Specification Greenlands Mire Restoration

Dorset Peat Partnership

As part of the Dorset Peat Partnership project the National Trust is undertaking the restoration of two sites to restore natural dynamic processes at Agglestone Mire, and Greenlands Mire, near Studland.

Greenlands Mire

The Dorset Peat Partnership has identified the catchment draining to Greenlands Farm as a site for restoration of natural processes. Historic drainage, incision and entrenchment, as well as excess nutrient overflow has caused areas of dominant scrubby vegetation, reduced floodplain connectivity and associated water table levels. This has disrupted the natural hydrological system of the wet heath and mire habitat as well as an area of wet woodland, making the site much drier and less capable of forming peat, and extremely vulnerable to the impacts of climate change.

Restoration works were carried out in Feb 2024 at the lower end of the mire, where water was reconnected from historic drainage channels to the adjacent floodplain using a variety of techniques, including dams and bunds. To support this restoration, further works are now planned for the next sections of the mire upstream and downstream.

The restoration aims of this project are to:

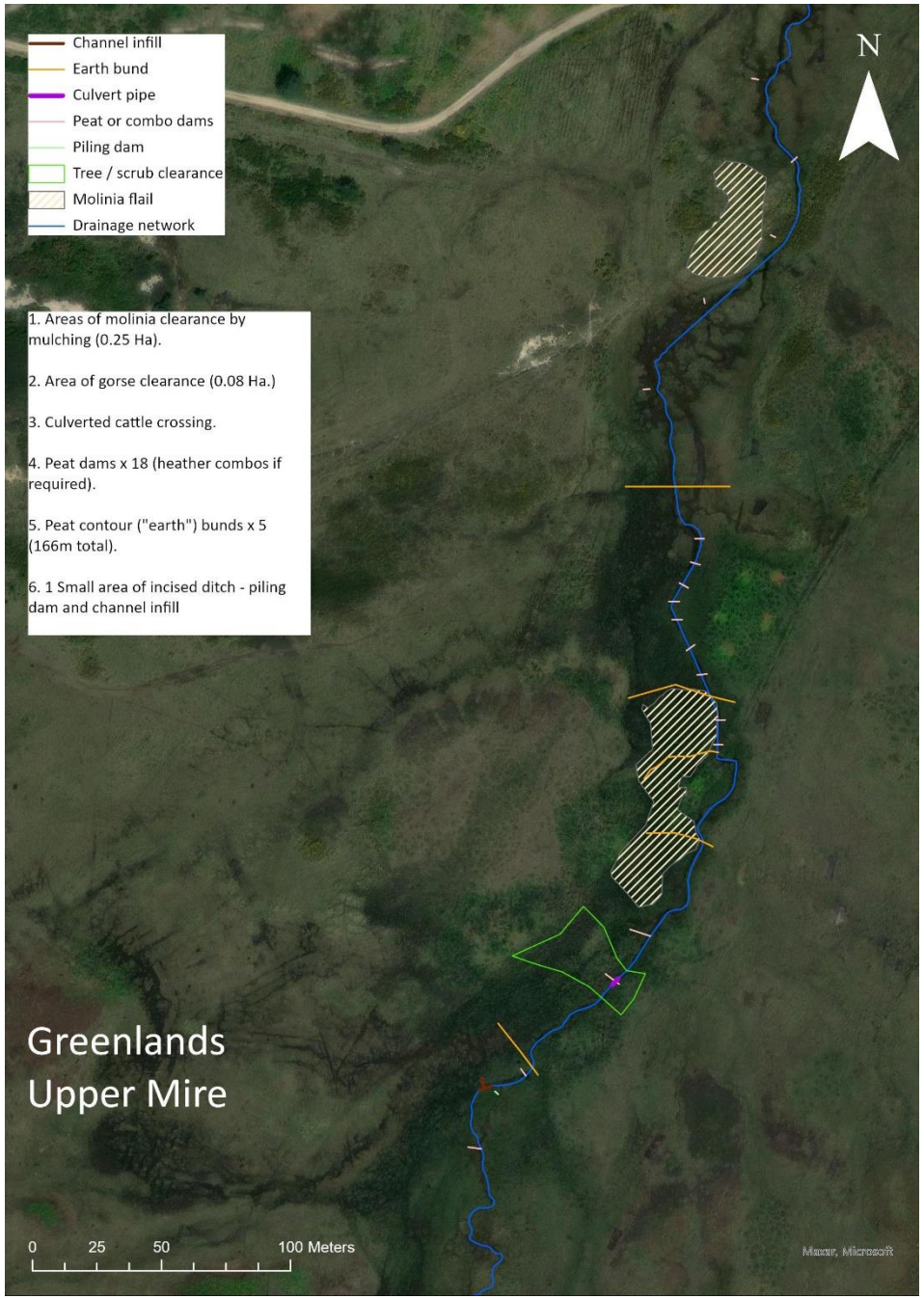
- Reduce areas of dominant scrubby vegetation allowing for the recovery of peat-forming sphagnum.
- Spread out the flow of water and restore hydrological function in the mire by raising the water table and diverting flow away from the gullies into the main body of the mire.
- Support previous restoration works at the lower end of the mire to ensure longevity.

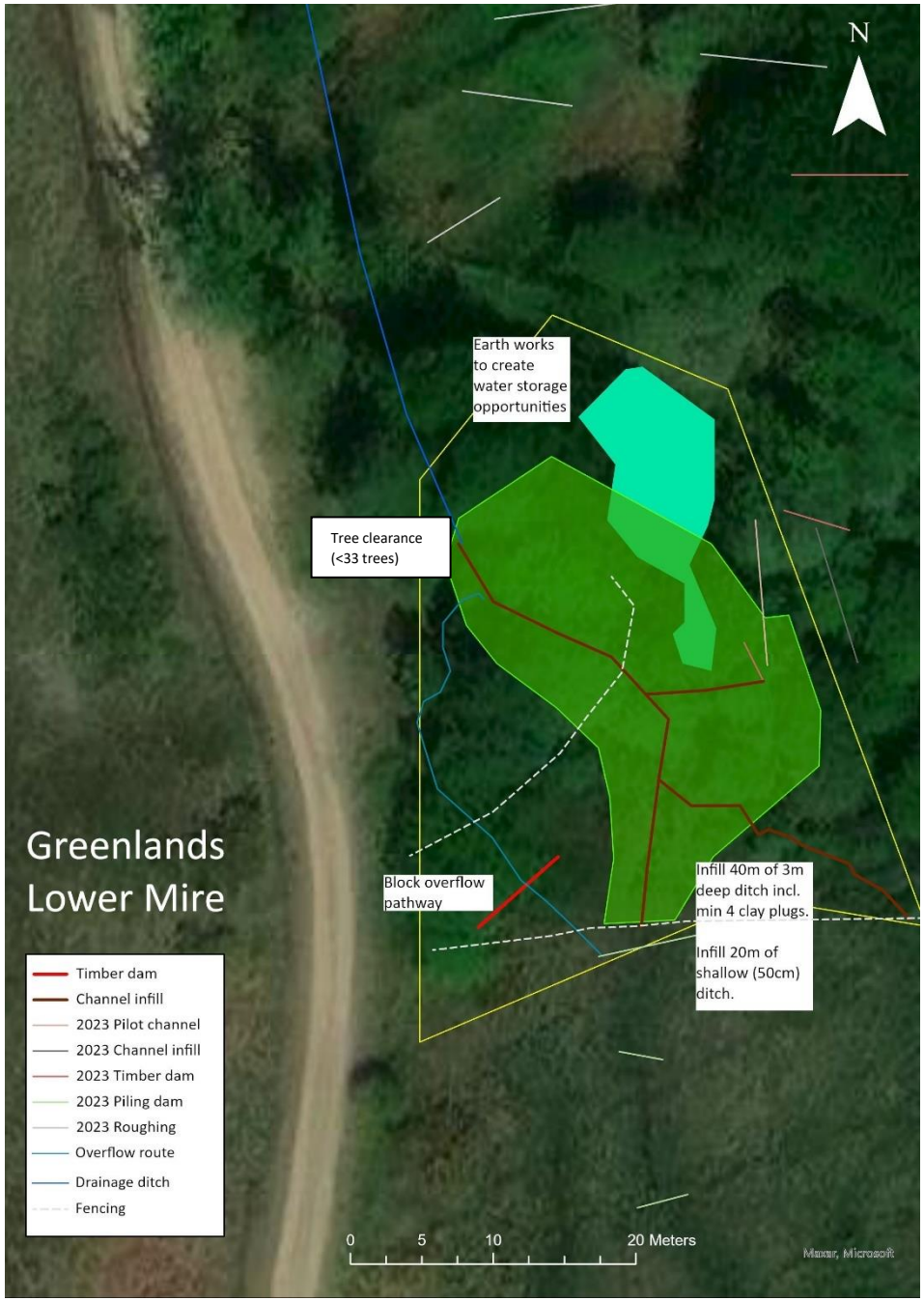
The objectives are to:

- Clear large areas of vegetation (dominant Molinia) by mulching, to allow for the recovery of peat-forming sphagnum in rewetted areas.
- Clear an area of gorse within the mire to allow for cattle grazing access to the mire edges and a cattle crossing point.
- Install a culverted cattle crossing bridge within a naturally narrow section of the mire – to allow for natural grazing on both sides of the wet mire habitat.
- Install peat dams (or heather bale & peat combo dams) to block channels and divert the flow of water into a multiple braided series of smaller channels.
- Install peat contour bunds across the mire to hold water for longer, providing a long-term solution to drainage issues.
- Install a piling dam & infill a section of channel in a small area of deeply incised channel
- Conduct earth works to infill a large drainage ditch located at the bottom of the mire and create water storage opportunities, to further support 2024 restoration works. A small area of tree cover will need to be cleared to allow plant access for this.
- Block a newly formed overflow channel that has formed around piling structures at the lower end of the mire, following 2024 works.

Considerations:

- Risk of unexploded ordnance (UXO) due to World War 2 training at Studland.
- Higher Tier Countryside Stewardship (LH1 – managing heathland)
- The extend of the project site falls within Godlingston Heath SSSI habitat designation.
- Open access land
- Protected species present, including reptiles, breeding birds, and invertebrates.
- Historic Environment features as identified in the HEA report (eg WWII tracks). NOTE: this report does not extend to the entire upper mire area.


Channel infill
Earth bund
Culvert pipe
Peat or combo dams
Piling dam
Tree / scrub clearance
Molinia flail
Drainage network
1. Areas of molinia clearance by mulching (0.25 Ha).
2. Area of gorse clearance (0.08 Ha.)
3. Culverted cattle crossing.
4. Peat dams x 18 (heather combos if required).
5. Peat contour ("earth") bunds x 5 (166m total).
6. 1 Small area of incised ditch - piling dam and channel infill
N
Greenlands Upper Mire
0 25 50 100 Meters
Maxar, Microsoft


N
Earth works to create water storage opportunities
Tree clearance (<33 trees)
Block overflow pathway
Infill 40m of 3m deep ditch incl. min 4 clay plugs.
Infill 20m of shallow (50cm) ditch.
Greenlands Lower Mire
Timber dam
Channel infill
2023 Pilot channel
2023 Channel infill
2023 Timber dam
2023 Piling dam
2023 Roughing
Overflow route
Drainage ditch
Fencing
0 5 10 20 Meters
Maxar, Microsoft

Section	Installation – see restoration plan for methodology	Grid reference
1. Upper mire – vegetation clearance and peat dams/bunds to slow and store water for longer.	(a) Molinia clearance as mapped. Approx. 0.25Ha area. (b) Gorse clearance as mapped. Approx 0.08 Ha area. (c) 1 x culverted cattle crossing. Spec detailed below. (d) 18 x peat dams installed into the channel. Supported by heather bales as required. (e) 5 x contour peat bunds, measuring approx. 166m length in total (from 25m – 42m per bund). Approx. 80cm wide, 50cm deep. (f) 1x plastic piling dam (ditch size tbc) (g) 1 x small area of ditch infill. Approx 9m length (ditch size tbc)	(a) From SZ0130083506 to SZ0126183219. Two areas centred around SZ0130083482 and SZ0127083264. (b) Centred around SZ0124383195. (c) SZ0125283189 (d) Individual grid refs available at Grid Ref Finder link below. Area from SZ0130683536 to SZ0119883123. (e) (i) From SZ0125583380 to SZ0129783380; (ii) From SZ0125883296 to SZ0129783296; (iii) From SZ0126483267 to SZ0129183276; (iv) From SZ0126483246 to SZ0128883240; (v) From SZ0120783171 to SZ0122583150. (f) SZ0120783144 (g) SZ0120183147
2. Lower mire – support 2024 ditch blocking works.	(h) Clear tree cover for access. Max 33 trees. (i) Earth works to infill large drainage ditch. Around 40m of deep ditch (3m deep) and around 20m of shallow ditch (50cm deep). Include minimum of 4 clay plugs. (j) Timber (plank) dam to block newly formed overflow channel. Around 7.5m width, 1.5m tall (dug in).	(h) Centred around SZ0156583989. (i) Centres around SZ0156584001. (j) SZ0155583971

Additional information

- Measurements are estimated. The chosen contractor will need to check measurements on site.
- Contractor to supply all materials.
- Please complete the attached Bill of Quantities template.

** Grid Reference Finder – see points listed mapped here, including What3Words. [Pink = peat dams; Orange = contour bunds (end to end); Green = piling; Red = Timber; Black = Channel infill; Dark blue = gorse clearance (central point); Light blue = Molinia clearance (central point); Purple = cattle crossing].

Suggested methods:

Culverted cattle crossing:

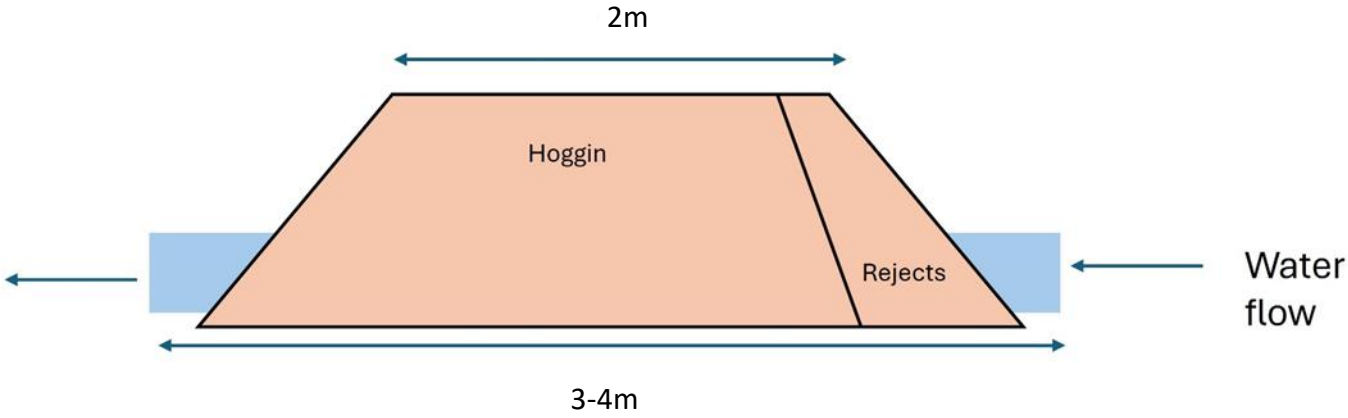
Gorse clearance must first be completed before confirming the exact location of the crossing as a better view of ground levels will then be available. Natural England is to be consulted at this stage for signoff on this feature.

The preferred design would be to construct a gravel causeway, which will form a culverted bridge crossing over a naturally narrow and incised section of channel. The causeways will need to be fronted by larger "rejects" to reduce the likelihood of erosion. The aim would be for a top surface width of 2m to allow sufficient space for cattle to cross comfortably, and it would need sloping sides to support this. The bottom should therefore measure around 3-4m, with the pipe ends protruding sufficiently that they are not buried over time as the gravel settles.
If possible, peat material should be added to an agreed height at the bottom of the crossing structure, so that it may also hold some water back, but not so much that it floods the crossing approaches on either side. The pipe can be secured at a height to achieve the desired outcome.

Materials: Must be neutral/slightly acidic in line with materials used on other parts of the heath.

- Twin wall unperforated drainage pipe
- As Dug hoggin
- Rejects

Design of causeway (not to scale).



Sawn timber dams:

- Timber dams are to be constructed from sawn untreated larch boards or similar agreed timber. Contractors are responsible for assessing the exact requirements on site at each location, with a recommended minimum thickness of 100mm unless otherwise agreed with the site managers.
- The boards are to be placed across the channel at right angles to the flow and must extend at least 1m either side into the channel bank and be dug into the channel bed by at least 400mm. This is to prevent undercutting and erosion to the dam edges.
- The boards must be at least 200mm proud of the channel edges to encourage water out and away from the channel.
- Boards are to be placed edge to edge, horizontally level and constructed with a 25mm gap between the horizontal boards to reduce the amount of pressure exerted on the dams when there are differentials in water levels upstream and downstream of the structure.

- Notches should be cut out of the top edge of the finishing board – to be agreed with the site managers.
- The dam structure should then be secured with vertical larch posts at 1m spacings and secured with M10 coach bolts to the vertical boards.
- Posts should be pointed and driven into the channel until submission.
- Where maintenance is likely to be more difficult or risk is higher, solid timber dams should use 100mm hardwood/oak beams with threaded bars connecting the planks. Bogmats as pictured beloware suitable for this purpose.

Molinia & gorse clearance / squashing tussocks:

- Areas identified for clearance will be clearly marked on site prior to commencement.
- The works are to be completed using an ultra-low ground pressure machine with mulching attachment and brushcutter, depending on access.
- All Molinia identified for removal must be cut to ground level as agreed with the site manager.
- All arisings are to be left in-situ.
- The identified area is to be carefully 'tracked in' using an ultra-low ground pressure machine with wide tracks (using bog mats if necessary due to ground conditions) in order to compress the tussocks together and slow the flow of water through this area.
- The machinery chosen by the contractor is to be approved by the site manager in advance of commencing this activity and will be carefully monitored during the work.

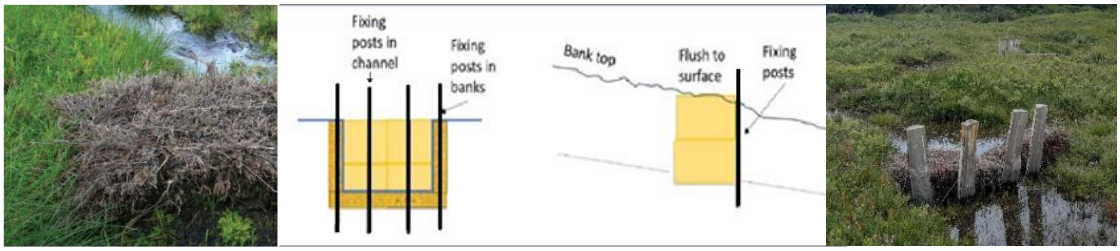
Tree clearance:

- Areas identified for clearance will be clearly marked on site prior to commencement.
- The works are to be completed using motor-manual techniques i.e. chainsaws fixed with appropriate blades.
- All trees and scrub identified for removal must be cleanly cut as low to its base as possible and below any side growth.
- Tree trunks can be used to create leaky woody debris dams. Brash to be removed from the wet mire habitat (to minimise nutrient inputs) and stacked on higher ground, as identified by site managers. Tops to be mulched to reduce volume.

Heather bale dams:

- Installed manually, using locally sourced heather bales (approximately L750mm X W500mm X H400mm) & 5'6" chestnut (1/2 & 1/4 split) stakes.

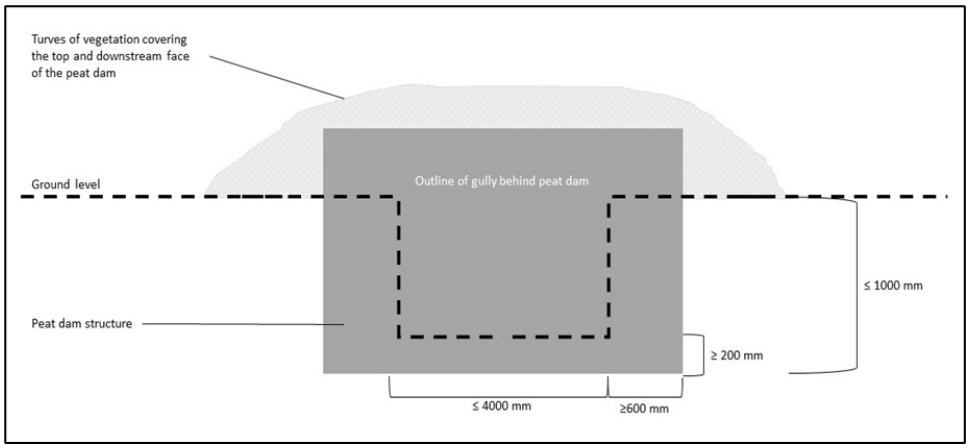
- The blockage should be to full channel height, in line with the height of the land either side of the channel, to retain as much water as possible and encourage any overflow onto the land either side.
- Heather bales should be keyed into the bank to prevent side-cutting.
- Where possible the heather stalks will lie parallel to the gully and the baling twine lies across the gully. It is important that the bale abuts tightly to the surrounding peat in order to prevent scouring around the sides of the dam;
- Additional heather, tufts of grasses or cotton grass can also be used to seal the joints between bales; and
- Stakes securing the bales should be on the downstream side, angled so the top of the stake is pointing upstream. The stakes should be left high and not cut flush so that additional bales can be added to in the future.



<u>Peat dams:</u>

- NOTE: Where water flow is too fast to successfully install a peat dam in isolation, a "peat/heather bale combo dam" should be installed. In this case, first install a heather bale dam, with the peat dam installed directly upstream, behind it.
- Installed in a 'single' pass method utilising onsite suitable peat by experienced operators utilising LGP excavators and tilt rotator buckets.
- Re-capped with existing turf and vegetation to ensure they grow and knit into the mire landscape.
- Carefully remove vegetation and/or degraded peat from the bottom of the channel at the Peat Dam location, ensuring the root zone is left intact in the turfs that are removed, and lay the turfs to one side ready to be replaced onto the finished Peat Dam or over the borrow pit.
- It is essential for the intended dam to 'key' into the peat profile. Trenches should be cut into the banks of both sides of the channel and into the base of the channel. The resulting ditches/trenches should cut approximately 60-100cm into the channel sides and 20cm down into the base of the channel (or until suitable humified peat is found).
- In planned & agreed locations, the excavator scoops out blocks of wet, 'clay-like' peat from the bottom of the channel. These are inverted and placed back into the trench from which they were removed and compressed with the bottom of the excavator bucket. This is done across the entire width of the channel.
- Additional wet 'clay-like' humified peat is then used to construct the remainder of the peat dam. This can be sourced from a borrow pit to the side of the channel. The borrow pit must be located within 90o or 180o of the machine but within easy reach without moving the excavator. Strip the vegetation from the borrow pit in as large an unbroken turf as possible and store to one side for later use.
- At the point of construction, the peat dam should be finished roughly 10cm higher than the intended height of the finished dam – this will allow for settlement following construction.

- Revegetate the dam and any remaining bare peat (including the top and sloping sides of the dam) using previously set aside vegetation turves.
- Finally make good any borrow pits by a) re-profiling margins to a shallow slope, b) filling with any previously excavated dried-peat and c) stretching any available vegetation turves onto exposed peat surfaces. It is important the turf is keyed in with the peat.

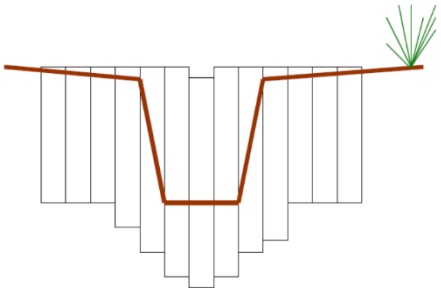


Low elevation contour bunding:

- Installed in a 'single' pass method utilising onsite suitable peat by experienced operators utilising LGP excavators and tilt rotator buckets.
- Re-capped with existing turf and vegetation to ensure they grow and knit into the mire landscape.
- Low elevation contour bunds are sub-surface trenches with a smaller surface peat bank of c.30cm high by c. 80cm wide. They are constructed along a given contour of a sloping peat surface to slow surface and sub-surface water run-off, raising the water table closer to the surface vegetation. Contour bunds are most successfully constructed in areas with a peat depth of 50cm or more.
- Bunds will be constructed by removing turf and the upper, degraded peat from a narrow (c.80cm wide) trench, excavated down (c.50cm) to well-humified, permanently wet, clay-like peat or 'Good' peat. Any tree stumps and associated root plates along the proposed route of the contour bund must be flipped and ideally placed stump-down into furrows or drainage features upslope of the bund location.
- If there are any cracks, deep heather roots or water escape routes, then excavate a further c.1 m into the permanently wet 'clay-like' 'good' peat. Overturn this peat and squash it back into the trench.
- Pack the trench to c. 20cm above adjacent ground surface level with good peat from an adjacent borrow pit on the uphill side of the bund.
- Cover the bund with a layer of turf and fill the borrow pit with the excavated degraded peat, leaving surfaces level and tidy.
- At 10-20m intervals along the bund, a 'cross-bund' running 6m upslope will be constructed (in a similar construction to the main bund). This will create elongated U-shaped compartments, safeguarding against any bund failure. If a bund fails, only one U-shaped compartment will fail.
- Level the bund crest carefully to ensure even overflow and even irrigation of downslope peat. A level crest is essential.

Piling dams:

- To be installed where the channel has been identified as being more disconnected and incised.
- Hammer piles in starting from the centre of the ditch. Position the longest pile in the deepest part of the drain. Use a sharp spade to pre-cut the outline of each pile in the surface vegetation. Push the pile into the peat using your own weight.
- Ensure that the piles remain vertical as it will become increasingly difficult to insert piles if they lean in any direction. Using a maul, drive further and when firm guide adjacent piles into their cams, repeating the process. Continue until all piles are firm in the peat.
- Piling will only create a good seal if driven into at least 75cm of solid peat, usually found below the 50 cm of soft peat in the base of the ditch.
- The top edge of the pile may require shielding from the metal of the maul. Several methods are used but the most effective is a timber batten resting on the pile.
- Shape the dam to form a gently curving upstream ‘C’ shape at the ends. This shape assists dam strength and increases the amount of water retained. The dam must extend well into the banks of the ditch. A rule of thumb is the extensions into the bank on each side, equal the width of the ditch. On slopes, the wings of the dam can be angled down the slope to re-distribute water over the site and reduce pressure behind the dam.



Site photos:

1) Upper mire habitat – Molinia mulching, dams & bunds.




2) Lower mire ditch blocking & overflow channel