections. Some low key path signage.	New minor path on bund creating lagg fen on the eastern side of the peat dome. Path signage.

Path funding

Potential funding options for the path works includes the Gannochy Trust <http://www.gannochytrust.org.uk/> which has funded a significant amount of path work in Perth and Kinross. The Living Lomonds Landscape Partnership may be able to support some of the path works and the Perth and Kinross Countryside Trust should also be approached for ideas and options.

Paths for All provide support for Community Path Groups and will also be able to give advice on funding opportunities. <http://www.pathsforall.org.uk/pfa-home>

Interpretation

The Portmoak Story

"Interpretation is a communication process, designed to reveal meanings and relationships of our cultural and natural heritage, through involvement with objects, artefacts, landscapes and sites." - *Interpretation Canada*

Portmoak Moss has many stories to tell:

- Vegetation and landscape history, the information hidden in countless millions of preserved pollen grains.
- A long human history of 'man and bog' going back to prehistoric times, the veneration of bogs and wetlands as ritual sites, monastic history, exploitation for fuel and grazing, drainage and agricultural improvement.
- The more recent management of the bog, climate change and the importance of peatlands as a carbon store.
- The range of species present on the bog, their role in the ecosystem.

Provoke, relate, reveal

Site interpretation is often based on Tilden's Interpretive Principles:

- 1) You must **provoke** curiosity, attention and interest in the audience and understand why a visitor would want to information about the site.
- 2) The interpretation communication must find a way to **relate** the message to the everyday life of the visitors
- 3) We should **reveal** the ending or answer of the communication through a unique or unusual perspective.

Existing Provision

At present the site interpretation at Portmoak is through two identical panels on the raised bog surface adjacent to the main path.

The panels explore the formation of raised bogs in the landscape and the plant communities which create deep peat. There are also wooden site signs at two main entrances to the site (the east entrance from Scotlandwell and the north-west entrance from the Michael Bruce Way) along with Woodland Trust welcome and safety information.



Existing Interpretation panel

New Site Interpretation

At the community consultation meeting some of those attending expressed a desire for a planned approach to interpretation on the site. Several attendees felt that too much interpretation, a plethora of panels and signs should be avoided stating that this would spoil the feel of a wild place.

Enhancing the experience of those visiting the site, without creating 'clutter' could be achieved by focussing interpretation at three locations:

- 1) The main eastern (Scotlandwell) entrance and,
- 2) The entrance to the site in the north-west corner and Michael Bruce way, where interpretation would continue broadly as present with welcome information and a leaflet dispenser, as well as,
- 3) Along the path/boardwalk crossing the raised bog surface.

Elsewhere on the site, around the minor path network a more subtle, partly hidden, form of interpretation could be used - see 'Signal Box Panels' below.



Main (Scotlandwell) site entrance



Entrance to site in the north-west corner (Michael Bruce Way)

Boardwalk

This is the best location to reveal how a raised bog is formed, how it grows, how it is sustained by rain water and how it locks-up carbon from the atmosphere and stores it permanently. The boardwalk will be routed to one of the wettest parts of the bog where the bog surface, *Sphagnum* and other characteristic plants are visible. At this point the boardwalk would be wider to give space for panels and a viewing point.

Viewing Tower

A viewing tower would allow visitors to see the whole of the moss surface, the pattern of vegetation communities, the changing colour of the vegetation and, if sufficiently high, wider landscape views beyond the woodland surrounding the moss placing it in its landscape context. A viewing tower has been built recently at Flanders Moss National Nature Reserve. Located on the edge the raised bog this structure has created a high viewing platform seven metres above moss surface. The structure is constructed entirely from oak. Oak piles which support the structure were sunk through the bog to the mineral ground below.

A logical location for a viewing tower at Portmoak would be on the eastern edge of the raised bog which would make it as easy as possible to access from the main (Scotlandwell) entrance. Possible sites would either be close to the steps/ramp location around the middle of the eastern edge of the bog at the start of the boardwalk or around the easternmost point of the raised bog close to the Glebe fields. Both locations would allow the oak piles to be sunk through the peat at the bog margin and into the mineral ground below.



Viewing Tower at Flanders Moss

©SNH

The Window into Time

The exposed peat faces on the east and west sides of the raised bog will become stabilised if re-profiled and re-vegetated. One disadvantage of this re-profiling will, though, be that the view of the bare peat face, the layer by layer history of the last 10,000 years it represents, will disappear. A short section of vertical peat face could be retained and preserved behind an armoured glass window. The timeline from the genesis of the raised bog, through from pre-historic times to the modern day, along with our changing climate since the last ice age could be interpreted here. To access a remnant of the original peat face within a re-profiled peat edge will need some careful grading of the bog edge around it and possibly some substantial revetment either side.

A possible location for this feature would be on the eastern peat edge just south of the point where the boardwalk will cross the raised bog surface.

'Signal Box' hinged mini panels

Site interpretation infrastructure can be located more subtly, almost partly hidden, within the landscape giving a sense of discovery when the interpretation is found. An example of this is the use of 'signal box' panels. These could be set out around the minor path network to form a discovery trail.



Signal box mini panels at the Plantlife Munsary Reserve, Caithness

© Plantlife

This approach has been used at Plantlife’s Munsary Peatland Reserve in Caithness where peatland plants and vegetation were the themes explored.



Hinged 'Signal Box' type panel from Munsary Peatland

© M. Scott/ Plantlife

On other sites the structure i.e. the 'information arm' and the post which it hinges out from can be made much less conspicuous than the Munsary example making use of

local timber with the bark still on and even the stumps of felled trees if they are cut at the correct height.

Hide

New open water and swamp wetlands created in the south-east corner of the site could accommodate at least one birdwatching/wildlife watching hide. Interpretation and species documentation panels could be located on the inside back wall of the hide.

An interpretation panel for each species group?

Interest has been expressed by an organisation representing one of the species groups in erecting interpretation panels at Portmoak. The support of these groups is invaluable at Portmoak but the *ad hoc* addition of interpretation panels could lead to the 'clutter' which many visitors wish to avoid. It would be best to keep this interest on hold until the opportunity arises to build in information on the different species groups into a planned series of panels and signal-box mini panels.

Interpretation Options				
Site Interpretation Action	Option			
	Do nothing	Status Quo/Minimum	Slow and Steady	The Big Vision
Main site entrances	Existing site signs and welcome panels age and eventually disintegrate	Maintain the two existing panels, replace with similar panels and leaflet dispensers when necessary	Maintain the two existing panels, replace with similar panels and leaflet dispensers when necessary Add small site map.	Bigger, bolder signs. A bigger welcome with a site map panel under a roof structure
Raised bog surface	Existing interpretation panels age and eventually disintegrate	Maintain the two existing panels, replace with similar panels when necessary	Maintain the two existing panels and replace with new panels when a section of boardwalk can be built.	Develop platform at level on the bog surface at the wettest point. New set of panels at this point.
Viewing tower	No tower built	No tower built	No tower built	Construct viewing tower at eastern of the raised bog.
Peat face	No 'window into time' built	No 'window into time' built	If trial re-profiling proceeds create location to build this feature at a	Build "window into time"

			later date.	
New wetlands	No new wetlands created	No new wetlands created	No new wetlands created	Birdwatching hide with species identification panels built
Wider path network	No new interpretation	No new interpretation	Signal box mini panel discovery trail	Signal box mini panel discovery trail

Community Engagement

Portmoak Community Woodland Group and the Woodland Trust have built a strong and effective partnership to develop community enjoyment of Portmoak Moss and engagement with its restoration. This is further strengthened by the second jointly-managed site, Kilmagad Wood. Activities and events such as the 2012 Boginar have been recognised as innovative and pioneering. PCWSG is aware of weaknesses within the existing situation:

- aging committee members with uncertainty over succession and who will take over these roles in the future,
- lack of involvement across age groups and generations, and,

PCWSG recognises the huge potential to develop community-use of the moss and interest in its management.

The most immediate priority, as a first stage, is building a wider base of community understanding and support for management of the Moss, particularly peatland restoration and woodland restructuring.

An important set of choices lie ahead for the moss. If major ecological restoration is chosen then it will need a significant input from the community in years to come. The likelihood of success of funding a visionary and ambitious restoration will be much higher if it can be shown that the community made an informed and enthusiastic choice to back the project.

This issue was raised and discussed at the community consultation. One suggestion which came forward was the production of a leaflet to help the wider public make informed choices about peatland restoration by explaining what bogs are all about. This could be combined with a further programme of talks and walks on the 'your moss your future' theme.

The second stage is to build community involvement, across age groups and generations, in the site and its restoration

Taking community participation to a higher level is a very hands-on time-consuming activity and highly resource intensive. At Flanders Moss NNR SNH have been able to fund major a 'bog awareness' effort including working with local schools, funding a variety of inter-generational projects such as poetry (the 'People, Peat and Poetry' initiative) and film-making.

PCWSG and WT staff has limited time to devote to a similar initiative. Developing a small project which employs a community officer with specialist community engagement skills and the ability to develop links to the curriculum with local schools is the most obvious solution. An initiative of this type could also build on experience of similar projects in the following areas:

a) Species Recording Groups and Citizen Science

Groups of naturalists recognise more than ever the need to inspire a new generation of botanists, birdwatchers, moth trappers etc. The importance of citizen science in empowering community members to make informed choices about site management is now widely recognised. Species recording groups offer an excellent opportunity to motivate, interest and educate a wide range of age groups making them much more intimately involved in the future of the Moss.

b) Art

Site-specific installations by individual artists or artist groups have enhanced the visitor experience and built lasting partnerships between a place and creative 'workers' and communities at a number of sites in Scotland. A recent example is Natural Bennachie Sculpture Workshop <http://www.naturalbennachie.org/>. Flanders Moss has had an artist in residence project and Portmoak has already been featured in art projects such as the Loch Leven Artist in residence <https://alisonbuckle.wordpress.com/2013/05/24/good-hair-day/portmoak-moss/>

c) Craft and Traditional Materials

The potential for craft and cultural use of raised bogs and wetlands is significant. West Moss-side Farm at Flanders Moss is a pioneering project and has demonstrated the diversity of products and traditional uses associated with bogs. Field rush and birch bark are used for basket-making and a variety of events and courses are run at the Centre throughout the year.

The good news is that in many ways Portmoak Moss is ripe for funding for a time-limited community-based development project with clear goals and intended outcomes. Compared to many raised bogs Portmoak also has strengths:

- It lies very close to communities (Scotlandwell and Kinnesswood) and close to several others.
- It isn't a SSSI, the woods, especially the conifer plantations are places which can be used for a variety of purposes that might be damaging to a SSSI.
- Existing links with other nearby projects and infrastructure Loch Leven Heritage trail, the National Nature Reserve RSPB, Vane Farm, SNH Loch Leven.

Conclusion

Portmoak Moss is a rich and fascinating site. From its nadir as a peat-cut, deep-drained and conifer-afforested darkness the site has come a long way, a transformation to the slowly healing open peatland and well walked woodlands of today.

Given the ownership of the Moss by a major environmental charity, the strength and commitment of the Portmoak Community Woodland Steering Group and the high level of interest in peatland restoration it seems highly unlikely that the future of the Moss lies with the 'Do nothing' option. That option serves to emphasise the benefits of site management at any level.

The 'status quo' option will be modest in cost, maintain existing paths and much of the present level of public use and enjoyment of the site but will not secure the hydrological integrity of the raised bog or its function as a carbon store.

The 'slow and steady' approach is a lower-risk, more cautious model of how to restore the function of the raised moss, increase community participation and enhance access for all abilities.

The 'big vision' is bold and ambitious:

An ecological restoration that is seen as an example of best practice

- The Moss is no longer a shrinking remnant of a much more extensive raised bog and fen wetland complex.
- The species and habitat diversity of the site is transformed, not just a raised bog and stale conifer wood. A balanced set of habitats including new native woodlands
- The raised bog is restored through further tree removal, damming and re-profiling the open peat faces, so that it re-wets and starts to grow actively again, re-establishing its full hydrological function. Vegetation cover dominated by cotton grass and Sphagnum moss is restored. A lagg fen, created around the bog, captures and stores water coming off the dome and thus helps to prevent flooding. Re-profiling and subsequent re-vegetation of bare peat also halt significant erosion
- Restoring open water, fen and swamp wetlands, which once surrounded the Moss, adds to the diversity of habitats and species.
- A significant area of native woodland types including wet woodland (willow and alder carr) and oak woodland ('putting the oak back in Portmoak') is created.
- Habitat restoration and creation is extended onto some of the land surrounding the existing landholding. Achieving habitat integration by rebuilding/new ecological networks and habitat corridors creating a link to the habitats along the shores of Loch Leven

Action on climate change through carbon storage and capture

- 57,000 tonnes of carbon is securely stored in the Moss, equivalent to the annual carbon footprint of 47,000 people
- Rewetting the main raised bog stops the drying peat decomposing, locking up this carbon, stopping its release back into the atmosphere
- Re-wetted, the vegetation growth on the bog will start to capture more carbon from the atmosphere
- Carbon capture and storage is on people's doorstep. Portmoak will become a site to demonstrate carbon capture and develop awareness of the carbon footprint we all leave
- Many of the fields around the moss have peat rich soils and, in places, areas of much deeper peat. Carbon storage and capture is extended over an even larger area.

An exciting place to visit, explore and discover

- An extensive path network around and across the site provides access opportunities for all abilities.
- Ramps with a gentle incline take an all abilities path onto the bog surface where a boardwalk crosses the peat dome. The new boardwalk route takes in some of the wettest areas of the bog where sphagnum and other bog features are most abundant.
- A new path follows the line of the bund which separates the lagg fen from the surrounding woodland
- There is a wider network of smaller less formal paths with bridges where necessary
- Paths through the new native woodlands also cross open glades
- The main entry points to the site have signs and panels which welcome and guide visitors.
- Interpretation panels on the main boardwalk reveal the mysteries of bog plants and how carbon is stored.
- A section of the vertical peat face has been retained behind glass and made accessible creating a window into the structure of the peat with a marked timeline over thousands of years with markers for Culloden, birth of Christ etc.
- Elsewhere, interpretation is more subtle, a trail to 'find' as you walk
- A bird watching hide gives views into the heart of the new open water and wetlands in the south-east corner of the site

A well-used community resource

- The cultural and community benefits of bog restoration are widely felt and realised with the site providing a place for recreation, open air therapy and contemplative space, a relationship with nature and the outdoor world
- Community and group activities make active use of the site and the materials it provides (photography, basket making etc.)
- Citizen science on the bog, wetland and woodland is well-developed with recording groups collecting species records, habitats and hydrology is monitored
- The moss is an established base for volunteering both offering opportunities to volunteers and making use of volunteers e.g. RSPB Vane Farm when they are available

This ambitious restoration is feasible, the individual restoration techniques required have already been developed and demonstrated elsewhere but in combination at Portmoak there are unique challenges and opportunities.

Funding such a scheme is, initially, a daunting prospect but a range of factors working strongly in its favour suggest this is achievable:

- The Moss lies next to two communities and restoration could gain strong community backing and support, an important factor for funders
- The Woodland Trust are major environmental charity with a strong track record of delivery on large scale projects
- Success breeds success, much has already been achieved at Portmoak and SNH are keen for it to become a demonstration site.
- There has never been a better time to seek funding for peatland restoration, climate change action and carbon capture.

In contrast to these strengths and opportunities there are some weaknesses and threats to consider:

- Small parts of the adjacent contiguous semi-natural habitats are not owned by the Woodland Trust, such as a small strip of woodland along northern boundary.
- Access for management of woodlands and peatland face on western side of the site is constrained by lack of a guaranteed access route. In places there is little space between the peat face and the adjacent intensive agricultural land.
- Drainage networks, direction of flow and flood risk may be an issue and needs to be assessed.

Acknowledgements

The authors would like to thank Portmoak Community Woodland Group, The Woodland Trust, Scottish Natural Heritage and the Living Lomonds Landscape Partnership.

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Jonny Hughes (Scottish Wildlife Trust)

Kate Sankey (West Mosside, Flanders Moss)

We also thank John Williams for taking and allowing reproduction of the superb oblique aerial photographs he took of Portmoak Moss.

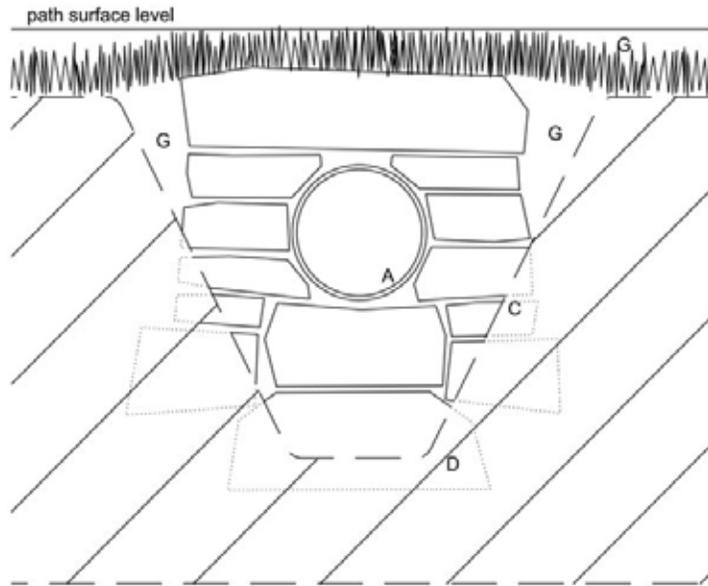
ANNEX 1 PATH SURVEY AND SPECIFICATION										
Route Section	Waypoint Reference	Current Route Condition	Proposed Work	Section Length (m)	Qty	Unit	Rate	Amount	Sub Section Total	Section Total
0	PM1	Gate	Remove kissing gate and dispose off site		1	no	50.00	50.00		
0-314			Whin dust surface dressing 2.5m wide	314	785	m ²	5.00	3,925.00		
85	PM2	Path junction	Waymark post		1	no	100.00	100.00		
314	PM3	Bottom of steps	Construct ramp 2.5m wide	31	38.75	m ³	47.32	1,833.65		
			Form 2.5m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	31	77.5	m ²	16.95	1,313.63		
345	PM4	Top of peat edge	Construct 2.5m wide timber boardwalk from untreated larch or equivalent 1600mm x 150mm x 50mm timber decking boards 2200mm x 100mm x 100mm timber stringers 100mm x 100mm square timber support posts 75mm x 75mm timber deck level edge rails fixed to the	295	737.5	m ²	91.00	67,112.50		

			ends of decking boards							
640	PM5	Edge of woodland	Form 2.5m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	17	42.5	m ²	16.95	720.38		
657	PM6	Path	Remove stobs and timber edging	281	562	LM	1.50	843.00		
			Whin dust surface dressing 2.5m wide	281	702.5	m ²	5.00	3,512.50		
839	PM7	Timber bridge - good condition								
938	PM8	top of steps	Construct ramp 2.5m wide	27	33.75	m ³	47.32	1,597.05		

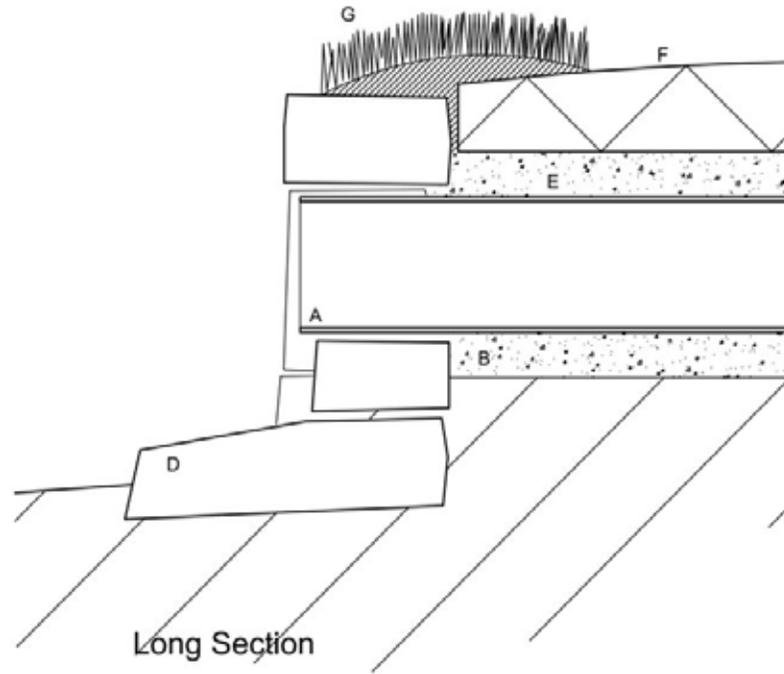
938-965	PM9	(bottom of ramp)	Form 2.5m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	27	67.5	m ²	16.95	1,144.13		
965-1442			Remove stobs and timber edging	477	954	LM	1.50	1,431.00		
			Whin dust surface dressing 2.5m wide	477	1192.5	m ²	5.00	5,962.50		
974	PM10	Narrow timber bridge	New 1.5m wide bridge	6	6	sum	1500.00	1,500.00		
1404	PM11	Timber bridge - good condition								
1442	PM12	Bottom of steps	Construct ramp 2.5m wide	18	22.5	m ³	47.32	1,064.70		
1442-1460	PM13		Form 2.5m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	18	45	m ²	16.95	762.75		
1460-1478	PM14	Top of new ramp link to path	Form 2.5m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	18	45	m ²	16.95	762.75		

1478-1850	PM15	Path junction	Remove stobs and timber edging	372	744	LM	1.50	1,116.00		
			Whin dust surface dressing 2.5m wide	372	930	m ²	5.00	4,650.00	99,401.53	
0	PM16	Start of path link								
135	PM17	Path junction	Whin dust surface dressing 2.5m wide	135	337.5	m ²	5.00	1,687.50	1,687.50	
0	PM18	Left turn at bottom of steps	Form 1m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	170	170	m ²	16.95	2,881.50		
170	PM19	Bottom of slope	Construct ramp 2m wide	8	8	m ³	47.32	378.56		
350	PM20	sleeper bridge	450mm piped culvert and 2 stone headwalls		1	no	400.00	400.00		
461	PM21	New bridge								
170-800			Form 1m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	630	630	m ²	16.95	10,678.50		
800	PM22	Plank over ditch	New 3m long timber bridge	3	1	sum	1500.00	1,500.00		

803-1144	PM23	Route through plantation	Form 1m wide whin dust path Half tray excavation Geotextile sheet in tray Geogrid on top of geotextile Min 150mm depth Type 1 granular sub-base 25mm depth whinstone or granite dust surfacing	341	341	m ²	16.95	5,779.95	21,618.51	
										122,707.54



End Elevation



Long Section

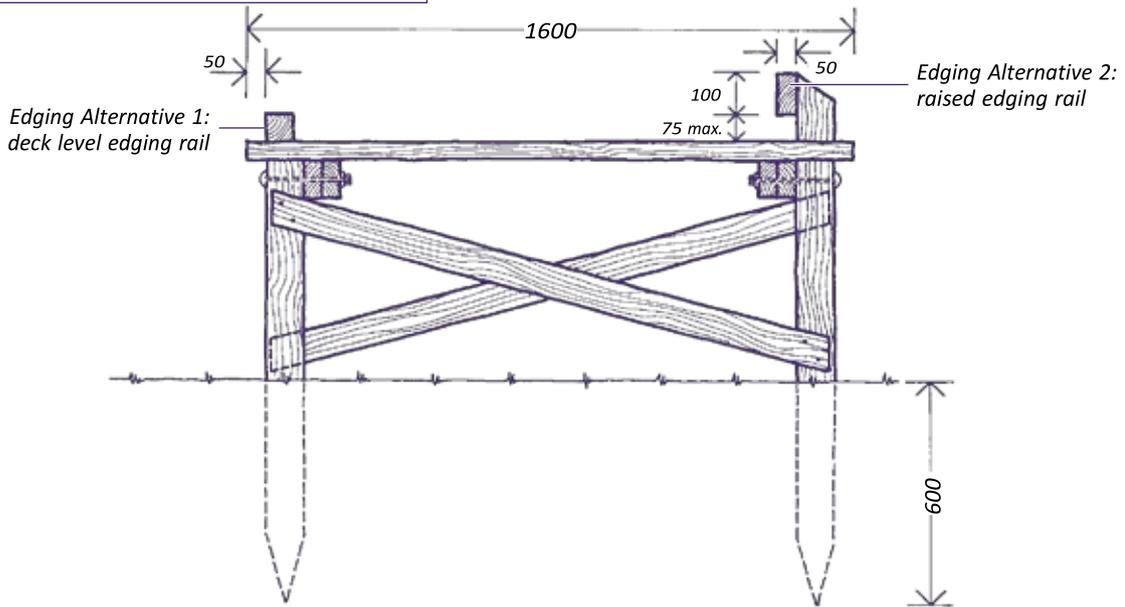
- A 300mm Ø twin-walled black pipe.
- B 100mm depth gravel bed.
- C Stone headwall, mortared in, around end of pipe and retaining trench backfill.
- D Splash stone.
- E Backfill material.
- F Path surface constructed over backfill.
- G Turfing won from site to restore path edge and disguise stone facing.

 P4 Projects 3 Drum Park, Lower Largo File KY8 6DA Tel: 01333 320701 Fax 01333 329793	Project		Portmoak Moss	
	Title		Piped Culvert (300mm Ø)	
Scale	Drawn by	Checked by	Auth	AP
1:10	DWR 13.1.12	DWR 13.1.12	DWR	13.1.12
Drawing Number				Rev
P4/D11/01 / D-06				

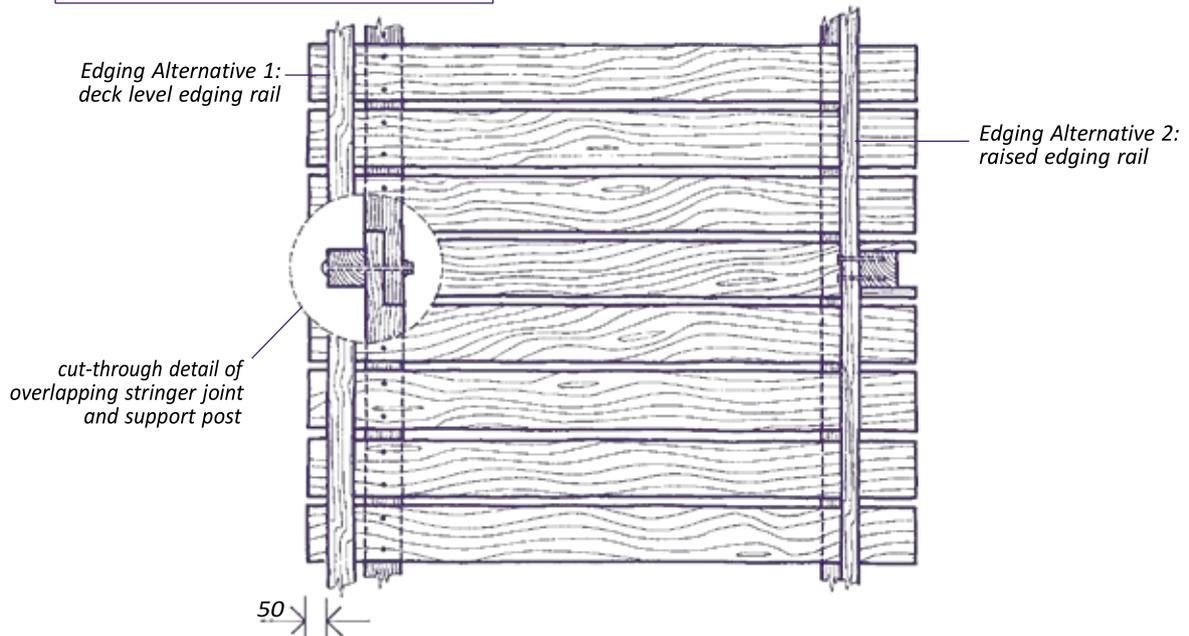


Information Sheet No.6.2
Raised Boardwalk with Edge Rails
(Page 1 of 2)

6.2^A Section - including alternative edging details
Scale 1:20
0 1000mm



6.2^B Plan - including alternative edging details
Scale 1:20
0 1000mm





Habitats & Wetlands People Mobility Difficulties Wheelchair Use • Notes

A design of boardwalk suitable for wetlands, marshes and other situations where the decking needs to be raised well above the ground level.

It provides a clear width of at least 1200 which is adequate in most situations and is accessible to wheelchair users. If a wider boardwalk is required, it will be necessary to use a different and more substantial design (e.g. 6.4); this design should not be modified or adapted to increase the specified decking width beyond 1600.

For reasons of safety, raised boardwalks should normally be fitted with edge rails or handrails, especially if it is accessible to wheelchair users. The specification overleaf provides details of alternative designs of edge rail; one is fixed directly onto the decking and the other is raised a maximum of 75 mm above the decking.

Information Sheet 6.3 provides details of a design with handrails.

With a deck level edging rail to either side, the clear width of the boardwalk is 1350. With a raised edging rail to either side, the clear width of the boardwalk is 1200.

The use of timber impregnated with wood preservatives should be avoided on wetland sites of conservation importance due to the leaching of copper, arsenic or other harmful chemicals.

• Construction and Installation Details

Decking Boards : 1600 x 150 x 50 with a 12 gap between boards (approx 12 no. boards per 2000 run of boardwalk).

Stringers : 2 no. 2200 x 100 x 100 per 2000 run of boardwalk (this allows for a 200 overlap at each join).

Stringer Support Posts : 100 x 100 x required length, at 2000 centres (max.), sunk to a minimum depth of 600.

Stringers to be fixed (at overlapping joint) to posts with 225 x M14 coach bolts.

Decking boards should be fixed to stringers with 100mm sherardised annular ring shank flat headed nails (4 no. per board).

Deck Level Edge : 75 x 75 rails fixed to decking with 100mm M10 galvanised coach screws countersunk . Edging should be set 50 in from edge to prevent decking boards from splitting.

Raised Edge : 100 x 50 rails nailed to stringer supports (extended through the decking).

If the boardwalk is raised more than 600 above ground level, 88 x 38 cross braces should be fitted between the stringer supports.

• Design Source and Contacts for Further Information

Design Sources : 'Countryside Commission for Scotland : Battleby Display Centre - Equipment and Materials for Countryside Recreation Sites' (1989) : Information Sheet 6.9.

National Rivers Authority Recreation Facility Design Manual : Information Sheet 1.6.1.

BT Countryside for All Good Practice Guide : Information Sheet 2.3.



Boardwalks extending over long sections of wetland are frequently constructed on nature reserves such as this one at the Ariundle National Nature Reserve in Sunart

Specification Detail for Ramps

- a) the recommended ¹ maximum ramp gradient for ambulant disabled and wheelchair users is 1:20 , although steeper gradients of up to 1:10 may be acceptable over short distances;
- b) the recommended ² minimum width of ramp to accommodate all types and abilities of user is 1200mm; if heavy use by wheelchairs is envisaged, passing places should be constructed or the ramp width increased to 1700mm;
- c) flat landings provide convenient resting places for wheelchair users, disabled and elderly people; the recommended ² distance between landings ranges from 9.00m to 19.00m depending upon location and gradient;
- d) the provision of a handrail at least 1000mm high on the down slope edge of a path will improve ease of use for disabled people; where this is not possible, a 100mm kerb can be installed, allowing a 1000mm strip of land between the kerb and the top of the slope;
- e) bends should be of a sufficient radius to provide an adequate turning space for wheelchair users; this varies from 1500mm for manual wheelchairs to 5000mm for larger motorised versions; the ramp surface should be firm and even, stable, non-slip and should have no loose particles in excess of 5mm in size; in the countryside, well compacted crushed rock or stone sub-base with a high proportion of fines is the most suitable material.

¹ Countryside Commission (1994)

² BT Community Partnership and Fieldfare Trust (undated)

Annex 2: Sources of Funding

Funding source	Details
European Union LIFE Programme 2014-20	<p>The LIFE programme is the EU's financial instrument for supporting environmental, nature conservation and climate action projects throughout the EU. The focus is on the implementation of Union policy and legislation. LIFE puts emphasis on innovation and with Integrated Projects.</p> <p>At €3.456b the new LIFE programme (2014-2020) has a bigger budget than ever This is spread across two themes; Environment (75%) and Climate Action (25%) The co-finance rate has been increased to 60% for all projects, so only 40% match funding is needed now.</p> <p>A Peatland EU LIFE bid project being developed by Defra. This Integrated Project (IP) bid will be a major habitat and ecosystem restoration project, focussed on peatlands. More than 80% of all UK peatlands are damaged – this bid plans to change that, but will not be a complete solution given the scale of action required to fully address all peatlands. The bid is likely to be climate focussed, but expected to deliver on a range of policy areas, including Biodiversity 2020 outcomes and ecosystems services such as flood risk management and tourism. Strong collaboration is needed to fulfil the potential of this large and complex bid.</p>
Scottish Rural Development Programme 2014-2020	<p>This is due to open to new applications in early 2015. In addition to the Forestry Grant Scheme which supports for forestry and woodland management there will be an Agri-Environment Climate Scheme. The following indicative rates for peatland and wetland management have been published:</p> <p><u>Relevant Capital Payments</u> Ditch Blocking - Peat Dams £13.00 Ditch Blocking – Plastic Piling Dams: Small Dam £62.00/dam, Medium Dam £151.00/dam, Large Dam £385.16/dam Creation Of Buffer Areas For Fens And Bogs £1,016.82/ha £2000/ha Control Of Scrub/Woody Vegetation: £900 -£1,300/ha Removal From Site Of The Cut Vegetation £1,050 per ha Follow Up Treatment £200 per ha Stock Bridges For Fen Or Wetland Management Bog £220-880 per bridge, Payment of actual costs of: Matting To Prevent Damage To Bogs Moving Or Realigning Ditches</p> <p><u>Relevant Area payments:</u> Pond Creation For Wildlife £4.50/m2 Lowland Bog Management £37.41ha Lowland Bog Management with Grazing £89.75ha Management of buffer areas for fens and lowland raised bogs £313.36ha</p> <p>A new Rural Development LEADER scheme will provide opportunities for individuals, businesses and communities to come together and support rural development and provide long lasting benefits to the local area.</p> <p>Scheme summary page https://www.ruralpayments.org/publicsite/futures/ Area payment rates http://www.scotland.gov.uk/Resource/0046/00463704.pdf Capital payment rates http://www.scotland.gov.uk/Resource/0046/00463705.pdf</p>
Heritage lottery Fund – Sharing	<p>The HLF will fund:</p> <ul style="list-style-type: none"> • Natural and designed landscapes and gardens • Natural heritage including habitats, species and geology

Heritage	<ul style="list-style-type: none"> · Histories of places and events <p>Schemes: <i>Sharing Heritage</i>: Small Grant for Projects less than £10,000. Timescale of less than a year Application online <i>Our Heritage</i> :Application online. Send funding enquiry first. Grants of £10k-100k <i>Heritage Grants</i>: Grants of more than £100k two stage application process <i>Landscape Partnerships</i>: £100k-£3million needs a range of partner organisation lead applicant up to five years.</p>
Scottish Natural Heritage - Peatland Action	<p>Peatland Action aims to:</p> <ul style="list-style-type: none"> · Restore and manage peatlands to maintain carbon stores and encourage carbon sequestration · Restore peatland ecosystem functions; · Enhance ecosystem resilience to climate change · Build peatland restoration capacity and understanding amongst land managers, contractors, advisors and the public <p>Although the grant scheme (which has already funded major work at Portmoak) is now closed, there is potential for Portmoak to receive further support from this initiative as a demonstration site and as a site to develop new peatland management techniques.</p>
Landfill Communities Fund	<p>The way landfill tax in Scotland is paid is changing. From April 2015, the tax collected from landfill operators will go to Revenue Scotland and will be called Scottish Landfill Tax. All projects under existing <i>Environmental Bodies</i> who currently distribute the Landfill Communities Fund monies from Entrust (who administer the fund) must be completed by 31 March 2017. A new Scottish Landfill Tax Communities Fund is being set up. SEPA will regulate the new scheme in Scotland which will be fully established once the two year transition period ends in March 2017.</p> <p>Proximity to a landfill site currently determines if a location can receive landfill funding. Portmoak Moss is within the “funding catchment” (a 10 mile radius) of landfill sites. An application to the Environmental Bodies <i>SITA Trust</i> and <i>Veolia Environmental Trust</i> may still be under the existing scheme possible before the transition period ends. Landfill funding eligibility and criteria under the new scheme will be broadly similar and it is likely that Portmoak Moss will continue to qualify.</p>
Climate Challenge Fund	<p>The Climate Challenge Fund (CCF) is a Scottish Government programme, managed and developed by Keep Scotland Beautiful, which provides funding for community groups that are tackling climate change through local community-led projects. Further details from http://www.climatechallengefund.org</p> <p>The fund is now closed to new applications as the remaining funds for projects in 2015-16 will be fully allocated to a selection of existing applications. It will, though, be worth checking to see if further funds are allocated to this fund for a new application round.</p>
Trusts	<p><u>The Esmee Fairbairn Foundation</u>: Gives grants for biodiversity nature conservation through the Foundation’s Main Fund. There is no longer a separate fund for biodiversity.</p> <p><u>The Gannochy Trust</u> –Has relevant grant themes: Inspiring Young People, Improving the Quality of Life of the Disadvantaged and Vulnerable. Supporting and Developing Community Amenities Care for the Natural and Man-Made Environment.</p> <p><u>Garfield Weston Foundation</u>: Supports innovative and established approaches to safeguard our natural environment</p> <p><u>The Robertson Trust</u>: Supports Community Arts, Education & Training</p>
Biodiversity	Biodiversity offsets are conservation activities that are designed to give biodiversity

offsetting	<p>benefits to compensate for losses. These ensure that when a development damages nature - and this damage cannot be avoided - then new, bigger or better nature sites will be created. Biodiversity offsets must measurable outcomes that are sustained over time. In the longer term biodiversity offsetting could become a significant funding source for ecological restoration and habitat creation at Portmoak Moss.</p> <p>Biodiversity offsetting is still at an early stage in Scotland although pilot work has been undertaken in the Borders. See:</p> <p>http://www.scotborders.gov.uk/info/379/countryside_facilities_and_wildlife/964/biodiversity/3</p> <p>and</p> <p>http://www.sup.org.uk/PDF/Biodiversity-offset-schemes-in-the-borders-290212.pdf</p> <p>Further information can be found at:</p> <p>https://www.gov.uk/biodiversity-offsetting</p>
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Annex 3: Indicative Costs for Peatland Management and Site Interpretation

Management Action	Indicative Cost
a) Peatland	
Surface mulching	<p>Surface mulching costs are now falling as contractors develop techniques and increase efficiency. Previous prices of up to £5,000 per hectare have fallen to £2,500 to £3,500 per hectare. Taking the mid-point price of £3,000 per hectare gives a cost for mulching the remaining un-mulched 3.6 ha (approx.) area of bog previously cleared of tress in Compartments 3a and 3c of £10,800.</p> <p>If the areas of remaining mature woodland growing on deep peat in Compartment 5c and 5b is felled as per the plan on page 17 that would leave a further 3 hectares of felled bog surface requiring mulching at a cost of £9,000 bringing the total estimated cost of surface mulching to £19,800.</p> <p>‘Stump clipping’ is a cheaper alternative to surface mulching which is considered by some to be more effective in restoring surface hydrology and vegetation. A machine removes the tree stump and its root plate from the peat, inverts it, and then buries it in the furrow between the rows of stumps. This deserves further investigation.</p>
Removal of tree regeneration I from the bog surface	<p>Approximately 3.6 hectares of dense tree regeneration remain in Compartment 3c and the southern-most part of Compartment 3a. SRDP funding will cover a maximum of £1,300 per hectare for this operation but due to the density and size of the trees in this area the costs may be considerably higher at up to £2,300/ha giving a total cost of £8,280.</p>
Mature tree removal from the bog surface	<p>The areas of remaining mature woodland growing on deep peat in Compartment 5c and 5b and proposed for felling as a part of the ‘Big Vision’ option (as indicated on the plan on page 17) cover approximately 3 hectares. Using low pressure machinery to extract the timber across the bog surface (a method which SNH are content with) removing this timber from the site would have a net cost £25-30 per ton after timber sales. Assuming around 150 tonnes per hectare over a 3 hectare area, and the upper figure of £30 per ton, the 450 tonnes of timber to fell and extract would have a cost of £13,500.</p>
Re-profiling the vertical peat faces and lagg fen creation	<p>Indicative costings for re-profiling the trial of a 250 metre section (including a bund to create a lagg fen) would be around £15 per metre, a total of £3,750. If significant desiccation cracks are encountered these will need to</p>

		<p>be plugged adding to the cost as these will require additional excavation and back-filling. Additional ditching work may also be necessary suggesting an approximate total cost of £6,000.</p> <p>The total length of peat face stated in the Mouchel report is around 1400 metres. Based on the approximate cost of the trial section (including the treatment of desiccation cracking) at £24 per metre the cost of the remaining 1150 metres might be around £25,600 and a combined figure of £31,600 for the full 1400 metres. Extrapolation of costs to the full length of peat face must, at this stage, prior to completion of a trial section, be seen as speculative.</p> <p>These costs take into account the need for additional ditch and water channel construction work to create a drainage network to carry water from the lagg fens on either side of the raised bog but this needs further investigation.</p> <p>The costs of felling mature trees growing: a) on the bog surface above the peat face and, b) Below the peat face in a corridor to allow access for machinery and the creation of a lagg fen, cannot easily be calculated on an area or linear basis. It may be necessary to specify the work and putting it out to tender.</p>
Creating open water and wetlands		<p>This element of the 'big vision' option needs further development before indicative costs can be calculated. There is space to create extensive wetlands necessitating a very sizeable budget. If test pits reveal a high and constant ground water level then a minimum budget of £10,000 to £15,000 should be considered for an initial phase.</p>
b) Site Interpretation		
Viewing Tower		<p>A tower of similar size and design to the Flanders Moss Tower will cost around £140,000 including design, construction and project management.</p>
Signal box panels		<p>Signal box type panels cost around £230 each (plus vat) this includes graphic layout of text and images, the manufacture of air dried oak post and a glass reinforced plastic (GRP) "information arm".</p>
Window in Time		<p>At this stage this element of the interpretation proposals is a concept. It needs to be taken further into a preliminary design stage before an outline cost can be developed. In discussion with PCWVG it was agreed that an installation of this size and complexity was likely to cost £5,000 to £10,000 to design and construct.</p>