Bolton Fell and Walton Mosses SSSI

Cumbria

Notification under section 28C of the Wildlife and Countryside Act 1981

Supporting Information

Issued by Natural England's Cumbria Area Team on 13 March 2015

Contact points and further information
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The date of notification of Bolton Fell and Walton Mosses SSSI is 13 March 2015

Contents

Summary

Bolton Fell and Walton Mosses SSSI is notified under Section 28C of the Wildlife & Countryside Act 1981, as inserted by Schedule 9 to the Countryside and Rights of Way Act 2000.

Bolton Fell and Walton Mosses SSSI is considered to be of special interest for its nationally important:

- **Lowland raised bog** – The site supports large areas of lowland raised bog, including areas of the rarer intermediate bog habitat. Intermediate bogs share features of both raised and blanket bog and are often described as 'semi-confined', in the sense that they have escaped the confines of the basin in which they originally formed, and spread a blanket of peat across parts of the surrounding landscape. Active (peat-forming) raised bog is present in the form of the National Vegetation Classification (NVC) type M18 cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised and blanket mire. This comprises characteristic bog mosses *Sphagnum* species, together with abundant heather *Calluna vulgaris*, cross-leaved heath, hare's-tail cotton-grass *Eriophorum vaginatum* and crowberry *Empetrum nigrum*. There are also large areas of degraded bog capable of restoration on Walton Moss and peat has been commercially milled from much of Bolton Fell Moss since 1959, with extraction coming to an end in 2013. These worked areas are predominantly bare peat but vegetation has started to recolonise the older workings. Both the degraded bog and milled peat areas are vital to the maintenance and full recovery of the hydrological and ecological integrity of Bolton Fell and Walton Mosses. The presence of lagg vegetation (where waters from surrounding mineral ground mix with rain-derived run-off from the bog), although partly modified, adds to the importance of the site, as most English raised bogs have little or no lagg remaining. Piecemeal peat cutting, drainage and agricultural activity, around the periphery of the mosses have resulted in a mixture of lagg communities. This includes wet woodland dominated by downy birch *Betula pubescens* and purple moor grass *Molinia caerulea*; and acidic mire and rush-pasture characterised by communities including the NVC types M6 star sedge *Carex echinata* – flat-topped bog-moss/cow-horn bog-moss *Sphagnum fallax/denticulatum* mire, M23 soft-rush/sharp-flowered rush *Juncus effusus/acutiflorus* – common marsh-bedstraw *Galium palustre* rush-pasture, M25 purple moor-grass *Molinia caerulea* – tormentil *Potentilla erecta* mire, and M27 meadowsweet *Filipendula ulmaria* –-wild angelica *Angelica sylvestris* tall-herb fen.
- **Geology** – Bolton Fell Moss and Walton Moss are key sites providing a detailed record of the palaeoecology and palaeoclimatology of the Holocene. They have produced a wealth of high resolution palaeoenvironmental records significantly contributing to our understanding of past ecological and climatic change, as well as human impact in the landscape of northern Britain, and further afield. Bolton Fell Moss is of international importance for its peat stratigraphy dating back to the Early Holocene. Similarly, Walton Moss is arguably the most intact intermediate bog in England and has also produced a record of natural and cultural change dating from the Early Holocene.

1. Information used to support the selection of Bolton Fell and Walton Mosses SSSI

Feature	Data source	Author	Date	Content
Lowland raised bog	Phase 1 surveys of Bolton Fell Moss. Nature Conservancy Council internal report	Clayden, D.	1989	Nature and distribution of habitats
	British Plant Communities. Volume 2: Mires and Heaths. Cambridge University Press, Cambridge	Rodwell, J.S. (ed).	1991	National Vegetation Classification (NVC) for raised bog communities
	Guidelines for the selection of biological SSSIs. Part 2: Detailed guidelines for habitats and species groups. Chapter 8: bogs. Joint Nature Conservation Committee, Peterborough	JNCC	1994	National SSSI selection guidelines for bogs
	Bogs: The Ecology, Classification and Conservation of Ombrotrophic Mires. Published by Scottish Natural Heritage	Lindsay, R.	1995	General background to peat bog ecology and conservation
	An inventory of Lowland Raised Bogs in Great Britain. Scottish Natural Heritage Research, Survey & Monitoring Report 78	Lindsay, R.A. & Immirzi, C.P.	1996	Extent, distribution and condition of lowland raised bogs
	Botanical Survey and Assessment of Bolton Fell Moss. Report to Terraquaeous Ltd (Appendix 3, Environmental Assessment for William Sinclair Horticulture)	Jerram, R.	1999	NVC plant community map
	New Atlas of the British and Irish Flora: An Atlas of Vascular Plants of Britain, Ireland, The Isle of Man and the Channel Islands. Oxford University Press, Oxford	Preston, C. D, Pearman, D.A. & Dines, T.D. (eds)	2002	Atlas of all species of vascular plants, with brief accounts and distribution maps
	Bolton Fell Moss Topographical Survey and Peat Depth Survey. Report to English Nature	James Banks (Survey) Ltd	2003	Peat depth information
	Interpretation Manual of European Union Habitats	European Commission	2007	Definition of active raised bog
	State of the Natural Environment 2008. Natural England, Peterborough	Natural England	2008	Review of the state of England's natural environment
	National Vegetation Classification Survey of Bolton Fell Moss. Report to Natural England	Averis, B	2009	NVC map, description and assessment of interest features
	Assessment of special interest features. Natural England internal advice note	Diack, I.	2009	Assessment of interest features identified by NVC survey
	LIDAR Survey	Environment Agency	2009	Topographic information

Feature	Data source	Author	Date	Content
	Determination of a boundary to support the hydrological functioning of Bolton Fell Moss. Report to Natural England by Rigare Ltd	Low, R.	2009	Professional opinion concerning hydrology of Bolton Fell Moss
	Making Space for Nature: a review of England's wildlife sites and ecological network. Defra, London	Lawton, J.H. *et al.*	2010	Recommendations for increasing the coherence of ecological networks in England
	Peat Bogs and Carbon – A critical synthesis. RSPB commissioned report by University of East London Environmental Research Group	Lindsay, R	2010	General background to peat bog ecology and conservation
	Topographical Survey Report – Bolton Fell Moss. Report to Natural England	Atlantic Geomatics (UK) Ltd	2010	Peat depth information
	Peaty Soils Location – a geographical information file collated from NSRI soils map information, BGS superficial geology layers, and habitat inventory mapping of blanket bog. Developed for the Partnership Project to Protect and Enhance Peat Soils	Shepherd, M., Natural England	2012	Indicates areas likely to support deep peaty soils (>40cm of peat deposit), shallow peaty soils (20-40cm peat) and other areas which are likely to support scattered pockets of deep peat
	Guidelines for selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection. Joint Nature Conservation Committee, Peterborough	JNCC	2013	National selection guidelines for biological Sites of Special Scientific Interest
	Walton Moss SSSI, Cumbria – National Vegetation Classification Survey. Report to Natural England	Jerram, R.	2013	NVC Survey with indicative peat depths
	Bolton Fell & Walton Mosses Proposed SSSI – Baseline Condition Assessment Surveys. Natural England internal report	Goodenough, A. & Land, D.	2015	Condition assessment surveys based on Common Standards Monitoring guidance for lowland raised bog habitats
	Specialist support for notification of Bolton Fell and Walton Mosses as a SSSI for lowland raised bog	Diack, I.	2015	Support for notifying the site for lowland raised bog from Natural England's terrestrial wetland specialist
Geology	Peat Stratigraphy and Climatic Change: a palaeoecological test of the theory of cyclic peat bog regeneration. Balkema, Rotterdam	Barber, K.E.	1981	Peat stratigraphy and the formation of Bolton Fell Moss

Feature	Data source	Author	Date	Content
	Climatic Change and Human Impact in North Cumbria: Peat stratigraphic and pollen evidence from Bolton Fell Moss and Walton Moss. From Boardman J. & Walden J. (eds). The Quaternary of Cumbria: Field Guide. Quaternary Research Association, Oxford	Barber, K.E.	1994	Description of the origins of Bolton Fell Moss and Walton Moss
	An Introduction to the Geological Conservation Review. Joint Nature Conservation Committee, Peterborough	Ellis, N.V. (ed.), Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent, M.A. & Wilson, R.C.L.	1996	Background information to the Geological Conservation Review
	Quaternary of Northern England. Geological Conservation Review Series, No.25; pp.518-526. Joint Nature Conservation Committee, Peterborough	Huddart, D. & Glasser, N.F.	2002	Overview of stratigraphical research at Bolton Fell Moss and Walton Moss
	Proposal form for the addition of a site to the Geological Conservation Review	Barbara Silva, Natural England	2013	Additional site information for the GCR
	Specialist support for notification of Bolton Fell and Walton Mosses as a SSSI for geological features	Wetherell, A.	2015	Support for notifying the site for geological features and advice on hydrology from Natural England's hydrology and hydrogeology specialist

2. Explanation of how Bolton Fell and Walton Mosses meets the SSSI selection guidelines

This section explains how the information listed in section 1 has informed our decision to notify the SSSI, according to:

- the *Guidelines for the selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection* (JNCC, 2013); and *Part 2: Detailed guidelines for habitats and species groups. Chapter 8: Bogs* (JNCC, 1994) hereafter referred to as 'the Guidelines'; and
- the selection guidelines listed in *An Introduction to the Geological Conservation Review* (Ellis *et al.,* 1996).

2.1 Lowland raised bog

The Bolton Fell and Walton Mosses SSSI is of special interest for lowland raised bog, including areas of Walton Moss which have characteristics of both lowland raised bog and blanket bog, representing a type known as intermediate bog.

Lowland raised bogs were once more widespread on the river terraces, floodplains and around the estuaries of Britain, particularly in the wetter north and west. They represent an advanced stage in

wetland development, in which the environment has been altered by the accumulating peat raising the surface above the local groundwater, creating a solely rain-fed environment in which bog-mosses, dwarf shrubs and various short sedges thrive. As the bog-mosses grow and die, further peat accumulates, forming a characteristic dome shape – the raised bog. These peat deposits have been exploited for agriculture, horticulture and energy production, to the extent that 94% of the original resource of lowland raised bog in Great Britain has been permanently destroyed or severely degraded (Lindsay & Immirzi, 1996). The rarity, continued threat of damage and loss to lowland raised bogs has given rise to targets for conservation and restoration under the EU Habitats Directive and listing as a habitat of principal importance for the conservation of biodiversity in England under section 41 of the Natural Environment and Rural Communities Act 2006. There is estimated to be 10,227 ha of lowland raised bog in England, of which 88% is within SSSIs (Natural England, 2008).

The core active peat-forming vegetation present on Bolton Fell and Walton Mosses is the National Vegetation Classification (NVC) type M18 cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised and blanket mire (see photographs 2, 4, 7 and 8 in section 6, and the vegetation maps in section 7). This vegetation is typified by a carpet of bog-mosses including papillose bog-moss *Sphagnum papillosum*, *S. palustre*, *S. magellanicum*, *S. tenellum*, *S. subnitens*, *S. capillifolium*, *S. recurvum* and *S. cuspidatum*, alongside heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, hare's-tail cotton-grass *Eriophorum vaginatum* and an unusual abundance of crowberry *Empetrum nigrum*. The characteristic bog species round-leaved sundew *Drosera rotundifolia*, common cotton-grass *Eriophorum angustifolium* and cranberry *Vaccinium oxycoccus* occur frequently, while more rarely, white beak-sedge *Rhynchospora alba*, bog-rosemary *Andromeda polifolia* and oblong-leaved sundew *Drosera intermedia* are also found.

Breaks Moss, Moss View Moss and Little Moss support large areas of degraded bog (see photographs 9 and 10 in section 6) which ranges from vegetation still forming peat, but lacking the bog-mosses of undamaged M18, to more damaged areas in which purple moor-grass *Molinia caerulea*, hare's-tail cotton-grass *Eriophorum vaginatum*, soft-rush *Juncus effusus* and sharp-flowered rush *J. acutiflorus* dominate.

Approximately 70% of Bolton Fell Moss has been commercially milled since 1959 until extraction ceased in 2013. These worked areas are predominantly bare peat, but vegetation has started to recolonise the older workings (see photographs 3 and 5 in section 6). This vegetation is likely to be a precursor of late-successional peat-forming vegetation communities.

Owing to piecemeal peat cutting (see photograph 6 in section 6), drainage and agricultural reclamation, much of the periphery of the mosses, particularly on Bolton Fell Moss, comprises a mixture of modified, degraded and remnant lagg vegetation (where waters from surrounding mineral ground mix with rain-derived run-off from the bog). Where present, lagg communities include wet woodland dominated by downy birch *Betula pubescens* and purple moor-grass, and acidic marshy grassland characterised by communities including the NVC types M6 star sedge *Carex echinata* – flat-topped bog-moss/cow-horn bog-moss *Sphagnum fallax/denticulatum* mire, M23 soft-rush/sharp-flowered rush *Juncus effusus/acutiflorus* – common marsh-bedstraw *Galium palustre* rush-pasture, M25 purple moor-grass *Molinia caerulea* – tormentil *Potentilla erecta* mire, and M27 meadowsweet *Filipendula ulmaria* – wild angelica *Angelica sylvestris* tall herb fen.

Lowland raised bogs develop in a number of different situations, defined by interactions between water and the underlying landforms. The Guidelines (Part 2, Chapter 8) set out a rationale for assessing lowland raised bogs according to their hydromorphological type, and the range of variation represented within each area of search; in this case the Solway Basin National Character Area (NCA)[1].

Bolton Fell Moss is a basin raised bog. Studies have shown that Bolton Fell Moss formed in a series of shallow ponds following the cessation of the last ice age (Barber, 1994). Over the past

[1] National Character Areas (NCAs) divide England into 159 natural areas, each defined by a unique combination of landscape, biodiversity, geodiversity and economic and cultural activity. Bolton Fell & Walton Mosses SSSI lies within the Solway Basin NCA. NCAs are now used as 'areas of search' for the purposes of SSSI selection (where appropriate) in England. For more information on NCAs, see https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making

10,000 years, these have slowly filled to form fens and eventually become ombrotrophic; that is, becoming entirely dependent upon rain as a water supply and disconnected from the underlying mineral hydrology. The basins merged to form one large basin raised bog that today we recognise as Bolton Fell Moss.

Walton Moss and possibly parts of the Breaks are intermediate bogs. These share characteristics of both raised and blanket bog. This geographically restricted bog type develops in areas that are climatically and topographically marginal for the development of blanket bog. Formation of the bog starts in a basin as with a raised bog, however, the bog continues to expand, engulfing the original rand (sloping bog margin) and lagg. Such bogs merge and spread gradually onto adjacent mineral ground resulting in little or no lagg fen (Lindsay, 2010). The estimated resource of intermediate bogs in England is just 981 ha (Lindsay & Immirzi, 1996) and, with approximately 221 ha of intact bog, Walton Moss supports over 20% of the estimated English total.

Collectively, Bolton Fell Moss, Walton Moss and the closely associated peat bodies of Moss View Moss, The Flosh, Broomhill Moss, Little Moss and Breaks Moss comprise a 'mire macrotope'. This term describes a large scale unit consisting of complexes in which peat bodies originating as different hydrological units have become either closely juxtaposed or merged together. The largest gap between any of the peat bodies in the Bolton Fell and Walton Mosses complex is approximately 200 metres between Moss View Moss and The Flosh (see the aerial view in photograph 1 in section 6).

2.1.1 Solway Basin NCA context

Including Bolton Fell and Walton Mosses, there are 11 lowland raised bog SSSIs within the Solway Basin NCA, six of which are basin raised bogs (see table 1). The Solway Basin NCA is one of just 27 NCAs (17% of a total 159 NCAs) in England that contains any lowland raised bog priority habitat and it contains a larger area than any other NCA, with 31% of the total. Collectively, the macrotope of Bolton Fell and Walton Mosses represents the largest bog SSSI in the Solway Basin NCA and by far the largest basin raised bog complex in the NCA. The size (extent) of a site is important because larger sites tend to be more species-rich, have more viable species populations, more subsidiary habitats and have greater structural diversity. They are also less susceptible to edge effects and more robust in the face of pressures, such as the predicted effects of climate change.

Table 1 Comparison between Bolton Fell and Walton Mosses SSSI and other lowland raised bog sites within the Solway Basin NCA

Site	Hydromorphological type	Area (ha)
Bolton Fell and Walton Mosses	**Basin raised bog and intermediate bog**	1,009.27
Bowness Common	Estuarine raised bog	803.29
Wedholme Flow	Estuarine raised bog	781.76
Glasson Moss	Estuarine raised bog	225.36
Drumburgh Moss	Estuarine raised bog	187.04
Scaleby Moss	Basin raised bog	68.24
Orton Moss	Basin raised bog	63.50
Salta Moss	Estuarine raised bog	45.62
White Moss, Crosbymoor	Basin raised bog	38.03
Black Snib	Basin raised bog	29.76
Oulton Moss	Basin raised bog	24.48

2.1.2 Detailed assessment

Lowland raised bogs are amongst our rarest habitats. The Guidelines (Part 1, Section 5.10.1) state that:

> "Any terrestrial habitat with a total area in Britain of less than 10,000 ha…can be regarded as rare, and for these there should be a general presumption in favour of selecting all remaining areas".

The Guidelines (Part 2, Chapter 8, Section 4.1) state that:

> "…raised bog in near-natural condition has been reduced to less than 4,000 ha…"

The Guidelines (Part 2, Chapter 8, section 4.1.3) state with reference to basin raised bogs that:

> "The criteria under section 4.1 apply to most basin raised mire sites…"

For intermediate bogs, the Guidelines (Part 2, Chapter 8, section 5.1) state that:

> "For the purposes of SSSI selection, intermediate mires should be classified as…raised mire if they have indications of a rand/lagg system…"

Lagg fen is present in places on the margins of Walton Moss (Jerram, 2013); accordingly the intermediate bog there is treated as raised bog for the purposes of this assessment.

The Guidelines (Part 2, Chapter 8, section 4.1) state that:

> "There should be a presumption towards the selection of all examples above the minimum standard (largely measured by size and capability for peat formation (see section 3.5))."

Section 3.5 of Chapter 8 in Part 2 of the Guidelines states that:

> "Raised bogs larger than 10ha...should be considered for SSSI status in all parts of Britain if capable of forming peat."

And that:

> "Peat formation capability for…raised…bogs is defined by the hydrological and biotic features described in Annex 1, the definition of 'active' raised…bogs adopted by the European Union."

The Annex 1 referred to in the Guidelines reproduces an extract from the *Manual for the interpretation of Annex 1 Priority Habitat Types of the Directive 92/43/EEC* (European Commission, 1994), which states that:

> "The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active formation is temporarily at a standstill such as after a fire or during a natural climatic cycle, e.g. a period of drought, are included."

Bolton Fell and Walton Mosses still contain areas of vegetation capable of forming peat. The main peat-forming community is M18 cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised mire. However, the bog pool communities M1 cow-horn bog-moss *Sphagnum auriculatum* and M2 feathery bog-moss *Sphagnum cuspidatum/recurvum* are also included as part of the bog expanse. M17 deergrass *Scirpus cespitosus* – hare's-tail cotton-grass *Eriophorum vaginatum* and M19 and M20 hare's-tail cotton-grass *Eriophorum vaginatum* blanket mire communities are also present, although these are more indicative of areas where burning, grazing and/or cutting have modified the previous M18 community. These areas are capable of restoration back to M18. The raised bog complex of Bolton Fell and Walton Mosses covers a total area of 1,009.27 ha, of which approximately 278 ha has M18 active peat forming vegetation and a further 122 ha of M17, which is a degraded form of M18 (see table 2).

Table 2 Approximate extent of intact and degraded bog and other main habitats in Bolton Fell and Walton Mosses SSSI

Habitat	Approximate area	% of SSSI
Intact bog	278 ha	28%
Partially degraded bog	122 ha	12%
Significantly degraded bog	100 ha	10%
Lagg communities	54 ha	5%
Milled peat	259 ha	26%
Other land supporting hydrology or within identifiable boundary	196 ha	19%

Sources: Averis (2009); Jerram (2013.

The Guidelines (Part 2, Chapter 8, section 3.4) state that:

"To help prioritise sites above the minimum standards of size and peat formation capability (section 3.5), there are certain general features which indicate the most natural sites, which may be assumed to have the greatest quality.

3.4.1 Parts of the original lagg fen still present…;

3.4.2 …a high proportion of the original central dome still physically intact;

3.4.3 Low frequency of drains and peat-cuttings;

3.4.4 Presence of plant species indicating peat formation capability and/or lack of disturbance…;

3.4.5 An area of natural surface pattern…within the mire expanse;

3.4.6 Absence of invasion by woodland or scrub, though some high quality sites may contain trees or scrub with a bog bryophyte floor.

There should be a presumption towards selection of any site exhibiting two or more of these characteristics."

Bolton Fell and Walton Mosses SSSI exhibits five of the characteristics described in the Guidelines, as set out below.

Lagg fen

Lagg fen is present in places in the mire margins of Bolton Fell Moss and Walton Moss. On these sites, the lagg vegetation comprises wet woodland in the form of W4 downy birch *Betula pubescens* – purple moor-grass *Molinia caerulea* woodland, and acidic mire and rush pasture, including M6 star sedge *Carex echinata* – flat-topped bog-moss/cow-horn bog-moss *Sphagnum fallax/denticulatum* mire, M23 soft-rush/sharp-flowered rush *Juncus effusus/acutiflorus* – common marsh-bedstraw *Galium palustre* rush pasture, M25 purple moor-grass *Molinia caerulea* – tormentil *Potentilla erecta* mire, and M27 meadowsweet *Filipendula ulmaria* – wild angelica *Angelica sylvestris* tall herb fen (Averis, 2009; Jerram, 2013). Past agricultural management and disturbance around the bog perimeter have, however, altered the location and nature of the lagg vegetation, and this in places now occurs on what would have been part of the bog expanse. In many parts, the original lagg vegetation is no longer present, and has been replaced by intensively-managed grassland with deep drains.

Central dome and peat formation capability

Walton Moss is one of the most intact ombrotrophic bogs in England (Huddart & Glasser, 2002). Large areas of Walton Moss and the western part of Bolton Fell Moss support active peat-forming vegetation comprising M18a cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised and blanket mire, magellanic bog-moss *Sphagnum magellanicum* – bog-rosemary *Andromeda polifolia* sub-community and M18b crowberry *Empetrum nigrum* – *Cladonia* sub-community.

M18 raised and blanket mire is the characteristic peat-forming community and is indicative of a lack of disturbance. 28ha of the central dome is still present on Bolton Fell Moss, supporting M18 vegetation (Averis, 2009). However, it is showing signs of shrinkage and drying out due to the extraction of peat and associated drainage in adjacent areas. Smaller areas of M18 are also present around the south side of Bolton Fell Moss (in total another 25 ha), including some high quality, relatively undamaged bog vegetation (M18a) at the south-east corner, as well as Moss View Moss to the south of Bolton Fell Moss. There is a much larger area of intact bog on Walton Moss (221 ha) and Jerram (2013) identified a large area (5.6 ha) of M18a at The Flosh.

Natural surface pattern

Walton Moss is relatively intact and consequently exhibits distinctive and repeated surface patterning. This takes the form of M18 raised mire vegetation with hollows supporting the M2a feathery bog-moss *Sphagnum cuspidatum/recurvum* bog pool, white beak-sedge *Rhynchospora alba* sub-community (Jerram, 2013).

Three types of surface feature have been described by Jerram (1999) from the open intact mire surface of Bolton Fell. Where remnant vegetation exists, terrestrial high ridge and terrestrial zone hummocks predominate with aquatic zone hollows occurring rarely. Other areas of the site have been too modified by peat cutting, drainage and grazing to support surface patterning.

Absence of woodland or scrub

The intact mire surface of Walton Moss is largely free from invading trees and scrub, with a few scattered trees on slightly drier areas (Jerram, 2013). Pine and birch are present on the intact areas of Bolton Fell, however beneath this tree cover the quality of the M18 raised mire is still high (Averis, 2009).

In summary, Bolton Fell and Walton Mosses:

- Supports a rare habitat type (lowland raised bog) for which the Guidelines contain a presumption in favour of selecting all remaining examples.
- Represents the largest basin raised bog (and indeed the largest lowland raised bog of any type) SSSI in the Solway Basin NCA.
- Includes an intact example of the rare intermediate bog type.
- Exceeds the minimum standards of size and peat formation capability.
- Demonstrates five of the six features listed in the Guidelines as indicating the most natural sites, which may be assumed to have the greatest quality. The Guidelines contain a presumption towards selecting any site exhibiting two or more of these characteristics.

2.1.3 Site boundary determination

The site comprises:

- Bolton Fell Moss – has recently been extensively milled for peat but retains areas of active raised bog and peripheral lagg communities.
- An area of raised bog between Bolton Fell and Walton Moss – it is unnamed on the Ordnance Survey map, but it is referred to as 'Moss View Moss' in this document.
- Walton Mosses – made up of five deep peat bodies:
  - Walton Moss is the largest peat body joining up with the smaller Broomhill Moss peat body. These two peat bodies were previously notified as the Walton Moss SSSI;
  - The Flosh is to the north of Walton Moss, separated from it by Hether Burn;
  - Breaks Moss is a large peat body to the south of Walton Moss connected to it by a thin band of peat; and
  - Little Moss lies to the east of the Walton Road, connected to the larger Walton Moss by a strip of thin peat. This incorporates the land south of Hill House.

Section 8.2 in Part 1 of the Guidelines states that:

> "SSSI boundaries should be drawn to encompass the special features of the site and all land necessary to ensure the sustainability of those features. Consideration should be given to the inclusion of whole management units, entire ecological units and supporting process (such as hydrology or sediment supply)."

The boundary of the SSSI has been drawn to include the intact areas of M18 cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised and blanket mire and all the associated vegetation features that are characteristic of the raised bog environment. NVC surveys for Bolton Fell Moss (Averis, 2009) and Walton Moss (Jerram, 2013) have mapped these communities in detail. The boundary includes all areas of peat and mineral ground that contribute to ensuring the hydrological integrity of the site is maintained or restored.

Inclusion of degraded areas

The Guidelines (Part 2, Chapter 8, section 4.2) state that:

> "Provided such sites contain significant areas of peat-forming vegetation…, there are two circumstances where it may be necessary to include damaged bog in an SSSI.
>
> …where a remnant of primary dome…survives, surrounded by a damaged surface, inclusion of some or all of the damaged area within the site will usually be necessary to protect the identified biological and scientific interest…"

Significant areas of Bolton Fell and Walton Mosses have been damaged or degraded, to a greater or lesser extent. The majority of Bolton Fell has been milled for peat and substantial areas of Breaks Moss and Broomhill Moss have been modified by drainage, with peat cutting around the edge of most of the mosses. Much of the margins of the peat bodies have also been agriculturally improved and Moss View Moss has been grazed.

All of the lowland raised bog sites in the Solway Basin NCA, indeed in Cumbria, have been degraded through peat cutting, drainage and afforestation. However, significant areas of peat forming vegeation are still present within Bolton Fell and Walton Mosses. While compromised in places, the hydology of the most impacted area, Bolton Fell Moss, is still restorable. The hydrology of Walton Moss, Broomhill Moss, Breaks Moss, The Flosh, Little Moss and Moss View Moss has been modified by installation of some drainage, but this is largely superficial and restorable through a programme of ditch blocking, as has been successfully achieved elsewhere in the Solway Basin NCA at Glasson Moss SSSI and Bowness Common SSSI.

The Guidelines (Part 1, section 5.12.1) include a 'potential value' criterion, which:

> "…acknowledges that sites can develop a substantially greater nature conservation value as a result of appropriate management or natural change over time. In theory, almost any area of land is potentially of high nature conservation interest, provided that enough re-creative or restorative effort can be expended upon it. However, potential value should only be applied as a criterion in a few specific circumstances. These might include cases where:
>
> - the habitat has recently deteriorated through adverse use, such as a degraded peat bog where the underlying substrate remains relatively intact and where the complement of characteristic species is still present or can recolonise, and recovery is likely to take place once the adverse pressure is lifted.
> - there is a need to reinstate key ecological processes or to support ecological resilience, such as improved land in floodplains, or lake or wetland catchments that can be restored to support the key interest feature and provide additional habitat.
>
> It is perhaps most appropriate to apply this criterion where part of a site…is in a poorer condition than the rest but its inclusion contributes strongly to the overall interest. One example is where the inclusion of a degraded area occurs between two high-quality parts of a compound site and where its restoration might benefit all three elements of the site."

Much of Bolton Fell Moss has recently deteriorated through peat milling and drainage. The eastern area has been milled for peat and has little or no vegetation, although a layer of the underlying peat remains relatively intact. However, some areas which were previously extracted for peat are now recovering and have developed special interest in their own right. These include M3 common cotton-grass *Eriophorum angustifolium* bog pool community and M27 meadowsweet *Filipendula ulmaria* – wild angelica *Angelica sylvestris* tall herb fen (Averis, 2009). This vegetation is likely to be a precursor of late-successional peat-forming vegetation communities. Peat milling has now ceased on the whole site and work is underway to secure ownership and agreements to allow restoration of the peat bog. Whilst the restoration of peat-forming vegetation on milled areas is likely to take up to 30 years (and the full recovery of the raised bog dome will be measured in centuries), some of the initial precursors of raised bog vegetation communities should be evident within a few years of the hydrology being restored.

Parts of Walton Moss have been modified. Whilst the main part of Walton Moss is largely free from drains, a deep drain separates it from Broomhill Moss, which itself contains two more deep

drains. The eastern part of Broomhill Moss and the whole of Breaks Moss are traversed by shallow drains at 10 m intervals. Much of the vegetation in these areas is still actively peat-forming and is referable to drier variants of M18 cross-leaved heath *Erica tetralix* – papillose bog-moss *Sphagnum papillosum* raised mire and vegetation that has a closer resemblance to M17 deergrass *Scirpus cespitosus* – hare's-tail cotton-grass *Eriophorum vaginatum* blanket mire, as a result of the very low frequency of the core M18 species and major peat builders magellanic bog-moss *Sphagnum magellanicum* and papillose bog-moss *S. papillosum* (Jerram, 2013). With appropriate management, including the blocking of ditches, these areas are restorable to M18, the characteristic vegetation of intact raised bogs.

The milled surfaces and other degraded areas form a complex mosaic with the relatively intact parts of the site and are an integral part of the macrotope. Their restoration will improve the resilience of the whole site to pressures, including the predicted effects of climate change.

Section 8.2 in Part 1 of the Guidelines (2014) also states that:

> "Where part of a site does not hold the special feature at the time of selection, the guiding principle is that there must be good evidence that this part of the site could support the special feature for which other parts of the site are notified."

Survey work by Averis (2009) mapped the north-eastern parts of Bolton Fell Moss where of peat extraction had ceased and vegetation was recolonising the bare peat. To date this is mostly species-poor soft-rush *Juncus effusus* vegetation, but there is also vegetation referable to purple moor-grass *Molinia caerulea* (M25), *Calluna* heath (H9) and common cotton-grass *Eriophorum angustifolium* bog pool community (M3). These communities are characteristic of the raised bog environment and may represent precursors of M18 vegetation. In addition, extensive successful restoration work on previously milled raised bogs, for example, Wedholme Flow, provides good evidence that the conditions present on the bare areas of Bolton Fell Moss will support active raised bog vegetation with appropriate restoration.

<u>Hydrological integrity</u>

The Guidelines (Part 2, Chapter 8, section 7.1) state that:

> "…bogs must be protected at their margins from potentially damaging activities, especially those activities likely to cause hydrological disturbance by maintaining or increasing water run-off by artificial drainage.
>
> Site boundaries must be chosen to include all land judged necessary to provide and maintain the hydrological functions needed to conserve the special features of the site."

The Guidelines (Part 2, Chapter 8, section 7.2) state that:

> "Bog systems subject to drainage influences from higher ground need to be protected by the inclusion of an adequate buffer zone…"

Section 7.3 of Chapter 8 in Part 2 of the Guidelines further states that:

> "Where a bog system is bounded by agricultural land, the site boundary may need to follow the original extent of the peat body. In many cases this may mean that the boundary includes some agricultural land on peat, but only if it stills plays a functional part in the overall hydrology of the peat body containing the special interest."

In some areas the SSSI boundary includes agricultural land on peat. For example, land at the Barracks, in the north-west of Bolton Fell Moss where adjacent land supports deep peat under agriculture; and south of Broomhill Moss where two agricultural fields comprise remnant peat and drain towards the bog. Similarly, the factory site in the north of Bolton Fell Moss is included in the SSSI because water drains from it towards the bog.

Peat depth surveys have been carried out on Walton Moss (Jerram, 2013) and Bolton Fell Moss (James Banks (Survey) Ltd, 2003; Environment Agency, 2009; Atlantic Geomatics, 2010). In a number of locations the hydrological boundary cuts across the middle of fields, such as on land south of Newlands on the north-west side of Bolton Fell Moss. In these cases the SSSI boundary includes land that is outside the peatland edge but within the catchment of the bog. Where it is not

deemed necessary to take in the whole field, the boundary includes the first break of slope and forms a straight line between fixed points or map co-ordinates, or is drawn a set distance from an identifiable feature.

In other areas such as the fields adjacent to Little Moss, the boundary encompasses the fields since their management could affect the integrity of the bog habitat. Where appropriate, the boundary has been drawn to the next field boundary, as a practical approach to ensure that the SSSI boundary can be clearly identified on the ground and to facilitate management of the SSSI. This is because of the need to apply the topographic unit principle, where whole management units can be included within a site. This is the case adjacent to Broomhill Moss and the land to the south of Bolton Fell Moss where numerous small fields are present.

Where the boundary follows the line of a ditch or a stream, the ditch or stream is also included in the SSSI. This is to ensure that the hydrology of the raised bog habitat is not adversely affected by inappropriate management of these water features.

Section 7.4 of the Guidelines also suggests that:

> "In some circumstances it may be necessary to seek expert hydrological advice prior to deciding the boundary of a candidate SSSI".

In 2009, Dr Rob Low considered the boundary around the Bolton Fell Moss portion of the SSSI and concurred that it is consistent with a hydrological protection zone necessary to maintain the hydrological integrity of the identified biological interest features and the identified peat body. The boundary around Walton Moss and adjacent peat bodies has been drawn in accordance with the same principles used for Bolton Fell Moss, as described above.

In summary, the boundary has been determined according to the following principles, applied sequentially:

- The starting position is the extent of typical raised bog, lagg fen and associated vegetation communities, as recorded by Averis (2009) and Jerram (2013).
- Degraded areas included which show a variety of vegetation communities, such as those typical of early stages of recovery/restoration, effects of impacted hydrology, or bare peat due to relatively recent milling. Again, as mapped by Averis (2009) and Jerram (2013).
- The full extent of the main peat bodies included (which roughly equates to the hydrological protection zone in most places) using British Geological Survey maps, peat depth surveys, and position of lagg streams.
- Where adjacent mineral ground slopes into the bog and there is no 'intercepting' drainage feature (or where that feature then supplies water to the bog), land is included to the first break of slope.
- Whole management units may have been included where the preceding steps identified part of a field or other land parcel.
- In all cases the boundary is aligned with mapped features or, where no such feature exists, the boundary follows straight lines between identifiable points or co-ordinates, or is drawn a set distance from an identifiable feature.

2.2 Geology

2.2.1 Selection of Geological Conservation Review sites

The special geological interests within Bolton Fell and Walton Mosses SSSI were selected for inclusion in the Geological Conservation Review (GCR) of Great Britain. The GCR systematically assessed sites to identify key localities that aid the interpretation of the geological evolution of Great Britain. Each GCR site demonstrates a unique and/or representative feature of this geological evolution, and the relationship between sites is particularly important in building up a picture of landscape evolution, and biological and environmental change over time.

All SSSIs with a geological interest have been assessed through the GCR process and sites described in the Review are eligible for selection on the basis of one or a number of the following categories:

(1) Sites of importance to the **international** community of Earth scientists.

(2) Sites that are scientifically important because they contain **exceptional** features.

(3) Sites that are nationally important because they are **representative** of an Earth science feature, event or process that is fundamental to Britain's Earth history.

Bolton Fell and Walton Mosses SSSI has been selected under the first and third categories. It is of **international** importance because Bolton Fell Moss was used as a palaeoecological test site, whose evidence led to the rejection of the cyclic peat-bog regeneration model by relating changes in stratigraphy and macrofossil assemblage to the known climatic variation of the last few centuries. This was developed into the climatic phase theory, whereby raised bog growth occurs in climatically forced phases. Bolton Fell Moss was also used to characterise and date the main humification change in a transect of bogs across Europe (Huddart & Glasser, 2002). The site is **representative** of the impact of humans on the landscape, which has been deduced in detail and links established with the archaeological and documentary records.

Bolton Fell Moss and Walton Moss are an important component of the network of 30 registered and proposed sites within 'The Holocene history and record of northern England' GCR network.

Northern England is characterised by diverse geographical zones which, in combination with the glacial legacy of the Quaternary, have resulted in diverse Holocene (Flandrian) sedimentation and geomorphology. This geography is characterised by the altitudinal gradient from estuaries to the uplands, as well as the sedimentology and geomorphology associated with river systems. The consequent variability in soils, climate, vegetation and human activity has also influenced the landscape. Holocene sediments are common within this network but are under threat of modification and destruction as a result of human activity such as ploughing, forestry and industrial activities.

This network of sites is based on key localities that provide an overview of the range, character and palaeoenvironmental value of surviving Holocene sediments with particular focus on wetland organic deposits because of their fossiliferous content and abundance in the region.

Bolton Fell Moss and Walton Moss are key sites in the UK history of Holocene environmental change. There are unlikely to be any other peatlands in the world that have been so thoroughly investigated and used in palaeoenvironmental research.

2.2.2 The geology of Bolton Fell and Walton Mosses

Bolton Fell Moss is an internationally important stratigraphic site comprising an ombrotrophic bog sequence dating back to the Early Holocene. The sediments at this site were initially analysed to produce a series of distinct high resolution, well dated, palaeoecological records. These data, in combination with the peat stratigraphy, were used as a 'palaeoecological test' demonstrating that vegetation and stratigraphic changes happened across the bog as a whole. This disproved the theory of 'autogenic cyclic peat-bog regeneration' and demonstrated that climate was the driving factor in changes of the peat-forming communities and that these changes could therefore be used to track past climate change. The Bolton Fell Moss record has also been used to characterise and date the main changes in peat humification from a transect across Europe.

Walton Moss, arguably the most intact ombrotrophic bog in England, has also produced a record of natural and cultural change dating from the Early Holocene and is comparable to Bolton Fell Moss.

The areas known to be of geological interest are associated with the more intact parts of the lowland raised bogs and are therefore encompassed within the SSSI boundary identified on the basis of the biological interests.

3 Assessment of the current condition of Bolton Fell and Walton Mosses SSSI

Site units*	Site unit name	Interest features	Reported condition**	Date of last assessment
1	Bolton Fell Moss	Lowland raised bog, geology	Unfavourable – recovering	23 January 2015
2	Moss View Moss	Lowland raised bog	Unfavourable – no change	
3	The Flosh	Lowland raised bog	Unfavourable – no change	
4	Walton Moss	Lowland raised bog, geology	Favourable	
5	Little Moss	Lowland raised bog	Unfavourable – no change	
6	Broomhill Moss	Lowland raised bog, geology	Unfavourable – no change	
7	Breaks Moss	Lowland raised bog	Unfavourable – recovering	

*** Site units** are divisions used by Natural England for administrative purposes only.

**** Reported condition**
SSSIs are notified because of special biological or geological features. When these features are being managed so that their special nature conservation interest is being maintained they are said to be in favourable condition. This is a United Kingdom standard and the terminology and definitions are more fully described in 'A Statement on Common Standards Monitoring', produced by the Joint Nature Conservation Committee in 1998.

3.1 Reasons for adverse condition

Unit 2 is assessed as being in 'unfavourable – no change' condition due to the presence of drainage, low diversity and cover of positive indicator species and presence of 'tussocky' purple moor-grass *Molinia caerulea.* There is also some localised cracking at the edge of peat body in the north-east of the unit.

Unit 3 is assessed as being in 'unfavourable – no change' condition due to the relatively species-poor nature of the M18 vegetation present. High cover of hare's-tail cotton-grass *Eriophorum vaginatum* and *Polytrichum* moss species, low diversity of positive *Sphagnum* indicator species, and the presence of 'tussocky' purple moor-grass were recorded. Some historic drainage has occurred in this unit and there are signs of past grazing.

Unit 5 is assessed as being in 'unfavourable – no change' condition because the unit as a whole has been highly modified by drainage, with bog vegetation now restricted to relatively small remnant areas in the north-east. Frequent semi-mature downy birch *Betula pubescens* have colonised much of this area and peripheral areas of the peat body are densely drained.

Unit 6 is deemed to be in 'unfavourable – no change' condition despite large areas of diverse M18 vegetation being present towards the western end of the unit where the peat body is relatively intact. Across the wider unit however, vegetation targets were failed for the combined cover of vascular plants, abundance of hare's-tail cotton-grass and cover of *Sphagnum* bog-mosses. Active drainage and presence of 'tussocky' purple moor-grass were also recorded.

The remedy for the adverse condition across all four units described above is to undertake a detailed hydrological study to fully appreciate the extent and therefore the impact of the existing drains and ditches. On completion of this, a programme of ditch blocking and selected surface bunding, particularly at the edges of the site, will be required to keep the water table within acceptable limits to promote active peat-forming species to dominate. It would also be prudent to undertake further studies of the impact that grazing is having on this site.

4 Selection of 'operations requiring Natural England's consent'

Natural England selects operations from a master list when determining the list of operations requiring consent for individual SSSIs. The selection is based on the likelihood that the operations may cause damage to the special features that are the reasons for notification of the SSSI. As well as selecting operations from the master list, the precise wording of each operation may be tailored to suit the particular circumstances at the site.

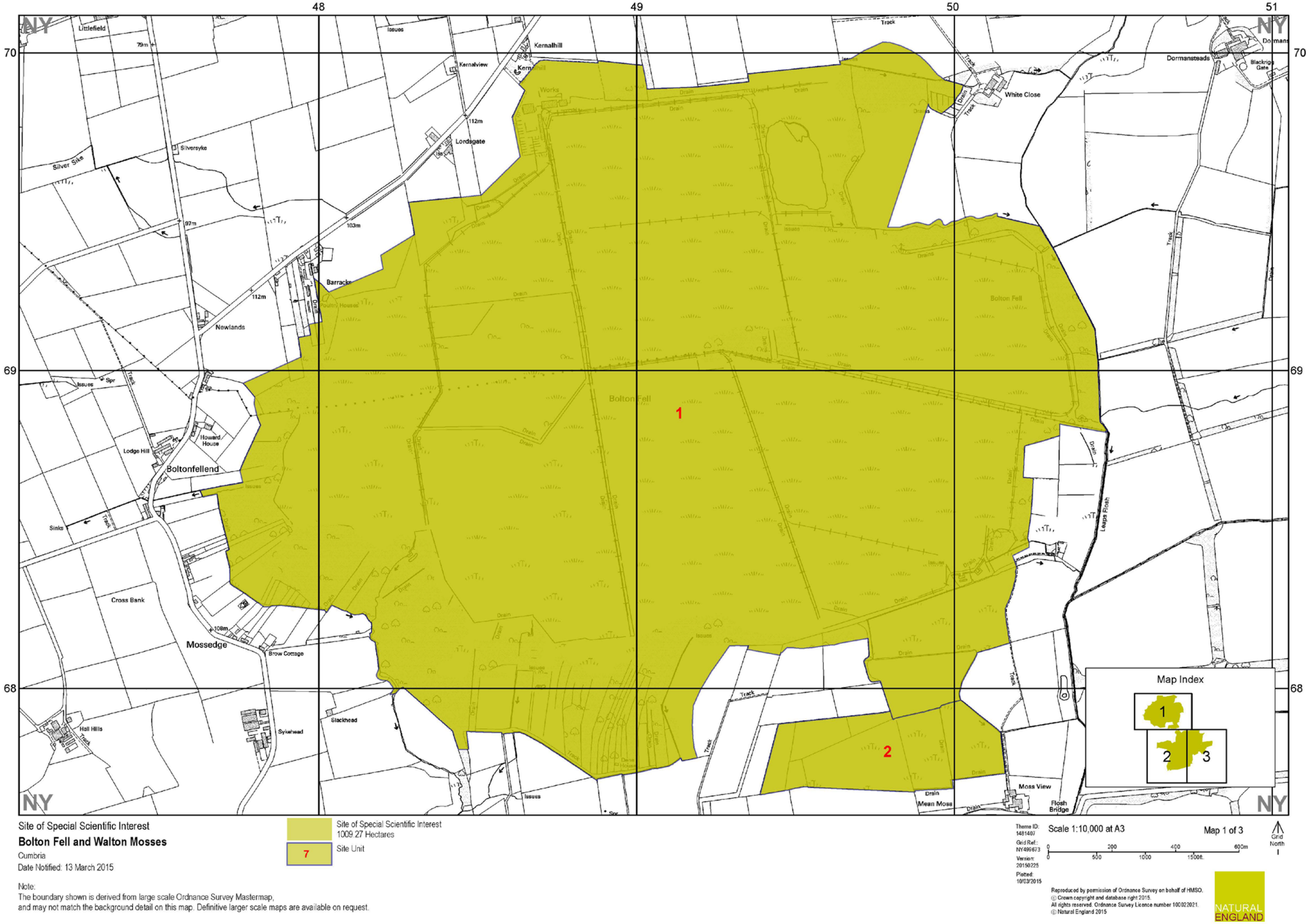
It is not possible to predict every possible eventuality that may arise on a site but the aim is to identify all operations where it is reasonably foreseeable that, if carried out at certain times or in a particular manner somewhere within the SSSI, they are likely to damage the special interest features. The table below records at least one reason justifying the inclusion of each operation in the list for Bolton Fell and Walton Mosses SSSI. It is not intended to be exhaustive and in most cases there will be other ways in which the specified operation is likely to cause damage.

Standard reference number	Type of operation	At least one reason for listing
1.	Cultivation, including ploughing, rotovating, harrowing and re-seeding.	Peat bog habitats could be destroyed.
2.	Grazing and alterations to the grazing regime (including type of stock, intensity or seasonal pattern of grazing).	Peat bog habitats sensitive to over grazing.
3.	Stock feeding and alterations to stock feeding practice.	Could lead to localised nutrient enrichment or poaching which would damage peat bog habitats.
4.	Mowing or cutting vegetation and alterations to the mowing or cutting regime (such as from haymaking to silage).	Inappropriate mowing can damage or destroy the structural diversity of peat bog habitats.
5.	Application of manure, slurry, silage liquor, fertilisers and lime.	Peat bog habitats sensitive to nutrient enrichment.
6.	Application of pesticides, including herbicides (weedkillers) whether terrestrial or aquatic, and veterinary products.	Peat bog vegetation and associated flora/fauna all sensitive to these.
7.	Dumping, spreading or discharging of any materials.	Risk of obscuring/smothering peat bog habitats.
8.	Burning and alterations to the pattern or frequency of burning.	Burning could damage or destroy peat bog vegetation.
9.	Release into the site of any wild, feral, captive-bred or domestic animal, plant, seed or micro-organism (including genetically modified organisms).	The introduction of invasive species can damage or destroy peat bog vegetation.
11.	Destruction, displacement, removal or cutting of any plant, fungus or plant remains, including tree, shrub, herb, hedge, dead or decaying wood, moss, lichen, fungal fruiting body, leaf-mould, turf or peat.	Damage to peat bog habitats and direct loss of characteristic species.
12.	Tree and/or woodland management and alterations to tree and/or woodland management (including, planting, felling, pruning and tree surgery, thinning, coppicing, changes in species composition, and removal of fallen timber).	Planting of trees could damage a peat bog through obscuring characteristic vegetation or drying out of the mire surface. Tree felling and management could cause incidental damage to peat bog habitats.
13a.	Draining (including the use of mole, tile, tunnel or other artificial drains).	Installation of drains could directly damage or destroy lowland raised bog features.

Standard reference number	Type of operation	At least one reason for listing
13b.	Modification to the structure of water courses (streams, springs, ditches and drains), including their banks and beds, as by re-alignment, regrading, damming or dredging.	Maintenance of water supply is crucial to the conservation of the lowland raised bog features and modifications could be deleterious.
13c.	Management of aquatic and bank vegetation for drainage purposes.	Risk of direct and incidental damage to adjacent habitats.
14.	Alterations to water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes). Also the modification of current drainage operations (such as through the installation of new pumps).	Alteration of the water levels could affect the hydrology of the lowland raised bog. A high water table is crucial to the conservation of the interest features.
15.	Infilling or digging of ditches, dykes, drains, ponds, pools, marshes or pits.	Could directly damage or destroy lowland raised bog features.
20.	Extraction of minerals including peat, sand and gravel, topsoil, subsoil and spoil.	Direct loss of interest features and indirect impact on hydrology.
21.	Destruction, construction, removal, rerouting, or regrading of roads, tracks, walls, fences, hard-standing, banks, ditches or other earthworks, including soil and soft rock exposures or the laying, maintenance or removal of pipelines and cables, above or below ground.	Direct loss of or incidental damage to important habitats and associated flora/fauna.
22.	Storage of materials.	Risk of obscuring/smothering important habitats and associated flora/fauna.
23.	Erection of permanent or temporary structures or the undertaking of engineering works, including drilling.	Direct loss of or incidental damage to important habitats and associated flora/fauna.
25.	Removal of geological specimens, including rock samples, minerals and fossils.	Direct loss of or incidental damage to important geological features, habitats and associated flora/fauna.
26.	Use of vehicles or craft.	Vehicles can erode and compact delicate soils and vegetation.
27.	Recreational or other activities likely to damage or disturb the interest features of special interest or their habitats.	Could have a negative impact on the lowland raised bog vegetation and associated habitats, and risk of disturbance to associated flora/fauna.
28a.	Game and waterfowl management and hunting practices and alterations to game and waterfowl management and hunting practice.	Could damage important habitats, lead to unforeseen changes in community composition and disturb species.

5 Site unit map

The map on the following page shows the provisional boundaries of the site units, which are divisions used by Natural England for administrative purposes only.



Site of Special Scientific Interest

Bolton Fell and Walton Mosses

Cumbria

Date Notified: 13 March 2015

Site of Special Scientific Interest
1009.27 Hectares

7 Site Unit

Note:
The boundary shown is derived from large scale Ordnance Survey Mastermap,
and may not match the background detail on this map. Definitive larger scale maps are available on request.

Theme ID: 1481407
Grid Ref.: NY496673
Version: 20150225
Plotted: 10/03/2015

Scale 1:10,000 at A3

Map 1 of 3

Grid North

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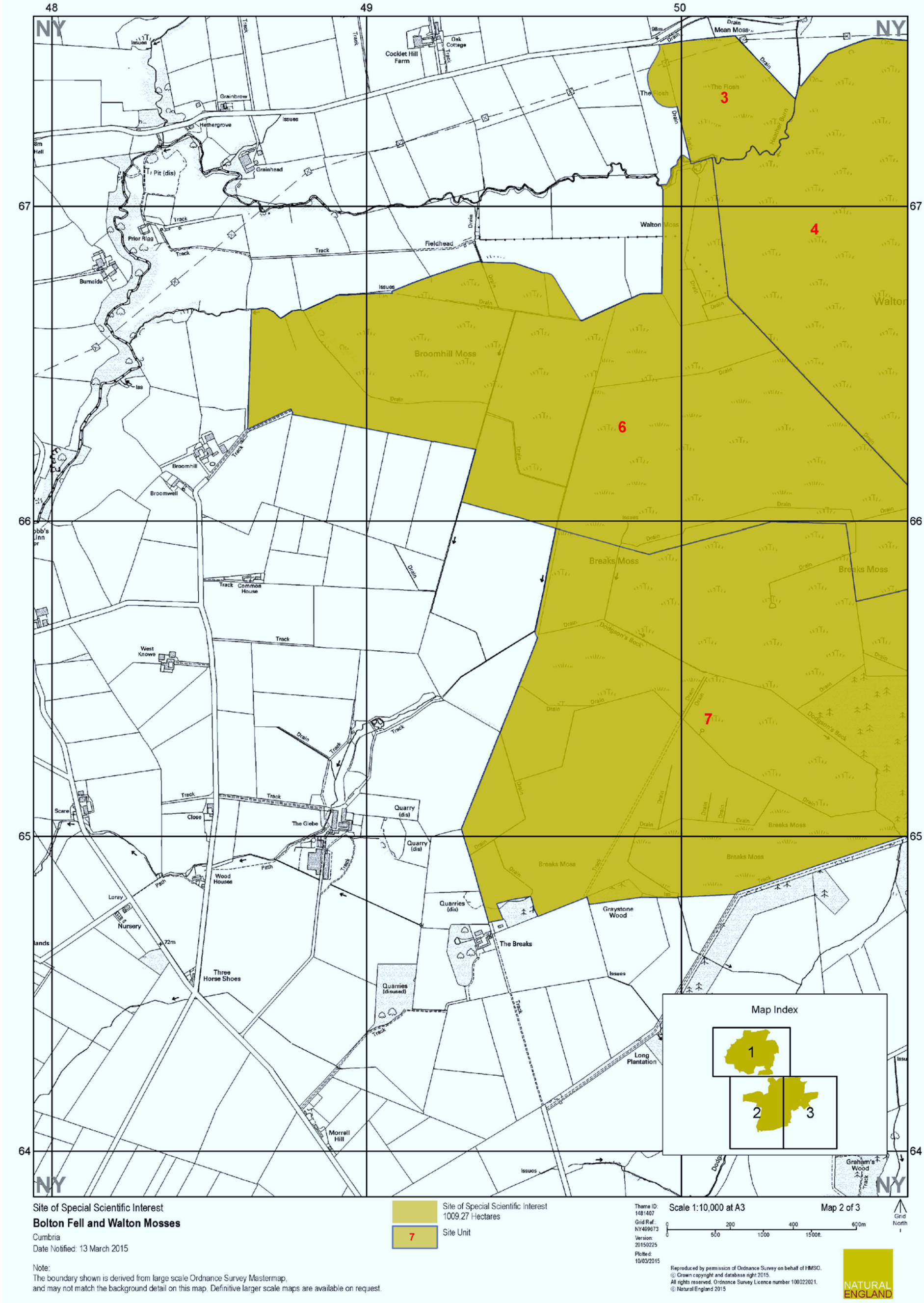

Site of Special Scientific Interest

Bolton Fell and Walton Mosses

Cumbria

Date Notified: 13 March 2015

Note:
The boundary shown is derived from large scale Ordnance Survey Mastermap, and may not match the background detail on this map. Definitive larger scale maps are available on request.

Site of Special Scientific Interest
1009.27 Hectares

7 Site Unit

Theme ID: 1481407
Grid Ref.: NY499673
Version: 20150225
Plotted: 10/03/2015

Scale 1:10,000 at A3

Map 2 of 3

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0 500 1000 1500ft.

Grid North

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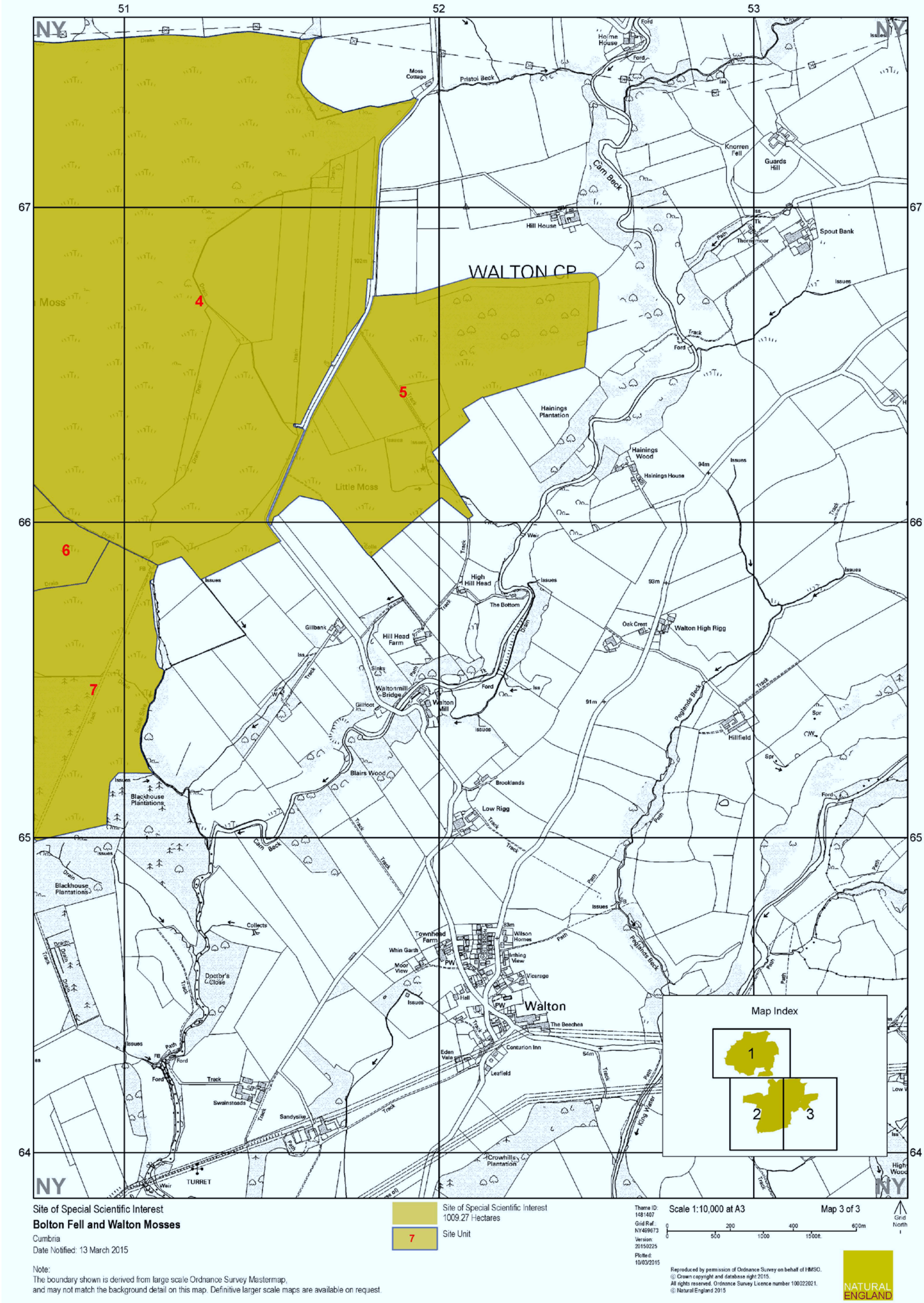
51
52
53
67
66
65
64
NY
Moss Cottage
Pristol Beck
Holme House
Ford
Knorren Fell
Guards Hill
Cam Beck
Hill House
Spout Bank
Thornmoor
Issues
WALTON CP
Moss
4
5
6
7
Little Moss
Hainings Plantation
Hainings Wood
Hainings House
94m
Track
Weir
High Hill Head
The Bottom
93m
Oak Crest
Walton High Rigg
Gillbank
Hill Head Farm
Sinks
Waltonmill Bridge
Walton Mill
Gillfoot
Ford
91m
Peglands Beck
Hillfield
Blairs Wood
Brooklands
Low Rigg
Blackhouse Plantations
Collects
Doctor's Close
Townhead Farm
Whin Garth
Moor View
Wilson Homes
Irthing View
Viceroge
Walton
The Beechea
Conturion Inn
54m
Eden Vale
Leafield
Swainsteads
Sandysike
TURRET
Crowhills Plantation
King Water
Map Index
1
2
3
Site of Special Scientific Interest
Bolton Fell and Walton Mosses
Cumbria
Date Notified: 13 March 2015
Note:
The boundary shown is derived from large scale Ordnance Survey Mastermap,
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Site of Special Scientific Interest
1009.27 Hectares
Site Unit
Theme ID: 1481407
Grid Ref.: NY499673
Version: 20150225
Plotted: 10/03/2015
Scale 1:10,000 at A3
Map 3 of 3
Grid North
0 200 400 600m
0 500 1000 1500ft.
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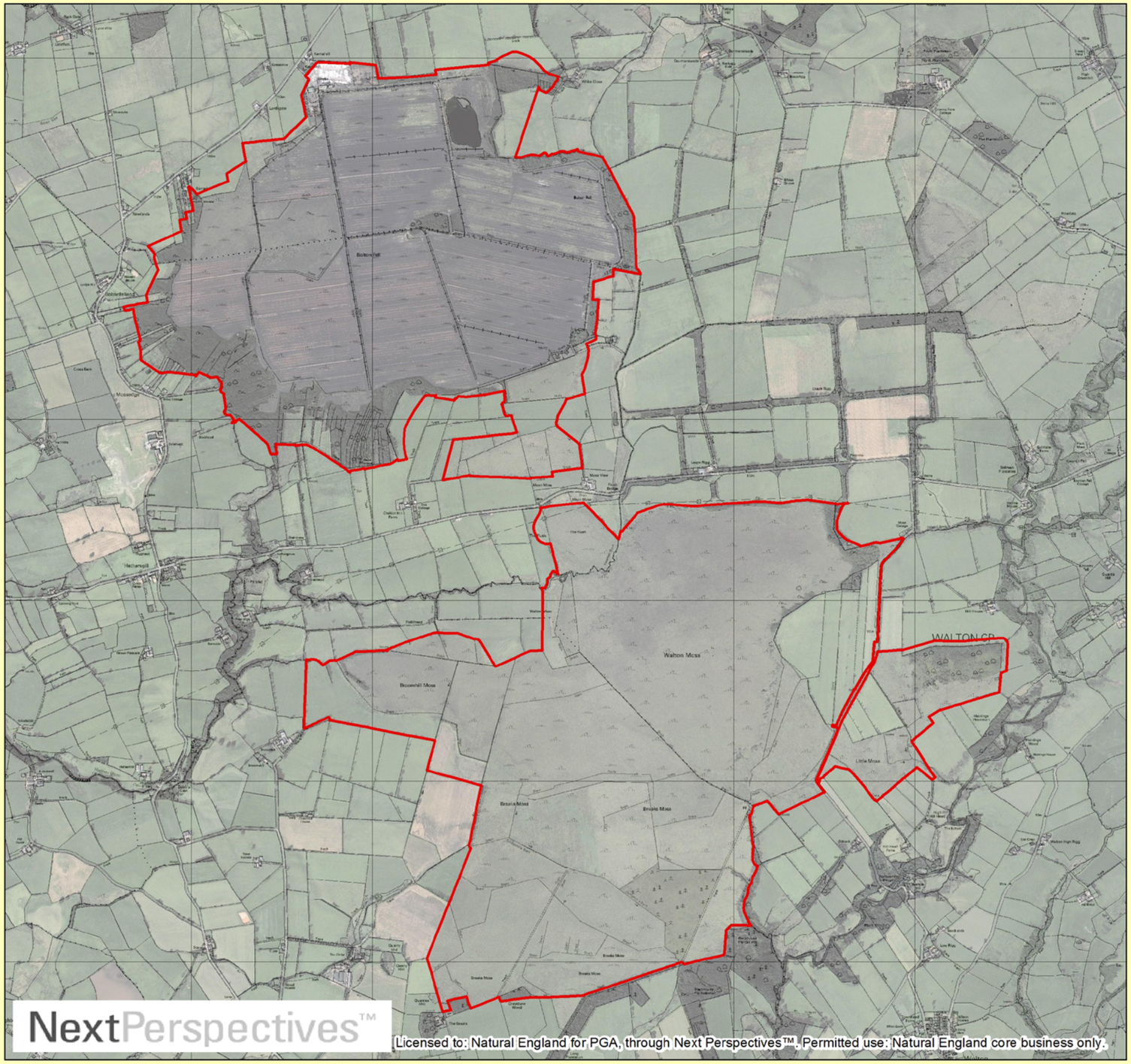
6 Photographs



Photograph 1:
Bolton Fell and Walton Mosses

Aerial view of SSSI boundary outlined in red

Scale (at A3): 1:20,905
Map produced by Denise Rose,
Conservation Strategy & Innovation Team
Date: 26/02/2015. Map Reference: NY499673

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Photograph 2: The reserve area on Bolton Fell Moss with M18 raised bog (unit 1)

Photograph 3: Looking across New Mill area of Bolton Fell Moss (unit 1)

Photograph 4: M18 vegetation on Armstrong area of Bolton Fell Moss (unit 1)

Photograph 5: Previously milled peat with rush and scrub invasion on Bolton Fell Moss (unit 1)

Photograph 6: Area of domestic cutting where the peat has dried and heather dominates on Bolton Fell Moss (unit 1)

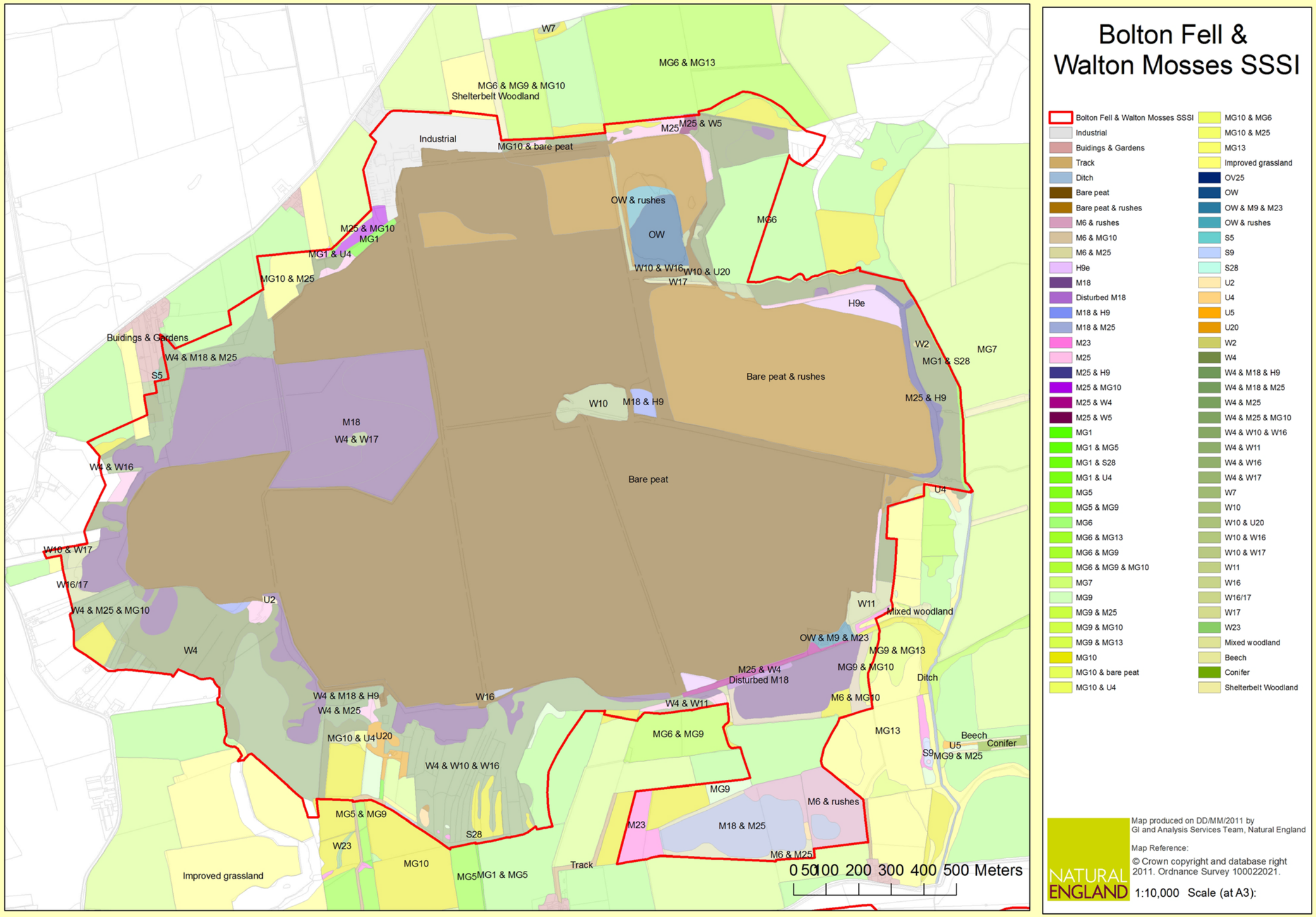
Photograph 7: Walton Moss Common (unit 4)

Photograph 8: Broomhill Moss (unit 6)

Photograph 9: Little Moss showing the scrub on M17 degraded mire (unit 5)

Photograph 10: Breaks Moss (unit 7)

7 Vegetation survey maps



Bolton Fell & Walton Mosses SSSI

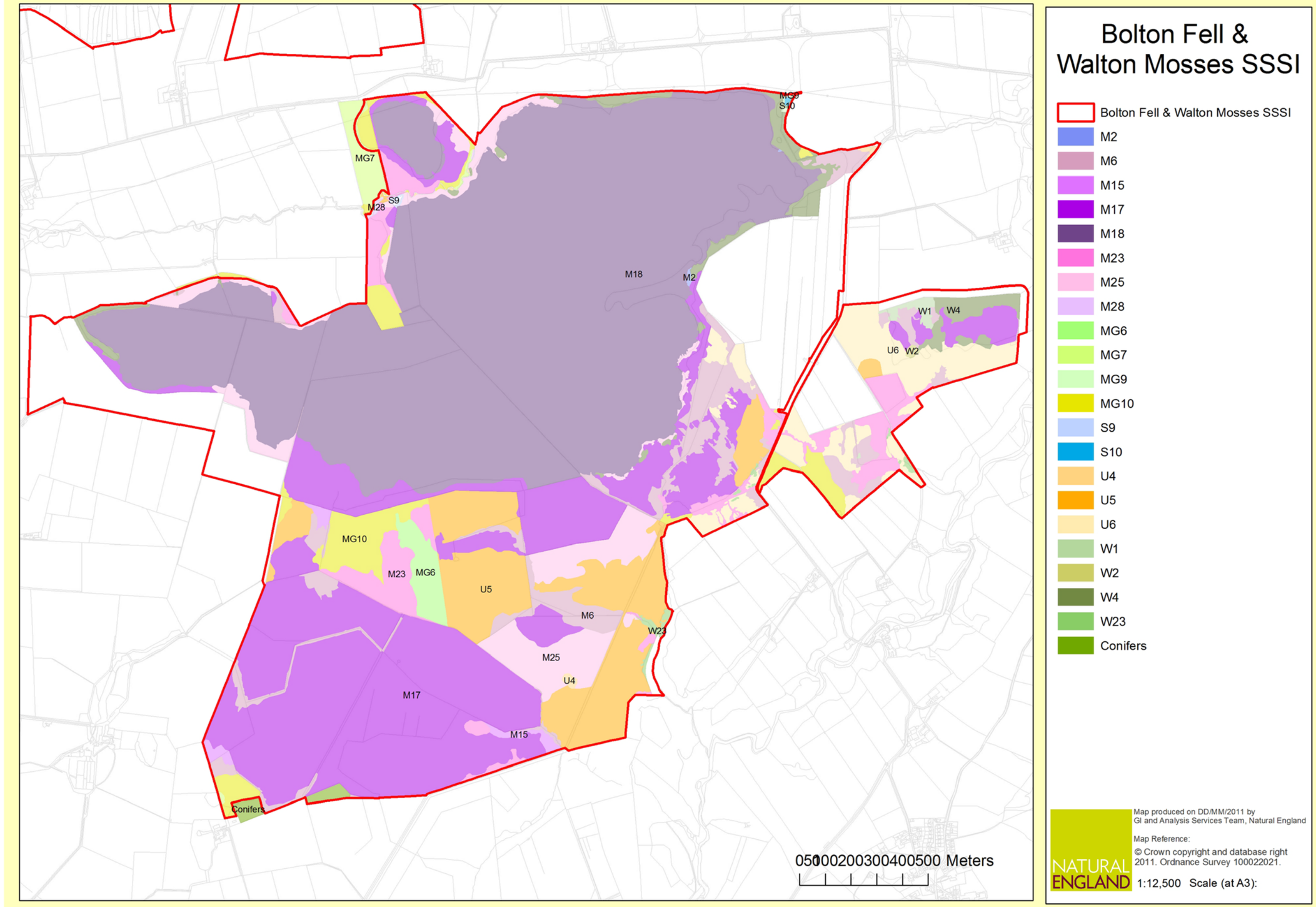
- Bolton Fell & Walton Mosses SSSI
- Industrial
- Buidings & Gardens
- Track
- Ditch
- Bare peat
- Bare peat & rushes
- M6 & rushes
- M6 & MG10
- M6 & M25
- H9e
- M18
- Disturbed M18
- M18 & H9
- M18 & M25
- M23
- M25
- M25 & H9
- M25 & MG10
- M25 & W4
- M25 & W5
- MG1
- MG1 & MG5
- MG1 & S28
- MG1 & U4
- MG5
- MG5 & MG9
- MG6
- MG6 & MG13
- MG6 & MG9
- MG6 & MG9 & MG10
- MG7
- MG9
- MG9 & M25
- MG9 & M10
- MG9 & MG13
- MG10
- MG10 & bare peat
- MG10 & U4
- MG10 & MG6
- MG10 & M25
- MG13
- Improved grassland
- OV25
- OW
- OW & M9 & M23
- OW & rushes
- S5
- S9
- S28
- U2
- U4
- U5
- U20
- W2
- W4
- W4 & M18 & H9
- W4 & M18 & M25
- W4 & M25
- W4 & M25 & MG10
- W4 & W10 & W16
- W4 & W11
- W4 & W16
- W4 & W17
- W7
- W10
- W10 & U20
- W10 & W16
- W10 & W17
- W11
- W16
- W16/17
- W17
- W23
- Mixed woodland
- Beech
- Conifer
- Shelterbelt Woodland

Map produced on DD/MM/2011 by GI and Analysis Services Team, Natural England

Map Reference:

NATURAL ENGLAND

1:10,000 Scale (at A3):


MG9
S10
MG7
S9
M28
M18
M2
W1
W4
U6
W2
MG10
M23
MG6
U5
M6
W23
M25
U4
M17
M15
Conifers
0501002003004005000 Meters
Bolton Fell &
Walton Mosses SSSI
Bolton Fell & Walton Mosses SSSI
M2
M6
M15
M17
M18
M23
M25
M28
MG6
MG7
MG9
MG10
S9
S10
U4
U5
U6
W1
W2
W4
W23
Conifers
Map produced on DD/MM/2011 by
GI and Analysis Services Team, Natural England
Map Reference:
© Crown copyright and database right
2011. Ordnance Survey 100022021.
NATURAL
ENGLAND
1:12,500 Scale (at A3):