



NATURAL
ENGLAND



Shropshire
Wildlife Trust



Lowland Raised Bog Framework Agreement LOT 2 – Contract Award

Marches Mosses BogLIFE project (LIFE15 NAT/UK/000786).

Works to raise water levels by 60 ha of cell bunding, 9568m contour bunding, ditch blocking and balance pipe installation of open mire on Fenn's, Whixall & Bettisfield Mosses and Wem Mosses National Nature Reserves, Shropshire.

Bravo Reference: ITT 5300/Ecm_54038

Please note that the terms and conditions as detailed in Natural England's Peat Bog Restoration Framework Agreement (NCS_22468) will apply to this call off Contract.

FROM

Authority	Natural England
Address	[REDACTED]
Contact Ref:	Ref: 25043 Name: [REDACTED] Phone: [REDACTED] E-mail: [REDACTED]
Bravo Reference Number	ITT 3500/Ecm_54038 <i>[To be quoted on all correspondence relating to this Order]</i>
Contract Start Date	w/c 21 st January 2019

TO

Contractor	Dinsdale Moorland Specialists Ltd.
For attention of:	Name: [REDACTED] Phone: [REDACTED] E-mail: [REDACTED]
Address	[REDACTED]

Service Requirements

Works to raise water levels by 60 ha of cell bunding, 9568m contour bunding, ditch blocking and balance pipe installation of open mire on Fenn's, Whixall & Bettisfield Mosses and Wem Mosses National Nature Reserves, Shropshire.

Services and deliverables required:

The Marches Mosses BogLIFE project (LIFE15 NAT/UK/000786) is a five year project running from 1 October 2016 to 31 December 2021. The project aims to restore Britain's 3rd largest lowland raised bog within the Fenn's, Whixall & Bettisfield Mosses and Wem Moss NNRs near Whitchurch, Shropshire and Wrexham in Wales. The LIFE project is led by Natural England working in partnership with Natural Resources Wales and the Shropshire Wildlife Trust. The project is financially supported by LIFE, a financial instrument of the European Commission and the Heritage Lottery Fund.

Location (Annex 1)

The work will take place at Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses are a complex of Lowland Raised Bogs totalling approximately 948ha. They are located about 4 miles south-west of Whitchurch in Shropshire and about 10 miles south of Wrexham.

The aim of restoration is to have 95% of the site vegetated with appropriate lowland raised bog or fen/bog vegetation within 5 years of work being completed.

Details/requirements

The works Natural England require are as follows:

- The work is to use cell bunding, contour bunding, short stretches of high-core contour bunding, peat dams and balance pipes to raise peat water levels on the areas shown in Annex 2, by blocking ditches and creating bunds to bring water levels to within 10 cm of the peat surface for more than 70% of the year, permitting Sphagnum bogmoss to establish or spread and to outcompete higher plants. It involves 3 distinct sites – Fenn's & Whixall Mosses, Bettisfield Mosses and Wem Moss. **Annex 2.**
- In contrast to previous use of bunding on other bogs to create impermeable lines on steeply sloping mire edges, or on surface milling fields with very little peat over clay, this work is generally on flat or gently sloping areas of peat where the purpose of the bunding is not only to make any degraded surface layers impermeable, but to cut through and block old drains and peat hand cuttings and to bridge gaps between residual peat baulks/ high areas.
- The Framework work categories vary between the different NNR sections. **Annex 2:**
CELL BUNDING
Bog Surface (intact - tree/scrub removal completed, 1-15 year old tree root plates)
– Molinia control trials on: - Wem Moss, Fenn's Moss section 6 and Fenn's/ Whixall Moss sections 7&15.

Bog Surface (intact - tree scrub removal completed, 16-80 year old tree root plate 7.5m apart) – N.E. Fenn's Moss Section 26 & 27 and Bettisfield Moss Section 18.2.

Bog surface (cut over - tree/scrub removal complete 1- 15 year old tree root plates)
– Fenn's Moss Section 31.2 & 32 and section 10 and Whixall Moss section 22/23/12

Bog surface (cut over - tree/scrub removal complete 16- 80 year old tree root plate 7.5m apart)
- Bettisfield Moss Section 18.1

CONTOUR BUNDING

Cut peat face (straight sections), peat face re-profiling (0-1m)

- N.E. Fenn's Moss Section 27 east rifle range; Molinia control trials on Wem Moss; Fenn's Moss section 6 and Fenn's/ Whixall Moss sections 7&15.

- **Cut peat face (straight sections), peat face re-profiling (2-3m) (category used because of presence of bigger root plates)**
- Bettisfield Moss Section 18.2; Fenn's Moss section 31.2/32

Cut peat face (undulating sections), peat face re-profiling (2-3m) High-core bunds linking contours or across deep cuttings

- Fenn's Moss section 31.1, N.E. Fenn's Moss section 26/27 and Molinia trial section 6; Whixall Moss sections 22/23/12

DAMS

Drains (drain damming), 1.5x1.5m

- Fenn's Moss Section 10 and Whixall Moss section 22/23/12; Molinia control trials on Fenn's & Whixall Moss sections 7&15.

Drains (drain damming), 3.0x3.0m

- Fenn's Moss Section 31.2 & 32 and section 31.1

BALANCE PIPES

O/S - installation of balance pipes

- Fenn's Moss section 31.2 & 32, section 31.1 and section 10 and Whixall Moss section 22/23/12; Molinia control trials on Fenn's Moss section 6 and Fenn's/ Whixall Moss sections 7&15.

TRACKS

Track repair, reinstatement

– installation of 3m wide crossing points over bunds

- Wem Moss, N.E. Fenn's Moss Section 26 & 27 and Fenn's Moss Section 10, Molinia control trials on Fenn's Moss section 6 and Fenn's/ Whixall Moss sections 7&15.

Also

- mineral ground tracks and peat track re-instatement.

REPORTING

Work also includes preparation of a report and plotting bund/ dam locations.

- Bunding. Construction of the banded cells is as described in the Framework documentation Lot 2, *sections 1.3, 2 and 3.*
Please note that unless otherwise specified, bund cores should only be about 150mm above ground level before turf is put back on, unless contours dip when higher stretches should be created or where high-core bunds are specified.
Drains, grips and cracks should be blocked and banded through as part of the cell construction.
Tree roots to be removed on the line of the bunds and tipped into borrow pits or be circumvented.

It is proposed to treat specified areas as if they need banded cells all over, although in practice less work may be required.

Where access is to be maintained across bunds, ramping of the bunds with peat will be needed on specified trackways – **see track maintenance below.**
- Damming ditches. These vary from 0.5m x 0.5m to 3m x 3m. Ditches should be blocked using dams as described in the Framework Lot 2 section 4.
- Contour bunding. Construction of contour bunds is as described in the Framework documentation, Lot 2, sections 1.3 and 1.4. **Re-grading of mire edges is not involved.** Category 2.2.4 is used where peat has larger rootplates than in category 2.2.2. Category 2.2.8 is used where bunds are needed to cross wide gaps of 2- 3 m depth.
- Balance pipes. 6m-long 300mm diameter U-PVC twin-walled balance pipes to be installed through peat dams or bunds in specified locations, fitted with seals and 90 degree bend at U/S end and 45 degree bend at D/S end – **outside scope.**
- Track Maintenance and re-instatement. Methodology generally as described in the Framework Lot 2 section 6 for mineral tracks Framework category **2.7.8.** For peat tracks as

specified in section 3.12 below – **outside scope**. Methodology for bund crossing points as described in section 3.12 below, – **outside scope**.

- **Report and electronic location records - outside scope**

A brief report of works is required, see section 4 below. Electronic data collected during the operations should be provided to enable plotting of bund and dam locations.

1 SITE INFORMATION

1.1 Ground conditions, Substrate, Areas, Peat Depths and Topography – Annexes 3 & 4

- Fenn's Moss in Wales and eastern Whixall Moss in Shropshire lie on glacial sands, where peat has formed by paludification rather than from an open water body. Western Whixall Moss and Bettisfield Moss overlie lake clay on top of glacial till. The southern dome of Wem Moss mainly overlies sand.
- The peat remaining after intensive commercial and hand peat cutting is predominantly very humified basal fen peat topped by humified "grey" Sphagnum peat. Prehistoric oaks are sometimes found at the base of the peat and there is a geographically restricted pine layer in the centre of the grey peat. There will also be lots of roots of recent forestry or scrub which has colonised on abandoned peat cuttings in the upper layer of the peat.
- Peat depths are generally between 1 and 4m. Shallow peats to 0.4m are found on the northern third of sections 31.2 and 32. Deep peats >5.5m depth are found in Bettisfield Moss section 18.2 (unfirm) and Fenn's Moss sections 6 and 26.4.
- Most of the areas are almost flat with slopes of 1 to 2m across sections, with steepest slopes where uncut peat abuts peat cuttings. The topography for each section is shown overlain on aerial photographs in Annex 3, as is the peat-cutting pattern. **Annex 3.1-3.10**

1.2 Drainage and topography

- The areas shown in **Annex 2** comprise:
 - Uncut areas affected by marginal drainage, scrub 1-15 years - Wem Moss
 - Uncut areas affected by marginal drainage with some internal deep drains, scrub 1-15 years - Sections 6 and sections 7 & 15, section 26/25 *Molinia* trials and section 27 east rifle range.
 - Uncut deep peat areas affected by marginal drainage, scrub 16-80 years - 80 year old self-seeded pine and birch forest removed in 2001 – Section 18.2
 - Uncut areas medium depth peat affected by marginal drainage and Whixall bible cuts, scrub 16-80 years - 50 year old self-seeded pine and birch forest removed in 2004 – Section 26.3/27.1
 - Old non-patterned domestic Whixall bible hand peat-cuttings with marginal and some internal drains, with some high peat baulks, scrub 1-15 years, - sections 10, 12, 22, 23, 31.2, 32
 - Old non-patterned domestic Whixall bible hand peat-cuttings with some high peat tracks with track-side drains, scrub 16-80 years, - 80 year old self-seeded pine and birch forest removed in 2001 - section 18.1.
 - Recent patterned domestic hand peat cuttings, scrub 1- 15 years, Section 31.1 and 3
- Drains and peat cuttings on these areas have been dammed up using peat on sections 6, 7/15, 26/26, 18.1 and 18.2 east, 12/22/23, 3 and 18.1, and plastic U-pipes have been inserted to conduct storm water off-site in some places, particularly both Railway drains. However for various reasons the peat water table has not been raised high enough. Consequently, mire species such as *Sphagnum* bogmoss are being out-competed by plants of drier habitats such as purple moor-grass (*Molinia caerulea*), wavy-hair grass (*Deschampsia flexuosa*), bracken, birch and excessive growth of cotton-sedges.
- The main drains around each block of land and topography are shown in **Annex 3.1- 3.10**. **The boundary ditch/ ditches specified as the outlet to the bunded and dammed areas must not be blocked unless specified.**
 - Wem Moss. **Annex 3.1** The southern dome of Wem Moss is bordered by a major drain to the south and west, and a lagg depression to the north.

There is a plateau in the centre east, at 85.2mAOD sloping to the NE & SE to 85mAOD. The western half slopes more steeply from 85.1 to 84.7 m. AOD.

- **Section 6 Annex 3.2** This area comprises an uncut peat block surrounded by dammed linear commercial and domestic cuttings. Drainage is into the English/ Welsh border drain to the south and cuttings to the west, north and east. The central plateau lies at 90 m. AOD, falling to 89.5 m. AOD in the south-east, with 0.3- 0.5m drops into surrounding cuttings. Large amounts of hydrological and vegetation monitoring plots and equipment.
- **Section 7.8, 7.9 and 15 Annex 3.3.** This comprises an uncut lump surrounded by commercial and domestic linear “Dutch” peat cuttings. It is bisected by a dammed deep double drain along the English/ Welsh border. There is a drain along the western edge parallel to the canal, drains down the sides of the Cinder track between section 7.8 and 7.9 and through the east of S.15 (D1-D4). The Cinder track was the centre track of a WW1 rifle Range which had drained cross shooting butts at 100yd intervals. An eastern plateau lies above 90.5mAOD, sloping south-west across Sect.15 to 90m AOD and WSW across Sect.7.9 to 89.5m AOD. There are drops of 30-50cm off the edge of the uncut lump into the cuttings.
- **Section 26/25/3 Molinia trials Annex 3.4** Most of this area comprises a largely uncut lump, bordered by the Whixall bible cuttings of by section 25.1 to the east and section 26.3 and the Railway line drain to the north, by the dammed old linear commercial Lundt’s cuttings to the north-east, section 3.1 to the south and 26.5 then 1.1 to the west. To the southeast are the dammed recent commercial linear cuttings of section 5. There are major drains draining southwards between sections 26.1 and 26.2 and 26.2 and 26.4, and one flowing west from the SW of the Lundt’s cuttings to marker M27. All tracks have trackside drains. Section 26.4 slopes gently from 93 m AOD in the north to 92m AOD at the edge of the plateau, then falls steeply to the west to 91m AOD into the peat cuttings of section 26.5 and less steeply into the eastern peat cuttings which slope to 91.5m AOD at the eastern edge of S26.1. There is a high lump at 93m AOD in the south west “the Tumps” which may have archaeological significance, so the south side is being left un-bunded.
- **Section 26.3/27.1 Annex 3.5.** This area comprises relatively intact Whixall bible cut areas. Area A is bordered to the northwest by the dammed Railway drain, and on section 27.1 by a double dammed drain in the south. Short spur drains running north from the latter have been dammed already. The east of section 26.3 is bounded by a drain along a winding track, and in the east of section 27.1 are the 2 drains and cross-butt drains of the WW1 rifle range. An old drain cuts through the centre of section 26.3 northeast of marker M17. Area B is bordered by the railway drain to the west, the rifle range drains to the east and the Piccadilly Track drain to the north. A plateau at 93m AOD in the east of section 27.1 falls towards the Railway Drain in the west to 91.75 m AOD and north towards the Piccadilly track drain to 92-92.5m AOD.
- **Section 18.2 Bettisfield Moss Annex 3.6** This area is very deep soft uncut peat, drained by a dammed ditch along the canal in the north, the dammed English/Welsh Border Drain in the east and a dammed ditch around field 18.3 in the south-east. To the south, open drains border Moss Lane and neighbours’ fields including steep wooded peat cuttings in the south west and the peat cuttings of section 18.1 draining to the Bronington/Bettisfield Manor Drain in the west. A NW-SE elongated plateau above 89.5m AOD in the north-east of the area falls gently to 89m AOD in the south and west before falling away quickly to 87.5m AOD into surrounding fields and peat cuttings. In the east it falls rapidly into the English cut-over mire to ca 88.5 m AOD, and to the north towards the canal drain at 89mAOD.
- **Section 31.2/32 Annex 3.7** This area has been cut by hand to leave either a flat surface with Whixall bible pits or high peat baulks with bible cuts on low areas between. (The more recently worked deep flooded linear peat cuttings of section 31.1 adjacent to the Railway line are dealt with separately below). Sections 31 and 32 are drained by the Bronington Manor Drain to the north and the

Railway Drain to the south. Section 32 is drained by ditches along high N-S bracken baulks, including the bridlepath to the east. Section 31.2 is drained by N-S ditches along the winding track from the Nook Lane Triangle section 33.1SW in the west, the bridlepath leading south from S 33.1 SE in the centre, and the bridlepath from the Railway to Chapel Lane in the west.

Area A of Sect.31.2 has a high disjunct ridge at 91mAOD just north of the Sect.31.1 pools (90m AOD), falling to 90.5m to the south, south west and north.

Section B has a central disjunct and south-western areas above 90.5m AOD, falling to the north to 90mAOD along the Bronington Manor Drain and section 32 in the west.

Area C (Sect. 32) lies largely below 90m AOD. All have high bracken or Molinia baulks left within them from peat cutting.

○ **Section 10 and 8. Annex 3.8.**

Section 10 and the uncut south of section 8 drain along trackside and high baulk-side drains flowing into the westward flowing Section 8/10 drain. The north of section 8 drains along trackside drains and like the Sect.8/10 drain ultimately drains through the peat cuttings westward and then southward into the Whixall Manor Drain.

The overall gradient is from north-east to south-west. The peat falls from above 91mAOD in the north and north-east of section 10 to 90.5mAOD in the south of section 10 and sections 8.5 and 8.6, falling through section 8.7 and 8.8 to 90m AOD, then through sections 8.9 and 8.10 to 89.5mAOD.

○ **Section 12.5/22.2/23. Annex 3.9.**

Drainage on section 22.2 is eastwards along the northern and southern track drains into the Whixall Moss Main drain. Section 23 drains along trackside drains to the Whixall Moss Main Drain in the south west corner. Section 12.5 drains along its northern trackside drain into the Main drain.

Section 22.2 slopes from 88.5 m AOD in the north to 88 m AOD in the south, with high north and south tracks. Section 12.5 is almost flat sloping north from 88.4 to 88.2mAOD. Section 23 has a high western track/ridge above 88.5mAOD, and the bulk of the north-eastern half of the flat lies above 88.5mAOD. The south-east corner and a channel down the west are cut away so lie between ca.88.2 and 88.3m AOD.

○ **Section 18.1. Annex 3.6**

Drainage is westward along dammed trackside drains to the southward flowing Bronington/Bettisfield Manor drain. Its eastern end has already been high-banded, sometimes with U-pipes in area 18.1E.

The section slopes from east to west with a greater fall in the south-west. The eastern third of section 18.1 falls steeply from the edge of the uncut lump of section 18.2 in the west at 88.5mAOD down to 87 m.AOD. The area then falls more gently to ca 86.25m then to 86m in the south-west corner.

○ **Section 31.1 Annex 3.10**

Drainage is south into the westerly-flowing Railway Drain or east into major trackside drains which then drain south to the Railway Drain.

In the eastern half of section 31.1, the highest parts of the peat baulks lie above 91m AOD as does the land to the north, and the railway line is between 90 and 90.5m AOD. Low mire areas lie between 90 and 90.5mAOD and the pools lower. The land south of the railway line lies falls from 90mAOD.

In the western half of section 31.1, the land to the north, the railway and the highest peat baulks lie at 90.5m AOD and the low mire areas above 90mAOD.

1.3 Rainfall

- Rainfall at Fenn's NNR is around 761mm per year (based on a 23yr average). Anecdotal observations reveals that rainfall patterns in recent years have changed from persistent light rain with occasional heavy showers to a pattern dominated by heavy downpours in short bouts. Monthly rainfall is fairly evenly spread, with some degree of autumn increase. The monthly rainfall averages based on the last 23 years for Whixall is¹:

Local rainfall data from Natural England

Month	J	F	M	A	M	J	J	A	S	O	N	D
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mm	68	53	48	55	62	63	60	65	61	80	71	74
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1.4 **Vegetation**

Vegetation for all areas is listed in detail in **Annex 4**.

Section 18.2 is predominantly wet mire on deep peat.

Wem Moss, sections 6, 7/15 and 26/25/3 have areas of wet mire, often heather dominated with large areas of Molinia on moderate to deep peat.

Sections 12, 22 and 23 have irregular high bracken covered baulks with lower wet mire between.

Section 31.2/32 has dry heather and bracken heath, wet heath often with high bracken dominated peat baulks and very small patches of mire.

Sections 10 and 18.1 are dominated by Molinia wet heath.

Section 31.1 has high bracken or heather baulks, patches of mire and deep pools in dammed peat cuttings.

1.5 **Access – Annex 2**

Annex 2 shows vehicular and ATV access points for each area. Many of the tracks are NNR Trails/ tracks and some are public rights-of- way which must not be blocked or damaged.

Public, NNR staff/volunteer and contractor access should be expected on all tracks.

Most access points are through locked gates which must be re-locked after use/ left as found.

Low ground pressure tracked machinery must be used and machinery movement limited to a maximum of two passes in any location where possible. **Machinery should enter onto each section by leaving the internal NNR tracks as soon as possible** to minimise damage to tracks, as NNR staff and visitors rely on using these tracks for access.

Wem Moss. Vehicular access to the southern dome of Wem Moss is along a bridlepath from the south and machinery access is through a private field. Landowner permission is required for both. There is third party access along the access track which must be maintained at all times. Parking is by the bridge. Internally, tracks have been mown along a 100m grid on the Moss marked with posts and metal Fenno-marker ground anchors. These tracks must not be crossed/ used except when bunding across them and access for mowers/ volunteers along these, and into isolated cells, must be provided over bunds.

Section 6. Vehicular access is to the car park at Morris's Bridge, Whixall, SJ493355, with ATV/machinery access to the north through the NNR gate up to the south and east of the area, as long as tracks are passible.

Section 7.8, 7.9 and 15. Vehicular access is to the car park at Morris's Bridge, Whixall, SJ493355, with ATV access to the north through the NNR gate up to the crossroads then west to section 17 and north to the English/Welsh border track as long as tracks are passible. Alternatively ATV access can be from the Railway Line in the north. These tracks is the Mosses Trail accessed by the public and NNR staff so must not be damaged.

Section 26/ 25/3 Molinia trials.

Vehicular access is along the gated Railway line, then ATV/machinery access either over sleeper crossings at marker M12 and along the track through the centre of section 26.4, or between sections 26.5 and 1.1 to the Tumps. The public use the railway line and 1.1/ 26 track.

Section 27.1/ 26.3. Vehicular access is along the gated Railway line and along the Piccadilly track

Section 18.2. Vehicular access is to the Bettisfield Moss car park at World's End at SJ 48033482, SY13 2QE and from there in ATVs along the tracks leading north or west to the English/Welsh border track and through field 18.3 to Moss Lane. Vehicles can drive to the Cadney Lane hammerhead at SJ47146 35537 with ATV access along tracks on section 18.1, stopping at the uncut ground of section 18.2, or along Moss Lane to a small hammerhead at SJ47480 35011.

Section 31.2/32. Vehicular access is either along the dis-used Railway line from the A495

down Conery Lane or from Bettisfield village, or alternatively from the A495 down Chapel Lane, or Nook Lane to shown parking spots. ATV access is possible on all surrounding tracks.

Section 10 and 8. Vehicular access is to the Shed Yard carpark at SJ50353681, SY13 2PD. ATV access is along most of the tracks.

Section 12.5/22.2/23. Vehicular access is either to the Roundthorn Bridge car park at SJ 501357 or the Morris's Bridge car park at SJ 493355. ATV access is north from both, along trackways around the sections.

Section 18.1. Vehicular and ATV access are from the Cadney Lane hammerhead as Section 18.2 above.

Section 31.1. Access along the dis-used railway line as section 31.2/32 above.

2 OUTPUTS - AREA WORK DETAILS

2.1 Wem Moss (Annex 3.1) Cell bunding intact bog – 1-15yr scrub (7.86ha).

Framework categories: **2.3.2, 2.3.3, 2.3.5. O/S (outside scope)**

2.3.2 - 20 x 10m cells 10%

2.3.3 - 20 x 20m cells 20%

2.3.5 - 40 x 40 cells 70%

O/S – 56 track crossings over bunds wherever bunds cross tracks and also into isolated cells.

The objective is to stop water loss from the dome edges by bunding near to the grid lines cut across the dome, to create ca.50m cells, but to allow access to cells for future pedestrianised mowing, and to leave a marginal track.

The west of the dome has been piled with plastic piling and this must not be damaged, particularly where crossed for access.

Boundaries. Cell bunding boundaries – the perimeter bund should be at least 10m away from edge woodland, and internal bunds generally 2m east and 2m south of mown grid tracks.

Where possible, avoid tracking over heather/ Sphagnum areas. Features which must be avoided are marked on the map and include hydrological monitoring sites, Long-Term Monitoring Network permanent quadrats, ammonia-monitoring tubes, grid tracks, marker posts & metal Fenno-markers. Old fence posts with broken barbed wire are marked where known.

2.2 Section 6 Molinia trials (Annex 3.2) Cell bunding intact bog – 1-15yr scrub (2.95ha), plus contour bunding (822 m) and 2 crossings.

Framework categories **2.2.2, 2.2.8, 2.3.2, 2.3.3, 2.3.4., O/S**

2.2.2 - Cut peat face (straight sections), peat face re-profiling (0-1m) 450m

2.2.8 - Cut peat face (undulating sections), peat face re-profiling (2-3m) 372m

2.3.2 - 20 x 10m cells 15%

2.3.3 - 20 x 20m cells 40%

2.3.4 - 30 x 30 cells 45%

O/S – track crossings 2no.

The objective is to encircle the uncut lump with contour bunds with irregular large-cell bunding of Molinia treatment areas.

Boundaries.

Cell Bunding. The 2 patches should be bunded around the external outlines of Molinia trial treatments then subdivide each if the treatment area is more than 45m square (to give large 30- 40 x 30-40 irregular cells).

Perimeter –Bund 2m away from the edge on the uncut lump, and round the internal edge of the northern and southern Molinia blocks.

Contour bunding with upslope 7.5m spurs every 30-40m as necessary on the uncut lump.

CB1 - W- 12m off edge uncut, S- 2m north of drain, E – 2m off edge off uncut

CB2 - W- 2m off edge uncut, S- 2m north of S drain

CB3 - 2m west of edge of uncut lump

CB4 - Along trackside if possible

CB5 - E – 2m off track edge, N - 2m south of boundary drain, W – through cuts or up track centre.

2 track crossings required over bunds on the hydrological monitoring route from marker M5 to M3.

Features which must be avoided include hydrological monitoring dipwells M1-M10, the evaporation pan, rain gauges and K plates and the Long-Term Monitoring Network permanent quadrats, marked in green. The border drain and northern drain should not be blocked. Keep to margins of the uncut heather-dominated mire as there is very little uncut peat on the NNR.

2.3 **Sections 7.8, 7.9 and 15 Molinia trials (Annex 3.3) - Cell bunding intact bog – 1-15yr scrub (1.66ha), plus contour bunding (2244 m), 8 dams, 3 balance pipes and 9 crossings.**

Framework categories **2.3.2, 2.3.3, 2.2.2, 2.6.2, O/S, O/S**

2.2.2 - Cut peat face (straight sections), peat face re-profiling (0-1m) 2244m

2.3.2 20 x 10m cells 50% = 0.83 ha

2.3.3 20 x 20m cells 50% = 0.83 ha.

2.6.2 - Drains dam (drain damming), 1.5x1.5m - 8 no.

O/S - 9 no. track crossings

O/S – 3 no. Balance pipes.

The objective is to encircle the uncut lump with contour bunds, joined to large cell bunds covering the Molinia trial treatment areas.

Cell bunds. Follow specified boundaries then follow Molinia treatment boundaries and subdivide to make 20-30m cells to fit.

Boundaries

- Sect 7.9. NW- 3m from edge of uncut lump, NE – 10m east of 4.2/7.8, SE – 10m north of track, SW – start of heather

- Section 15. NW - 3m from edge of uncut lump, NE – Molinia trial cell bund, SW – 5m off edge of wood, SE- English/ welsh border

Contour Bunds. With upslope 5 m long spurs every 30-40m as necessary.

CB1 - NW - 3m from edge of uncut lump, NE – Molinia trial cell bund, SW – 5m off edge of wood, SE – 3m from edge of uncut lump

CB2 - 10m from CB1 except round edge of the centre-south S.15 cuttings and in NW 2m east of cinder track

CB3 - NW- 2m south of cinder track, NE – 3m from edge of uncut lump, SE – 10m north of track, SW – Molinia trial cell bund and the end of the border track. Avoid Hydro tube 8.

CB4 -10m from CB3. Avoid Hydro tube 7.

CB5 - 3m from edge drains

CB6 - From SJ48254 35787 parallel to rifle range butt to SJ48320 35717 then following heather edge to SJ48329 35662

Dams – D1-D8, blue dots on map

Balance pipes - UD1- UD3, blue dots on map

Track crossings – 2 no. on English/Welsh border track on section 15, 7 no. on Cinder track between section 7.8/7.9.

Avoid 2 hydrological monitoring tubes marked H7 & H8, the permanent quadrats marked in green and the PEATBOG experimental plot in the south-west of section 15. Keep to margins of the uncut mire as there is very little uncut peat on the NNR.

2.4 **Sections 26.4, 25.1, 25.2 and 3.1 Molinia trials (Annex 3.4) Contour bunding – Cut peat face (straight sections), (0-1m) - 4465m, 2no balance pipes and 8 no crossing points**

Framework categories **2.2.2, 2.2.8, O/S, O/S**

2.2.2 Cut peat face (straight sections), peat face re-profiling (0-1m)

2.2.8 Cut peat face (undulating sections), peat face re-profiling (2-3m) (category used for making high core bunds across peat cuttings)

O/S – track crossings 8 no

O/S – balance pipes 2 no

The objective along the north and west is to contour bund along the steep marginal slope to the surrounding peat cuttings, and in the east to follow the boundary of the high lump round the cuttings. In the south it is to cell or contour bund the more intensive Molinia trials and to reduce the impact of the major drains.

Area 26.4

CB4 - From 5m south of 27.2/27.3 track at Marker M14 to 5 m south of 26.3/ 26.4 track at M16 then turning east 5m north of track to 27.4/26.2 track at M15. Marker M10 marks where the route leaves the track.

CB5 - From CB4 at M16, - 5 m south of 26.3/ 26.4 track to M17, turning south following the heather boundary to M19. Make a bund crossing point over the track at start.

CB6 - From CB5 at M20, 5m south of the track to M20 then turning south 5m from east side of the track to M21, then circling west following the edge of the high bracken lump and re-crossing the track to M23. Make bund crossing points when crossing tracks.

CB7 – From CB 6 at M20, 5m south of the track which leads to the sleepers (M12) then from M25, along the edge of dammed cuttings to M26.

CB8 – From M26, 5m east of the dammed drain to M27 then following 5m off the edge of the low area to M28, damming through drains, leaving a 5 m gap from the edge of the cuttings.

CB9 - From CB6 at M22 following 5m east of the track to M24

CB10 - From CB4 in N, 3m off the Sect. 26.4/26.2 drain, following the top level around the cuttings, 2m from the edge.

CB11 - Bridging from the 92.5 to 92.5m contours from M32 to M33, using a high core across the low point, damming the 2 major drains.

CB12- Following the edge of the heather from CB9 (M24) to CB10 (M35)

Area 3.1

CB13 - from M41, 2m from edge of high lump of sect.3.1b north, round to Sect.3/26 track (between M39 and M40)

CB14 - Along the northwest of the cutting, west of CB13.

CB15 - Along the sect.3.1/3.2 track to M42 then north-east along a peat baulk to the sect. 3.1a/ 3.1b centre track.

CB16 - From M43 to M45, 2m west of the S3/S.5 track.

CB17 - Down the 3.1a/3.1b track.

CB18 - Through the cuttings in sect.3.1a north from CB17 to M44, skirting the edge of the wet cuttings

Area 26.1/ 26.2

CB19 - 2m north of the Sect.5/26 track then turning north, 2m west of the Sect.25/26 track to on a level with the Hydro tube 45.

CB20 - Cross contour high-core bund between the 91.5mAOD contours.

CB21 - 2m west of sect.26.1/26.2 drain from UD2 to M49 then following the north edge of the Molinia to M36.

CB22 - Following the mowing edge.

Balance pipes – 2 no. - UD1 at SJ49447 37265 and UD2 at SJ49456 337261

Crossing Points – 8no.at M15, M16, M33, M35, M21, M22, between M39 & 40 and between M37 & 38.

2.5 Sections 27.1/26.3 (Annex 3.5)- Cell bunding 7.6 ha and 987m contour bunding of the rifle range

Bog Surface (intact tree scrub removal 16-80 year old tree root plate 7.5m apart)

Framework categories: **2.3.7, 2.3.8, 2.3.9, 2.2.2**

Overall.

2.3.7 20 x 10m 15% = 1.22ha

2.3.8 20 x 20m 50% = 3.68 ha

2.3.9 30x30m 35% = 2.7ha

Area A

2.3.7 20 x 10m 15% = 1.22ha

2.3.8 20 x 20m 40% = 3.68 ha

2.3.9 30x30m 45% = 2.7ha

Area B

2.3.7 20 x 10m 20% = 1.22ha

2.3.8 20 x 20m 80% = 3.68 ha

Rifle Range Contour Bunding

2.2.2 Cut peat face (straight sections), peat face re-profiling (0-1m) - 987m

The objective is to block the piping/drainage caused by the Whixall bible cuts, military structures and tree root cracks and major drains in this very dry area.

Area A cell bunding boundaries

N- between 60 and 70m south of the Piccadilly track drain following the edge of the recently-felled tall scrub (Marker M3 to M4). **S** - east half – north of the double drain along the sect.27.1/27.2 boundary with a dip to 5m off the sect.27.2/27.3 track in east (M7- M8). **S-west half** – 5m off the west boundary of sect.27.2 then 2m off the “sleepers to 27.2/27.3” track (note new change to location of the eastern end of track) (M8 to M13). **E** - 5m west of the rifle range west drain (M3 - M5). **W** - 5m east of the railway drain (M4 - M13).

Area B cell bunding boundaries

N - 25m south of the Piccadilly track drain (M1-M2). **S** - between 60 and 70m south of the Piccadilly track drain following the edge of the recently-felled tall scrub (Marker M3 to M4). **E** - 5m west of the rifle range west drain (M2- M3). **W** - 5m east of the railway drain (M1 – M4)

Rifle Range contour bunding

CB1 - from M31 to M32, 5m off the forest edge, from M32 to M33 2m east of the drain, from M31 to M33 5m north of the ditch

CB2 – from M34 to M35, 5m south of the ditch, from M35 to M36 2 m west of the drain, from M36 to M39 2m off the track, from M39 to M32 2m east of the drain.

CB3 – from M42 to M44 2m south of the track, from M44 to 46 2m off the track, from M47 to M48. **Avoid damaging the end of the butt.** From M47 to M48 straight, from M49 to M42, 2m east of drain.

CB2a M40 to M44, CB2b M41 to M36 and CB3a M50 to M45– cross bunds as shown.

Avoid the 3 hydrological monitoring tubes and damaging the butts on the eastern rifle range and existing dams/ U-pipes.

2.6

Bettisfield Moss S.18.2 (Annex 3.6) – Cell bunding 3.45 ha bog surface (intact tree scrub removal completed,16-80 year old tree root plate 7.5m apart) and 423m contour bunding (NOTE- treatment of Section 18.1 east cuttings is specified separately below)

Framework categories **2.2.4, 2.3.7, 2.3.9**

2.2.4 – 423m - Cut peat face (straight sections),(peat face re-profiling (2-3m) because of past forestry root plates)

2.3.7 — 20m x 10m cells - 75% = 2.59 ha (implement as 10 x 30m cells, wanted in some locations to minimise damage to the uncut surface)

2.3.9 — 30 x 30 m cells - 25% = 0.86 ha

The objective is to ring the uncut deep peat (>6m) area with a single 10m or double 20m wide ring of cell bunds just above the 89m AOD contour, with 5 m spurs into the intact area as necessary, damaging the uncut peat as little as possible, and creating 2 contour bunds

within this ring, one across the 89.5m AOD contour in the north-east and one across the 89m AOD contour within the forestry extraction brash-mat in the south.

Boundaries and cell sizes.

Cell Bunding.

2.3.9 ca 30 x 30 m cells to fit

NW – 0.67ha (90-130m x 68m) on the sloping area – 5 m off the N edge of the wood

2.3.7 10 x 20 m cells

NE corner – 0.14ha of 10x20m cells in the Molinia area extending from the N brashtrack to 2m west of the Border Drain

2.3.7 10 x 30 m cells in a 10m wide row

N- eastern half - 0.28ha of a single row of 10 x 30m cells, to the south of the forestry brash track, cutting through it at the west end to join the bunds below. **SW** – 0.43ha of one row of 10 x 30m cells immediately south of the inner brash track then 2m north of the woodland along the 89m AOD contour running to the end of the spur brash track and then northwards to join area 18.1F(see para.3.10 below)

2.3.7 10 x 30 m cells in 2no. 10m wide rows (=20m wide).

N – west half - 0.44ha of 2 rows of 10 x 30m cells parallel to canal woodland - 5 m south of the edge of wood. **E-** 0.87ha of 2 rows 10 x 30m cells from 2 m west of the Border drain. **S-** 0.75ha of 2 rows of 10x 30m cells immediately south of the inner brash track, between the 2 brash tracks in the south-east.

Contour Bunding.

CB1 - Following the 89.5m AOD contour, keyed into adjacent cell bunds, with upslope 5m projections at ca.30m intervals.

CB2 - Following 89 m AOD contour, cutting through the brash track in the west, keyed into adjacent cell bunds with upslope 5m projections at ca.30m intervals.

Avoid the LTMN permanent quadrats, the hydrological dipwells or damaging the NNR tracks and if possible keep to boundaries of uncut area. NOTE - very deep soft peat.

2.7

Section 31.2/32 (Annex 3.7) Cell bunding of 17.5 ha bog surface (cut over - tree/scrub removal complete, 1- 15 year old tree root plates) plus 249 m of high-core contour bunding cut peat face (straight sections), (peat face re-profiling (2-3m) category used as high-core bunds are required), 34 deep dams (drains- drain damming), 3.0x3.0m) and 4 balance pipes. (NOTE Section 31.1 peat cuttings are covered separately in para 3.11 below)

Framework categories: **2.2.4, 2.4.2, 2.4.3, 2.6.3, O/S**

2.2.4 contour bunds 249m

2.4.2 20 x 20m cells 50%, 8.75ha

2.4.3 30x 30 m cells 50%, 8.75ha

2.6.3 dams 34no.

O/S balance pipes 4 no.

The north of section 31.2 is old low level Whixall Bible peat cuttings (1). South of that are low areas separated by high peat baulks (2), and south of that high dry peat with a few cut through (3). Just north of the pools is a fourth area (4) of high ground with low patches between.

Section 32 has low areas with 2 main N-S peat baulks which do not reach to the higher ground to the north along the Bronington Manor drain. There is a Molinia trial in the centre of section 32.

The objective for section 32 is to create northerly high core extensions to the 2 peat baulks, to ring-cell bund the Molinia trial treatments and to cell bund the rest of the lower level.

The objective for Section 31.2 is to cell bund the low northern area (1), encircling rather than bunding through nice heather/ mire areas. The objective for the middle area (2) is to create high-core cross-bunds from baulk to baulk to rewet the lower areas, cell bunding within them if more than 40 x 40m. Area (3) should be cell bundled. The objective for the high southern area (4) is to cell bund it, encircling any nice areas, but with cross contour bunds at 91m

AOD as specified to link the disjunct high blocks.

Area A. 8.4ha

Boundaries

N – 3m south of the track ditch. **NW** – 20m N&S of the corner. **NE** – 5m off the tree boundary

E- 2m west of the track-side ditch. **W** – 2 m off the trackside ditch except for U-pipes in the south which are in the trackside and railway ditches. **S** – 5m north of the cuttings

Bunding types

Area (1) Bunding at ground level.

Comprises the north and the SW corner of Sect.31 to the east of the Nook Lane track - very old flat cuts.

E- In the nice old cuts near Chapel lane track, use 40x40 cells.

Area (2) High-core bunds from high baulk to baulk to create high cells in the lower ground.

Comprises the centre N and has high bracken bunds with low areas

Area (3) Bund at baulk level Comprises the centre S- high bracken baulks

Area (4). Bunding at ground level keyed in to high baulks

Comprises the S- flat areas of heather/Molinia/Birch in old cuts, bund 40 x 40m cells at low level keyed into Bracken lumps. In the bracken to the north bunds round the heather cuttings, keyed into the bracken lumps.

Dams – 21,

6 no. high-core bunds, totalling 105m, (B9, B25-B28 – cross contour bunds, B29 – across a cutting).

2 no. balance pipes (UD60b in the Nook Lane east drain, RUD60 in Railway drain)

Avoid Quadrat 1 at SJ48503 37436

Area B. - 6ha Bunding types, same as areas (1) to (4) in area A

Boundaries

N – 5m south of the woodland boundary. **NE** – 5m off the tree boundary. **E**- 2m west of the track-side ditch except for the U-pipes which are in the ditch. **W** – west of the raised bracken ridge bridlepath. **S** – 5m from the cuttings. **Centre** – 2m off each side of the winding track running from S33.1SW at SJ48017 37182 to SJ48101 36935.

Dams – 13no.

2 no. High core bunds - 39m (B10 across end of old cuttings, UB24 high bund from contour to contour),

2 no. balance pipes (UD69 in E-W ditch with collar on west, UB24 in new bund with collar on east)

Area C (sect 32) – 3.12ha. Molinia mire with high bracken lumps

2.4.2 20 x 20m 50% in the east above the 90mAOD contour, **2.4.3 30x 30 m 50%** in the rest. Molinia trials areas to be banded around treatment boundaries, with 1 cross bund per treatment.

Boundaries

NW – 5m south of the woodland boundary except bunds. **E**- west of the raised bracken ridge bridlepath. **S** – 5m north of the railway ditch

High-core bunds – 2no. B1 and B2 – 50cm high core – 95m.

No dams or balance pipes.

Avoid Ammonia tube at SJ47802 36741 and Quadrat 2 at SJ47907 36922

2.8

Section 10 (and 8). (Annex 3.9) Cell bund 6.8 ha of bog surface (cut over - tree/scrub removal complete 1- 15 year old tree root plate) with 13 dams, 3 crossing points and 1 balance pipe

Framework categories: 2.4.2, 2.4.3, 2.4.4, 2.6.2, O/S, O/S

2.4.2 - 20 x 20m cells - 50% = 3.4 ha

2.4.3 - 30 x 30m cells - 40% = 2.72 ha

2.4.4 - 40 x 40m cells - 10% = 0.68 ha

2.6.2 Drains (drain damming), 1.5x1.5m dams – 13 no.

O/S – 1 balance pipe
O/S – 3 crossing points

This area is mainly Whixall bible cuts with high tracks and some deep drains. The objective is to cell bund keyed into tracks and high peat baulks. Keep the Section 8/10 ditch undammed except where dams/ balance pipes are specified.

The Molinia trials - bund around the outside of each treatment then subdivide into ca 20 (30) x 20 (30) m cells to fit treatment outlines.

Boundaries.

Section 8.5. **NW** – start of the Dutch cuttings, **NE** – 2 m off the main track ditch, **Centre** - key into high baulk, **SW** – key into the sect.8.5/8.6 track, **SE** – 2 m west of the Sect.8/10 ditch

Note: create 6 dams in deep drains

Section 8.6 **NW** - 3m east of the drain to the south of the track, **SE** – 2 m west of the Sect.8/10 ditch, **NE** – runs into Sect.8.5. **SW** – key into the track to sect.8.7

Note: create 3 dams in deep drains

Section 8.7 **NE** – key into the track to sect. 8.6, **SW** – key into the track to sect.8.8, **NW** – 2m from drop into the Dutch cuttings, **SE** – 2 m west of S.8/10 ditch

Section 8.8 **NE** – the track to sect.8.7, **SW** – the track to sect.8.9, **NW** – 2m from the drop to the Dutch cuttings, **SE** - 2 m west of the Sect.8/10 ditch

Section 8.9 **NE** – the track to sect.8.8, **NW & SW**– the limit of the trackside Molinia, **SE** - 2 m west of the Sect.8/10 ditch

Section 8.10 **NW** - the end of the Dutch cuttings, **S**- 3m from the track

Section 10.1 **NW** – 2 m east of the Sect.8/10 ditch, **NE** – 2 m off the main track ditch, **SW** – key into the sect.10.1/10.2 track, **SE** – 2 m west of the retained trees

Section 10.2 **N** – key into the sect.10.1/10.2 tk, **NW** – 2 m east of the Sect.8/10 ditch, **S** – 3m north of the sect.10.2/10.3 track, **E** – 3m west of the track

Dams. 13 no. D1 –D12, D13 is in Sect.8/10 drain.

Balance pipes 1 no. UD14 – balance pipe in the Sect.8/10 drain, 90 degree collar on east side

Crossing points 3 no. On tracks at Sect. 8.6/8.7, at Sect.10.1/10.2 and at Sect.8.8/8.9

Avoid Q1 quadrat at SJ49955 36759 and U-pipe already in S8/10 drain at SJ49934 36735

Hazard - Metal railway track in peat at D1 and D9

2.9

Section 12.5/22.1/23. (Annex 3.9) Cell bund 9ha of bog surface (cut over - tree/scrub removal complete, 1- 15 (B8 – 16-80) year old tree root plates) with 8 no. 235m high-core bunds, 11 dams, and 3 balance pipes.

Framework categories: **2.2.8, 2.4.2, 2.4.3, 2.4.4, 2.6.2, O/S,**

2.2.8 Cut peat face (undulating sections), (peat face re-profiling (2-3m) – category used because of high-core bunds and for B8 larger root plates) – 235m

2.4.2 - 20 x 20m cells - 50% = 4.5 ha

2.4.3 - 30 x 30m cells - 40% = 3.6 ha

2.4.4 - 40 x 40m cells - 10% = 0.9 ha

2.6.2 – Drains (drain damming), 1.5x1.5m - 11 no. dams

O/S – 3 no. balance pipes

The objective for these Whixall bible cuts with high tracks, high bracken baulks and some deep drains is to cell bund keying into tracks and high peat baulks. Keep the Sect.12.5/12.4 (northern) ditch undammed and Main Drain undammed.

Boundaries and bunding instructions

CELL BUNDING

Section 12.5

NW – bund to 1m south of N drain.

NE – key into track, **SE** – the ditch to 23 has been dammed. Bund through it or into dams.

SW – stop bunds 5m east of Main Drain. Work from the east – no tracking near the Drain.

Section 23.

NW – the ditch to 12.5 has been dammed. Link bunds to dams,

NE – include the high trackside Molinia, keyed into the track, key the lower ground bunds into this lump.

SE – **west half** - 2m N of the track ditch, **east half to north of wood** - 5m off retained woodland edge.

SW - north half – Main drain – keep 5m away and work from the east.

SW – south half –make a N-S edge bund parallel to the high Pt lump which the track runs along, in case there are old drains cutting through to the Main Drain. Key through to the high lump at the E-W bund locations.

Avoid Quadrat at 349,622 336,038

Section 22.1

NW – key into the track, damming the drain

NE – Main drain – keep 5m away and work from the east.

Centre - Key bunds into high bracken baulks

SE – Key into the southern track

SW – stop 5m off the dense woodland – include isolated trees inside bunds.

HIGH-CORE BUNDS 7no.106m (1-15yr root plates) B1- 6m, B2 – 12m, B3 – 4m, B4 13m, B5-22m, B6- 9m, B7- 40m, as shown.

1no. -B8 (15-86yrs root plates) – 129m running 2 m from the south and east tracks of section 23, through recently cleared woodland.

DAMS – 11no.

BALANCE PIPES – 3 no. with the 90 degree collars on the north end - UD9a through the bund B9 into the S drain of section 23 and another UD9b through the track; UD13 from the S drain through the track both with upstream pipes set high not to flow at moment.

Avoid Dipwell HX18 at SJ49348 35886. The southern woodland will be cleared as necessary.

2.10

Section 18.1 (Annex 3.6) Cell bund 2.79 ha of bog surface (cut over - tree/scrub removal complete 16- 80 year old tree root plate 7.5m apart), (Note the western woodland edge shown on Annex 3.6 is not correct, the bunding plot outlines shown now border the wood).

Framework categories **2.4.7, 2.4.8**

2.4.7 20x20m cells - 75%– 2.09 ha

2.4.8 30 x 30m cells – 25% – 0.70 ha

The objective for the old dammed hand cuttings of sections 18.1A to 18.1E is to bund across from track to track in an approximately N-S direction from the western woodland boundary to the existing eastern cross bunds, taking care to minimise damage to the developing Molinia tussocks particularly in section 18.1C where Hagenella caddis fly breeds. The cells should be narrower on the steeper slopes in the east of sections 18.1A and 18.1B. In section 18.1F the objective is to cell bund the slope to the canal drain, recently cleared of trees, which has partly been dammed and high-bunded.

Boundaries and bunding instructions.

Section 18.1A. 0.21ha, 17m x 120m ; Use 17m x 30m cells keyed into tracks apart from two 10 x 17m cells in the east on the steeper slope (**2.4.7 20 x 20m cells**)

Boundaries. **S-** the fence, **W-** the woodland edge, **N** - track 1, **E-** an existing bund.

Section 18.1B. 0.52ha, 22m x 190m; construct (22) m x 30m cells keyed into tracks apart from three (22) x 20m cells in the east on the steeper slope (**2.4.7 20 x 20m cells**)

Boundaries. **S-** track 1, **W-** the woodland edge, **N** - track 2, **E-** an existing bund and uncut edge

Section 18.1C. 0.33 ha, 27m x 125m; use 27m x 30m cells keyed into tracks (**2.4.8 30 x 30m cells**) **Care** – this flat is the main stronghold of Hagenella caddis fly. Alert NE staff.

Boundaries. **S-** track 2, **W-** woodland edge, **N** - track 3, **E-** existing bund.

Section 18.1D. 0.48 ha, 46m x 110m; construct a double row of 23m x 30m cells keyed into tracks (**2.4.7 20 x 20m cells**)

Boundaries. **S-** track 3, **W-** the woodland edge, **N** - track 4, **E-** an existing bund
Section 18.1E. 29 -55m x 135m; Construct 27- 29m x 30m cells keyed into tracks/ bunds
(2.4.8 30 x 30m cells)

Boundaries. **S-** track, **W-** track, **N** – the field trees, **E-** the central existing bund.

Section 18.1F. 0.8 ha, 20 - 75m x 230m; construct 15-20m x 20m cells **(2.4.7 20 x 20m cells)**. Key into existing dams/ bunds as necessary.

Boundaries. **N** – the canal drain, **NW** – the field edge trees, **SW-** 5m from edge of peat cuttings, **S & SE-** Sect 18.2 bunds.

Avoid damaging Hagenella areas, hydrological monitoring tubes and existing bunds/ balance pipes.

2.11 **Section 31.1 (Annex 3.10). Contour bunding 143m cut peat face (undulating sections), peat face re-profiling (2-3m) (in lieu of high-core bunds across peat cuttings), with 29 large dams, and 5 balance pipes**

2.5ha south of Area B, 2.7ha south of Area A, both on section 31.2, - deep recent linear hand-cuttings with high lumps covered by bracken or heather, and mire between on intermediate levels and pools at the lower levels.

Framework categories: **2.2.8, 2.6.3, O/S**

2.2.8 Cut peat face (undulating sections), (peat face re-profiling (2-3m)) – high-core bunds across cuttings) – 15no. - 143m total

2.6.3 Drains (drain damming), 3.0x3.0m - 29 no. dams

O/S - Balance pipes – 5no.

The objective is to prevent the linear cuttings from draining into the Railway drain, and to lessen wave action in the pools by creating cross dams and bunds to the level of the top of the peat baulks. Where it is too difficult to block the cuttings, installation of balance pipes in the railway drain will at least raise water levels to the surrounding bank level.

Boundaries

N – a mown track , **E & W** – limit of the cuttings, **S** – the Railway ditch

Bunding/ damming instructions.

Create high-core dams and bunds across the deep peat cuttings with balance pipes, as indicated.

Bunds. 15 no. totalling 143m., B3 to B8, B11 to B14, B15- 25m long, HB16- 20m long, HB17- 6m long, HB18- 6m long, B20-23 (6no @6m, 5no @ 10m) (HB – high core bunds), marked with labelled canes.

Dams - 29 no. as shown and marked with labelled canes.

Balance pipes – 5 no. UD 22, 23, 24, RUD60, RUD62, all south of area B. (RUD – in railway drain).

2.12 **Access track re-instatement**

Apart from the railway line, tracks are on peat. Car parks and the dis-used railway line are topped with granite. Use of low ground pressure equipment is required at all times to minimise damage and these must leave NNR tracks as soon as possible. Maintenance will be required during operations to ensure the public can use the tracks with minimal inconvenience (as the track are used by NNR staff and the public and some are rights-of-way and trails) and re- instatement will be required after works.

- o Photos to be taken prior to work starting

- o Mineral areas – 100 m.
Framework categories **2.7.8**

2.7.8 Access track repair –re-instatement of mineral tracks and mineral areas

Re-instate damage to the dis-used railway line and any car parks/ mineral access tracks by regrading and filling ruts and potholes with 40mm to dust granite. Quantity to be agreed with NE's Project Officer.

Peat tracks – outside scope – 400 m.

Re-instate damage to peat tracks by flattening ruts and if necessary filling with dry rank vegetation obtained from adjacent areas (Molinia/ bracken and surface peat) and levelling off within a day of creating the damage so NNR staff and visitors can continue to pass. Quantity and source to be agreed with NE's Project Officer to avoid damage to Hagenella areas.

- Any damage to culverts, fences, gates to be made good.
- Work must be to Natural England's Project Officers satisfaction and will be based on the pre-works photos

Crossing Points – outside scope – 78 no.

Where bunds cross tracks needed for future access or to allow future access into certain cells, the covering over the core of the bunds will need extending by 3m each side for a central 5m width, graded from bund height down to track height, so light machinery (mowers, ATVs) can be run over the bund.

3 Report and Photographic record

➤ **Framework category – outside scope**

- Contractors shall make no financial investment in the project and, therefore, shall not benefit from any intellectual property rights arising from the project.
- A brief report is required, detailing the implementation of the work. This will help Natural England to understand the positive and negative problems related to this type of restoration work and highlight any pitfalls that need to be communicated in future tenders. To include, for each different area:
 - Methodology of grip and ditch blocking/bunding with quantities
 - A portfolio of photos and or videos taken during the works in electronic format. These will potentially be used for talks, seminars etc. but only with the contractors permission. Photos/Videos to have appropriate file name explaining location and detail of the content.
- The cover of all reports and/or maps produced as part of the contract must include a statement © Natural England and the date of creation.
- The front cover must:
 - include the following wording 'The Marches Mosses BogLIFE Project (LIFE15/NAT/UK/000786)' is financially supported by LIFE, a financial instrument of the European Commission'.
 - display the Natural England, Natura 2000, LIFE and HLF logos. The LIFE and N2K logos are available from the European Commission's LIFE toolkit – guidance on how to use these logos can be obtained from the website or they can be supplied by the Project Officer.
- The following standardised wording must be included in the report:
 - The Marches Mosses BogLIFE project (LIFE15 NAT/UK/000786) is a five year project running from 1 October 2016 to 31 December 2021. The project aims to restore Britain's 3rd largest lowland raised bog within the Fenn's, Whixall & Bettisfield Mosses and Wem Moss NNRs near Whitchurch, Shropshire and Wrexham in Wales. The LIFE project is led by Natural England working in partnership with Natural Resources Wales and the Shropshire Wildlife Trust. The project is financially supported by LIFE, a financial instrument of the European Commission and the Heritage Lottery Fund.
 - A link to the Marches Mosses Bog LIFE Project webpage.

4 Bund/ Dam Location Plotting – out of scope

Record whilst carrying out the bunding and damming works, an electronic record of the

locations of dams and bunds and supply in a format suitable for use in ArcGIS v 10.2.2. Also incorporate findings into the report above. **HEALTH AND SAFETY AT WORK** **First Aid**

- The Contractor will be responsible for the health, safety and welfare of the contract work force, and a practicing first-aider with current certification will be present at all times. The Contractor will provide all appropriate first-aid equipment.

5.2 Lone Working

- Because of the remote location of the site there will be no lone working at any time.

5.3 Certification and codes of practice

- All work is to be conducted in accordance to codes of practice and operators must hold appropriate and current training certification for any machinery or equipment they use. Copies of all current personnel and machinery certification must be presented to the Natural England Project Officer, for retention, one week prior to work commencing.

5.4 Warning signs

- The site has visitors, staff and volunteers who will be using the tracks and Trails adjacent to the work areas. Contractor will be responsible for alerting visitors, staff and volunteers by erecting warning signs.

5.5 Risk Assessment and CDM

- **A copy of the Fenn's & Whixall Moss NNR risk assessment will be supplied to the contractor. The Contractor shall carry out a comprehensive Risk Assessment for all aspects of the project and present a copy to the Natural England Project Officer one week prior to work commencing.** This should be signed as having been read and understood by all those who will be working on the site.
- A CDM co-ordinator Aegis Services Ltd. has been appointed: contact. All works will be carried out in accordance with CDM Regulations 2015 and the Contractor will liaise with the CDM coordinator accordingly to prepare the Construction Phase Plan. Contact: [REDACTED]

5.6 Accident Reporting

- The Contractor will be responsible for immediately reporting any accidents involving either their personnel or the public to the Natural England Project Officer. All incidents involving the public, however minor, are reportable under RIDDOR.

5.7 Smoking

- **SMOKING IS STRICTLY PROHIBITED ON SITE FOR ALL PERSONNEL.** There is an extreme fire hazard on the raised mire at all times.

5.8 Work start date and order of works.

- Works must commence by late-January 2019 and Wem Moss must be the first area to be completed.
- In accordance to codes of practice and operators must hold appropriate and current training certification for any machinery or equipment they use. Copies of all current personnel and machinery certification must be presented to the Natural England Project Officer, for retention, one week prior to work commencing.

5.9 Warning signs

- The site has visitors, staff and volunteers who will be using the tracks and Trails adjacent to the work areas. The Contractor will be responsible for alerting visitors, staff and volunteers by erecting warning signs.

5.10 Risk Assessment

- **A copy of the Fenn's & Whixall Moss NNR risk assessment will be supplied to the contractor. The Contractor shall carry out a comprehensive Risk Assessment for all**

aspects of the project and present a copy to the Natural England Project Officer one week prior to work commencing. This should be signed as having been read and understood by all those who will be working on the site.

5.11 Accident Reporting

- The Contractor will be responsible for immediately reporting any accidents involving either their personnel or the public to the Natural England Project Officer. All incidents involving the public, however minor, are reportable under RIDDOR.

5.12 Smoking

- **SMOKING IS STRICTLY PROHIBITED ON SITE FOR ALL PERSONNEL.** There is an extreme fire hazard on the raised mire at all times.

6. Work Programme

- Commencement Date – w/c 21st January 2019.
- Completion Date – The project should be completed and final invoice issued by 31st March 2019

Invoice referencing – invoices must include the following wording 'The Marches Mosses BogLIFE Project (LIFE15/NAT/UK/000786)' is financially supported by LIFE, a financial instrument of the European Commission'.

The Marches Mosses BogLIFE project (LIFE15 NAT/UK/000786) is a five year project running from 1 October 2016 to 31 December 2021. The project aims to restore Britain's 3rd largest lowland raised bog within the Fenn's, Whixall & Bettisfield Mosses and Wem Moss NNRs near Whitchurch, Shropshire and Wrexham in Wales. The LIFE project is led by Natural England working in partnership with Natural Resources Wales and the Shropshire Wildlife Trust. The project is financially supported by LIFE, a financial instrument of the European Commission and the Heritage Lottery Fund.

Costs:-				
Works	Unit/Area size	Cost /ha (this must not be more than the agreed maximum rate which were assessed as part of the framework tender)	Total (excl VAT)	Total (incl VAT)
Cell bunding and contour bunding with damming ditches and installation of balance pipes– (sections 3.1 – 3.11 above)				
Molinia trials - Wem Moss, Section 6 and Section 7/15 Bog Surface (intact - Tree/scrub removal completed, 1-15 year old tree root plates)	12.75 ha total			
2.3.2 20 x 10m cells	2.04 ha			
2.3.3 20 x 20m cells	3.55 ha			
2.3.4 30 x 30m cells	1.33 ha			
2.3.5 40 x 40 m cells	5.83 ha			
Sections 26/27 and 18.2 Bog Surface (intact tree scrub removal completed, 16-80 year old tree root plates 7.5m apart)	11.05 ha total			
2.3.7 20 x 10m cells	3.81 ha			
2.3.8 20 x 20m cells	3.68 ha			
2.3.9 30 x 30m cells	3.58 ha			
Section 31.2/32, 10 and 12/22/23 Bog surface (cut over - tree/scrub removal complete 1- 15 year old tree root plate)	33.1 ha total			
2.4.2 20 x 20m cells	16.65 ha			
2.4.3 30 x 30m cells	15.08 ha			
2.4.4 40 x 40m cells	1.58 ha			

Section 18.1 Bog surface (cut over - tree/scrub removal complete 16- 80 year old tree root plate 7.5m apart)	2.79 ha total			
2.4.7 20 x 20m cells	2.09 ha			
2.4.8 30 x 30m cells	0.7 ha			

<p>Sections 26/27 rifle range and Molinia trials on sections 26/25/3, 6 and 7/15 Contour bunding Cut peat face (straight sections), peat face re-profiling (0-1m) 2.2.2 contour bunds</p>	<p>7407m total 7407 m</p>			
<p>Sections 18.2 and 31.2 Cut peat face (straight sections), peat face re-profiling (2-3m)- category used because of bigger rootplates and high core bunds needed respectively 2.2.4 contour bunds</p>	<p>672 m total 672 m</p>			
<p>Sections 31.1, 12/22/23, 26/25/3 and Molinia trials S6 Cut peat face (undulating sections), peat face re-profiling (2-3m) – category used as high core bunds needed 2.2.8 high core bunds bridging contours or cuttings</p>	<p>1489 m total 1489m</p>			
<p>Sections 10, 12/22/23 and Molinia trial 7/15 Drains (drain damming), 1.5x1.5m 2.6.2 dams</p>	<p>32 no. total 32 dams</p>			
<p>Section 31.2/32 and 31.1 Drains (drain damming), 3.0x3.0m 2.6.3 dams</p>	<p>63 no. total 63 dams</p>			
<p>Sections 10, 12/22/23, 31.1, 31.2/32 and Molinia trials - 7/15 and 26/25/3 Balance pipes in dams/bunds Out of scope</p>	<p>18 no. total 18 U-pipes</p>			
<p>Ancillary work</p>	<p>Section 3.12 above) Cost/ m</p>			

Access track re-instatement – mineral tracks and mineral areas 2.7.8	100m		[REDACTED]	
Access track maintenance and make good – peat tracks Out of scope	400m.			
Access track re-instatement – peat tracks Out of scope	400m			
Section 10 and Molinia trials - Wem Moss, Section 6, 7/15 and 26/25/3 Track crossings over bunds Out of scope	78 no. totals 78 crossings		[REDACTED]	
Report and Photographic record (section 4 above) Out of scope	Cost/unit			
Bund/ dam location plotting (section 5 above) Out of scope	Cost/unit			
Total			£156,418.95	£187,702.74

Total Cost - £156,418.95 excluding VAT

Total Cost - £187,702.74 including VAT

Invoicing and Payment

The Contractor shall issue one invoice, once all of the works are complete

The work must be completed by 31st March 2019

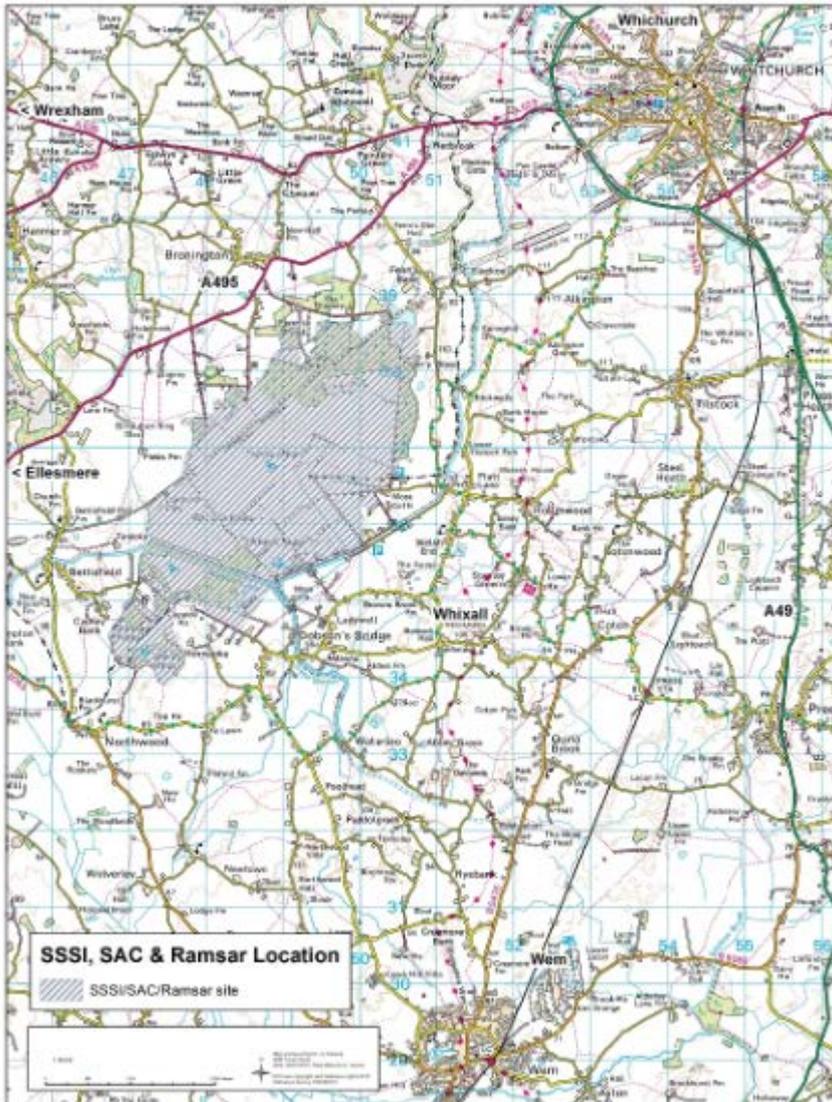
The Supplier shall submit the invoice to the Authority at the following addresses:

ssd.apne@defra.gsi.gov.uk or Shared Services Connected Limited (SSCL), Accounts Payable NE, PO Box 793, Newport, Gwent, NP10 8FZ

The invoice should clearly state the purchase order number.

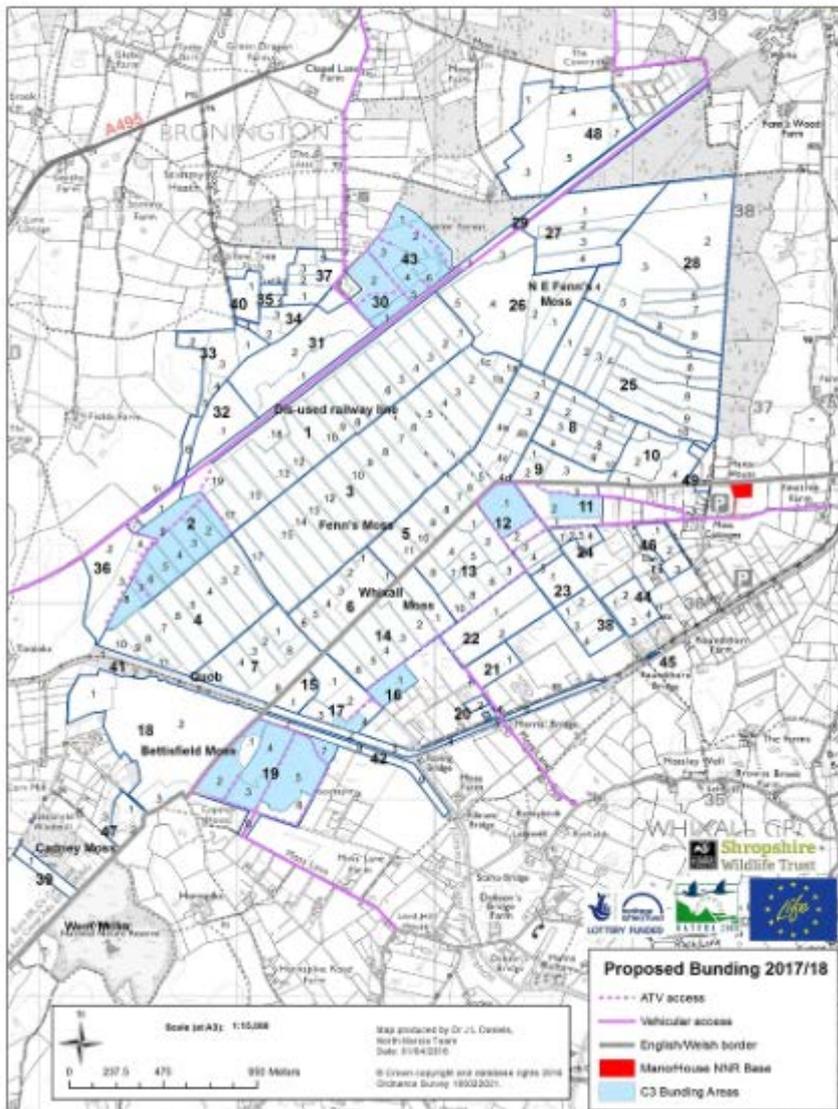
Annex 1

Map 1 Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses
Site of Special Scientific Interest
Special Area of Conservation & Ramsar Site

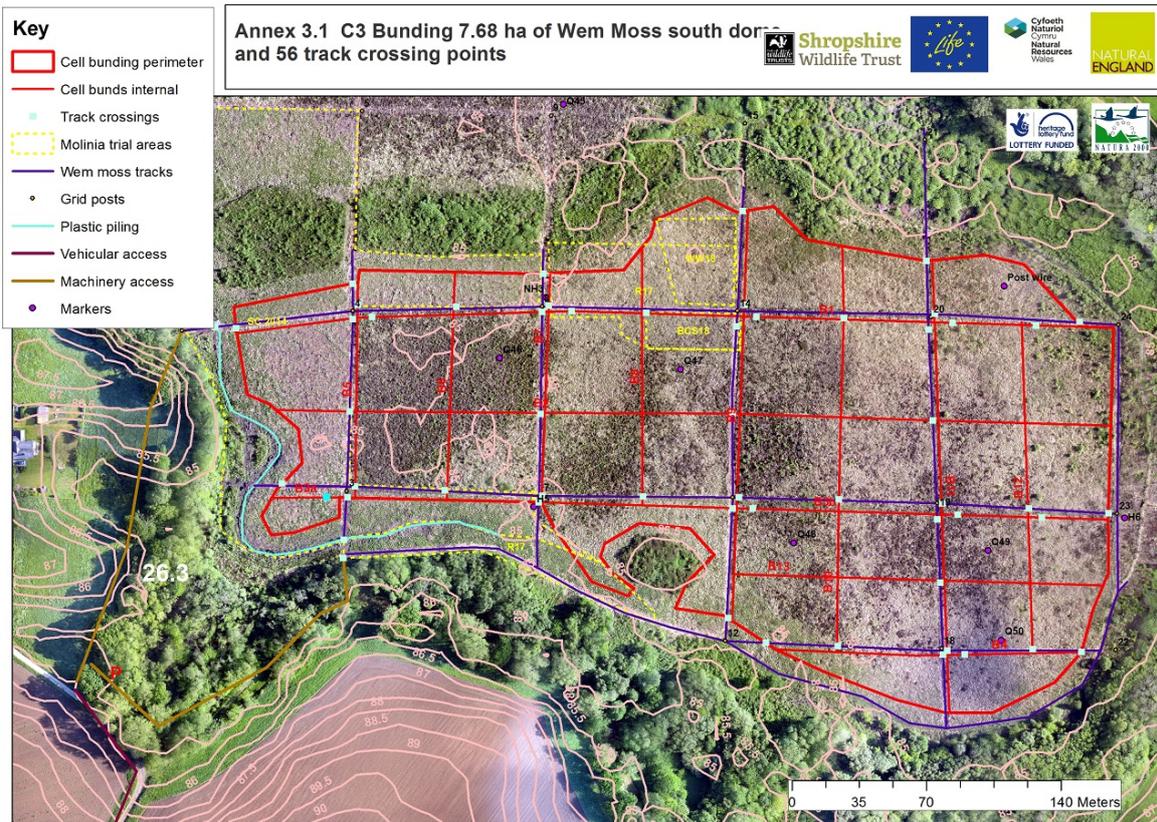


Annex 2

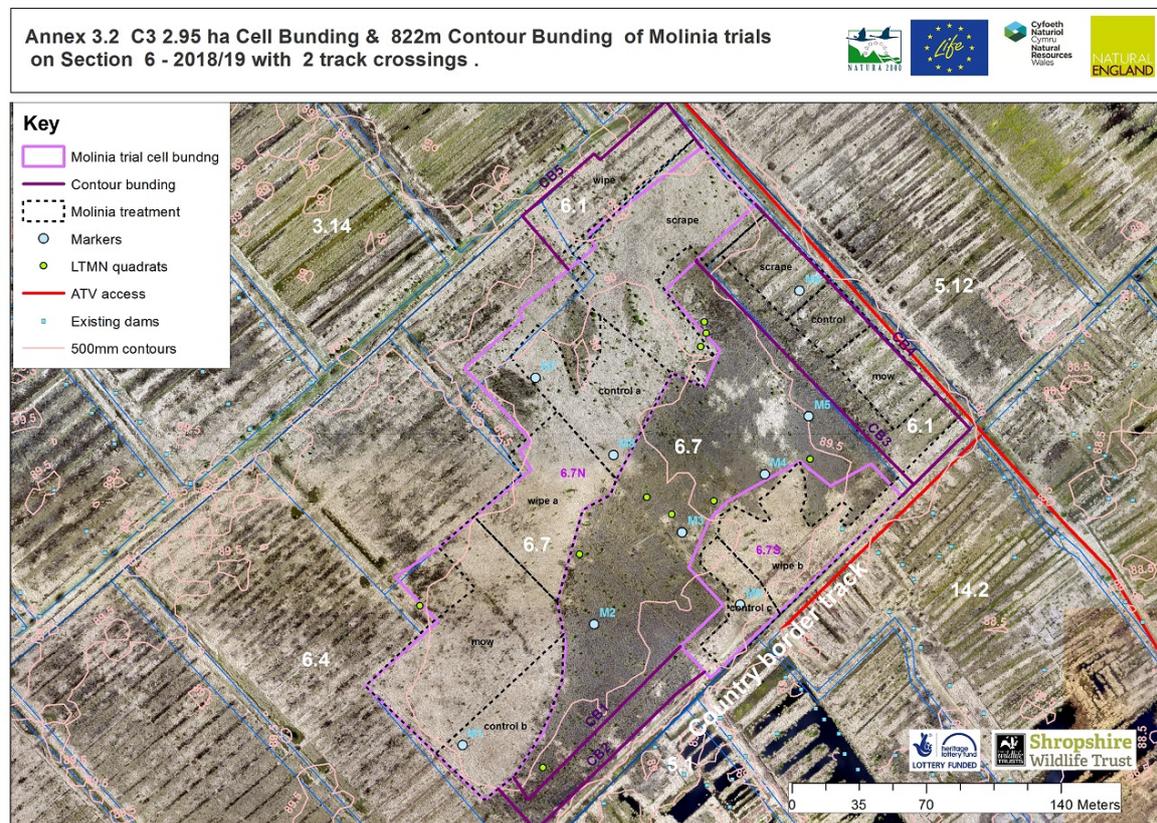
Fenn's, Whixall, Bettisfield, Wem & Cadney Mosses SSSI
Annex 2 - Marches Mosses Bog LIFE Project (LIFE15/NAT/UK/000786)
Action C3 Bunding areas 2017/18



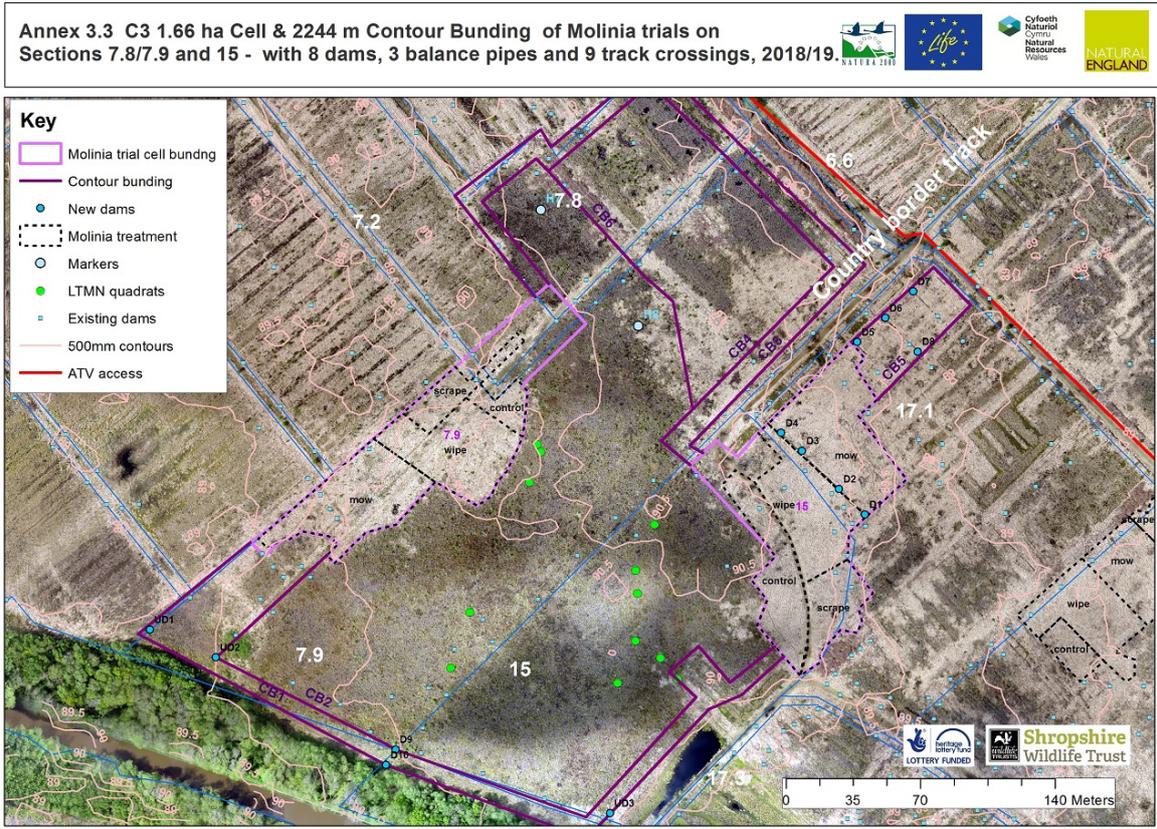
Annex 3.1



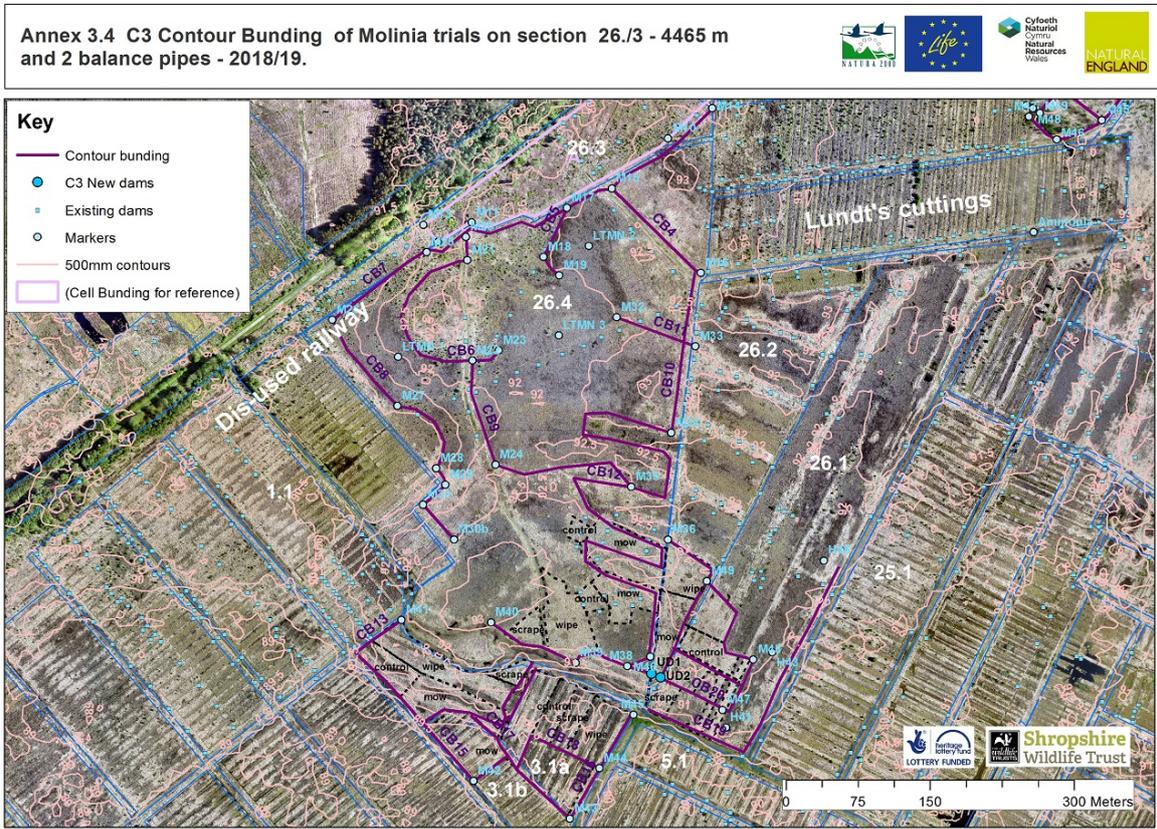
Annex 3.2



Annex 3.3

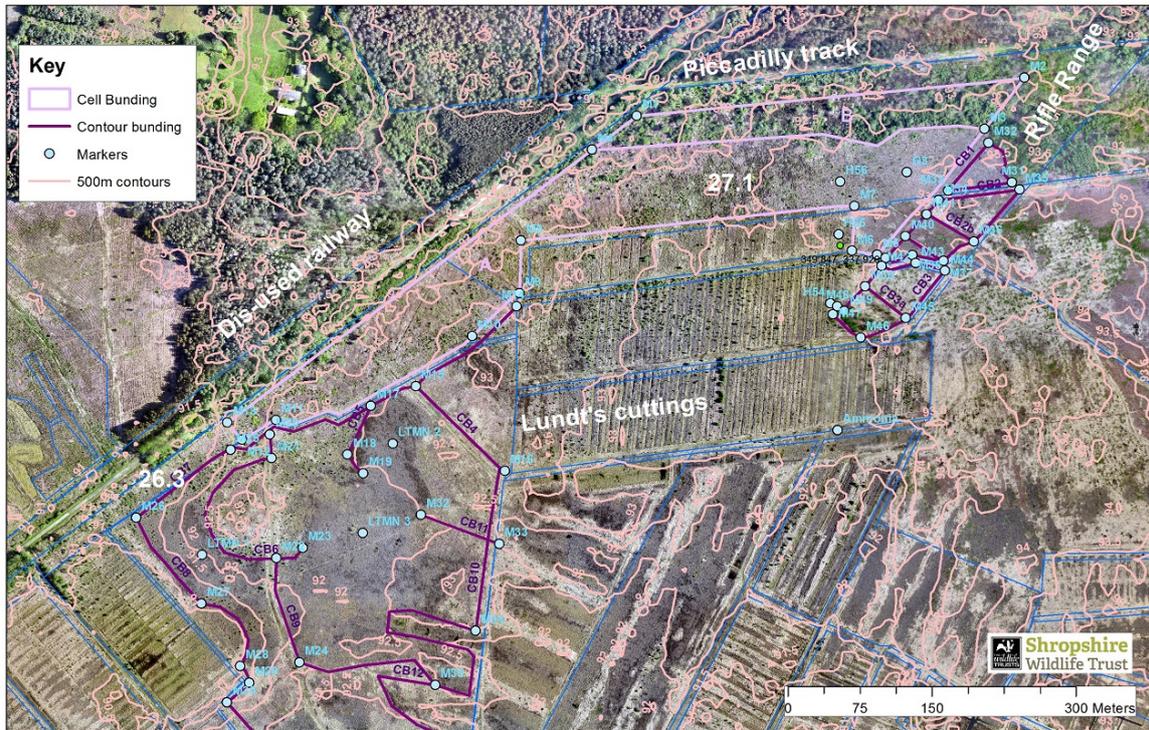


Annex 3.4



Annex 3.5

Annex 3.5 C3 Bunding 7.6 ha of sections 26.3 and 27.1, and 987m contour bunding of eastern rifle range, 2018/19.



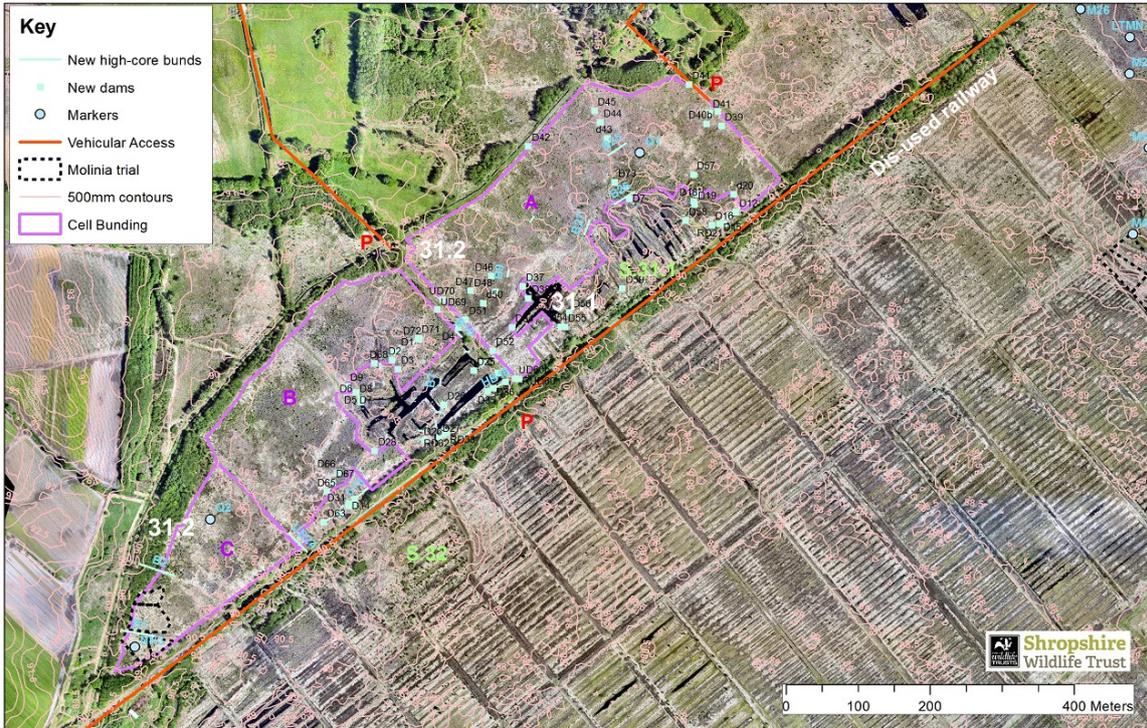
Annex 3.6

Annex 3.6 C3 6.24 ha of Cell bunding of Sections 18.1 (2.79ha) & 18.2 (3.45ha) and 423 m contour bunding on section 18.2



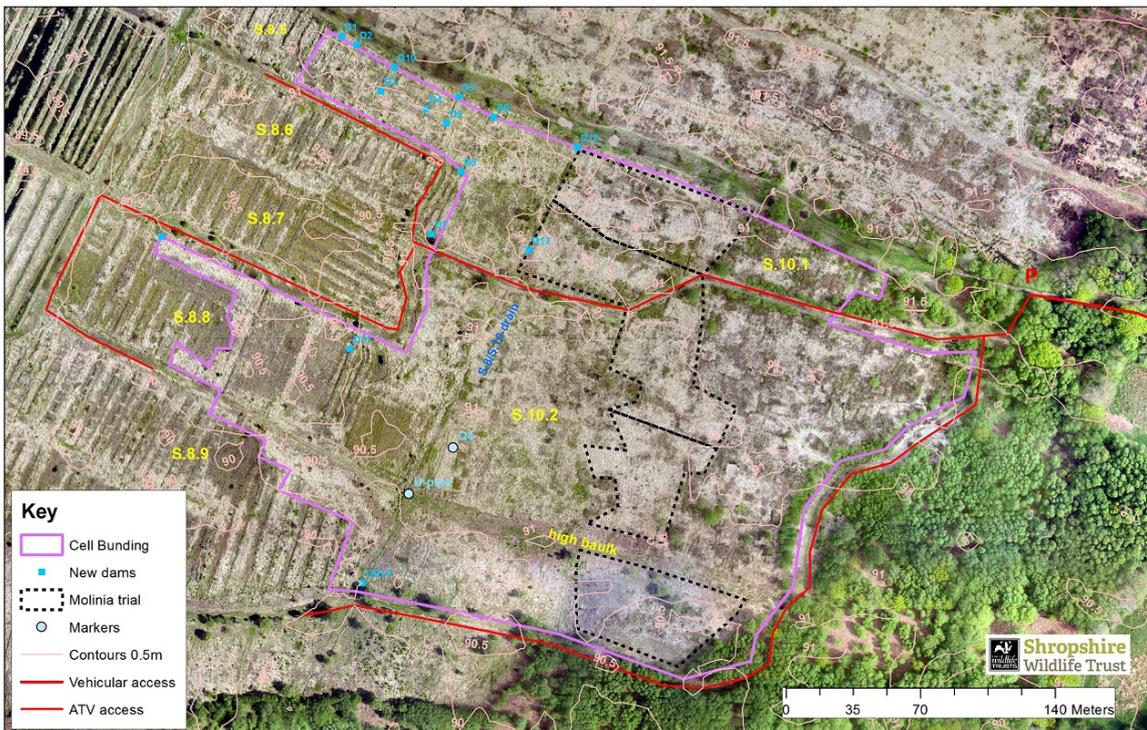
Annex 3.7

Annex 3.7 C3 Cell Bunding 17.5 ha of Areas A, B and C of sections 31.2 and 32, with 249m high bunds, 34 dams and 4 balance pipes, (not S31.1 pools)

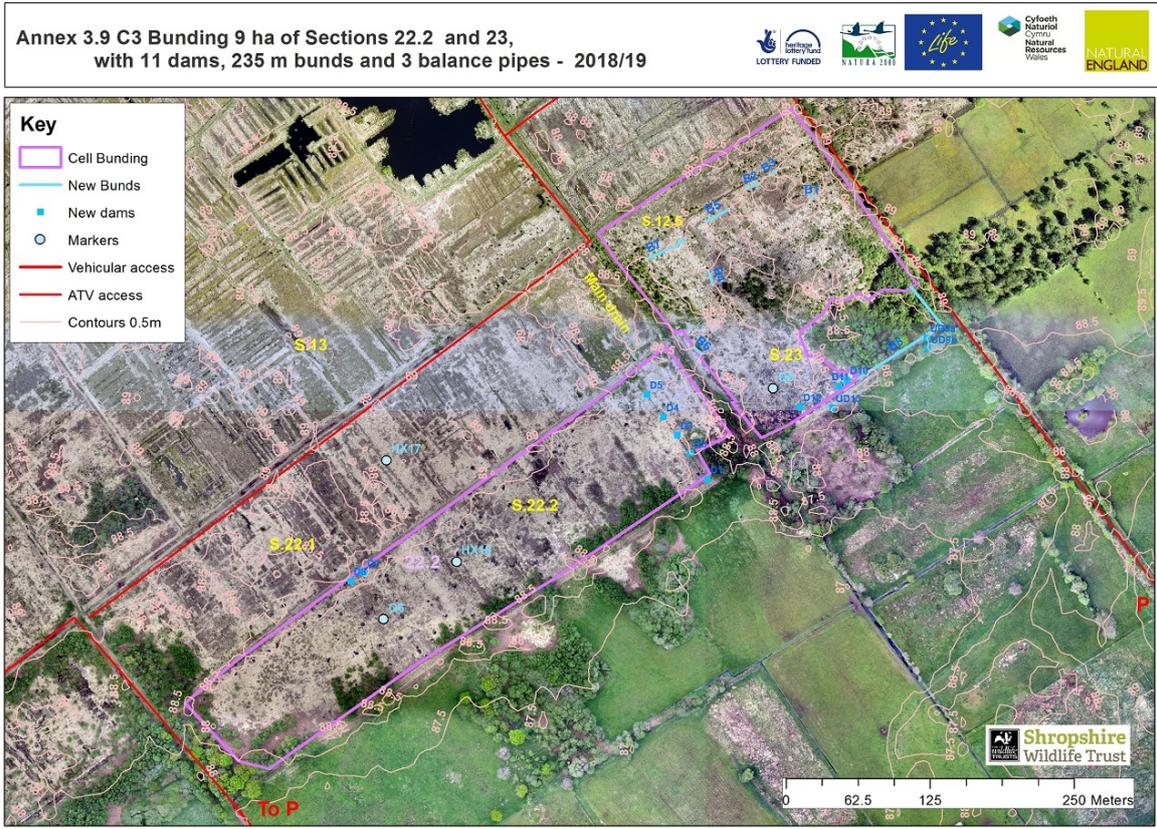


Annex 3.8

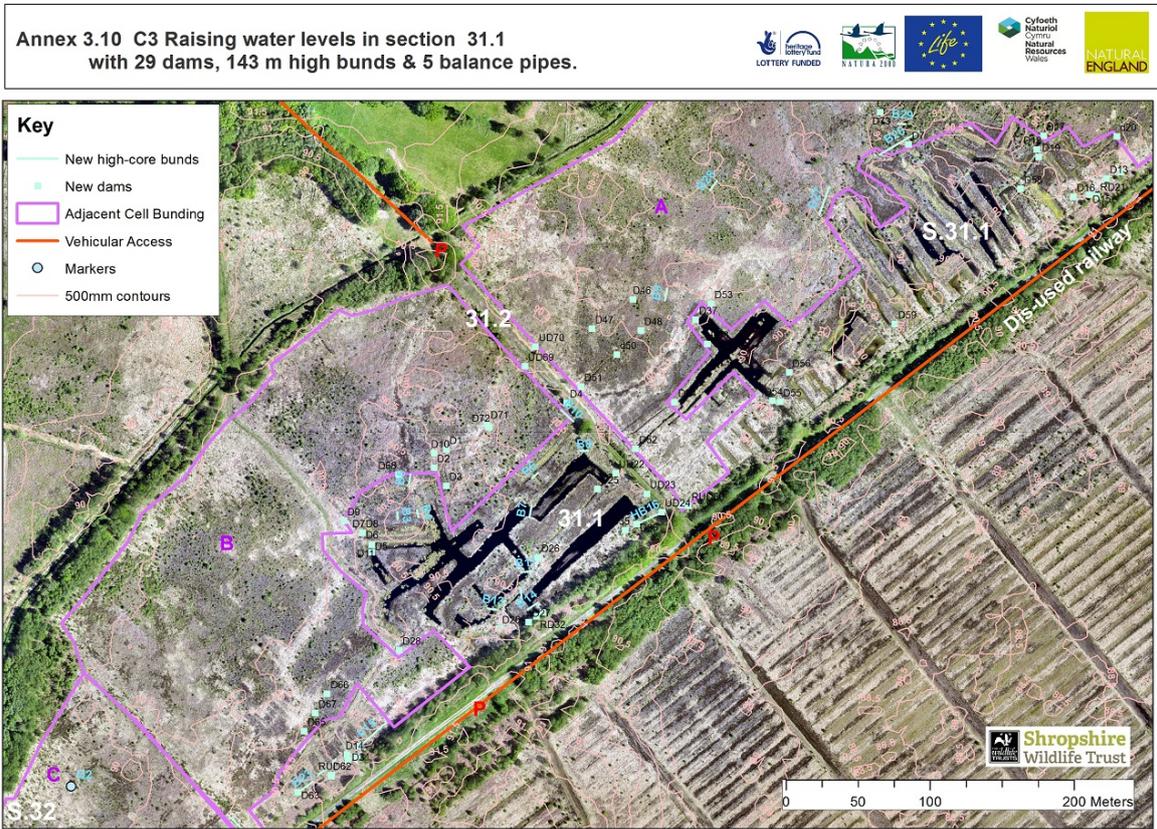
Map 3.8 C3 Bunding 6.8 ha of Sections 8 and 10, with 13 dams, 3 crossing points and 1 balance pipe - 2018/19



Annex 3.9



Annex 3.10



Annex 4 – C3 Cell and contour Bunding 2018-19

Ground conditions, Areas, Peat Depths and topography

Framework category & site	Area /dist.	Type	Current vegetation	Ground conditions	Peat depths m
Intact 1-15 yr rootplates					
Wem Moss, south dome	7.68 ha	uncut	Molinia/ heather or heather-rich mire	Damp - dry	1-4m
Molinia trials – sect 6	2.95 ha + 822m	Uncut + drains	Molinia or heather-rich mire	Damp	3.0 – 6.3 m
Molinia trials – sect 7/15	1.66 ha 2244m	Uncut + drains	Molinia or heather-rich mire	Wet - damp	1.6-4.1 m
Molinia trials – sect 26.4/25/3	4465m	Uncut + drains, cutover	Molinia and heather mire	Damp - dry	1.9 – 6.0+m
Intact, 16-80 yr rootplates					
27.1/26.3	7.6 ha +987m	Whixall bible cuts	Dry heath, forest cleared 12 yrs ago	Damp - dry	1.06- 2.9 m
18.2	3.45 ha +423m	uncut	Mire - forest cleared 2001	Wet unfirm	6.0+ m
Cut-over (old) 1-15yr rootplates					
31.2 (A & B)	14.4ha +154m	Old hand cuts	Wet & dry heath, bracken on baulks	Damp low areas dry baulks	(0.6) 1.0-3.3 m
32 (C)	3.12 ha + 95m	Old hand cuts	Wet & dry heath, bracken on baulks Molinia trial	Damp heathy areas. High dry baulks	(0.4) 1.0 – 2.7 m
10/ 8	6.8 ha	Old hand cuts	Wet & dry heath, bog in cuts Molinia trial	Dry tracks, damp low areas, wet pits	1.4-3.8 m
22/23/12.5	9 ha+ 106 m	Old hand cuts	Molinia mire	High dry baulks, wet low cuts	2-3 m
31.1	143m	Recent linear cuts	Bracken/Molinia/heather baulks, mire on low flats and pools	Dry to open water	1.8 -3.3m
Cut-over (old) 16-85yr rootplates					

18.1	2.8 ha	Old handcuts	Molinia, Molinia/mire	Damp flats, dry tracks	1.0-3.4m
23	129	cutover	Recent wet woodland	Mod wet	2 -3m