

**MARTCRAG  
MOOR  
AXE FACTORY  
SITES,  
GREAT LANGDALE,  
CUMBRIA**

**Archaeological  
Recording  
Survey Report**



**Oxford Archaeology North**

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**The National Trust and  
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**Oxford Archaeology North**

Mill 3, Moor Lane Mills  
Moor Lane  
Lancaster  
LA1 1GF  
t: (0044) 01524 541000  
f: (0044) 01524 848606

w: [www.oxfordarch.co.uk](http://www.oxfordarch.co.uk)  
e: [info@oxfordarch.co.uk](mailto:info@oxfordarch.co.uk)

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Janus House  
Osney Mead  
Oxford  
OX2 0EA  
t: (0044) 01865 263800  
f: (0044) 01865 793496

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## SUMMARY

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As part of the on-going work to improve footpaths within the Lake District National Park, Oxford Archaeology North (OA North) was invited by The National Trust to undertake an archaeological survey and investigation of an area of axe working sites that had been exposed by footpath erosion on Martcrag Moor, Great Langdale (NGR NY 26992 08129). The programme of work was intended to provide data to inform and guide forthcoming upland footpath conservation work and, specifically, to record the existing exposed limits of each of the axe working sites before renewal works can be undertaken. The survey and recording was undertaken at various dates between September and October 2008.

The survey entailed a rectified photographic survey of each of the individual working floors, which were digitally corrected and superimposed upon a topographic survey of the site. The rectified photographic survey provided a detailed record of the working floors and demonstrated that they had been subject to relatively little erosion, as most of the flake scatters were relatively localised and had not significantly spread down slope.

The survey identified nine new archaeological sites and the largest of the sites (MC1) was in part preserved beneath an eroded peat hag. The hag was cleaned back in two sections (one section on the western side of the hag and the other on the southern side) to clarify the archaeological character of the working floor and to enable the taking of a series of monolith cores. The westernmost section revealed two distinct layers of axe working debris. The earliest (**1003**) was 0.15m thick, comprised many hundreds of densely-packed small- to medium-sized flakes of fine-grained blue/grey tuff. The second axe working layer (**1002**) overlay and sealed the earlier axe working floor (**1003**) and comprised a 0.07m-0.13m thick deposit of densely-packed medium/large flakes. The dispersed flake material, along with rough-out axes originated from this upper layer. Above the axe working floors was a single layer of homogenous humified blanket peat (**1001**) which was up to 0.55-0.65m deep.

Selected palaeobotanic analysis was undertaken of the cores, and samples were taken for radiocarbon dating from the axe working floors. A date of 1780-1630 cal BC ( $3425 \pm 30\text{BP}$ ; SUERC 22147) was obtained from flake layer **1003** and 1540-1420 cal BC ( $3225 \pm 30\text{BP}$ ; SUERC 22146) from flake layer **1002**. In addition, a date was obtained from the base of the peat: 550-390 cal BC ( $2405 \pm 30\text{BP}$ ; SUERC 22142). The pollen analysis indicated that at the time of the axe production the environs of Martcrag Moor was an open grass and heather dominated landscape, with some hazel and alder scrub, and that the land had been given over to pasture.

Given how many sites have been revealed in what is still a relatively narrow linear exposure, within a large expanse of peat-covered moor, there is the possibility that there are many more sites still buried beneath the peat. The previously limited number of Type D sites, consisting of working sites located away from the geological source material, may in actuality be an indication of low site visibility, rather than actual axe production.

In the course of the proposed path repair work, it is recommended that the Martcrag sites be protected by layers of terram, sheep fleeces and imported mineral soil. The line of the revised path route should be designed to avoid any areas of known archaeological

sensitivity, but should remain within the area of the erosion scar. There would need to be an archaeological watching brief during any ground works in the environs of the sites and further along the line of the Martcrag Moor path.

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## ACKNOWLEDGEMENTS

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Oxford Archaeology North would like to thank Jamie Lund, archaeologist at The National Trust for commissioning the project, and for considerable support and advice in the course of the project. We would also like to thank Eleanor Kingston, archaeologist at the Lake District National Park Authority (LDNPA) for her valuable input. Thanks are also due to Fraser Brown at OA North and Paul Gajos for identifying the lithic scatters eroding along the footpath on Martcrag Moor.

The desk-based study was undertaken by Peter Schofield. The field survey and digital photographic recording was undertaken by Jamie Quartermaine, Peter Schofield and Will Gardner. The digital photographic rectification was undertaken by Karl Taylor and the excavation of the peat hag sections was undertaken by Peter Schofield and Denise Druce. The environmental samples were processed by Denise Druce, who also commented on the radiocarbon dates. The report was written by Peter Schofield and Denise Druce and the illustrations were produced by Ann Stewardson. The report was edited by Jamie Quartermaine, who also managed the project.

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## 1. INTRODUCTION

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### 1.1 CIRCUMSTANCES OF THE PROJECT

- 1.1.1 As part of the on-going work to improve footpaths within the Lake District National Park, Oxford Archaeology North (OA North) was invited by Jamie Lund of The National Trust to submit a Project Design (*Appendix 1*) for an archaeological survey and recording of an area of axe working sites that had been exposed by footpath erosion on Martcrag Moor, Great Langdale (NGR NY 26992 08129). The programme of work was intended to provide data to inform and guide forthcoming upland footpath conservation work and, specifically, to record the existing exposed limits of each of the axe working sites before renewal works can be undertaken.
- 1.1.2 The present survey was undertaken in accordance with the project design prepared by OA North; however, select elements of the project design were not ultimately commissioned and were not undertaken. A scheme of palynological work was originally proposed to be undertaken on deposits on Langdale Combe in order to tie the present sites on Martcrag Moor and the axe factories in general into a datable local palynological chronology. Secondly, the project was to provide a watching brief of footpath renewal at the site. These two elements are not a part of the present study, but the present work will inform management proposals and mitigative measures to be undertaken during any future footpath renewal works on Martcrag Moor. The survey and recording was undertaken at various dates between September and October 2008.

### 1.2 OBJECTIVES

- 1.2.1 The primary purpose of the project was to provide a full accurate survey record of the axe working sites located on Martcrag Moor that have been exposed through footpath erosion. This information will inform future management decisions with regard to formulating a scheme of mitigative path repair work on Martcrag Moor. The aims of the project are broadly as follows:
- to provide a detailed record of the axe working floors in advance of further disturbance;
  - to provide guidance for on-going maintenance and repair of the path;
  - to sample the deposits that seal the recently identified axe sites on Martcrag Moor;
  - to analyse the pollen and plant macrofossils recorded in these deposits;
  - to implement AMS radiocarbon dating at the Martcrag Moor sites;
  - to identify environmental changes that may have been caused by prehistoric anthropogenic activity at Martcrag Moor.
- 1.2.2 It was proposed to sample the organic sediments surrounding the axe working debris from open sections on one of the Martcrag Moor sites (at Site MC 1).

Suitable material from the axe working layer and immediately above it were selected for AMS dating. Sub-samples were taken from the lower levels of the same section of the deposits for pollen and plant macrofossil analysis. Dating the peat above the axe working material was to provide a *terminus post quem* for any activity at the site, whilst the results of the pollen analysis will inform an understanding of the environment of the Langdale Fells following the abandonment of the site.

- 1.2.3 This report sets out the results of the work, followed by a discussion of the archaeological significance and potential of the area. In addition, the potential impacts of the footpath renewal are discussed, together with overall management recommendations for the study area as a whole.



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## 2. METHODOLOGY

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### 2.1 PROJECT DESIGN

- 2.1.1 A project design (*Appendix 1*) was submitted in September 2008 by OA North in response to a verbal brief by Jamie Lund at The National Trust on behalf of John Hodgson of the Lake District National Park Authority (LDNPA) for a programme of survey to record accurately a series of axe factory sites under threat from on-going erosion, which has been discovered exposed on the line of a footpath extending from Pike O' Stickle to Martcrag Moor (Figs 1-3). The present survey is linked to an on-going programme of path repair within the central Lake District - Fix the Fells, several of which have been subject to recent archaeological investigation (OA North 2009a). The recording programme was intended to inform the conservation management of the landscape and to ensure that the sites are recorded in advance of path repair, so that the path repair does not affect the archaeological resource.

### 2.2 THE SURVEY

- 2.2.1 ***Axe Working Floor Recording:*** it was proposed to produce a detailed record of the individual axe working floors at the Martcrag Moor sites by means of semi-rectified photography. The three further sites identified higher up the Stake Beck path (Sites MC6-8) have been severely disturbed by foot path erosion and the worked material has been spread down the slope (Fig 2). The distribution of flakes did not relate to the original working floor and, therefore, did not warrant detailed planning; however, it was proposed that they be recorded by close oblique photography.
- 2.2.2 ***Semi-Rectified Photographic Survey:*** the survey entailed taking photographs of the Martcrag Moor axe working sites from a large bipod set at a height of *c* 2.5m above the ground. The bipod was constructed from light weight aluminium to enable its easy transportation, and had the camera suspended from its apex facing down. Although every attempt was made to make sure that the photographs were as close as possible to being perpendicular to the plane of the ground (ie rectified), in practice it was not possible to precisely achieve this. The photographs were therefore subject to a process of digital adjustment to ensure that they were accurate in plan. This required establishing at least four and preferably eight surveyed control points within the extent of each photograph. The control points were marked using photogrammetric targets, which were surveyed in with a total station.
- 2.2.3 ***Digital Rectification:*** using the survey control points, the digital photographs were digitally rectified using Photoplan software. This produced corrected .JPG images which were seamlessly merged as a raster background into AutoCAD. The outlines of the scatters were digitised from the photographs producing an accurate plan of the lithic floors, which highlight the worked material (Figs 4-10).

- 2.2.4 **General Photographic Survey:** a general photographic archive was generated in the course of the field project, comprising landscape and detailed photography to show the detail of the sites and their wider context. Detailed photographs were taken of all sites using a scale bar. All photography was recorded on photographic pro-forma sheets showing the subject, orientation and date. The photography was undertaken primarily within black and white 35mm format for archival purposes to be maintained to archival standards. Photography was also undertaken digitally using an 8 megapixel camera.
- 2.2.5 **Recording of Peat Hag Sections:** two peat hag sections that have been formed by footpath erosion at site MC 1 were cleaned back and recorded; each was c 900-1000mm in width (Fig 4). The site was chosen as there was a well-defined axe working floor at the base of the hag sections (Figs 11 and 12) and as four rough-out axes had been retrieved from the site. The field observation recorded accurately the two sections, defining the extent and character of surviving archaeological features and showing the location where environmental samples had been taken (*Section 5.1 and Appendix 3*).

### 2.3 ENVIRONMENTAL SAMPLING, ASSESSMENT AND ANALYSES

- 2.3.1 An exposed section of peat above axe working site MC1 on Martcrag Moor, (MC1, Fig 11) was cleaned, photographed and described by an environmental specialist. Duplicate monolith samples were taken for pollen analysis and dating. The samples were wrapped in polythene, sealed and returned to the OA North offices in Lancaster for storage. Environmental bulk samples were taken from above, in, and below the working floor of the axe site for the analysis of pollen, charred material (including charcoal), and radiocarbon dating. The English Heritage Environmental Archaeology (2002) guidelines were followed at all stages of the project.
- 2.3.2 **Monolith Descriptions and Sub-sampling:** the monolith samples were cleaned, photographed and the lithology recorded. Sub-samples were taken from the lower 0.20m from the section sample at regular sampling intervals for the analysis of pollen, which had the potential to provide data about the environment of the Langdale Fells following peat initiation. Samples were also taken from the basal deposits of the section for dating.
- 2.3.3 **Methodology for the Analysis of Pollen:** the sub-samples were prepared for pollen in the laboratory of the Geography Department at the University of Lancaster. Sub-samples of a standard size (1ml in volume) were prepared for pollen analysis using the standard technique of heating with hydrochloric acid, sodium or potassium hydroxide, sieving, hot hydrofluoric acid, and Erdtman's acetolysis to remove carbonates, humic acids, large particles, silicates, and cellulose, respectively. The samples were then stained with safranin, dehydrated with tertiary butyl alcohol and mounted in 2000 centistoke silicone oil (Method B of Berglund and Ralska-Jasiewiczowa (1986)). Tablets containing a known number of *Lycopodium* spores were then added to the known volume of sediment at the beginning of the preparation so that pollen and spore concentrations could be calculated (Stockmarr 1972). Pollen was counted from equally-spaced traverses to a sum of 300-500 grains across the slides at a magnification of x400

(x1000 for critical examinations). Identifications were aided by keys (Moore *et al* 1991; Faegri and Iverson 1989) and a modern reference collection. Cereal-type grains were defined using the criteria of Andersen (1979). Indeterminate grains were recorded using groups based on those of Birks (1973) as an indication of the state of pollen preservation. Charcoal particles (>5 microns) were recorded following the procedures of Peglar (1993). Other identifiable inclusions on the pollen slides (fungal spores, turbellarian eggs, pre-Quaternary spores, etc) were also registered. Plant nomenclature follows Stace 2001.

- 2.3.4 **Radiocarbon Dating:** the relatively precise radiocarbon dating of sampled organic material was essential to the success of the project. The interpretation of archaeological and palaeoecological material recovered relies, in no small part, on the availability of reliable dates. The project sought the advice of Dr Sue Stallibrass, the English Heritage Regional Scientific Advisor for the North West. Material suitable for dating was selected and submitted to Dr Gordon Cook of the Scottish Universities Research and Reactor Centre for AMS dating (*Appendix 5*).
- 2.3.5 **Presentation of the Results:** analysis and the storage of analytical data was accomplished electronically using computer-based tools, particularly the TILIA software package, to categorise data and facilitate its interpretation (Grimm 1990). Pollen calculations and diagrams were made using the programs TILIA and TILIA-GRAPH in TGView (Grimm 2004). Data has been analysed in order to ascertain possible human and climatic influences on the natural environment, and to attempt to relate this to the known, and newly discovered, archaeological remains (*Section 5.6*).
- 2.3.6 **Plant Macrofossil Analysis:** following the sub-sampling for pollen from the monoliths, bulk samples were taken from the two flake layers in MC Section 1 (**1002** and **1003**). These were soaked in water and then sieved through a set of graded sieves of 2mm, 500 microns and 250 microns mesh sizes. The flots were examined using a low-powered binocular microscope and the plant macrofossils and matrix components, such as amorphous material, *monocotyledon* remains and charcoal fragments were recorded on a scale of abundance of 1-4, where 1 is rare (up to 5 items) and 4 is abundant (>100 items).

## 2.4 GAZETTEER OF SITES

- 2.4.1 All of the information concerning archaeological sites within the study area has been collated into a gazetteer (*Appendix 2*), which provides details of their location, period, character and significance. Locations are given as ten-figure National Grid References where possible, and the position of each site is indicated on maps of the study area (Figs 1-3). In addition, a sample of axe working flakes and rough-out axes were catalogued and retained for possible future analysis from the present and initial surveys of Martcrag Moor in 2002 (*Appendix 4*).

## **2.5 PROJECT ARCHIVE**

- 2.5.1 A full archive has been produced to a professional standard in accordance with current English Heritage guidelines (Management of Archaeological Projects, 2nd edition, 1991) and is provided in the English Heritage Centre for Archaeology format, both as a printed document and digitally. Digital survey data is provided in a suitable format for incorporation into the respective National Trust and Lake District National Park Historic Environment Record. Geographical Information Systems (GIS). A synopsis (normally the index to the archive and the report) will be deposited in the Lake District National Park Historic Environment Record.

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## 3. TOPOGRAPHIC AND HISTORICAL BACKGROUND

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### 3.1 SITE LOCATION AND TOPOGRAPHY

- 3.1.1 The sites are located on the current footpath which extends in a south-east/north-west direction along the ground sloping downwards across Martercrag Moor between the summit of Pike O' Stickle and Langdale Combe (NGR NY 26992 08129), and ranging approximately between 530-600m OD (Figs 1 and 2). The area is one of spectacular mountain scenery comprising a mosaic of high craggy peaks with scree slopes, heaths, mires, peatland, heath moorland, acid grassland, bracken, fast-flowing streams and tarns (Countryside Commission 1998, 31). The Cumbrian high fells is an area with radiating deep U-shaped glacial valleys, such as that of Great Langdale immediately to the south of the site (*ibid*). The land form in the area has been repeatedly cut by glaciers, leaving a series of hanging valleys (eg Blea tarn), raised benches (eg Harrison Path area), cwms (eg Stickle Tarn) and morainal deposits. The site is on a gently sloping plateau, which was carved by ice sheets, and is edged to the south by the steep crag edge of the glacially cut Great Langdale valley.

### 3.2 GEOLOGY AND GEOMORPHOLOGY

- 3.2.1 The geology of the area is dominated by the igneous rocks of the Ordovician period (500 to 440 million years ago) known as the Borrowdale Volcanic Group. The Borrowdale Volcanic Group comprise a series of mainly volcanic rocks, including lava flows, tuffs and agglomerates (Taylor *et al* 1971, 12-17). The hard form of this geology has contributed to the elevated, and rugged form of the mountain landscapes in the central Lake District. By contrast, a much gentler landscape has developed out of the Silurian rocks south of Coniston and Ambleside, which includes Windermere and the Howgill Fells. A near complete 'collar' of carboniferous rock exists around the central fells, only broken on its south-western coastal flanks by Upper Permian Triassic rocks. The carboniferous rocks that were once present in the central fells have all but eroded away since the central Tertiary uplift that created the domed structure of the Lake District (Moseley 1978).
- 3.2.2 The source rock of the axe manufacturing sites is a fine-grained tuff of the Seathwaite Fell Tuffs, itself an upper band of the Borrowdale Volcanic Group (Claris and Quartermaine 1989, 3). The tuff was formed by the deposition of volcanic ash under water, and is interspersed with bands of ignimbrite, resultant from the deposition of lava (Taylor *et al* 1971). Although originally horizontal bands, these tuffs now slope down to the north, and outcrop mainly on the faces of Pike O' Stickle and Harrison Stickle in the Langdale area. They outcrop in a horseshoe-shaped band that extends from Langdale Pikes, via Bowfell, Scafell Pike, Seathwaite Fell and thence to Glaramara.
- 3.2.3 The fine-grained tuff is formed of bands of rock that are up to 30m thick, with two of these bands being pertinent to the present study (Claris and Quartermaine

1989). The lowest of these two bands is the most coarse tuff and is the principal source for Neolithic axe manufacture (Group VI). It outcrops on the shoulder of Pike O' Stickle, and Harrison Stickle, as well as the lower northern shoulder of Scafell Pike and near the summit of Glaramara (Hartley 1932). The finer-grained tuff is a high band and outcrops on the plateau behind (north of) the Langdale Pikes and near the summit of Scafell Pike. It also outcrops on the summit of Fairfield (Davis and Quartermaine 2007). This rock was only occasionally used for axe manufacture and there are a few working sites exploiting it and a few dispersed axes using the rock (Group XI). Significantly, at working floors such as Site 123, in Langdale Combe, the local outcropping rock is Group XI, but the source material was Group VI, which must have been transported to the site either by glacial action or was carried (OA North 2004). This would indicate that Group XI was not the rock type of choice. The tuff bands have been eroded by glacial action and detached blocks of the tuff are present within morainal mounds, as well as scattered as scree across the slopes of the Great Langdale valley (Figs 13 and 14).

- 3.2.4 The doming of the central fells played a major role in the development of its radial drainage pattern. This drainage pattern was enhanced by subsequent glacial activity, which formed the major glacial lakes and valleys that radiate out from the centre of the Lake District (Pennington 2003), including the Langdale Valley. Due to the high relief and good drainage of the central fells, peat development has been hindered and tends to occur mainly on the gentler slopes of the north and on the West Cumbrian coastal plain, such as at Black Moss and Williamson Moss (Hodgkinson *et al* 2000). Therefore, due to the lack of extensive peat in the uplands, much of the investigations into earlier vegetation history of the central fells has concentrated on lake deposits (Pennington 1965a; 1965b; 1970; 1975). On present evidence, it appears that peat development occurred in the central uplands in the second half of the post-glacial period but, initially, this was confined to shallow basins and areas of impeded drainage (*ibid*). This peat growth was, for the most part, initiated following a long period of human activity on the central uplands, which was associated, at least in part, with the Langdale axe production during the Neolithic period (OA North 2009b).

### 3.3 HISTORICAL BACKGROUND

- 3.3.1 **Introduction:** the Great Langdale valley and mountains of the Central massif are characterised by some of the most significant archaeological remains in the Lake District, notably the well documented axe factory remains around the higher summits of the Langdale Pikes, Scafell Pike and Glaramara (Claris and Quartermaine 1989); however, there is also an extensive cairnfield at the base of the Mickleden Valley, which is a rarity within the Central Lake District. Presented below is a background to the principal site groups within the environs of the study area.
- 3.3.2 **Axe Factories - history of investigation:** the initial identification of axe production in the area was made at Martcrag Moor Crag by a Professor Watson, between Stake Pass and Pike O' Stickle (Bunch and Fell 1949) and the industry was initially named after Stake Pass. Then in 1948 Clare Fell, along with Brian

Bunch, discovered the enormous working deposits in South Scree gully (*ibid*), and further research by Clare Fell was able to highlight the very substantial scale of the workings across Great Langdale, which led to a corresponding change in name to the Langdale Axe Factories (Fell 1950 and 1954). Dick Plint (1962) and Chris Houlder (1979) were then able to demonstrate further working around the area of Scafell Pike and Glaramara. An attempt to schedule the monuments in the early 1980s by Tom Clare (then Cumbria County Archaeologist) was thwarted by the lack of reliable mapping for the monuments, and this prompted the establishment of a detailed survey of the axe remains by The National Trust in conjunction with the Cumbria and Lancashire Archaeological Unit (now OA North). This survey extensively explored the Langdale and Scafell Pike areas, examining areas above and below the bands of outcropping fine-grained tuff, and recorded numerous axe-working sites (219 sites in Great Langdale and 357 from Scafell Pike / Glaramara) (Claris and Quartermaine 1989).

- 3.3.3 Excavations of axe factory sites are relatively few, the earliest documented example being the excavation of an isolated site, between 1969-1970, at Thunacar Knott, which revealed flakes, rough-outs and a post hole (Clough 1973, 21-31; *Section 3.3.15*). More recently, Richard Bradley and Mark Edmonds, then at Reading University, excavated six sites at Stake Beck, Dungeon Gill, Harrison Stickle, two quarry sites on Top Buttress and one on Loft Crag (Bradley and Edmonds 1993; *Section 3.3.16*). A further quarry at Dungeon Gill was also excavated, as were isolated sites on Stake Beck and on the shoulder of Harrison Stickle (*ibid*).
- 3.3.4 A programme of recording was undertaken by Lancaster University Archaeology Unit (now OA North) in 1991 in advance of path repair work undertaken by The National Trust. This entailed detailed mapping of sites affected by the path repair work on the face of Pike O' Stickle and also the sites on Top Buttress, even though they were not affected by path repair. This included mitigative excavations of a site on the shoulder of Harrison Stickle and another on the shoulder of Thorn Crag. The most recent excavation to be conducted on the Langdale Pikes was undertaken by OA North, on behalf of The National Trust, on Site 123 in May 2003, again in response to proposed footpath repair work (OA North 2004; *Section 3.3.20*)
- 3.3.5 A further programme of recording was undertaken by OA North in 2005, again in advance of path repair work undertaken by The National Trust. This entailed the detailed mapping of axe working sites located in and around the Stickle Tarn and Pavey Ark area, which is located on the eastern limit of the Langdale production areas (OA North 2005). The survey revealed that the band of Seathwaite Fell Tuff used elsewhere for axe manufacture (Group VI) extends through the face of Pavey Ark crag and then peters out on the western side of Bright Beck. Despite intensive searching of the extensive area of crags to the east of Bright Beck no outcropping of this or any other of the bands of Seathwaite Fell Tuff were identified. The survey did, however, reveal a number of new sites; some were located under Pavey Ark immediately below the outcropping bands of source rock, but others were on a path extending east of Stickle Tarn, and were remote from any outcropping source (*ibid*).



- 3.3.6 In addition to these projects, pollen analysts have done a great deal of work in the area surrounding the stone source, with the result that the basic vegetational history of this region is known in greater detail than in most parts of upland Britain (Pennington 1970 and 1975).
- 3.3.7 In 2003 a programme was initiated to investigate the archaeological potential beneath and within the upland peats and to determine the threats to the archaeology and peatlands (OA North 2009b). This entailed detailed investigations in four study areas, of which one was Great Langdale. Langdale was selected because it had a well documented archaeological resource beneath the peat and because it was envisaged that it would allow an assessment of the impact of visitor pressure on the peats. The programme included detailed surveys of the elevated peatland areas behind the Langdale Pikes looking for artefacts within the peat scars. It also provided an investigation of the peat condition and development of the peats, entailing the dating of upper and lower peat deposits to determine the chronology of the peats inception and truncation.
- 3.3.8 *Fairfield:* Vin Davis has for many years been expounding the belief that the fine-grained tuff used at Langdale outcrops around much of the Lake District and that there is the potential for axe production away from the central massif (Davis 1985; Fell and Davis 1988) However, it was not until relatively recently that worked material was found away from the central massif, with a casual discovery on the summit of Fairfield (NGR NY 36015 11584) to the south of Helvellyn (Davis and Quartermaine 2007). Flakes were found within four distinct concentrations on either side of the broad erosion scar caused by the footpath that extends east from the Fairfield Summit (NGR NY 36015 11584). The density of flakes at each concentration was relatively low at no more than *c* 3 flakes per square metre. The petrology of the flakes was consistent with Group XI which outcrops in the area. The small amount of material would suggest that this was an unsuccessful trial. Following on from this, a further survey was undertaken of the axe working sites on Fairfield in 2008 in advance of path repair work, and this confirmed the earlier study (OA North 2009a).
- 3.3.9 *The Axe Factories:* the ‘Great Langdale’ axe factories were the largest producers of stone axes in Britain with the exploited rock, petrological Group VI and variant Group XI, being recognised as the most commonly represented raw material of British Neolithic stone axes (Chappell 1987; Clough and Cummins 1988; Annable 1987). The ‘Great Langdale’ axe factories comprise a range of Neolithic axe production sites grouped at intervals near the Seathwaite Fell Tuff outcrops which continue west from Great Langdale to Scafell Pike and north to Glaramara (Fig 13). The axe making sites are widely distributed, covering some five square kilometres of fell, and range from places where very small quantities of parent material had been prised from the ground in order to make a few artefacts to large-scale quarries and associated major spoil mounds. The largest of these axe production sites, and the site made famous by the discoveries of Bunch and Fell (1949), is at Great Langdale itself, hence the name enshrined in archaeological literature. Axes were, however, made at several other locations, in particular at Glaramara and Scafell Pike (Claris and Quartermaine 1989). Here the tuff, which has the same mechanical properties as flint, and can be worked in a regular and controlled manner, was prepared to rough-out stage for subsequent

polishing away from the mountain zone, notably on the Cumbrian coastal plain, as represented by the Ehenside Tarn settlement site (Darbishire 1873).

- 3.3.10 A typology for the axe production sites was defined (Claris and Quartermaine 1989) comprising Types A to D. Type A sites are where there is clear evidence of quarrying. Type B sites are where the production is located on scree slopes or block fields adjacent to the outcrop of the bedrock and production reflects the working of naturally-detached blocks. Type C sites reflect the exploitation of scree slopes far below from the outcrop of bedrock; and Type D, working floors, are located away from the source material implying that the material was carried to the site, although there also remains the possibility that suitable glacial drift material was used (Claris and Quartermaine 1989, 5).
- 3.3.11 *Great Langdale*: the largest area of working on the Langdale pikes is around the south face of Pike O'Stickle (Types A and B; Fig 14), and to a lesser extent the south face of Harrison Stickle. Here the fine-grained tuff has been quarried directly from the rock face, often exploiting natural fissures, leaving clear signs of conchoidal fracturing and, in some cases, creating small artificial caves (*eg* on South Scree). The Top Buttress sites are located on a series of narrow ledges, situated one above the other on the face of Pike O'Stickle. Accompanying these quarries are very large quantities of debitage, ranging in size from angular blocks, which have evidently been detached from the rock face, to the characteristic flake debitage of axe manufacture. This raw material is a major feature of the screes seen on the flanks of the mountain. Type C sites are usually located on lower scree slopes, where frost-fractured blocks have come to rest, and were subsequently worked for axes. These sites typically comprise worked flakes but few indications of worked blocks (*ibid*).
- 3.3.12 It was found during one recent survey (OA North 2005) that a site previously discovered on the north shore of Stickle Tarn (CLAU Site 193) was in fact part of a Type C axe production site and related to the newly discovered exposure of Group VI rock exposed above the scree of Pavey Ark. Two substantial working floors comprising medium to large flakes were identified underneath large boulders that had fallen from Pavey Ark and which had come to rest subsequent to the axe production. The local geology is a coarse-welded tuff, comprising pyroclastic breccia and agglomerate which varies in composition from basaltic to andesitic (Millward *et al* 1978). The source material for these flakes was fine-grained tuff that had detached from the Pavey Ark crag as a result of frost fracturing and come to rest on the slopes below.
- 3.3.13 A limited number of potentially significant sites have been identified away from the principal stone sources and are on access routes leading out from the main working areas, extending ultimately down to the major valley floors (Type D sites). These sites represented either the working of glacial erratics or material that was physically carried to these locations and occur on the northern flanks of the Langdale Pikes in the area of Harrison Combe and Thunacar Knott, where there is an implied access route that leads out from the Pikes by way of Langstrath into Borrowdale. There are also sites on the lower shoulder of Harrison Stickle, along the main paths leading down into the Great Langdale valley and from where access is afforded into the southern Lake District and beyond. These sites consist of working floors well beyond the known distribution

of the rock used for making axes, and the linear spread of these monuments is an indication of routeways used in antiquity. It is the sites of this type that are of most interest to the present study, as the study area is remote from the parent geology. A new Type D site (OAN78) was identified located on the putative high-level route running away to the east of the axe factories and on the east side of Stickle Tarn during a recent survey (OA North 2005). OAN78, along with the previously discovered Site 194 (NY 28869 07690), comprised flakes that were typically small in size and reflect the fine working of an axe, rather than the course reduction of a block. As such, it is possible, indeed probable, that the source rock was brought to the sites as partly worked rough-outs. Site 194 is on the shore Stickle Tarn and was a logical place for a camp site, being adjacent to a water supply and was relatively sheltered from the elements by the crag of Pavvey Ark. Similarly, Site OAN78 was on relatively flat ground, on the top of a small knoll, and, significantly, is one of the few areas in the very undulating, local landscape that is both relatively flat and also well drained. This now provides possible evidence for an easterly high level route and reinforces the tentative supposition that the axe factories were in part exploited by populations deriving from the eastern side of the working sites (Bradley and Edmonds 1993).

- 3.3.14 The programme of fieldwalking and peat scar prospecting in the Langdale study area of the Upland Peats Project (OA North 2009b) identified 101 peat scars and, of these, eight were found to contain archaeological remains (Sites L1, L2, L12, L15, L21, L22, L24 and L28; Fig 15). These find spots were all in the area around the Langdale Pikes and Harrison Combe, in the general area of the Langdale axe factories, and the finds were mainly flakes or rough-outs. The distribution of the sites identified in the survey suggested that they were within a relatively localised area, typically on the plateau immediately behind the Langdale Pikes, or in a line extending out from the area of Loft Crag towards Stake Beck. The implication is that these sites defined a broad band of activity that followed a potential route into Borrowdale. Because the identified sites were in peat scars their distribution was inevitably biased towards those areas with greatest erosion; however, there was a substantial number of scars, from which no sites were recorded, on the gentle moorland of Thunacar Knott and High Raise.
- 3.3.15 **Excavation:** intrusive investigation at the axe factory sites are relatively few, the earliest being that of a Type D site excavated between 1969-1970, at Thunacar Knott. This site revealed a single flake layer, or working floor, with associated broken rough-outs beneath 0.10m to 0.25m of peat and above a natural inorganic or mineral soil (Clough 1973, 21-31). Importantly, this site produced a radiocarbon date of 3350–2923 cal BC (4474 BP; BM 676), and also a tentative posthole. A second trial trench produced a further scatter of many thousands of small trimming flakes (*ibid*).
- 3.3.16 More recently Richard Bradley and Mark Edmonds excavated six sites at Stake Beck, Dungeon Gill (CLAU Site 148), Harrison Stickle, two sites on Top Buttress (Sites 95 and 98), and one on Loft Crag (CLAU Site 87) (Bradley and Edmonds (1993, 105-30)); the descriptions below (*Sections 3.3.17 to 3.3.19*) are taken from the Bradley and Edmonds excavation report (*ibid*).

- 3.3.17 The two sites at Top Buttress are both Type A sites. Site 98 is suggested to have formed relatively quickly, with clearly defined layers of quarrying by fire setting followed by layers of axe production. A high degree of control over the working of axes is suggested by the debitage and rough-outs collected, with attempts to correct errors in working to avoid wasted effort. In contrast, Site 95, which represents the extraction of material from a cave, was believed to reflect more intermittent activity of quarrying and axe production. The initial extraction and working was followed by a period when the cave was used as a dump for stone working waste material. This was succeeded by a return to the cave for *in-situ* working of stone brought to the site, and reflects a period when the cave served as a convenient position for preparing rough-outs, presumably during adverse weather conditions.
- 3.3.18 Dungeon Gill (Site 148) is a Type A site, an extraction pit forming an open-cast quarry, but has no evidence of fire setting; instead blocks were simply prised out of the ground. Two phases of activity were identified, separated by a thin soil horizon. The initial phase of the site only provides evidence for the earlier stages of axe production, with few flakes recovered associated with the final finishing stage of the process. There is also little evidence for the development of unworkable flaking angles, indicative of a high degree of wasted effort when the rough-out became difficult to finish off. In contrast, the second phase of activity has all stages of the reduction process with greater effort made to develop flaking angles, including the working of material abandoned in the earlier phase.
- 3.3.19 Stake Beck and Harrison Stickle are both Type D sites, with the emphasis on the latter stages of production with material brought to them as large or partially worked blocks. Trench 4 of Harrison Stickle shoulder contained flakes predominantly associated with the final finishing of crude rough-outs.
- 3.3.20 The most recent excavation was on a Type D site - Site 123 (OA North 2004), which is located on the plateau behind the faces of Pike O' Stickle and Loft Crag, and is set above the outcropping band of Group VI bedrock. The flakes from the excavation appeared to be Group VI, although this has yet to be confirmed by thin sectioning, but the adjacent outcrop is Group XI tuff. The stratigraphy recorded from within the trench and from the section of the eroded peat hag demonstrates a single layer of fine-grained tuff waste flakes associated with the preparation of rough-out axes, and two rough-outs were recovered from the excavation of the trench. The archaeological deposits had, however, been substantially impacted upon by footpath erosion, and the working floor evidently extended substantially beyond the limits of the trench.
- 3.3.21 The site was classed as Type D (a rare site type, representing only 0.5% of Langdale axe production) because it appears to be utilising Group VI, rather than the locally available Group XI source material and may reflect a use of the site as a camp. Site 123 is the largest known Type D working site and, by virtue of its rarity, and in terms of how it can contribute to an understanding the working practices at Langdale, it is potentially one of the more important Langdale axe factory working sites (OA North 2004).
- 3.3.22 **Chronology:** radiocarbon dates from Type A sites have a relatively late chronology. Site 95, a quarry site on Top Buttress, produced two dates from within the sequence of debitage build up, the one from lower down giving a date

of 3690-3370 cal BC (BM 2628) and the higher one giving a date of 3500-3100 cal BC (BM 2627) (Bradley and Edmonds 1993).

- 3.3.23 Radiocarbon dates have been obtained from several Type D sites at Langdale. Charcoal obtained from the excavated Type D site at Thunacar Knott, located some way from the stone source and probably an ancillary working floor doubling as a temporary camp, has given a radiocarbon date of 3777-3040 cal BC (BM 281) (Clough 1973, 21-31). A further Type D site on the shoulder of Harrison Stickle produced a date of 3780-3532 cal BC (BM 2625) (Bradley and Edmonds 1993). The Reading University project also undertook excavations of a Type D site and putative temporary camp at Stake Beck which produced a date of 3730-3410 cal BC (OXA 2181).
- 3.3.24 Excavations at Thorn Crag (Site 187) were conducted by Lancaster University Archaeology Unit (now OA North) in 1991, a Type C site. This produced a radiocarbon date from charcoal recovered from directly below a layer of waste flakes of 4041-3662 BC (OxA-4212; Hedges *et al* 1994, 360-361). This date provides a *terminus post quem* for Site 187, which coincides with the beginnings of forest clearance identified in the pollen sequence at Blea Tarn (Pennington 1975).
- 3.3.25 Potentially, one of the most significant dates comes from a Type D site, Site 123, on the plateau behind the faces of Pike O' Stickle and Loft Crag (OA North 2004). It is set above the outcropping band of Group VI bedrock, and is adjacent to Group XI outcropping, but appears to use non-local Group VI rock as a source. The flakes were within a very humified organic soil at the base of the peat and a radiocarbon date from a sample taken from a charred *Empetrum nigrum* seed from within the flake deposit produced a date of 5968-5732 cal BC ( $6965 \pm 30$ BP; KIA23485). This suggests a Mesolithic date for this deposit of waste flakes associated with the preparation of axe rough-outs, and is potentially of considerable importance, but as only one sample was dated further dates are needed to confirm the antiquity of the sample.
- 3.3.26 **Peat Development:** the results of the palaeoecological survey of the Upland Peats in the Langdale study area demonstrated that peat initiation occurred at 2470-2200 cal BC ( $3865 \pm 35$  BP; SUERC-4521/GU-6076) at Site 123, adjacent to the Pike O' Stickle, and later at 1380-1050 cal BC ( $2980 \pm 35$  BP; SUERC-4517/GU-6074) at the more distant Sampling Site 2 on the slopes of High Raise (NY 27837 09020) (OA North 2009b). Pollen analysis from sites at the southern end of the study area suggests that heather had already become established prior to peat inception at 2470-2200 cal BC. It would appear that the landscape had been subject to burning activity at, and before, this date as evidenced by the charred *Empetrum nigrum* seeds from Site 123 (Section 3.3.25). These results, together with those from the programme of radiocarbon dating, suggest that peat formation occurred sometime after the woodland clearance at the site and for the most part axe working post-dated the clearance, but pre-dated peat formation.
- 3.3.27 Perhaps the most striking feature from Sampling Site 1 on the western side of Harrison Combe, and Site 4 to the north of Pike O' Stickle was the apparent similarity in the pollen record at both sites in the transition from the mor humus to peat. The development of the mor humus itself, plus the presence of an iron pan at the very base of the peat at Sampling Site 1, suggest that waterlogging and

podsolisation probably inhibited vertical drainage and facilitated the development of blanket mire (Birks 1988). The high values of *Sphagnum* spores within the iron-rich deposit at Sampling Site 1 suggest that the local conditions had become wetter. The evidence suggests that vegetation and soil conditions on the Langdale Fells underwent a great deal of modification for a long time prior to the initiation of the peat, and this may have been, in part, anthropogenically driven. Peat formation began some time after the main period of forest clearance of the uplands, and represents a period when certain environmental thresholds had been reached. This goes some way towards explaining the age differential between the Mesolithic radiocarbon date for the Site 123 axe working deposit, and the Late Neolithic to Early Bronze Age peat/humus interface just above it. Evidently, given the elevated character of the terrain, no soil or peat formation developed over the axe debitage for some considerable period following the axe production episode. However, peat formation did not post-date axe manufacture in all areas. A few of the flakes located in the Harrison Combe area (Sites L15, L21 and L28; OA North 2009b) were embedded within the peat/mor humus, and not at the interface with the mineral soil, as had previously been expected. The flake layer at Site 123 was on the mineral soil, but had organic material incorporated within it being compressed in from the overlying peat layer. The potential dating of this layer (*Section 5.6.22*), together with the pollen data from Sampling Sites 1 and 4, indicate a substantial interval between axe production and peat inception, and suggest that these basal deposits accumulated very slowly.

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## 4. ARCHAEOLOGICAL INVESTIGATION RESULTS

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### 4.1 INTRODUCTION

4.1.1 During the recent Fix the Fells survey (OA North 2009a) eight sites were recorded on the line of Stake Beck path, descending from Pike O' Stickle, Great Langdale, including a group of five sites on the line of the Stake Beck path as it converges upon the plateau of Martcrag Moor. The footpath erosion and exposed axe working sites on Martcrag Moor had initially been identified by Fraser Brown of OA North and Paul Gajos in 2008 (Plate 1), within the extent of a large, expansive peat scar, which has been formed by the combined effects of footpath and water erosion. The scar is shown on Google earth aerial images, which are typically 4-5 years old, and has evidently been in existence for a number of years. Despite the evident antiquity of the scar, the sites exhibit relatively few indications of serious erosion, and they are in good condition by comparison with other sites exposed by footpath erosion elsewhere on Langdale (Figs 1-3).

### 4.2 PREVIOUS FIELD SURVEYS AND INVESTIGATION ON AND ADJACENT TO MARTCRAG MOOR

4.2.1 **Early discoveries:** the earliest finds of axe working material at Great Langdale were made at Martcrag Moor by Professor D.M.S. Watson (Warren 1921, 148; Bunch and Fell 1949, 1), and because of the proximity to Stake Pass, this was called the Stake Pass Axe Factory sites. There were two potential locations given, the first recalled the site by personal communication with the Professor as being 500 yards east of the summit of the Stake Pass path on Martcrag Moor at a height of 1760 feet O.D (Keiller *et al* 1941, 58). The second recorded location was written on a rough-out axe from the site which is accessioned in Manchester Museum (Bunch and Fell 1949, 3; Plate IIa). It read 'Found with others and chips in a small manufacturing site ten feet square, half a mile S.E. of the summit of Stake Pass, Lake District.' (*ibid*). The potential site was marked on their figure of the axe factory but no further finds from this location are recorded in any later literature (Houlder 1979, 87; Claris and Quartermaine 1989) (Fig 15). This description, along with the verbal description reported in Keiller *et al* 1941 puts it around the summit of Martcrag Moor. The verbal description of both the location and of the actual site given by Professor Watson clearly differs from that which is marked on the rough-out axe. He described the site as containing axe working of a fair-sized detached block of tuff which had been completely reduced to flakes. The site consisted of six broken axes at various stages of production and a great mass of flakes occurring over an area of 20 feet and at a depth of 18 inches under the peat (Keiller *et al* 1941, 58, Bunch and Fell 1949, 18; Plate IIa and IIb).

4.2.2 In 1948 Clare Fell, along with Brian Bunch, discovered the enormous working deposits in South Scree gully (*ibid*), and further research by Clare Fell was able to highlight the very substantial scale of the workings across Great Langdale, which led to a corresponding change in name to the Langdale Axe Factories (Fell



1950 and 1954). During their investigations Bunch and Fell did not rediscover the original Stake Pass site but did, however, record the complex at Martcrag Moor, and this was marked on their distribution map as being roughly equidistant between OA North Sites MC7 and MC8 (Figs 2 and 14). The complex was described as consisting of two broken axes and a large number of flakes located on the open moor at a height of 1900 feet OD, near to the source of the Stake Beck, and close to the path leading from Stake Pass to the Langdale Pikes. The finds had underlain peat and were exposed where it had disappeared (Bunch and Fell 1949, 3). They surmised that this site was not that which had been recorded by Professor Watson, unless it had been subject to much more erosion subsequent to his discovery thirty years previously, as there was a large concentration of flakes and two rough-out axes from the site (*op cit*, 9), which was more substantial than that described by Watson.

- 4.2.3 Clough in summarising his work and those of earlier discoverers at the axe factories (eg Plint) described several new sites located on and adjacent to Martcrag Moor that had been identified in the period between the late 1940s and early 1970s (Clough 1973, Fig 1). He also probably incorrectly assigned the current complex at Martcrag Moor (OA North Sites MC1-MC7) as being the sites discovered and recorded by Professor Watson as the Stake Pass axe factory (Clough 1973, 26); he did, however, record a site further south-east than that which he interpreted as Bunch and Fell's Martcrag Moor Site (CLAU Sites 16 and 17). A further three sites were subsequently discovered to the north alongside, and within, the watercourse of Stake Beck (CLAU Sites 9, 10 and 14).
- 4.2.4 ***Thunacar Knott excavation:*** Clough recorded a site located slightly to the north-east which had initially been discovered by Peter Johnson in 1966 and named 'Thunacar Knott'. This was the earliest documented excavation of a Langdale axe factory site, undertaken between 1969-1970. The excavation revealed a single flake layer, or working floor, with associated broken rough-outs lain beneath 0.10m to 0.25m of peat and above a natural inorganic or mineral soil (Clough 1973, 21-31). Importantly, this site produced a radiocarbon date of 3250-2923 cal BC (4474±52 BP, BM 676), and also a tentative posthole. A second trial trench located immediately to the north-west produced a further scatter of many thousands of small trimming flakes (few longer than 50mm) surrounding and piled on several rocks (*ibid*).
- 4.2.5 Pollen evidence from the peat immediately overlying the working floor showed a semi-wooded landscape dominated by hazel, alder, birch and grass. Oak was fairly well represented, as was pine, elm, and heather. The pollen data indicates a very low percentage of elm and would suggest that this post-dates the elm decline (*c* 3000bc). At *c* 0.10m above the base of the section, there was a disappearance of pine and a corresponding increase in heather pollen (Pennington 1973). Through correlation with other diagrams, such as those from Blea Tarn and Angle Tarn, this marked change is interpreted as having taken place around 2500 uncal BC. Pennington (1973) suggests that this indicates a dramatic decline in the upland forest and a relatively permanent transition to heather moorland on the higher fells around Thunacar Knott.
- 4.2.6 ***Langdale and Scafell Pike Axe Factory Catalogue sites:*** a series of intensive surveys by The National Trust and the Cumbria and Lancashire Archaeological

Unit (now OA North) was undertaken of the Langdale and Scafell Pike axe factories (Claris and Quartermaine 1989) in 1984 and 1985. Ten axe working sites were recorded in the 1984 survey catalogue as being within the immediate vicinity of those of the present survey (CLAU Sites 9-17 and 193). The latter site 193 was the Thunacar Knott excavation site, and was eventually re-discovered and accurately located *c* 130m east-south-east of the NGR co-ordinates given in the excavation report. The largest group of seven sites recorded was named Stake Beck (north) and were found to be located adjacent to, or within Stake Beck (CLAU Sites 9-15). The final two sites were recorded along the footpath scar on the south-east of the present Martcrag Moor complex and were named as Stake Beck (south) complex (CLAU Sites 16 and 17); these sites correspond roughly to the location recorded by Clough as being the Martcrag Moor complex. The 1984-5 surveys did not identify Clough Site 4, discovered in 1969 (Clough 1973, Fig 1), which corresponds to OA North sites MC1-5, of the present survey nor any evidence of Professor Watson's initial discoveries on Martcrag Moor (Keiller *et al* 1941), despite extensive targeted searches in the areas of the documented locations. The implication is that the turf cover over these sites has fluctuated over the years, and localised erosion patches have appeared and the vegetation cover has subsequently recovered.

- 4.2.7 **Reading University excavations:** Reading University undertook an intensive scheme of investigations involving test pitting, palynology and excavation at the Langdale Axe Factory complex. This followed on from and was informed by the CLAU survey (Bradley and Edmonds 1988; Bradley and Edmonds 1993), and included an excavation by Roy Entwistle in 1987 on CLAU Site 16 (Bradley and Edmonds 1993; Fig 6.1 - Site 1), immediately adjacent to the footpath. It was an axe finishing site exposed by peat erosion that had evidence on the surface of poor quality rough-out axes (Bradley and Edmonds 1988, 197; Fig 8). The excavation revealed that the site was delimited by an arc of large boulders, some of which may have been placed there in the Neolithic period possibly as work benches or anvils. They were associated with a scatter of larger flakes around the outer edge of the site with concentrations of finer material, comprising five dumps of debitage rather than waste from *in-situ* working. The debitage was stratified within a layer of sediment, probably of alluvial origin which was sealed by blanket peat (Bradley and Edmonds 1993, 112). As at Thunacar Knott, it was implied that the debris formed as a result of several episodes of axe manufacture. Two flint flakes (? including a broken blade) were discovered during the excavation, which must have been brought to the site, and there were also 63 retouched flakes which suggested that the site had been used as a camp site (Bradley and Edmonds 1988, 198; Bradley and Edmonds 1993, 114). The raw material for axe manufacture was probably brought to the site as rough-outs or large blocks, given that the later stages of axe making were over-represented in the debitage (Bradley and Edmonds 1993, 115). A sample was taken from charcoal from the surface of the working floor at Stake Beck and this produced a radiocarbon date of 3730-3410 cal BC (4790±80 BP, OXA 2181), which provided a *terminus ante quem* for this particular site (*op cit*, 112-3).
- 4.2.8 Bradley and Edmonds (1993) commissioned pollen analysis on a number of deposits associated with axe factory production, including sites at Stake Beck (CLAU Site 16) and Harrison Stickle. They also re-excavated, sampled and dated

the same post elm-decline layers underlying blanket peat at Langdale Combe from which Walker (1965) had produced a very detailed but undated pollen diagram in the 1960s (*Section 5.6.15-6*). The pollen results from Bradley and Edmond's work at Langdale Combe is only briefly mentioned in the published literature. However, they suggest that the principally trees in the post elm-decline layers had been birch, oak and hazel with the expansion of grasses and heathland plants early on in the sequence (Bradley and Edmonds 1993).

- 4.2.9 ***Upland Peats Project sites:*** the programme of fieldwalking and peat scar prospecting in the Langdale study area of the Upland Peats Project (OA North 2009b) identified eight working floors from within peat scars, and were in the area of Harrison Combe. The distribution of the sites was in a line extending out from the area of Loft Crag towards Stake Beck (Fig 15) and confirms the test pitting results of Reading University; there is an implication that these sites defined a broad band of activity that followed a potential route into Borrowdale. Because the identified sites were in peat scars their distribution was inevitably biased towards those areas with greatest erosion; however, there was a substantial number of scars, from which no sites were recorded, on the gentle moorland of Thunacar Knott and High Raise. In addition, the Upland Peats survey identified two adjacent peat scars nearby which relate to the excavation trenches at Thunacar Knott Type D site (CLAU Site 143).
- 4.2.10 A key aim of the Upland Peats project was to establish dates for the formation and truncation of peats within the area. Palaeoenvironmental work (OA North 2009b) suggests that peat initiation near Pike O' Stickle (Sampling Sites 1 and 4) occurred at *c* 2500-2000 cal BC. This was in a landscape where heather had already become established and suggests that woodland clearance substantially preceded peat formation (*Section 5.6.17*). That this landscape was associated with burning activity is attested by the presence of charcoal macrofossils within the mor humus and the overlying peat. The relatively low levels of birch, elm, pine and oak pollen in the Sampling Sites 1 and 4 diagrams suggest that these species were only minor components of the vegetation at the site, or that these pollen types represent the dispersal of grains from the vegetation on the lower slopes.
- 4.2.11 The evidence suggests that the vegetation and soil conditions on the Langdale Fells underwent a great deal of modification, for a long time prior to the initiation of the peat, and this may have been in part, anthropogenically driven. Peat formation in this area began some time after the main period of axe working activity and clearance of the uplands, and represents a period when certain environmental thresholds had been reached. A subsequent minor clearance episode is registered just above the base of the peat at Sampling Site 4, and is related to a substantial peak in microfossil and macrofossil charcoal. Without a radiocarbon date, however, the age of this phase of activity is uncertain. It is probable that it is more recent than the basal peat, which has been dated to 2470-2200 cal BC (3865±35 BP; SUERC-4521/GU-6076). By the time of peat inception near High Raise, dated to 1380-1050 cal BC (Sampling Site 2, OA North 2009), arboreal pollen had fallen to levels of *c* 40% total land pollen, and microscopic charcoal had reached levels of between 60 and 80%.

### 4.3 MARTCRAG MOOR SITES

- 4.3.1 **Introduction:** in all nine, new archaeological sites were identified by the recent survey, comprising eight newly discovered axe working sites (Sites MC1-MC8), and a boundary marker/walkers cairn (Site MC9). In the lower site group five individual working floors were identified (MC1 - 5) and these comprised varying amounts of lithic waste, some of which is eroding out of peat hags. The largest of the sites (MC1) is at the highest point of the scar and has a large concentration of large to medium flakes, of which some are thickly patinated and others are thinly patinated, indicating that part of the site has been under peat and part under non-humic turf. There is a *c* 100mm thick exposure of flakes protruding from the peat hag, indicating that part of the site still survives intact beneath the peat. There is peat on, and within, the deposit of flakes, but it is also resting on mineral soil, which possibly indicates that the working took place probably around the period of the inception of the peat. There were four rough-out axes identified on the mineral soil/disturbed peat at the base of the peat section. There is a lot of worked material present, and it is obviously a very sizeable site; this, coupled with the fact that there are a number of large flakes, would suggest that this reflects the working of a sizeable glacially-transported erratic boulder rather than the secondary working of rough-out axes.
- 4.3.2 The axe working debris scatters are very localised, and display very little spread down-slope, and contrasts markedly with the sites identified higher up Stake Beck path (MC6 and MC8), which are spread up to 10m down the path from the source location. The indication is, therefore, that the MC1-5 group has been only recently exposed, and is in very good condition. A further site (MC7) is located further up the Stake Beck Path, comprising a very narrow, and relatively deep, gully beside the present day footpath. At the head of the site is a very compact, *c* 150mm deep, deposit of unpatinated flakes, that is within the mineral soil. The upper layer of this deposit is just below the upper surface of the present day footpath, and if the footpath erodes much further it will expose and damage those parts of this site that are presently undisturbed.
- 4.3.3 **Description Site MC1** (Plates 2-4): this is the largest of the sites within the recently discovered group on Martcrag Moor, and comprises an exposure through peat down onto mineral soil caused by the combined effects of footpath and water erosion. Four closely grouped axe rough-outs were found located immediately to the west of the exposed profile of the peat hag (MC1(a)/10005; MC1(b)/10003; MC1(c)/10002 and MC1(d)/10004; Plate 17). There is an intact deposit of patinated flakes within the adjacent peat hag that is *c* 100mm thick. The flakes are seemingly sitting on mineral soil and, in places, there is turf, rather than peat, sitting on the flakes; hence only a limited number have thick patination, with the rest having a blue/grey coloured surface. The flakes are small to medium in size, though there are some large ones, and there are 180 flakes within a 0.4m x 0.4m grid (Relative Flake Quantity Code 6 (Claris and Quartermaine 1989, 21)).
- 4.3.4 The site reflects very high density working which is possibly associated with the reduction of a glacial erratic, as the occasional large flakes are not consistent with the secondary reworking of an axe. The scatter is not particularly dispersed and has not yet suffered unduly at the hands of footpath erosion.

- 4.3.5 **Description Site MC2** (Plate 7): there are two sites within the footpath erosion on Martcrag Moor to the north-west of MC1, both of which are very close together (Sites MC2 and MC3), but which have two slightly diverse centres and have a slightly different character. MC2 is the northernmost and consists of a small, localised concentration extending out from an eroded peat hag. The flakes are mainly small- and medium-sized, are predominantly white-patinated and were evidently covered by peat. The site is considerably smaller and more localised than Site MC1; however, there has been some recent spread of peat, partly obscuring the floor, and it may be in reality somewhat larger. The material is for the most part on the mineral soil, although it has in the past been peat-covered. There are 68 flakes within a 0.4m x 0.4m grid (Relative Flake Quantity Code 4 (Claris and Quartermaine 1989, 21)), mainly medium in size. The flakes are significantly larger than those of the adjacent MC3. There are some coarse stone elements within the area which are seemingly *in situ*.
- 4.3.6 **Description Site MC3** (Plate 8): a small localised scatter of flakes within the area of footpath erosion on Martcrag Moor, comprising mainly small and some medium flakes. The flakes are almost entirely white patinated and have a different colour of patination to the brownish white flakes of nearby Site MC2, although there are a few isolated examples of grey flakes too. There are a number of large earthfast stones spread across the site and although there is no longer any peat over the site, it was evidently covered in the past, hence the patination. The flakes are significantly smaller than those of the adjacent site (MC2), and there are 120 mainly small flakes within a 0.4m x 0.4m grid (Relative Flake Quantity Code 5 (Claris and Quartermaine 1989, 21)).
- 4.3.7 The significance of these two sites (Sites MC2 and MC3) is that they are immediately adjacent to each other but show a different character, with one having markedly bigger flakes than the other. This may reflect the spatial separation of working tasks, with coarse and fine working taking place at immediately adjacent locations. The possibility exists that these tasks were performed by different people at the same time, hence the spatial separation - akin to a production line type of approach.
- 4.3.8 **Description MC4** (Plate 9): this is a small site located within the large Martcrag Moor peat exposure to the north-west of MC2 and MC3, consisting of a concentration of mainly small and medium flakes. The flakes are predominantly covered with patchy patination with some white and some relatively unpatinated examples. There is one major concentration of mainly medium-sized flakes extending out from the tip of a peat hag, although, there is no evidence of any axe working deposits within the hag itself. Two axe rough-outs were identified at the edge of the peat hag at the northern end of the flake scatter (MC4(a)/10000 and MC4(b)/10006; Plate 10), but there were very few flakes in the immediate vicinity. The axe rough-outs were located on a very thin film of peat and there is the possibility that they were *ex situ*. There are two distinct concentrations of flaking waste, but both have a similar character and were probably parts of the same site. There are 84 mostly medium-sized flakes within a 0.4m x 0.4m grid (Relative Flake Quantity Code 5 (Claris and Quartermaine 1989, 21)).
- 4.3.9 **Description Site MC5** (Plate 11): a very small, low density scatter of mainly medium flakes within the large Martcrag Moor peat scar to the north-west of

MC4. It is surrounded by peat hags and is in a slightly waterlogged area. The flakes are mainly patinated white, reflecting that they have historically been covered by peat. The site has a relatively low density of flakes, and is quite localised in extent, possibly representing the working for a single axe rough-out. Twenty medium flakes were identified within a 0.4m x 0.4m grid (Relative Flake Quantity Code 2 (Claris and Quartermaine 1989, 21)).

- 4.3.10 **Description Site MC6** (Plate 12): a small, low density site, mainly consisting of large and medium flakes exposed within the footpath scar on the eastern edge of Martcrag Moor to the south-south-east of MC1. There is a small scatter of mainly small and medium flakes surviving within an, as yet, uneroded part of the footpath (to the north of the main path) which reflects localised survival. The rest of the site consists of a general scatter of flakes that have been dispersed downslope through footpath erosion. The flakes are mainly medium-sized and white-patinated and there are 39 flakes identified within a 0.4m x 0.4m grid (Relative Flake Quantity Code 3 (Claris and Quartermaine 1989, 21)). The middle of the flake scatter is buried beneath a marker/walkers cairn (Site MC9) which has protected an island of ground surface underneath it. A single rough-out axe was identified at the western end of the flake scatter (MC6(a)/10001).
- 4.3.11 **Description Site MC7** (Plates 13 and 14): a small localised, but fairly deep, exposure of flakes within an area of footpath erosion on Martcrag Moor to the south-east of MC6. The footpath erosion is narrow and deeper than the rest of the surrounding erosion scars and the flakes are exposed in this section at a depth of 0.15m below the present surface. There is a thick deposit (0.1m) of predominantly small- and medium-sized unpatinated flakes (and a few large flakes) exposed in the turf section. The narrow erosion channel has cut into the top of the flake scatter, and there will be further flake material surviving below the current ground level of the path, which has a mineral soil surface. The fact that the flakes are within mineral soil is in marked contrast to the majority of the sites which are on top of the mineral soil, raising the possibility that there may be further sites within the, as yet, undisturbed mineral soils. The flakes have very little patination and clearly have not been exposed to the peat. The site survives in relatively good condition and is probably a deeply stratified flaking site. There are 58 mainly medium- to large-sized flakes in a 0.4m x 0.4m grid (Relative Flake Quantity Code 4 (Claris and Quartermaine 1989, 21)).
- 4.3.12 **Description Site MC8** (Plates 15 and 16): an axe working site identified through footpath erosion on Martcrag Moor some distance to the south-east of MC7. The site has a small localised core exposed on the eastern (upslope) end and a large expansive spread of flakes scattered downslope along the length of the footpath erosion. Given the nature and extent of the spread of flakes, it is evident that the site has been exposed by footpath erosion for some time. The flakes are mainly medium in size and are, for the most part, patinated white, perhaps not surprisingly the exposed soil surrounding the flakes consists predominantly of peat. There are 52 small- to medium-sized flakes were identified within a 0.4m by 0.4m grid (Relative Flake Quantity Code 4 (Claris and Quartermaine 1989, 21)).
- 4.3.13 **Description Site MC9** (Plate 9): a single, substantial boundary marker/walkers cairn (Site MC9; Plate 9) was identified during the present survey within MC6. It

was located along the alignment of the northernmost of two marked footpaths running down from the Langdale Pikes and over Martcrag Moor. The cairn is also protecting a proportion of one of the axe working sites (Site MC6), which is partially exposed beneath it.

- 4.3.14 A cursory inspection was undertaken of many of the small/medium-sized peat scars located immediately (up to *c* 100m) to the north and south of the large area of footpath erosion on Martcrag Moor. This revealed occasional axe working flakes at the base of the peat hags, but were not sufficient (minimum of 10 flakes needed) to be defined as a site. The implication is that there are extensive axe working sites around the main eroded exposures. Consequently, there may be surviving axe working layers beneath the protective peat; however, at the present time this has not been adequately demonstrated. Conversely, the evidence may point to small-scale residual axe working sites, such as those identified within exposed peat hags further to the east (Fig 14; OA North 2009b), which follow a high-level routeway down from the west of the Langdale Pikes towards Borrowdale. There is no evidence of exposed axe working sites to the west of the main erosion scar as the sloping ground on Martcrag Moor descends into a boggy area some 400m to the west.



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## 5. EXCAVATION RESULTS

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### 5.1 EXCAVATION AND RECORDING OF PEAT HAG SECTIONS

5.1.1 Presented below is a summary of the results from the excavation of the sections upon the peat hag at MC 1 (Plate 4); detailed descriptions of all contexts are in *Appendix 3*. The full extent of MC1 is not precisely known, as it has a substantial buried component, but the present surface extent (including lateral spreads as a result of erosion) has been defined in the light of the present survey and photographic recording (Figs 4 and 5). Section 1 was exposed in the westernmost extant face of the hag, and Section 2 was exposed in the south-western face of the hag, some 2.5m to the south-east of Section 1.

### 5.2 STRATIGRAPHY RECORDED WITHIN SECTION 1

5.2.1 Three layers were identified in the cleaned section of the peat hag (Fig 11; Plate 5). Exposed at the base was a natural deposit, **1004**, consisting primarily of a glacial clay till interspersed with fragmented igneous stones, above which were two distinct working floors (**1003** and **1002**). The occurrence of waste flakes within the section was evident and it is probable that the section was located near the centre of the surviving working floor. These deposits were overlain by 0.55-0.65m of blanket peat (**1001**) and 0.2m depth of a peaty topsoil (**1000**).

5.2.2 **Natural Subsoils:** the natural subsoil (**1004**) at the base of the excavation, comprised a natural glacial clay till interspersed with fragmented igneous stones. The deposit was exposed in a narrow sondage which was excavated between two large earthfast stones. The layer probably conforms to the glacial natural, seen exposed in Section 2 - **2003**. The upper part of this deposit contained some worked flakes (10% of the deposit) but it was difficult to tell if these flakes were deposited during soil formation or if they had been pressed/trampled in from the layer above.

5.2.3 **Archaeological Stratigraphy:** the archaeological stratigraphy was not complex in its nature; above the natural subsoil were two distinctive axe working layers. The earliest comprised a surviving *in situ* working floor measuring up to 0.15m thick (**1003**), with many hundreds of densely-packed small- to medium-sized flakes of fine-grained blue/grey tuff (up to 95% of the deposit). One axe rough-out was retrieved from within this context (MC1/10017) and the flakes were layered above and packed between two large earthfast boulders and other medium-sized stones.

5.2.4 The second axe working layer (**1002**) overlay and sealed the earlier axe working floor (**1003**) and comprised a 0.07-0.13m thick deposit of moderately densely-packed medium/large flakes, which had a yellow patina from contact with the peat layer (**1001**) above. A thin band of smaller flake debitage was recorded on the upper surface of the layer where it covered the top of a large stone. The current exposed ground level, at the foot of the peat hag, corresponds with the upper half of this layer, and the scattered debitage of Site MC1 is caused by the erosion of the upper half of this flake-rich mineral soil deposit. In particular, it is

from this layer that the four, dispersed rough-out axes (MC1(a)-(d):10002-10005) originated (Plate 3). The lower half of the layer survives beneath the current modern ground level exposed within the footpath. Above the axe working floors was a single layer of homogenous humified blanket peat (**1001**) which was up to 0.55-0.65 deep, and was itself topped by a thin band of very rooty peaty topsoil that was up to 0.2m deep (**1000**).

- 5.2.5 There is a very distinct change in axe working debitage below **1002** where layer **1003** consists almost entirely of fine worked debitage (and one rough-out axe). So while it is evident that the visible scatter of flakes at Site MC1 for the most part derives from axe working deposit **1002**, it is also possible that a light scatter of smaller flakes, originated from **1003**. Some flakes were also discovered in the lower layer **1004** although it is difficult to ascertain in such a small sondage if they consisted of a discrete layer of axe working debitage.

### 5.3 STRATIGRAPHY RECORDED WITHIN SECTION 2

- 5.3.1 Section 2 is located 2.5m to the south-east of Section 1, within the same hag. Four layers were identified in the cleaned section (Fig 12; Plate 6); exposed at the base was a natural deposit **2003**, consisting primarily of glacial clay till interspersed with fragmented igneous stones. Above this was a mineral soil layer **2002**, which contained only a single axe working flake. These deposits were overlain by 0.55-0.65m of blanket peat **2001** and 0.2m of a peaty topsoil **2000**.
- 5.3.2 **Natural Subsoils:** the natural subsoil, at the base of the excavation, comprised a natural glacial clay till interspersed with fragmented igneous stones, defined as **2003**. The deposit was exposed in the south-east end of Section 2 adjacent to several large earthfast stones; the layer was not investigated further with a sondage. The layer conforms to the glacial natural, seen exposed in Section 1 - **1004**.
- 5.3.3 **Archaeological Stratigraphy:** the archaeological stratigraphy was not complex in its nature. Above the natural deposits described above, was a relict mineral soil layer **2002**, consisting of a clayey peat silt that formed approximately 70% of the layer and was 0.15m-0.17m thick. It was interspersed, particularly in the centre of the section, with frequent medium- and large-sized fragmented stones and there was an ironpan formed at the interface with the layer below, **2003**. The layer contained no evidence of a working floor other than a single possible flake which reinforces the view that the low density of axe working flakes found adjacent to Section 2 form the *ex situ* remains of the south-eastern edge of the core of MC1. The mineral soil was sealed by a single layer of homogenous humified blanket peat **2001** which measured up to 0.55-0.65 deep, and which was itself topped by a thin band of very rooty peaty topsoil measuring up to 0.2m deep **2000**.
- 5.3.4 **Extent of Site MC 1:** the majority of the scatter of flakes in Site MC1, extend west and down-slope from the westernmost face of the extant hag (Section 1), but there is a low level scatter of flakes extending upslope and to the east of the section adjacent to Section 2. The cleaning of Section 2 has demonstrated that there is no extant working deposit at this point, and suggest that the low concentration scatter has been dispersed up-slope by pedestrian activity. It is

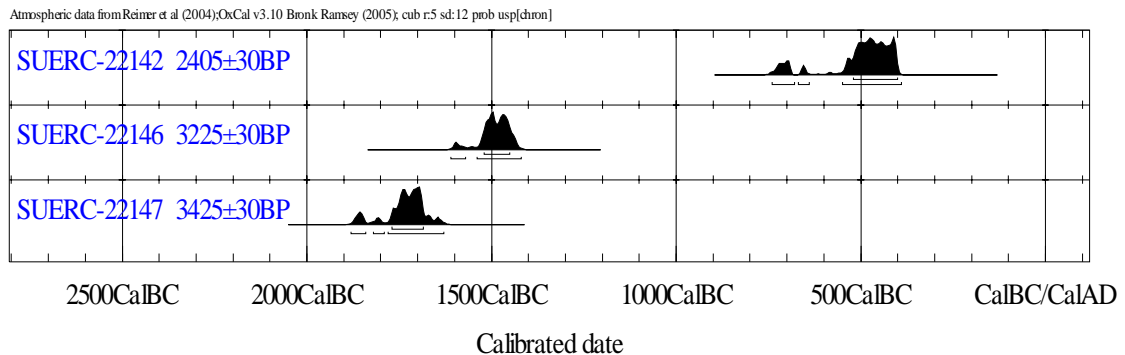
evident that the original thickness of the axe working deposit at Section 1 was 320-350mm deep, but only 2.5m away there is no evidence of any axe working deposit. It would appear that this was a substantial, but fairly localised working floor, although much of the deposit may have originally extended west of the hag, before being truncated.

**5.4 RADIOCARBON DATES**

5.4.1 In total, three radiocarbon dates were obtained from three layers (Table 1). One radiocarbon date of 1780-1630 cal BC (3425 ± 30BP; SUERC 22147) was obtained from birch charcoal, recovered from a bulk sample within the lower flake layer **1003**. A second date of 1540-1420 cal BC (3225±30BP; SUERC 22146) was obtained from Alder charcoal, recovered from a bulk sample of the upper flake layer **1002**. Humic acid fractions of the humic peaty soil of the sample from deposit **1001**, were recovered from the base of monolith 2 at the inception of the peat formation above flake layer **1002**; it was dated to 550-390 cal BC (2405 ± 30BP; SUERC 22142) (*Appendix 6*). The results of the radiocarbon dates are given in the table below:

Laboratory Number	Context Number	Sample/ OR Number	Fraction	Radiocarbon Date	Date cal BC	Probability
SUERC 22142	<b>1001</b>	Tin 2	Humic acid	2405 ± 30BP	550 - 390	83.9%
SUERC 22146	<b>1002</b>	10015	Charcoal: Alder	3225± 30BP	1540 - 1420	90.3%
SUERC 22147	<b>1003</b>	10016	Charcoal: Birch	3425 ± 30BP	1780-1630	83.8%

Table 1: Radiocarbon dates



5.4.2 The dates of 1780-1630 cal BC (3425 ± 30BP; SUERC 22147) and 1540 - 1420 cal BC (3225± 30BP; SUERC 22146) obtained from charcoal deposits within the two flake layers, may suggest two chronologically distinct depositional episodes of waste flakes of Early to Middle Bronze Age date associated with the preparation of axe rough-outs. The axe working is followed by the inception of peat formation on the site in the Early and Middle Iron Age which has been dated to 550 - 390 cal BC (2405 ± 30BP; SUERC 22142) from humic acid fractions.

This is in contrast to both those dates published in Bradley and Edmonds (1993) and those obtained from Thorn Crag (Hedges *et al* 1994, 360-361) which lie within the Neolithic period and those obtained for Site 123 from the organic material around the flake layer which suggested a Mesolithic date for this deposit of waste flakes associated with the preparation of axe rough-outs (OA North 2004).

## 5.5 PALAEOENVIRONMENTAL ANALYSIS

- 5.5.1 **Introduction:** a number of monoliths and bulk samples were taken from the excavated sections at Martcrag Moor site MC1 in order to provide material for palaeoenvironmental analysis and for radiocarbon dating. The purpose of sampling Section 1, which contained the two flake layers, was to provide palaeoenvironmental data and dates directly associated with the activity. It was hoped that the date of peat inception at the site would also provide a *terminus ante quem* for the axe production. As Section 2 was just outside the limits of the working floors, it provided a mineral soil horizon, **2002**, that was less disturbed by anthropogenic activity, by comparison with Section 1. The purpose of sampling Section 2 was to provide a less disturbed and, hopefully, contemporary palynological sequence, which could be compared to the actual area of axe working.
- 5.5.2 **Sampling:** three overlapping monoliths were taken through the peat **1001** in Section 1, and two overlapping monoliths were taken through the peat **2001** and mineral subsoil **2002** in Section 2. A bulk sample was taken from each working floor deposit (**1002** and **1003**) in order to provide material for palaeoenvironmental analysis and radiocarbon dating.
- 5.5.3 **Sub-sampling - Pollen:** a single pollen sub-sample was taken from the lowest 0.01m of peat in Section 1, at its contact with the underlying flake layer **1002**, plus sub-samples were taken from each of the bulk samples **1002** and **1003** prior to their processing for plant macrofossils and charcoal remains. Seven pollen sub-samples were taken from Section 2, concentrating on the mineral soil **2002** and its boundary with the overlying peat **2001**.
- 5.5.4 **Plant Macrofossils:** plant macrofossil and charcoal analysis was carried out on the mineral soil layer in Section 2 (**2002**), which was divided into an upper and lower layer, and the two flake layers **1002** and **1003** in Section 1, which were seen to contain organic material. The overlying peat layer in both sections was also analysed.
- 5.5.5 **Plant macrofossil and charcoal remains results - Section 1:** the results of the macrofossil and charcoal analyses from Section 1 are shown in Table 2. No identifiable organic remains were present in the flake layers apart from >2mm charcoal fragments of *Quercus* sp. (oak), *Betula* sp. (birch) in **1003** and *Alnus glutinosa* (alder) in **1002**. In addition, a few undiagnostic wood fragments were present in the lower flake layer **1003**. The peat layer in Section 1 (**1001**) contained small (<2mm) undiagnostic charcoal fragments, uncharred and charred moss stems, and charred Poaceae stems.

Context	1001 (peat-basal 0.775-0.785m depth)	1002 (upper flake layer)	1003 (lower flake layer)
Volume processed (ml)	10	c 200	c 200
Amorphous organic	4	4	4
Monocotyledon stems/roots		4	4
Moss stems	2		
Wood fragments <2mm			1
Wood charcoal fragments >2mm		2 (including <i>Alnus glutinosa</i> )	2 (including <i>Quercus</i> and <i>Betula sp.</i> )
Wood charcoal fragments <2mm	2	4	4
Charred moss stems	2		
Charred Poaceae stems	1		

Table 2: Plant macrofossil and charcoal analysis results from MC1, Section 1.

Quantifications are based on 1-4 where 1=1-5 items (rare), 2=6-25 items (frequent), 3=26-100 items (common) and 4=>100 items (abundant).

5.5.6 **Plant macrofossil and charcoal remains results - Section 2:** the results of the macrofossil and charcoal analyses from Section 2 are shown in Table 3. No identifiable organic remains were present in the mineral soil; however, it contained abundant undiagnostic wood fragments. Charcoal fragments >2mm in size were present in the mineral soil, including *Quercus* sp. and *Betula* sp. (birch) in the lower 0.25m, and *Quercus* sp. and *Alnus glutinosa* (alder) in the upper 0.25m.

5.5.7 The lowermost 0.01m of the overlying peat layer **2001** contained abundant small (<2mm) undiagnostic charcoal fragments, abundant charred moss stems, and a charred Cyperaceae (sedge) seed. The samples above, taken at 0.68-0.69m and 0.66-0.67m depth, contained much fewer charcoal fragments.

Context	2001 (peat- 0.66-0.67m depth)	2001 (peat- 0.68-0.69m depth)	2001 (peat- basal 0.70- 0.71m depth)	2002 (upper 0.25m of mineral soil)	2002 (lower 0.25m of mineral soil)
Volume processed (ml)	10	10	10	50	30
Amorphous organic	4	4	4	4	4
Monocotyledon stems/roots				3	3
Moss stems	3				
<i>Sphagnum</i> leaves		1	1		
Wood fragments <2mm				3	3
Wood charcoal fragments >2mm				2 (including <i>Quercus</i> and cf	2 (including <i>Quercus</i> and

				<i>Alnus/Corylus</i> )	<i>Betula</i> sp.)
Wood charcoal fragments <2mm	1		3	3	3
Charred Cyperaceae seeds			1		
Charred moss stems			4		

Table 3: Plant macrofossil and charcoal analysis results from MC1, Section 2.

Quantifications are based on 1-4 where 1=1-5 items (rare), 2=6-25 items (frequent), 3=26-100 items (common) and 4=>100 items (abundant)

- 5.5.8 **Discussion:** the mineral horizon in Section 2, and the flake layers in Section 1 appear stratigraphically contemporary, and the macrofossil remains support this. Only three charcoal wood species were positively identified and of interest is the consistency between the mineral soil in Section 2 and the flake layers in Section 1. Both the lower 0.25m of the mineral horizon (**2002**) in Section 2 and the lower flake layer in Section 1 **1003** were dominated by *Quercus* (oak) and *Betula* sp. (birch). Similarly, both the upper 0.25m of (**2002**) and the upper flake layer **1002** contained fragments of *Alnus glutinosa/Corylus avellana* (alder/hazel).
- 5.5.9 It is notable that the charcoal present in the overlying peat in both sections differed from that in the mineral soil and flake layers. It consisted of either very tiny undiagnostic charcoal fragments and/or charred moss and Poaceae stems. The base of the peat in Section 2 also contained a charred Cyperaceae (sedge) seed. The charred material from the peat may represent *in-situ* burning of the peat surface and/or material blown in from a distance. Conversely, the wood charcoal recorded in both the mineral soil and flake layers, which were often >2mm in size, may indicate the local burning of wood either for fuel or clearance.
- 5.5.10 The fact that the dates from the flake layers were sequential lends further support to the fact that the charcoal accumulated *in-situ* and does not necessarily represent material from later activity that found its way in to the flake bearing layers (although of course this cannot be ruled out). There are no obvious signs that the mineral soil or flake layers represent eroded material as the flakes did not appear to be sorted by weight, which one would expect if they had been eroded downslope from elsewhere (Bradley and Edmonds 1993).

## 5.6 POLLEN ANALYSIS

- 5.6.1 **Introduction:** the pollen diagrams for both sections are shown in Figures 16 and 17, where the results are presented as percentages of the total land pollen (TLP) and spore sum. Obligate aquatic taxa and other palynomorphs are presented as percentages of the pollen sum plus the sum of the category to which they belong. The pollen diagram from Section 2 was divided into two zones (PAZ) by visual examination; depths (m) are measured from the surface of the peat hag.
- 5.6.2 **MC1 Section 1 (Fig 16):** the pollen counts from the two flake layers **1002** and **1003** are almost identical and are dominated by *Corylus avellana*-type (hazel/bog-myrtle) (c 20/27% TLP), *Calluna* (heather) (25/34% TLP) and

Poaceae (grass) (20/17% TLP). *Alnus* (alder) pollen is also well represented in both samples, with values of 10% TLP. *Pteropsida* (monolete) (fern) spores and *Sphagnum* moss spores are also well represented with values of 13% and 18/25% TLP respectively. Other arboreal pollen recorded in low abundance includes *Betula* (birch), *Ulmus* (elm), *Quercus* (oak), *Tilia* (lime), *Fraxinus* (ash) and *Salix* (willow). Other notable herbaceous taxa recorded in both flake layer samples include *Plantago lanceolata*/*Plantago* sp. (ribwort plantain/plantain), *Taraxacum* (dandelion-type), *Solidago virgaurea*-type (daisy-type) and *Succisa pratensis* (devil's bit scabious). Low values of Cyperaceae (sedge), *Filipendula* (meadowsweet), *Ranunculus* sp. (buttercups), *Potamogeton* (pondweed) pollen and *Lycopodium* moss spores were recorded in the sample from the upper flake layer **1002**. Both flake layer samples contained high numbers of indeterminate corroded and crumpled grains, which may indicate some biases in the pollen counts due to preferential pollen preservation and some degree of reworking, which one would expect in soils. Both of the samples contained very abundant microfossil charcoal fragments, which is not surprising given the abundant macrofossil charcoal fragments present in the bulk samples from the two layers.

- 5.6.3 The sub-sample taken from the overlying peat layer **1001**, near its contact with the upper flake layer **1002**, contained a similar range of pollen types. The value of *Calluna* pollen, however, was much higher, representing 60% of the pollen sum and *Betula* was also slightly better represented. Other differences observed in the peat include a significant reduction in Poaceae pollen to *c* 5% TLP and a fall in *Pteropsida* and *Sphagnum* spores. Values of microscopic charcoal were also slightly lower.
- 5.6.4 **MCI Section 2 (Fig 16):** the pollen diagram from Section 2 is divided into two Pollen Assemblage Zones (PAZ's) based on observational changes in the represented taxa.
- 5.6.5 **PAZ 1:** this zone is dominated by Poaceae pollen with abundant *Calluna*, *Corylus-avellana* type, and *Alnus*; it also contained abundant *Pteropsida* (monolete) and *Sphagnum* moss spores, plus *Pteridium* (bracken) is fairly well represented in the upper half. Other arboreal pollen recorded in low abundance include *Quercus*, *Betula*, *Ulmus*, *Pinus* (pine), *Tilia*, *Fraxinus* and *Salix*. Other notable herbaceous taxa in PAZ1 include *Plantago lanceolata*/*Plantago* sp., *Taraxacum*, *Solidago virgaurea*-type, *Succisa pratensis* and *Ranunculus* sp.. Low values of Cyperaceae pollen, and *Polypodium* (fern) and *Lycopodium* moss spores were also recorded.
- 5.6.6 **PAZ 2:** the lower boundary of PAZ 2 marks a change in the pollen sequence, which coincides with the development of the peat. This change is marked by a significant reduction in Poaceae and other herbaceous pollen types with a corresponding rise in *Calluna* and arboreal pollen. Both *Betula* and *Quercus* show a marked recovery in this zone. The only notable herb to increase in PAZ 2 is *Potentilla* (cinquifolds), although values of Rosaceous (rose family) pollen also increase slightly in this zone.
- 5.6.7 The percentages of the main taxa were broadly similar in both diagrams although values of Poaceae and other herbaceous pollen, such as *Plantago lanceolata*/*Plantago* sp., *Taraxacum* and *Ranunculus* sp. and *Pteridium* appear better represented in Section 2, perhaps as a result of improved preservation.

Additional taxa recorded in the mineral soil from Section 2 include Apiaceae (carrot family), Caryophyllaceae (pink family), *Rumex* (docks), and *Potentilla*. Microscopic charcoal fragments were extremely abundant in the mineral soil in Section 2.

- 5.6.8 Both diagrams show a shift in the relative abundance of *Calluna* and Poaceae at the mineral soil/flake layers and peat interface. In both cases, values of *Calluna* increase at the expense of Poaceae.
- 5.6.9 **Interpretation:** it is assumed, based on the proximity of the two sites and their stratigraphic relationship, that the deposits in Section 1 and 2 were contemporary. The pollen evidence broadly corroborates this and consists of similar taxa. Although slight differences are apparent, these are probably as a result of differences in pollen preservation and sampling. The samples from the mineral soil in Section 2 and the flake layers in Section 1 both contain taxa indicative of an open grass and heather dominated landscape, with some hazel and alder scrub. In addition, the presence of a number of key anthropogenic indicator types, such as ribwort plantain, buttercups, docks, carrot-family, daisy-type, devil's bit scabious and bracken, suggests that the area was given over to pasture. The occasional pollen grain of elm, oak, lime, and ash were also recorded; however, these are likely to have come from trees growing in the valleys surrounding the site. The presence of abundant microscopic charcoal in the mineral soil and flake layers suggests that the landscape may have been subjected to burning events, although it is also possible that the charcoal derived from nearby hearths.
- 5.6.10 A change in conditions is indicated at the onset of peat development, and is especially marked in Section 2. Peat development at the site coincides with a significant increase in heather pollen and a corresponding decline in grass pollen and other herbaceous taxa. Although there is no significant change in values of hazel and alder, an increase in birch pollen in both sections (and oak in Section 2), suggests that a period of woodland recovery may have taken place after the onset of peat development at the site.
- 5.6.11 The changes highlighted above, though significant, need to be considered alongside the associated radiocarbon dates. For example, the changes appear minimal if one considers that there was potentially a gap of up to c 1000 years between the development of the mineral soil, with the associated flake production? and the peat inception.
- 5.6.12 **Comparison with other sites:** the pollen data from Martcrag Moor is consistent with other pollen records from the Langdale area, and reflects a landscape with a long history of anthropogenic activity following the earliest clearance episodes and initial spread in grassland. At both Langdale Combe and Mickleden (Walker 1965), following some initial minor clearances at around the Zone V11a and VIIb boundary (c 3500 BC; Bell and Walker 1992), there is a very marked increase in grass and heather and disturbance indicators such as *Plantago lanceolata* and *Artemisia* (mugworts). Walker (1965) describes this change as representing the first major shift in vegetation, from woodland to bog conditions, possibly related to the earlier stages of axe factory working.



- 5.6.13 Above this level the Langdale Combe pollen data indicates at least a further four periods of increased activity and clearance episodes, including a very marked episode related to the occurrence of wood charcoal and increase in minerogenic input in the Langdale Combe stratigraphy (Walker 1965). Bradley and Edmonds (1988; 1993) re-excavated the site in 1986 and sampled and dated the same post elm-decline layers underlying the blanket peat.
- 5.6.14 The evidence shows that the date of peat inception at Langdale Combe and Martcrag Moor are similar, dated to 700-450 cal BC ( $2450 \pm 70$  BP, OXA 2179) and 550-390 cal BC ( $2405 \pm 30$ BP, SUERC 22142) respectively. Based on pollen evidence, Bradley and Edmonds (1993) suggested that up to four possible clearance episodes took place between the elm decline and the development of the peat. In the event, charcoal extracted from alluvial sediments, believed to be associated with the most intensive of these clearance episodes, and possibly the same as that identified by Walker (1965), was dated by Bradley and Edmonds (1993), to 2050-1750 cal BC ( $3510 \pm 70$  BP, OXA 2180). A date which is believed to post-date axe production, and, coincidentally, is not that dissimilar to that of the charcoal associated with the lower flake layer from this study, dated to 1780-1630 cal BC ( $3425 \pm 30$ BP; SUERC 22147).
- 5.6.15 Excavation of a working floor at Stake Beck (Site 16/R1; Fig 14) by Bradley and Edmonds (1988, 1993) included the sampling of the sediments for pollen analysis, which, like the post-elm decline sediments at Langdale Combe and Martcrag Moor, indicated a very open landscape (on average only 18% arboreal pollen) and was dominated by grasses and heather. Charcoal collected from the working floor provided a *terminus ante quem* of 3410-3730 cal BC ( $4790 \pm 80$  BP, OXA 2181), which, providing the material is not reworked, suggests that very open conditions had become established in the area around Langdale by the mid Neolithic period. Pollen evidence from Red Tarn, Wrynose, Red Tarn Moss and Blea Tarn (Pennington 1965a, 1975) all show a significant expansion in heather after the elm decline. Similarly, pollen evidence from peat overlying a working floor at Thunacar Knott, Langdale (CLAU Site 143: Fig 15), shows a reduced percentage of elm, the disappearance of pine, and a substantial increase in heather pollen, which, through correlation with other diagrams, is dated to 2500 uncal BC (Pennington 1973).
- 5.6.16 Recent work as part of the Upland Peat Project (OA North 2009b) also highlighted the existence of a heather-dominated landscape prior to 2500-2000 cal BC near to Pike O' Stickle (Sampling Sites 1 and 4 at CLAU Site 123 and L22; Fig 15). The relatively low levels of birch, elm, pine and oak pollen in the two diagrams suggest that these species were only minor components of the vegetation at the site, or that these pollen types represent the dispersal of grains from the vegetation on the lower slopes.
- 5.6.17 That this landscape was associated with burning activity is attested by the presence of charcoal macrofossils within the mor humus and the overlying peat. The evidence suggests that the vegetation and soil conditions on the Langdale Fells underwent a great deal of modification, for a long time prior to the initiation of the peat, and this may have been in part, anthropogenically driven. Peat formation in this area began some time after the main period of axe working

activity and clearance of the uplands, and represents a period when certain environmental thresholds had been reached.

- 5.6.18 A period of recovery in the birch woodland has been recognised at a number of sites around Langdale during the later prehistoric period (Pennington 1975, OA North 2009b). Pennington (1973) and Pearsall and Pennington (1973) suggest that, after the initial period of Neolithic clearance, many of the upland areas surrounding Langdale recovered and woodland regenerated. However, this was not true of the highest fells, where conditions impeded the regeneration of woodland. Instead, as at Great Langdale and Martcrag Moor, soil deterioration encouraged the development of heather moorland at the expense of woodland.
- 5.6.19 **Conclusion:** the deposits recorded in the two sections appear to be stratigraphically contemporary, and the plant macrofossil and pollen evidence seems to support this. As such, the pollen evidence from Martcrag Moor is consistent with other studies from the Langdale Fells, which suggests that very open conditions dominated by grass and heather, existed in the area prior to peat development. At Stake Beck, such conditions were evident as early as *c* 3500 cal BC, and, similarly, many of the tarn and peat deposits in and around Langdale indicate that a heather-dominated landscape existed after the elm decline (*c* 3500 uncal BC), but before *c* 2000/2500 uncal BC (Pennington 1973). A period of time which broadly corresponds with the perceived peak in axe production (*Section 3.3.22*).
- 5.6.20 The pollen evidence from both Martcrag Moor and other sites in Langdale suggest that more open grassland conditions existed during the development of the mineral soil and the period of flake production, coincident with both increased burning activity and possible evidence for grazing. Although there is no significant change in values of hazel and alder, an increase in birch pollen in both sections (and oak in *Section 2*), suggests that a period of limited woodland recovery may have taken place after the onset of peat development at the site. This is in keeping with other evidence from the Langdale area.
- 5.6.21 Assuming that the pollen record and dating evidence from Martcrag Moor is sound, open conditions dominated by grass and heather persisted at the site for at least 1000 years. This is based on the period of time between the date of the lower flake layer (1780-1630 cal BC) and the onset of peat development (550 - 390 cal BC), which is very similar to the picture from near Pike O' Stickle, where the onset of peat development followed by as much as 1000 years after the period of axe working at Site 123 (OA North 2009b).
- 5.6.22 The date of the charcoal from the lower flake layer from this study is very similar to the date of a major clearance episode recognised at Langdale Combe, which is associated with a period of increased sediment accumulation and charcoal. It is possible that the charcoal within the flake deposits at Martcrag Moor stems from this later activity, which managed to find its way into the working floor. Similarly, it is possible that the flake layers together with the charcoal were redeposited at this time; however, no definitive evidence for reworking is indicated by the current stratigraphic, plant macrofossil and pollen evidence from Martcrag Moor.

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## 6. DISCUSSION

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### 6.1 MARTCRAG MOOR DISCUSSION

- 6.1.1 ***Extent of Working:*** in the past it has been perceived that the main ‘Langdale’ axe working deposits were concentrated on the steep craggy slopes of the Langdale Pikes, where there is little or no turf cover, and around the similarly turf free summit of Scafell Pike. However, it is clear from recent archaeological investigations, with this project being but one, that the nature and extent of the axe working sites making up the Langdale Axe Factory complex are still being refined. Flaking sites have been identified recently at some distance from the main outcropping source rock at Fairfield Summit (Davis and Quartermaine 2007) and further new sites recorded at, or adjacent to, the main complex at Langdale Pikes, to the north (OA North 2009b), to the east at Stickle Tarn (OA North 2005), and to the west at Martcrag Moor (this report).
- 6.1.2 The gently sloping plateau to the north of the Langdale Pikes contrasts with the area around the Pikes in that it is either turf- or peat-covered and the extent and density of the axe material here is, as a consequence, largely unknown. Only a limited number of sites has been discovered across this large area, which have been categorised as Type D sites on the basis that they are remote from the source geology. Significantly, the earliest discovery of the workings by Professor Watson was within the Martcrag Moor area (Bunch and Fell 1949). An example of one of these sites was excavated by Tim Clough at Thunacar Knott (Clough 1973), providing a date for the workings 3350–2923 cal BC (4474 BP; BM 676) and raising the possibility of a camp site as indicated by a post hole. The survey of 1984 revealed 24 Type D sites (Claris and Quartermaine 1989) and the number was increased by the work of Reading University, which undertook test pitting across the area of Langdale Combe and identified a scatter of sites close to the Langdale Pikes. This number was further increased by the Upland Peats project which examined peat scars and, again, there was a marked concentration towards the Pikes (*c* 200m from the Pikes). It has been argued (Claris and Quartermaine 1989) that the footpath leading along Martcrag Moor away from the Langdale Pike area, towards Borrowdale, forms a high-level routeway out from the complex. Indeed, the evidence of sites recorded within the peat scars located along this footpath seem to support this supposition, as no further flaking sites were found in any of the peat scars located to the north of this in the Upland Peats Survey transect (OA North 2009b).
- 6.1.3 When the 1984 survey was undertaken the footpath west from Pike O’ Stickle was a narrow exposure, which for much of its length had not broken through the peat to the mineral soil. It had revealed only two sites immediately adjacent to Stake Beck. In the intervening years the line of the path has changed, it has expanded and deepened, such that today there are now eight new axe working sites exposed. Given how many sites have been revealed in what is still a relatively narrow linear exposure, within a large expanse of peat-covered moor, there is the possibility that there are many more sites still buried beneath the peat. The previously limited number of Type D sites may in actuality be an indication of low site visibility. This situation is compounded by Site MC7, which has a

dense axe working deposit within the mineral soil and buried below the compacted path surface, a scenario also found at CLAU Site 123 (OA North 2004), where a deposit of flakes was identified beneath the mineral soil surface. Given that most of the footpaths have not deeply penetrated the mineral soil, there is potentially a large number of sites to be discovered within that context also. The implications of this is that there may be considerably more working sites across the area which are presently protected by thin deposits of mineral soil, and undertaking path repair work across an area of apparently clean mineral soil may potentially result in the exposure of new sites.

- 6.1.4 **Axe Factory Chronology:** with the increasing availability of radiocarbon dating for investigations at Langdale, the chronology of the axe factories has come under close review. It has long been perceived that the Langdale axe factories were purely a product of Neolithic activity, based on dispersed polished axes and on excavations by Clough (1973), Bradley and Edmonds (1993) at Langdale; indeed the principal question had been what part of the Neolithic do the axe factories relate to. However, recent excavations at CLAU Site 123, in Langdale Combe (OA North 2004), and now the present investigations have cast doubt on this long established premise.
- 6.1.5 At Site 123 a radiocarbon date of 5968-5732 cal BC ( $6965 \pm 30BP$ ; KIA23485) had been obtained from charred crowberry seeds (*Empetrum nigrum*), which was within an axe working layer. This provided a Mesolithic date and, as such, put it up to 2000 years earlier than previously obtained dates. There are two possible explanations for such a remarkably early date. Firstly, and most simply, is that this does represent a date for the establishment of the flake layer and, as such, is the earliest record of stone axe production in the North West at a significantly earlier date than had previously been envisioned. A second alternative is that the dry conditions of the latter half of the Boreal period (7000BC to 5000BC) may have led to a slow accumulation rate of the humic soil (**1003**) at Site 123 (Evans 1975, 101) and that there has been some compression of the flakes into the earlier humic soil resulting in an 'earlier' date than the axe working layer.
- 6.1.6 In the latter scenario the charred seed would, therefore, represent an episode of burning predating the stone working at the site, the waste material from such workings being subsequently incorporated into the upper surface of an earlier sediment. Regardless of the above discussion, it is clear that burning was taking place on these slopes during the sixth millennium BC, which begs the question as to whether this represented a fire of anthropogenic or natural origin. Because crowberry (*Empetrum nigrum*) is found today in peat and rocky moors, mountains and bogs the presence of charred seeds from this plant suggests that in this area there was a loss of forest cover, with the subsequent formation of an acid mor humus soil and possibly an early date for peat initiation, which only occurs if there is paludification of the mor humus (Pearsall and Pennington 1973, 124-129). The speed with which mor humus soils can develop is also variable, either over a long or short timescale, and, therefore, if the worked flakes became embedded into the earlier humic soils, there is a possibility that the crowberry seeds predated the flakes by a substantial period.
- 6.1.7 Although it is clear from the above discussion that the matter has not been resolved, a potential Mesolithic date for the production of polished stone axes

must also be considered as a possibility. Polished axes of a Mesolithic date are known from both Wales (David 1989) and Ireland (Woodman 1978). Polished axes from later Mesolithic contexts were also recovered from Newferry Site I, Ireland, made from Mudstone and Schist (Woodman 1978, 108-9). Other possible Irish examples have been recovered from sites associated with the Mesolithic/Neolithic transition, such as from Newferry Site I and Dalkey, but may be associated with Neolithic intrusions. A single polished stone axe from Mount Sandel, Ireland, has been attributed to the early Mesolithic (*op cit*, 51-2).

- 6.1.8 No polished axes have been unambiguously recovered from Mesolithic contexts in North West Britain, although it is worth noting that Ehenside Tarn is dated as Neolithic due to presence of polished, and partly polished, axes despite the fact the site shows some similarities to the Mesolithic settlement at Eskmeals (Darbishire 1873; Bradley and Edmonds 1993, 136). A later excavation at Ehenside, in 1957, produced radiocarbon dates ranging from the early Mesolithic to the Bronze Age, although these were undertaken during the early development of the technique and, therefore, do not have the precision of modern dates (Hodgkinson *et al* 2000, 73).
- 6.1.9 **Martcrag Moor Dating:** at Martcrag Moor, site MC1 is the opposite situation, a pair of dates that are both significantly younger than expected. The lower axe working deposit (**1003**) produced a date of 1780-1630 cal BC (3425 ± 30BP; SUERC 22147) from Birch charcoal and the higher working deposit (**1002**) produced a date of 1540 - 1420 cal BC (3225± 30BP; SUERC 22146) from Alder charcoal. The samples are early to middle Bronze Age date and, as such, significantly later than previous dates obtained from Langdale. Being more modern in date there is the possibility that these samples have been contaminated by more recent carbon, such as from the humic deposits above; however, it is possibly significant that both are of a broadly consistent date, and that the more recent date corresponds with the stratigraphically higher axe working deposit. The other possibility is that the dates are both genuinely of Bronze Age date and that there has been some small-scale axe manufacture at Langdale continuing into the Bronze Age.
- 6.1.10 **Artefacts of fine-grained tuff recovered from Bronze Age deposits:** there is limited evidence for the deposition of finished items produced from fine-grained tuff that have been recovered from scientifically dated Bronze Age archaeological deposits. It has always been argued that these artefact, in particular polished stone axes, were ancestral heirlooms or rediscovered items produced in the Neolithic period and subsequently curated and then finally deposited in later contexts. Conversely it should not be discounted that some axe working and artefact production, albeit on a small scale, could have continued at the Langdale axe factories into the Bronze Age. Readily available evidence for the deposition of polished axes is limited to two of Group I petrology. The first was excavated from the primary fill of a water hole at Perry Oaks in the Thames Valley and was found in association with a log ladder, axe haft and wooden beater, which had been radiocarbon dated to the Bronze Age (Brown *et al* 2006, 138-145).
- 6.1.11 The second Group I axe was excavated at the Cotswold Community project, near Cirencester (Powell and Smith forthcoming). It was from a pit that also contained

20 flint flakes, eight scrapers, four knives, three blades, two arrowheads as well as a hammerstone and Beaker pottery. The axe was deliberately located in the centre of the pit with the cutting edge facing upwards. It must be born in mind that although these artefacts were clearly not from the Langdale source of Group VI tuff they do show that other sources of tuff may be being utilised in this period.

- 6.1.12 An archers' wrist guard produced from Group VI tuff was recently excavated from within a Beaker Burial at Ferry Fryston in Yorkshire dated to 2210-2030 cal BC (3732+-BP; KIA-25326 (Brown *et al* 2007, 298)), further examples of up to 14 wrist guards have been identified in Britain as having been produced from the Group VI source at Langdale. This does suggest that some sort of working at the source at was occurring during the period. Another examples includes a reused Group VI fragment that came from a Beaker grave at Chew Park, Somerset (ApSimon 1977, 175, Fig 85).
- 6.1.13 This is only a sample of the dispersed axe / Group VI artefacts that have been recovered from secure Bronze Age artefacts, but they illustrate that there is a potential that axe production continued both at Langdale and at other stone axe production sources into the Bronze Age, and indicates that there is a possibility that the two dates from Martcrag Moor may be genuine.

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## 7. RECOMMENDATIONS

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### 7.1 MANAGEMENT RECOMMENDATIONS

- 7.1.1 ***Path Repair Works:*** in the course of the proposed path repair work in the area of Martcrag Moor, it is recommended that the Martcrag sites be protected by an initial layer of terram, then sheep fleeces, and then overlain by imported mineral soil. The line of the revised path route should be designed to avoid any areas of known archaeological sensitivity. However, this should not extend beyond the area of the erosion scar, as this would entail new disturbance, and may impact on as yet undiscovered sites. In theory, this will not entail any direct damage to the working floors and, therefore, there will not be a requirement for any mitigative excavation on the line of the revised path. However, there will be a requirement for a watching brief which will need to be maintained during any ground works that have the potential to impact upon archaeological deposits. In particular, it is recognised that defining a straight line through the Martcrag Moor peat exposure may avoid known sites, but is likely to entail disturbance to small extant peat blocks. The cutting back of any such blocks will need archaeological investigation in advance of and during the path repair works.
- 7.1.2 There is the potential for further sites along the whole of the section through Martcrag Moor, and leading up to the Langdale Pikes. Any ground works that will extend through the turf or peat in this area should also be subject to an archaeological watching brief.
- 7.1.3 ***Further Management and Research Potential:*** a scheme of work was defined in the project design for the current project (*Appendix 1*) to undertake coring and pollen analysis at Langdale Combe. In the event this was not undertaken, but would have immense potential for understanding the development of the landscape, should further funding become available. An environmental and dating programme from the site would place the activity associated with the Langdale axe factories within a clearly defined chronological and environmental framework. By using Walker's original pollen record, the results of pollen analysis from the present site on Martcrag Moor and the AMS dates from Langdale Combe, it should be possible to date more accurately the time over which the Langdale axe factories were actively producing axes, and to establish the periods when there was clearance activity in the environs. In order to do this, a transect of boreholes would be taken across Langdale Combe with a hand-held 30mm bore Eijkelkamp gouge auger to record the present stratigraphy of the deposits in the Langdale Combe and to relocate the position of Donald Walker's 1965 pollen core. In addition, duplicate, overlapping cores should be taken to a depth of 7.5m at the location of Donald Walker's original pollen study for the analysis of pollen and dating. The pollen from the samples would be analysed so as to correlate with Walker's diagram and confirm their position in the sediment sequence. Following confirmation, further samples should be taken for radiocarbon dating. Depending on the dating results, further sub-samples could be taken from the section of the core in which Neolithic activity is recorded to enable an improvement in the resolution of the pollen diagram.

7.1.4 The sites exposed on Martcrag Moor are actively being eroded, and while detailed recording of the exposed flaking sites has been undertaken, it is clear from only cursory inspection of eroded peat scars in the immediate vicinity that there are potentially further axe working sites surviving within this area. It has been argued that the footpath leading along Martcrag Moor away from the Langdale Pike area, towards Borrowdale, forms a high-level routeway out from the complex. Indeed, the evidence of sites recorded within the peat scars located along this footpath seem to support this supposition (Fig 15), as no further flaking sites were found in any of the peat scars located in the northern part of the Upland Peat Survey transect (OA North 2009b). It is important, therefore, that further investigation and recording of all exposed axe working scatters within the peat scars be undertaken within the vicinity of path lines across Martcrag Moor. The defined limits of such an investigation could involve a c 150-200m buffer zone corridor following the northernmost footpath along Martcrag Moor. The western limit of the area would be the natural boundary of the boggy water-filled lands at Stake Pass, located some 400m to the west of the present Martcrag Moor sites.



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## APPENDIX 1 PROJECT DESIGN

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Oxford  
Archaeology  
North

September 2008

MARTCRAG MOOR AXE FACTORY SITES  
GREAT LANGDALE,  
CUMBRIA

ARCHAEOLOGICAL RECORDING SURVEY

PROJECT DESIGN

### ***Proposals***

*The following project design is offered in response to a request from the Lake District National Park Authority and the National Trust to undertake a programme of recording of the recently discovered axe factory sites at Martcrag Moor, Great Langdale. The purpose of this study is to provide a record of the sites in advance of further erosion and proposed path repair, and to undertake palaeoenvironmental analysis to establish the wider context of the axe production.*

## **1. INTRODUCTION**

### **1.1 CONTRACT BACKGROUND**

- 1.1.1 A series of axe factory sites were discovered on the line of a footpath extending from Pike O' Stickle to Martcrag Moor, and given that they are under threat from on going erosion, John Hodgson, Lake District National Park Authority and Jamie Lund, National Trust, has invited Oxford Archaeology North (OA North) to submit a project design for a programme of recording of the sites and to record their palaeoenvironmental context. The programme is linked to an on-going programme of path repair within the central Lake District - Fix the Fells. The recording programme is intended to inform the conservation management of the landscape and to ensure that the sites are recorded in advance of path repair and that the path repair does not affect the archaeological resource.

### **1.2 ARCHAEOLOGICAL BACKGROUND**

- 1.2.1 Outcropping in a narrow band around the central lakes is a fine grained volcanic tuff, which was ideally suited for axe production. It had the advantage that it could be easily worked and polished sufficient to produce some substantial tree felling axes (Claris and Quartermaine 1989). The quality of the axes were such that they acquired a value greatly exceeding their functional value and appear to have been status objects and may have served as a form of currency (Bradley and Edmonds 1993). Considerable work undertaken by OA North (then called Lancaster University Archaeological Unit) entailed extensive surveys around most of the higher fells and specifically traced the outcropping band of source geology (Claris and Quartermaine 1989).
- 1.2.2 Martcrag Moor: during the recent Fix the Fells survey eight sites were recorded on the line of Stake Beck Path, descending from Pike O' Stickle, Great Langdale, and included a group of five sites on the line of the Stake Back path as it converges upon the plateau of Martcrag Moor. This is the location of a large, extensive peat scar, which has been formed by the combined effects of footpath and water erosion. The scar is shown on Google earth aerial images, and has evidently been there for a number of years. All eight sites are new discoveries and reflect the onset of recent erosion.
- 1.2.3 In the lower site group five individual working floors were identified (MC1 - 5) and comprise varying amounts of lithic waste, some of which is eroding out of peat hags. The largest of the sites (MC1) is at the highest point of the scar and has a large concentration of large to medium flakes, of which some are thickly patinated and others are thinly patinated. This indicates that part of the site has been under peat and part under non-humic turf. There is a c100mm thick exposure of flakes protruding from the peat hag, indicating that part of the site still survives intact beneath the peat. There is peat on, and within, the deposit of flakes, but it is also resting on mineral soil; this possibly indicates that the working took place around the period of the inception of the peat. There were four rough-out axes identified on the mineral soil/disturbed peat at the base of the peat section. There is a lot of material at the site, and it is obviously a very sizeable site; this, coupled with the fact that there are a number of large flakes, would suggest that this reflects the working of a sizeable glacial erratic boulder rather than the secondary working of rough-out axes.
- 1.2.4 The scatters of the floors are very localised, and display very little spread down-slope, and contrasts markedly with the sites identified higher up Stake Beck path, which are spread for up to 10m down the path from the source location. The indication is, therefore, that the MC1 - 5 group has been only recently exposed, and is in very good condition.
- 1.2.5 A further site (MC7) is located further up the Stake Beck Path. It comprises a very narrow, and relatively deep gully beside the present day footpath. At the head of the site is a very compact, and c150mm deep deposit of unpatinated flakes, that is within the mineral soil. The upper layer of this deposit is just below the upper surface of the present day footpath, and there is an implication that if the footpath erodes much further it will expose and damage those parts of this site that are presently undisturbed. The implications of this are firstly that the site is very vulnerable to further footpath erosion, secondly much of the material is contained within the mineral soil, not on it. Consequently, there may be considerably more working sites across the area which are presently protected by thin deposits of mineral soil, and undertaking path repair work across an area of apparently clean mineral soil may potentially result in the exposure of new sites.

### **1.3 OXFORD ARCHAEOLOGY NORTH**

- 1.3.1 OA North has considerable experience of the evaluation, survey and excavation of sites of all periods, having undertaken a great number of small and large scale projects during the past 19 years. One of its particular specialisms is in the sphere of landscape recording and assessment. OA North has the professional expertise and resource to undertake the project detailed below to a high level of quality and efficiency. OA North and all its members of staff operate subject to the Institute of Field Archaeologists (IFA) Code of Conduct.
- 1.3.2 OA North has undertaken a large number of upland landscape surveys for a variety of clients (both private and national agencies such as English Heritage and Royal Commission on the Historical Monuments of England

(RCHM(E)) and employs a qualified surveyor (Jamie Quartermaine, BA, DipSurv, MIFA) who has many years experience of the identification and survey of upland landscapes, having worked closely with the RCHM(E), the Lake District National Park Authority and the National Trust on a large number of projects. In particular Jamie has undertaken or managed all the survey and excavation projects on Langdale and Scafell Pike undertaken by OA North (formerly Lancaster University Archaeological Unit) since 1984. Jamie undertook the recent survey of Stickle Tarn for the National Trust which revealed a number of new axe working sites on Pavey Ark, and also undertook the investigations on the summit of Fairfield (Davis and Quartermaine 2007). Jamie has particular experience of the recognition and recording of the axe factory monuments and the associated geology and it is proposed that he has an active role in the implementation of the present project. OA North has undertaken the initial survey for the fix the fells project, and it was as a result of that these sites were discovered.

- 1.3.3 Since 1982 OA North has been undertaking extensive upland landscape surveys through-out Northern England but mainly in the Lake District. Surveys include the Lake District National Park Survey, the Torver Common surveys (Lake District), Haweswater and Thirlmere estate surveys (Lake District), Lyme Park (Peak District), most of the Forest of Bowland AONB, Lancashire, the surveys of the axe factories on Langdale and the Lakeland central massif, and a multitude of smaller landscape projects in the Lake District National Park. To date OA North has undertaken archaeological field surveys of over 810sqkm of upland landscapes and has recorded over 21,000 field monuments. On the Arnside/Silverdale project, in 1992. OA North can claim to be one of the foremost specialists in the field of upland landscape recording.

## 2. OBJECTIVES

### 2.1 PALAEOENVIRONMENTAL PROPOSALS

- 2.1.1 The proposed programme of environmental work will be linked to the excavation of the recently identified axe working site on Martcrag Moor, Langdale. This proposal has been divided into two stages. The first is directly related to the site and the second with the existing pollen study by Donald Walker (1965) from Langdale Combe (NGR NY 262083), which is less than a kilometre north-west from the site. Walker describes Langdale Combe as being like a corrie in appearance (Walker 1965, 490) with a depth of organic sediments of more than eleven metres in 1964. This was cored in the deepest section, the deposits were analysed for pollen and plant macrofossils and a pollen diagram was drawn. Walker recorded a number of changes in the stratigraphy and the pollen diagram that are very likely to be associated with anthropogenic activity. Unfortunately this diagram is undated and therefore cannot be related with any certainty to activity associated with the axe factories.
- 2.1.2 ***Environmental work to date the existing pollen diagram from Langdale Combe and to relate this to the present axe site:*** at the Martcrag Moor site itself it is proposed to sample the organic sediments surrounding the axes from open sections. Suitable material from the axe layer and immediately above it will be selected for AMS dating. Sub-samples will be taken from the lower levels of the same section of the deposits for pollen and plant macrofossil analysis. Dating the peat above the axes will provide a terminus post quem for any activity at the site and also the results of the pollen analysis will inform about the environment of the Langdale Fells following the abandonment of the site.
- 2.1.3 The results from the pollen and plant macrofossil analysis and the radiocarbon dating will then be correlated with Walker's diagram from Langdale Combe (1965). It is hoped to achieve this by relocating Walker's original coring site at Langdale Combe with reference to his geographical and stratigraphical descriptions and by re-coring it to a depth of 7.5m. The modern stratigraphy will be compared with the published record (Walker 1965) and a few subsamples will be taken from the significant stratigraphical horizons, as described by Walker, for pollen analysis. If it is possible to replicate the stratigraphic record and identify significant changes in the pollen curves, material suitable for radiocarbon dates will be selected and submitted for AMS dating.
- 2.1.4 ***Aims:*** the primary purpose of the project is to inform future management decisions with regard to path repair work on the Stake Beck Path, and to provide mitigative recording in advance of the path repair. The secondary aim is that the proposed environmental and dating programme from the site itself and from Langdale Combe will place the activity associated with the Langdale Axe Factories within a clearly defined chronological and environmental framework. By using Walker's original pollen record, the results of pollen analysis from the present site on Martcrag Moor and the AMS dates from the Combe, it should be possible to date more accurately the time over which the Langdale axe factories were actively producing axes, and to establish the periods that there was clearance activity in the environs.
- 2.1.5 ***Objectives:*** to provide a detailed record of the axe working floors in advance of further disturbance
- to provide guidance for on going maintenance and repair of the path
  - to provide a watching brief during path repair

- to sample the deposits that seal the recently identified Langdale axe site on Martcrag Moor
- to analyse the pollen and plant macrofossils recorded in these deposits
- to identify material suitable for AMS radiocarbon dating at the Martcrag Moor sites
- to compare the results with the previously published pollen and stratigraphic diagrams from Langdale Combe, Langdale (Walker 1965)
- to resample the sediment sequence from Langdale Combe
- to identify and date changes in the stratigraphy that were recorded in Walker's published work
- to identify environmental changes that may have been caused by prehistoric anthropogenic activity on the Langdale Fells

### 3. METHODS STATEMENT

3.1 The following work programme is submitted in line with the objectives of the archaeological work summarised above. It is divided into two elements: archaeological recording, and palaeoenvironmental analysis and dating.

#### 3.2 AXE FLOOR RECORDING

3.2.1 A survey of the peat exposure has already been undertaken using a differential GPS. This provided a record of the overall site, but has not provided a record of the individual floors. It is therefore proposed to produce a detailed record of the individual axe floors at the Martcrag Moor site by means of semi-rectified photography. The three sites identified further up Stake Beck path have been severely disturbed by foot path erosion and the worked material has been spread down the slope. The distribution of flakes does not reflect that of the original working floor and therefore does not warrant detailed planning. However, it is proposed that they be recorded by close oblique photography.

3.2.2 The survey will entail taking photographs of the Martcrag Moor axe sites from a large bipod set at a height of c 2.5m above the ground. The bipod will be constructed from light weight aluminium to enable its easy transportation, and will have the camera suspended from its apex facing down. Although every attempt will be made to make sure that the photographs are as close as possible to being perpendicular to the plane of the ground (ie rectified), in practice it will not be possible to precisely achieve this. It is therefore proposed to digitally correct the images so that they are accurate in plan. This requires establishing at least four and preferably eight surveyed control points within the extent of each photograph. The control points will be marked using photogrammetric targets, which will be surveyed in with a total station. This is a fairly quick procedure and can be achieved for all five sites in one or two days.

3.2.3 **General Photographic Survey:** a general photographic archive will be generated in the course of the field project, comprising landscape and detailed photography to show the detail of the sites and the wider context. Detailed photographs will be taken of all sites using a scale bar. All photography will be recorded on photographic pro-forma sheets which will show the subject, orientation and date. The photography will be primarily undertaken within black and white 35mm format for archival purposes and will be maintained to archival standards. Photography will also be undertaken within digital formats.

3.2.4 **Digital Rectification:** using the survey control points the digital photographs will be digitally rectified using Photoplan software. This will produce corrected .JPG images which will be transferred as a raster background into AutoCAD and from there will be digitised to produce an accurate plan of the lithic floor and will highlight the worked material. It is proposed to digitise around the outline of the scatters, digitise any features that are obscuring the flakes and also any large non flake components. In addition it is proposed to shade around groups of small stones that are not flakes. In effect this will be defining the patterns of the working floor, without defining the individual flakes, which instead will be evident from the superimposed rectified image which will be retained as part of the final drawing.

#### 3.3 ENVIRONMENTAL SAMPLING AT MARTCRAG MOOR AND LANGDALE COMBE

3.3.1 **Introduction:** the English Heritage Environmental Archaeology (2002) and Geoarchaeology Guidelines (2004) will be followed at all stages of the project and Dr Sue Stallibrass, the English Heritage Regional Scientific Advisor for the North West will be consulted.

3.3.2 **Martcrag Moor Site Section:** an exposed section of peat above the Langdale axe site on Martcrag Moor, Langdale will be cleaned, photographed and described by an environmental specialist. Duplicate monolith samples will be taken for pollen analysis and dating. The samples will be wrapped in polythene, sealed and returned to the OA North offices in Lancaster for storage. Environmental bulk samples will be taken from



above, in and below the working floor of the axe site for the analysis of pollen, charred material (including charcoal), and radiocarbon dating.

- 3.3.3 **Langdale Combe**; a transect of boreholes will be taken across Langdale Combe with a hand held 30mm bore Eijkelkamp gouge auger to record the present stratigraphy of the deposits in the Combe and to relocate the position of Donald Walker's 1965 pollen core. The sediments will be described in the field and the type and depth of each stratigraphic unit identified within the cores will be recorded in the field. If it is necessary small samples will be taken and examined in the laboratory to confirm the field descriptions. The NGR and height OD of each core will be recorded with an accurate differential GPS.
- 3.3.4 **Core for pollen analysis and dating**: duplicate, overlapping cores will be taken to a depth of 7.5m at the location of Donald Walker's original pollen study (Walker 1965) for the analysis of pollen and dating. A 50mm diameter hand held Russian-type peat corer will be used and the extracted cores will be placed in plastic guttering, wrapped in polythene, sealed and transported to the OA North offices in Lancaster for storage. The NGR and height OD of the core will be recorded.

### 3.4 ENVIRONMENTAL ASSESSMENT AND ANALYSES

- 3.4.1 **Core descriptions and sub-sampling**: the monolith and core samples will be cleaned, photographed and the lithology recorded. Sub-samples will be taken from the lower 0.20m from the section sample at regular sampling intervals for the analysis of the pollen, which will inform about the environment of the Langdale Fells following the abandonment of the site and for correlation with Walker's pollen diagram from Langdale Combe. Samples will also be taken from the basal deposits of the section for dating.
- 3.4.2 Sub-samples will be taken from the core samples at the stratigraphic boundaries identified earlier by Walker and which are interpreted as likely to be caused by anthropogenic activity. The pollen from these samples will be analysed so as to correlate with Walker's diagram and confirm their position in the sediment sequence. Following confirmation, further samples will be taken for radiocarbon dating. Depending on the dating results further sub-samples will be taken from the section of the core in which Neolithic activity is recorded for the analysis of pollen analysis at an appropriate resolution.
- 3.4.3 **Methodology for the analysis of pollen**: the sub-samples will be prepared for the pollen in the laboratory of the Geography Department at the University of Lancaster. Subsamples of a standard size (1ml in volume) will be prepared for pollen analysis using the standard technique of heating with hydrochloric acid, sodium or potassium hydroxide, sieving, hot hydrofluoric acid, and Erdtman's acetolysis to remove carbonates, humic acids, large particles, silicates, and cellulose, respectively. The samples will then be stained with safranin, dehydrated with tertiary butyl alcohol and mounted in 2000 centistoke silicone oil (Method B of Berglund and Ralska-Jasiewiczowa (1986)). Tablets containing a known number of *Lycopodium* spores will be added to the known volume of sediment at the beginning of the preparation so that pollen and spore concentrations can be calculated (Stockmarr 1972). Pollen will be counted from equally spaced traverses to a sum of 300-500 grains across the slides at a magnification of x400 (x1000 for critical examinations). Identifications will be aided by keys (Moore *et al* 1991; Faegri *et al* 1989) and a small modern reference collection. Cereal-type grains will be defined using the criteria of Andersen (1979). Indeterminate grains will be recorded using groups based on those of Birks (1973) as an indication of the state of pollen preservation. Charcoal particles >5 microns will also be recorded following the procedures of Peglar (1993). Other identifiable inclusions on the pollen slides (fungal spores, turbellarian eggs, pre-Quaternary spores, etc.) will also be registered. Plant nomenclature will follow Stace (2001).
- 3.4.4 **Radiocarbon Dating**: the relatively precise radiocarbon dating of sampled organic material will be essential to the success of the project. The interpretation of archaeological and palaeoecological material recovered will rely in no small part on the availability of reliable dates. The project will consult and seek the advice of Dr Sue Stallibrass, the English Heritage Regional Scientific Advisor for the North West. Material suitable for dating will be selected and submitted to Dr Gordon Cook of the Scottish Universities Research and Reactor Centre for AMS dating.
- 3.4.5 **Presentation of the results**: analysis and the storage of analytical data will be accomplished electronically using computer-based tools, particularly the TILIA software package, to categorise data and facilitate its interpretation (Grimm 1990). Pollen calculations and diagrams will be made using the programs TILIA and TILIA-GRAPH in TGView (Grimm, 2004). Pollen count record sheets, microscope slides, and the residues of the prepared samples will be stored at OA North offices in Lancaster, under appropriate conditions. Data will be analysed in order to ascertain possible human and climatic influences on the natural environment, and to attempt to relate this to the known and newly discovered archaeological remains. The results will be correlated to Walker's pollen diagram from Langdale Combe.

### 3.5 WATCHING BRIEF

- 3.5.1 It is proposed that the Martercrag sites be protected by a layer of terram, then sheep fleeces and then overlain by imported mineral soil. The line of the revised path route will be designed to avoid any areas of known archaeological sensitivity. In theory this will not entail any direct damage to the working floors and therefore there will not be a requirement for mitigative excavation on the line of the revised path. However, there will be a requirement for a watching brief which will need to be maintained during any ground works that have the potential to impact upon archaeological deposits. In particular it is recognised that defining a straight line through the Martercrag Moor peat exposure and which will also avoid known sites, is likely to entail disturbance to small extant peat blocks. The cutting back of any such blocks will need archaeological investigation in advance and during their excavation.
- 3.5.2 A close dialogue will be maintained with the path repair team to ensure that intrusive disturbance to areas of archaeological sensitivity will be undertaken on pre-defined days and that there will be an archaeologist present on these days. If important archaeological deposits are discovered which will be impacted, there may be a need to call out additional archaeological personnel to provide for the recording of the deposits in advance of the path work.
- 3.5.3 **Recording:** during this phase of work, recording will comprise a full description and preliminary classification of features or materials revealed, and their accurate location (either on plan and/or section). All archaeological information collected in the course of fieldwork will be recorded in standardised form, and will include accurate national grid references. Features will be planned accurately at appropriate scales and superimposed on the site plan previously produced. A photographic record will be undertaken simultaneously. The recording techniques and procedures employed by OA North for such detailed recording represent current best practice.
- 3.5.4 It is assumed that OA North will have the authority to stop works to enable the recording of archaeological features and deposits, and to call in additional archaeological support if a find of particular importance is identified. In normal circumstances, field recording will also include a continual process of analysis, evaluation, and interpretation of the data, in order to establish the necessity for any further more detailed recording that may prove essential.

### 3.6 PROJECT ARCHIVE

- 3.6.1 **Archive:** the results of the fieldwork will form the basis of a full archive to professional standards, in accordance with current English Heritage guidelines (Management of Archaeological Projects, 2nd edition, 1991). The project archive represents the collation and indexing of all the data and material gathered during the course of the project. This archive will be provided in the English Heritage Centre for Archaeology format, both as a printed document and digitally. Digital survey data will be provided in a suitable format for incorporation into the MapInfo Geographical Information System (GIS). A synopsis (normally the index to the archive and the report) should be placed in the Cumbria Sites and Monuments Record.
- 3.6.2 **Digital Presentation:** the survey data will be digitally transferred into a CAD system (AutoCAD) and superimposed with digital 1:10,000 OS data. The dimensioned site drawings will be digitally superimposed onto the raw survey data, thereby ensuring a high level of both numeric and representational accuracy. The use of CAD dispenses with the manual production of drawings and considerably increases the efficiency of the preparation of completed drawings, as well as enhancing the flexibility of map output. The final output drawings will be output in MapInfo and Autocad formats. The drawings can be output at any required scale, but site plans will typically be 1:50 or 1:20. The archive will be passed to the Cumbria Record Office and a digital copy will be passed to the client on completion of the survey alongside the final report.

### 3.7 REPORTING

- 3.7.1 The report will identify areas of defined archaeology and an assessment and statement of the actual and potential archaeological significance of the material, within the broader context of regional and national archaeological priorities, will be made. The potential for further archaeological fieldwork will be examined both in relation to individual sites. The report will make a clear statement of the archaeological potential of the individual sites within the study area.
- 3.7.2 **Content:** the full report will consist of an acknowledgements statement, lists of contents, executive summary, introduction summarising the brief and project design and any agreed departures from them, methodology, archaeological background, interpretative account of remains found, conclusions, list of archive contents and bibliography. Illustrative material will include location maps and plans.
- 3.7.3 **Report:** the report will be presented on the basis of the results of the field study and it is intended that it will be accessible to both specialist and a more general readership. It will present the results of the site recording and the palaeoenvironmental work. It will examine the extent to which it has been possible to link in the pollen diagrams at the Martercrag Moor site with that from Donald Walkers diagram at Langdale Combe. With

the benefit of a dated diagram at Langdale Combe the report will examine the vegetational history of the area and set the axe factory activity, clearance episodes and peat inception within the wider context. The report will present the dating evidence for the axe factory sites at Martcrag Moor and the core sample from Langdale Combe.

- 3.7.4 Illustrative material will include a location map, site map, survey plans, detailed plans of the working floors, pollen diagrams for the Langdale Combe and Martcrag Moor sites, and also pertinent photographs. It can be tailored to the specific requests of the client (eg particular scales etc), subject to discussion.
- 3.7.5 The report will include a frontispiece showing the grid reference. It will have a summary and a methodological statement, and will define any variations to the defined programme.
- 3.7.6 **Assessment of Potential for Further Work:** the report will examine the archaeological condition, survival, stability and significance of the archaeological monuments. On this basis the report will make recommendations for further recording or archaeological investigation that will be compatible with the overall research and management aims for the survey areas. These proposals may include selective excavation or more detailed survey works in specific areas of the landscape, geochemical works or environmental analysis, use of GIS and Digital Terrain Models to enhance the understanding and perception of the archaeological resource and the landscape.
- 3.7.7 **Output:** five bound and one unbound copies of the full report will be submitted to the client, and three copies will be deposited with the County Sites and Monument Record. A digital copy of the data and report will also be submitted.
- 3.7.8 **Publication:** a summary report of the results will be submitted to a regional journal, and information from the project will be fed into the OASIS project (On-line Access to Index of Archaeological Investigation). A summary of the results will be prepared for publication in an appropriate journal.

### 3.8 CONFIDENTIALITY

- 3.8.1 The report is designed as a document for the specific use of the Client, for the particular purpose as defined in the project brief and project design, and should be treated as such; it is not suitable for publication as an academic report, or otherwise, without amendment or revision. Any requirement to revise or reorder the material for submission or presentation to third parties beyond the project brief and project design, or for any other explicit purpose, can be fulfilled, but will require separate discussion and funding.

## 4. OTHER MATTERS

### 4.1 ACCESS

- 4.1.1 It is assumed that OA North will have unrestricted pedestrian access to the study area for the duration of the survey.

### 4.2 HEALTH AND SAFETY

- 4.2.1 Full regard will, of course, be given to all constraints (services) during the survey, as well as to all Health and Safety considerations. The OA North Health and Safety Statement conforms to all the provisions of the SCAUM (Standing Conference of Unit Managers) Health and Safety manual, as well as the OA Health and Safety Statement. Risk assessments are undertaken as a matter of course for all projects, and will anticipate the potential hazards arising from the project.

### 4.3 INSURANCE

- 4.3.1 The insurance in respect of claims for personal injury to or the death of any person under a contract of service with the Unit and arising in the course of such person's employment shall comply with the employers' liability (Compulsory Insurance) Act 1969 and any statutory orders made there under. For all other claims to cover the liability of OA North in respect of personal injury or damage to property by negligence of OA North or any of its employees there applies the insurance cover of £10m for any one occurrence or series of occurrences arising out of one event.

### 4.4 PROJECT MONITORING

- 4.4.1 Monitoring meetings will be established with the client and the Lake District National Park Archaeologist at the outset of the project. OA North will inform the client of all significant developments, and any potential departures from the agreed programme will be discussed and agreed with them prior to implementation.

## 5. WORK TIMETABLE

- 5.1 The phases of work will comprise:

### 5.1.1 *Field Survey*

2 days will be required for the planning of the axe factory sites

3 days will be required for the sampling at Martcrag Moor and Langdale Combe

The watching brief time will be subject to the programme of path repair

### 5.1.2 *Palaeoenvironmental Processing*

20 days will be required for palaeoenvironmental analysis

### 5.1.3 *Archive and Reporting*

15 days would be required to complete this element.

- 5.1.3 The project can be undertaken at short notice, subject to the requirements of the client and it is proposed that the survey be undertaken in October 2008.

## 6. OUTLINE RESOURCES

### 6.1 STAFFING

- 6.1.1 The project will be under the management of and will be directed by **Jamie Quartermaine BA DipSurv** (OA North Project Manager) to whom all correspondence should be addressed. He will monitor the progress of the project ensuring adherence to all agreed programmes and timetables. He will also provide technical back-up, advice, and will have editorial control over the compilation of the full report. He has many years experience of surveying upland landscapes, particularly in the Lake District and Yorkshire Dales National Parks. Jamie will provide a post-survey assessment of the results. It is proposed that he will undertake the field survey of the study areas where there is the potential for axe factories.
- 6.1.2 The survey will be assisted by **Peter Schofield BA** (OA North Project Officer) who has considerable experience of field survey work, including prehistoric landscapes, and has undertaken considerable survey work through-out Cumbria and was a team leader on the recent major survey of the Northern Welsh Uplands. He undertook part of the survey at Hartley, near Kirkby Stephen, was involved in a recent survey at Ennerdale in West Cumbria, undertook the survey of St Catherine's Windermere, and Borrowdale.
- 6.1.3 The palaeoenvironmental programme will be led by **Elizabeth Huckerby BA, MSc, MIFA** (OA North's Environmental Manager), who will be responsible for the co-ordination of the environmental programme. She has considerable experience she has extensive knowledge of the palaeoecology of North West England, alongside environmental sampling and processing procedures. She was a member of the North West Wetlands Survey (NWWs) and English Heritage Upland Peat project. She specialises in palynology and collaborated in the successful isolation of Icelandic tephra from a lowland raised mire in England.
- 6.1.4 **Denise Druce, BA PhD** (OA North Project Officer) will carry out a major part of the environmental programme. She is a specialist in pollen, plant macrofossils and charcoal analysis and has worked extensively in the Uplands of North West England and Wales. Her earlier work for her PhD involved using multiple palaeoenvironmental indicators to interpret Holocene coastal sedimentation of the Severn Estuary in relation to relative sea level and climate change. Since joining Oxford Archaeology North she has worked on the English Heritage Upland Peat project and carries out and writes client reports on the assessment and analysis of pollen, waterlogged and charred plant remains, charcoal analysis and also undertakes auger surveys and associated stratigraphic description and visualisation. Denise has also contributed to and written numerous publication reports.



with one having bigger flakes than the other site. This may possibly reflect spatial separation of working tasks with both coarse working of a glacial erratic and fine working for axe manufacture.

**OGAN Site** MC4 **Name** Martcrag Moor, Great Langdale, axe working Site IV  
**SAM** **NGR** NY 26978 08140  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** OA North Field Survey 2008 **Stability** Rapid deterioration **Survival** Good  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

#### Description

Axe working site MC4, with overall dimensions 3.9m long by 1.7m wide. It is a small site located on Martcrag Moor, consisting of a concentration of mainly small and medium flakes. The flakes are predominantly covered with patchy patination with some white and some relatively clear examples. There is one principle concentration of mainly medium sized flakes extending out from the tip of a peat hag although there is no evidence of any axe working deposits within the hag itself. Two rough-out axes were identified at the edge of the peat hag at the northern end of the flake scatter (MC4(a)/10000 and MC4(b)/10006), but there are very few flakes in the immediate vicinity. The rough-out axes were located on a very thin film of peat and there is the possibility that they were not in-situ. There were two distinct concentrations of flaking waste but they have a similar character and hence they are probably the same site (unlike MC2 and MC3). There were 84 mostly medium-sized flakes within a 0.4m x 0.4m grid.

**OGAN Site** MC5 **Name** Martcrag Moor, Great Langdale, axe working Site V  
**SAM** **NGR** NY 26967 08145  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** OA North Field Survey 2008 **Stability** Rapid deterioration **Survival** Good  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

#### Description

Axe working site MC5, with overall dimensions 2.1m long by 1.1m wide. It is a very small, low density scatter of mainly medium flakes. It is surrounded by peat hags and is in a slightly waterlogged area. The flakes are mainly patinated white, reflecting that they have historically been covered by the peat. The site has a relatively low density of flakes, and is quite localised in extent. The site may possibly represent the working for a single rough-out axe. 20 medium flakes were identified within a 0.4m x 0.4m grid.

**OGAN Site** MC6 **Name** Martcrag Moor, Great Langdale, axe working Site VI  
**SAM** **NGR** NY 27022 08097  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** OA North Field Survey 2008 **Stability** Rapid deterioration **Survival** Good  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

#### Description

Axe working site MC6, with overall dimensions 6.3m long by 3.9m wide. It is a small, low density site located on Martcrag Moor, consisting of large and medium flakes exposed within the footpath scar. There is a small scatter of mainly small and medium flakes surviving within an, as yet, uneroded part of the footpath (to the north of the path) which reflects localised survival. The rest of the site consists of a general scatter of flakes that have been dispersed downslope through footpath wear. The flakes were mainly medium-sized and white-patinated and there were 39 flakes identified within a 0.4m x 0.4m grid. The middle of the flake scatter is protected where a marker/walkers cairn (OGAN Site MC9) has protected an island of ground surface underneath it. A single rough-out axe was identified on the western end of the flake scatter (MC6(a)/10001).

**OGAN Site** MC7 **Name** Martcrag Moor, Great Langdale, axe working Site VII  
**SAM** **NGR** NY 27060 08069  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** OA North Field Survey 2008 **Stability** Rapid deterioration **Survival** Good  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

#### Description

Axe working site MC7, with overall dimensions 3.2m long by 0.4m wide. It is a small localised exposure of flakes within an area of footpath erosion on Martcrag Moor. The footpath erosion is narrow and deeper than the rest of the surrounding erosion scars, hence the site is only exposed in this section. There is a thick deposit (0.1m) of predominantly small- and medium-sized unpatinated flakes (and a few large flakes) exposed in the turf section. By implication, the erosion has cut into the top of the flake scatter in a very

narrow exposure, and there clearly will, therefore, be further flaking material surviving below the current path level. The flakes have very little patination and clearly have not been exposed to the peat cover. The site survives in relatively good condition and is probably a deeply stratified flaking site. There were 58 mainly medium- to large-sized flakes identified in a 0.4m x 0.4m grid.

**OAN Site** MC8 **Name** Martcrag Moor, axe working Site VIII  
**SAM** **NGR** NY 27192 08000  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** OA North Field Survey 2008 **Stability** Rapid deterioration **Survival** Good  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

**Description**

Axe working site MC8, with overall dimensions 11m long by 1.8m wide. It is an axe working site identified through footpath erosion on Martcrag Moor. The site has a small localised core exposed on the eastern (upslope) end and a large expansive spread of flakes scattered downslope along the length of the footpath erosion. Given the nature and extent of the spread of flakes the site has evidently been exposed through the footpath for some time and has suffered severe erosion. The flakes were mainly medium in size and were for the most part patinated white. The exposed soil surrounding the site consists predominantly of peat. There were 52 small- to medium-sized flakes identified within a 0.4m by 0.4m grid.

**OAN Site** MC9 **Name** Martcrag Moor, Marker/Walkers Cairn  
**SAM** **NGR** NY 27021 08098  
**Monument Type** MARKER CAIRN **Period** Post-Medieval  
**Source** OA North Field Survey 2008 **Stability** Slow deterioration **Survival**  
Medium  
**Vulnerability** Low **Significance** 2 **Certainty** Absolute

**Description**

A sub-circular boundary/walkers cairn located upon the line of a footpath descending over Martcrag Moor. It measures c 1.5m in diameter by up to 1m high. The site is sat on top of an area of axe working (OAN Site MC6) which has been exposed by peat erosion.

**CLAU 1984-5 Survey Sites:**

**LUAU Sites** 9-15 **Name** Stake Beck (north) axe working complex  
**LDNPA HER** 8601 **NT SMR Number**  
**SAM** **NGR** NY 27030840  
**Monument Type** Stone Axe Factory **Period** Neolithic  
**Source** LDNPA HER, CLAU 1985, Claris and Quartermaine 1989, 22  
**Stability** Unknown **Survival** Uncertain  
**Vulnerability** High **Significance** 2 **Certainty** Absolute

**Description**

An axe factory complex surveyed in the 1980s as part of the CLAU axe factory survey. The information was compiled in the Langdale Axe Factory Catalogue (CLAU 1985).

Site Type: D

No. of sites: 7

Total area (approx.): 40m sq

Relative flake quantities: 2

Altitude: 500m-540m.

The sites are either in or adjacent to the beck, but there may be others obscured by vegetation. Site 9 is on a hummock of drift.

9 - NY 2699508463

A moderately concentrated, exposed patch of flakes on the North-facing slope of a drumlin. It is a shallow flake deposit scattered amongst rocks of differing geology. There are up to 30 fragments of unworked hornstone, which are larger than 110mm x 100mm. Below are some examples:

1) Sized: 150mm x 120mm x 60mm, this has no conchoidal fractures, just straight angular fractures.

2) Sized: 190mm x 140mm x 50mm

3) Sized: 100mm x 100mm

4) Sized: 170mm x 180mm x 60mm

Site size: c. 5m x 4m

Concentration: 3 (106)  
 Flake size: Small, medium & large  
 Finds: Rough-out

10 - NY 2701308401  
 An exposure of flakes in a bank just above a stream.  
 Size: c.1.3m x 0.5m  
 Concentration: 2  
 Flake size: Small and medium

11 - NY 2702008396  
 A few flakes in the stream bed. There is no worked material in situ in the sections, so they are probably washed down from nearby sites.  
 Concentration: 1  
 Flake size: Medium

12 - NY 2702308375  
 Here there are two very similar sites, separated by only a few metres: 12 and 12a. There are a few flakes in the stream bed, but there is nothing visible in the exposed sections and the flakes are probably washed down from nearby sites.  
 Concentration: 1  
 Flake size: Medium

13 - NY 2703208365  
 A few flakes in the stream bed (which is about 0.4m wide here). There are no flakes in the exposed sections, so they are probably washed down from sites further upstream.  
 Concentration: 1  
 Flake size: Medium  
 Finds: Rough-out

14 - NY 2703008350  
 An exposure of mainly medium flakes in an eroded bank, West of the stream. The flakes are stratified below humus (no peat deposit here) and above morainic material. The cutting is in the side of one of the many mounds in the vicinity. There are also a few flakes in the stream bed.  
 Size: c.4m across.  
 Concentration: 2  
 Flake size: Small, medium & large

15 - NY 2707808284  
 A few flakes are visible in the eroded bank of the stream, stratified above morainic material.  
 Concentration: 1  
 Flake size: Medium

**Conclusion:** to explain the location of the type d sites far away from known outcrops there have been suggestions that the source material was transported by the Neolithic workers to these sites either as coarse rough-outs or raw hornstone <1>. But the presence of lumps of unworked hornstone at Site 9 indicates that rough-outs were not transported here for finishing. Also it would seem unusual for the raw material to be carried over a kilometre from the nearest outcrop if it was then going to be left unused. Being a drumlin it would seem probable that the source material was glacial erratics from the drumlin.  
 <1>Pers comm//Edmonds M/1986/Petrology Conference/

<b>LUAU Sites</b>	16 and 17	<b>Name</b>	Stake Beck (south) axe working complex	
<b>LDNPA HER</b>	8602	<b>NT SMR Number</b>		
<b>SAM</b>		<b>NGR</b>	NY 2728207965 & 2723008015	
<b>Monument Type</b>	Stone Axe Factory	<b>Period</b>	Neolithic	
<b>Source</b>	LDNPA HER, CLAU 1985 , Claris and Quartermaine 1989, 22			
<b>Stability</b>	Unknown	<b>Survival</b>	Uncertain	
<b>Vulnerability</b>	High	<b>Significance</b>	2	<b>Certainty</b> Absolute
<b>Description</b>				



An axe factory complex surveyed in the 1980s as part of the CLAU axe factory survey. The information was compiled in the Langdale Axe Factory Catalogue (CLAU 1985). Site Type: D, No. of sites: 3, Total area (approx.): 100m sq, Relative flake quantities: 3, Altitude: 600m-640m. Site 143 is the Thunacar Knott excavation site (Clough 1973). Site 16 has been excavated by the Reading University project revealing distinct areas of coarse and fine flakes (Bradley and Edmonds 1988; Bradley and Edmonds 1993)

16 - NY 2728207965

An area of flakes has been revealed by a modern footpath cutting through the vegetation and peat. The site can be divided into three distinct areas: The higher south-eastern area comprises heavily patinated medium lakes which display brown staining. In the centre of the site and 2m to the West of the footpath lies an area of lightly patinated small flakes. Finally the lower part of the site and 3m West of the path is an area of large flakes and cores, which are mostly heavily patinated and brown stained. These areas probably represent where different stages of the manufacture took place, i.e. coarse roughing-out and fine roughing-out. There are some flakes and a rough-out in the stream bed where the site spills into the stream.

Pollen samples have been taken by Reading University in Sept. 1985 and Sept. 1986 from the South edge of the site (Site 1 in Bradley and Edmonds 1993). The peat deposit was found to be lying directly on top of a thin layer of flakes. In Sept. 1986 excavation of this site was undertaken by Roy Entwistle, on behalf of the Reading University project <1>. The flake material was shown to be defined by an arc of large, non-hornstone, boulders. These boulders were associated with a scatter of larger flakes and enclosed several concentrations of finer material, and overall there were five distinct piles of debitage.

Size: 12m x 5m

Concentration: 3 (41)

Flake size: Small, medium & large

Finds: Rough-out x2

17 - NY 2723008015

This is a site exposed by the modern footpath through the peat. The flakes are scattered down the path and are mainly small and medium with an occasional large one. The flakes are heavily patinated. There is a rough-out in the stream bed near to and North-West of the site. The rock beneath the peat does not seem to be hornstone.

Size: 1.5m x 19m

Concentration: 2 (8)

Flake size: Small and medium

Finds: Rough-out

<b>LUAU Sites</b>	143	<b>Name</b>	Thunacar Knott
<b>LDNPA HER</b>	8612	<b>NT SMR Number</b>	
<b>SAM</b>		<b>NGR</b>	NY 27268 08116
<b>Monument Type</b>	Stone Axe Factory	<b>Period</b>	Neolithic
<b>Source</b>	LDNPA HER, CLAU 1985 , Claris and Quartermaine 1989, 22		
<b>Stability</b>	Unknown	<b>Survival</b>	Uncertain
<b>Vulnerability</b>	High	<b>Significance</b>	2
		<b>Certainty</b>	Absolute

**Description**

Part of an axe factory complex surveyed in the 1980s as part of the CLAU axe factory survey. The information was compiled in the Langdale Axe Factory Catalogue (CLAU 1985). (as part of Stake Beck (south) site complex) Site Type: D, No. of sites: 3, Total area (approx.): 100m sq, Relative flake quantities: 3, Altitude: 600m-640m. Site 143 is the Thunacar Knott excavation site (Clough 1973).

The original NGR co-ordinates given in the literature NY 2740 0814 are incorrect and it should read NY 27268 08116. The site was again relocated during the Upland Peats project where it was located by GPS equipment. Both of the trenches survive as adjoining peat scars (OA North 2008).

This site was originally found by Mr P Johnson in 1966 and it was then the subject of excavations undertaken by T McK Clough in 1969 and 1970 <1>. The following description is from the excavation report:

'The chipping site is in a shallow scoop in the fellside where a saucer of peat which once formed over the archaeological material is now eroding and spilling downhill to expose at its base an extensive bed of chippings.'

In the course of the excavation no definite structural features were found. There was, however a small amount of scattered charcoal which was sent for carbon dating, and produced a date of 2524+- 52 BC. There were found two main concentrations of flakes; one concentration comprised large flakes and rough-outs, while the other in a separate trench 10m from the first comprised no rough-outs and very small flakes (<50mm). This would seem to imply that the coarse roughing and the trimming stages of manufacture were conducted in different places.

Size of main trench: 8m x 4.5m

The site was located by T.Clough in c. 1989 and was surveyed in August 1992.

LUAU description - 1992:

A semi-circular peat hag, with an exposed, 0.9m deep section of peat lying on top of mineral soil. Flakes are scattered around the edge of the section and there is also a concentration of flakes within the middle of the hag. The flakes are all located on the mineral soil and peat formation clearly post-dated axe manufacture. The precise location of the 1969 trench is not obvious from the present surface evidence, but appears to have extended across the floor of the peat hag. The flakes have moderate patination.

To the west of the main hag is a small square of thin grass (2.5mx2.0m); it has appearance of a former trench, however the only trench recorded by T.Clough was 3m across, and 10m to the north-west of the main trench, whereas this is only about 3m to the west of the main trench. Within the centre of the square is a moderate concentration of medium and large flakes (the concentration for the site was counted from this area). There are also some more flakes exposed to the west of the square. There is a small hag to the north-west of the main trench which was probably the location of the small trench reported by Clough, however there was no obvious trench. A limited number of medium and large flakes were observed at the base of the trench.

Concentration: 3 (56)

Flake size: mainly medium and large

## APPENDIX 3

### DETAILED CONTEXT DESCRIPTIONS

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**Context Number:** 1000  
**Category:** Humic Soil  
**Form:** Layer

**Description**

A black, firm, silty humic peaty topsoil measuring 0.20m thick. It was located stratigraphically above **1001**. The soil is very rooty.

**Interpretation**

Silty humic peaty topsoil

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**Context Number:** 1001  
**Category:** Humified Peat  
**Form:** Layer

**Description**

A single homogenous layer of humified peat, measuring 0.55m-0.65 deep. The layer overlay an axe working floor **1002**.

**Interpretation**

Layer of blanket peat.

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**Context Number:** 1002  
**Category:** Working Floor  
**Form:** Layer

**Description**

A mineral soil comprising mid-brown peaty clayey. Silt forms approximately 30% of the layer which measures up to 0.07m-0.13m deep. The working floor is interspersed with occasional med-large sub-angular and sub-rounded stones and the worked flakes comprised up to 65-70% of the deposit. The worked flakes consist of hundreds of moderately densely-packed medium/large flakes which have been made friable and yellow in patina due to proximity with the acidic peat above **1001**. A thin band of smaller flake debitage was recorded in section on the upper surface of the layer where it covers the top of a large stone.

The current exposed ground level at the foot of the peat hag corresponds with the upper half of the layer. It is from this layer that the four rough-out axes (MC1(a)-(d)), initially encountered, were found, lain closely scattered on the current ground surface. The flakes exposed in the section have been affected by the acidic peat above them and are yellowed, friable and biscuity in fabric. The layer overlies a further working floor layer **1003**.

**Interpretation**

This deposit represents the *in-situ* remains of the chronologically latest working floor of site MC1. The layer has been disturbed over much of its area by the incursion of footpath and water erosion which have removed the upper half of the mineral soil adjacent to the section, causing the flakes to be removed from their stratified context within the mineral soil. The upper half of the layer was found to survive within Section 1 and presumably so does a proportion of the site within the peat behind it. The lower half of the layer survives beneath the current modern ground level exposed within the footpath.

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**Context Number:** 1003  
**Category:** Working Floor  
**Form:** Layer

**Description**

The soil matrix of this working floor layer consists of a mid-brown peaty clayey silt which measures c 0.15m deep. The working floor is interspersed with frequent med-large sub-angular and sub-rounded stones and the worked flakes comprised up to 95% of the deposit. The worked flakes consist of many hundreds of

densely-packed small/medium flakes which are of fine-grained blue/grey tuff. The flakes are layered above and packed between two earthfast boulders and medium-sized stones. One rough-out axe was retrieved from within this context (MC1/10017). The rest of the layer was difficult to define as a soil as such, although a bulk sample was taken. A sondage was excavated down between the boulders to the base of the deposit, where it overlay natural **1004**.

**Interpretation**

This deposit represents the *in-situ* remains of the chronologically earliest working floor of site MC1. The layer is sealed completely intact below a later working floor **1003**, and at this location it has not been disturbed by the footpath and water erosion. The worked flake component of the layer is distinctively different in both density and flake form to the layer above, which has much higher proportion of larger flakes within it and none of the very small flakes found in this layer. In addition the layer is pristine in that it has not been affected by oxidisation by the acidic peat above.

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**Context Number:** **1004**  
**Category:** Clayey till  
**Form:** Layer

**Description**

A medium grey/yellow glacial clay till making up 75-80% of the exposed deposit. There are frequent medium-sized sub-angular and sub-rounded stones and the deposit was only exposed for a maximum of 0.27m wide and 0.08m deep. Approximately 10% of the deposit consisted of a mixture of large and small worked flakes from within the upper portion of the deposit.

**Interpretation**

Although it was exposed in only a small finite area, the material layer does have some similarity to the glacial till seen exposed in Section 2 - **2003**. The layer contains some worked flakes but it was difficult to tell if these flakes were deposited during soil formation or if they had been pressed/trampled in from the layer above.

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**Context Number:** **2000**  
**Category:** Humic Soil  
**Form:** Layer

**Description**

A black, firm, silty humic peaty topsoil measuring 0.2m thick. It was located stratigraphically above **2001**. The soil is very rooty.

**Interpretation**

Silty humic peaty topsoil

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**Context Number:** **2001**  
**Category:** Humified Peat  
**Form:** Layer

**Description**

A single homogenous layer of humified peat, measuring 0.55m-0.65 deep. The layer overlay an axe working floor **1002**.

**Interpretation**

Layer of blanket peat.

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**Context Number:** **2002**  
**Category:** Soil Horizon  
**Form:** Layer

**Description**

A mineral soil comprising mid-brown clayey peat silt which measures up to 0.15m-0.17m deep. It is interspersed with frequent med-large fragmented angular and sub-angular stones and has an ironpan formed at the interface with the layer below **2003**. The current ground level exposed by the footpath and water

erosion at Section 2 conforms roughly to the upper edge of the deposit. There was one potential axe working flake recovered from this layer (MC1/10014); however, it may reflect natural fracturing of the parent rock.

**Interpretation**

A mineral soil represented beneath the peat. There was no evidence of a working floor at this location, which reinforces the view that the low density of axe working flakes found adjacent to Section 2 form the *ex situ* remains of the south-eastern edge of MC1.

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**Context Number:** 2003

**Category:** Natural?

**Form:** Layer

A medium grey/yellow glacial clay till. There are moderately frequent small to medium-sized sub-angular and sub-rounded stones and the deposit was only exposed for a maximum of 0.12m deep.

**Interpretation**

The layer probably conforms to the glacial natural. The layer does not contain any worked flakes.

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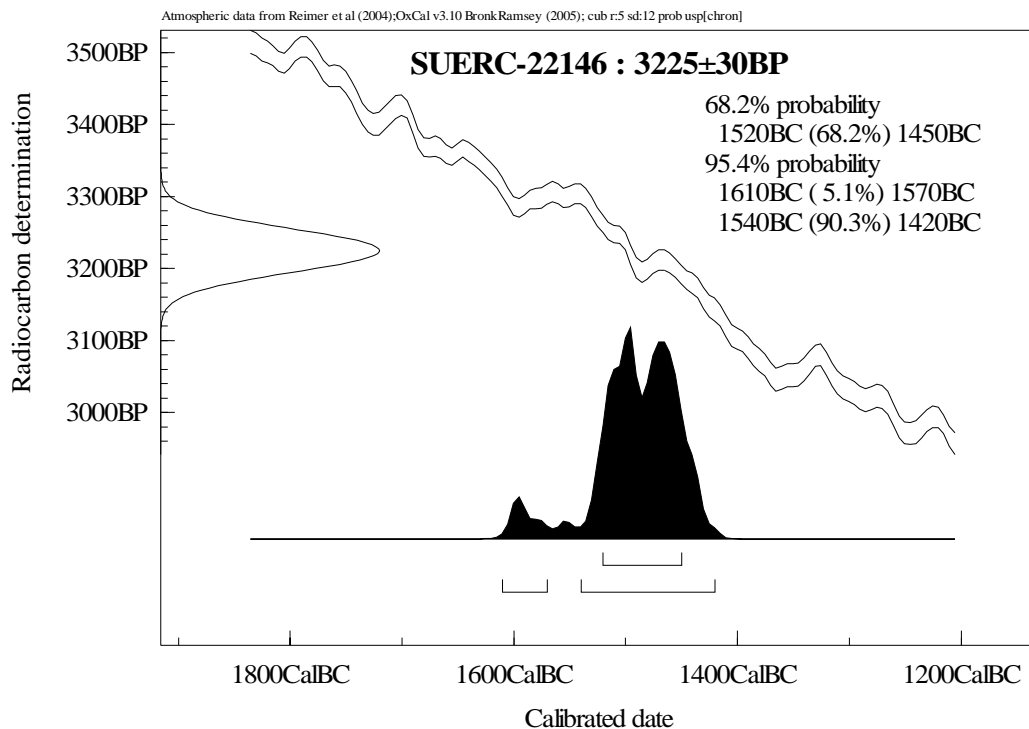
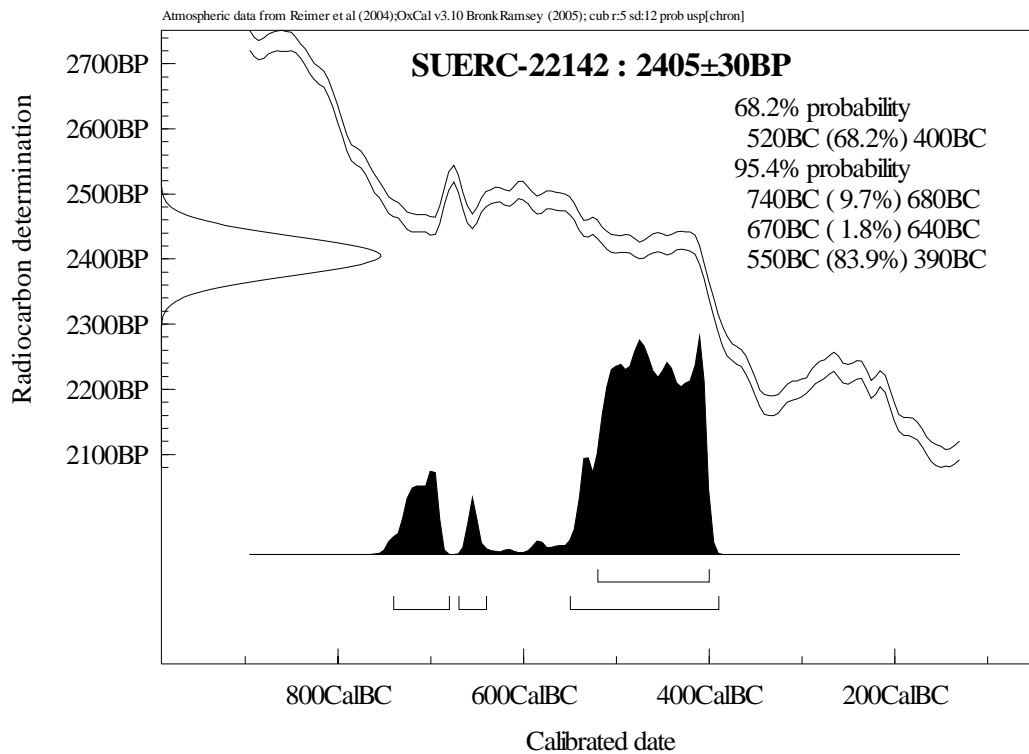
## APPENDIX 4 FINDS CATALOGUE

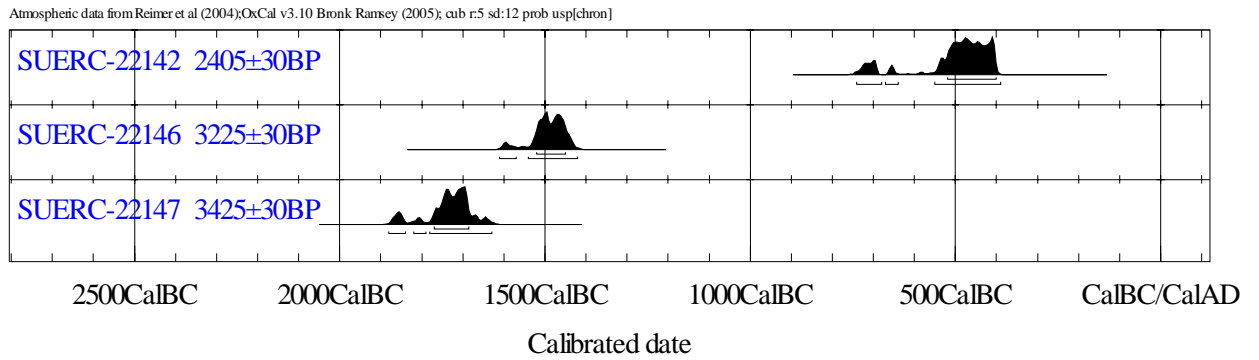
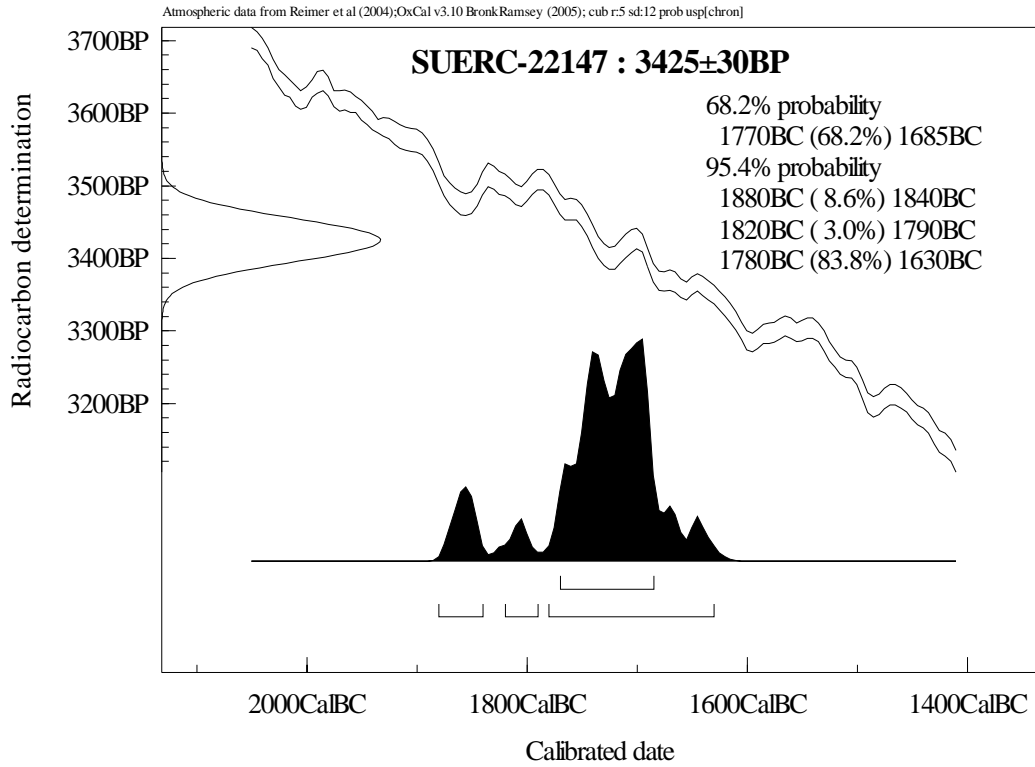
Rough-out axes and flakes retained by OA North from the survey and excavation at Martcrag Moor (Plate 17):

(Site Code MCM08)

OR No	Context No	Count	Description	Easting	Northing
10000	MC4_A	1	Rough-out	326977.65	508142.41
10001	MC6_A	1	Rough-out	327029.36	508096.35
10002	MC1_C	1	Rough-out	327000.13	508129.45
10003	MC1_B	1	Rough-out	327000.16	508129.33
10004	MC1_D	1	Rough-out	327000.33	508128.99
10005	MC1_A	1	Rough-out	327000.09	508129.03
10006	MC4_B	1	Rough-out	326978.93	508142.26
10007	MC1 general	1	Flake	NA	NA
10008	MC2 general	1	Flake	NA	NA
10009	MC3 general	1	Flake	NA	NA
10010	MC5 general	1	Flake	NA	NA
10011	MC6 general	1	Flake	NA	NA
10012	MC7 general	1	Flake	NA	NA
10013	MC4 general	1	Flake	NA	NA
10014	2002	1	Possible flake	NA	NA
10015	1002	20	Bulk sample with flakes	NA	NA
10016	1003	396	Bulk sample with flakes	NA	NA
10017	1003	1	Rough-out	NA	NA
10018	1004	53	Bulk sample with flakes	NA	NA

## APPENDIX 5 RADIOCARBON DATE CALIBRATION PLOTS







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## ILLUSTRATIONS

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- Fig 3: Detail of axe working sites subject to photographic survey
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- Fig 6: Detail of axe working sites MC2 and MC3
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- Fig 10: Detail of axe working site MC8
- Fig 11: North-west facing section 1 of MC1
- Fig 12: South-west facing section 2 of MC1
- Fig 13: Updated distribution of fine grained tuff outcrop and the principal axe flaking groups (after Claris and Quartermaine 1989)
- Fig 14: Distribution of all axe flaking sites at Great Langdale and extents of fine grained tuff outcrop (after Claris and Quartermaine 1989)
- Fig 15: Martcrag Moor sites in context with previously surveyed Type D sites, excavated sites, test pits and palaeoenvironmental sites at Great Langdale, superimposed on extrapolated peat depths
- Fig 16: Pollen diagram from Martcrag Moor, site MC1, Section 1
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### PLATES

- Plate 1: General view of footpath erosion on Martcrag Moor looking south-east
- Plate 2: Exposed axe-flaking site (MC 1) looking south-east
- Plate 3: Four rough-out axes exposed at axe working site (MC1) looking south
- Plate 4: General view of the two sections recorded at axe working site (MC1) looking south-east
- Plate 5: Martcrag Moor (MC1) Section 1, looking south-east
- Plate 6: Martcrag Moor (MC1) Section 2, looking north-east
- Plate 7: Exposed axe working site (MC 2) looking south-east
- Plate 8: Exposed axe working site (MC 3) looking south

Plate 9: Exposed axe working site (MC 4) looking south-east

Plate 10: Two axe rough-outs exposed at axe working site (MC4) looking south

Plate 11: Exposed axe working site (MC 5) looking south-west

Plate 12: Exposed axe working site and cairn (MC 6 and MC9) looking north-west

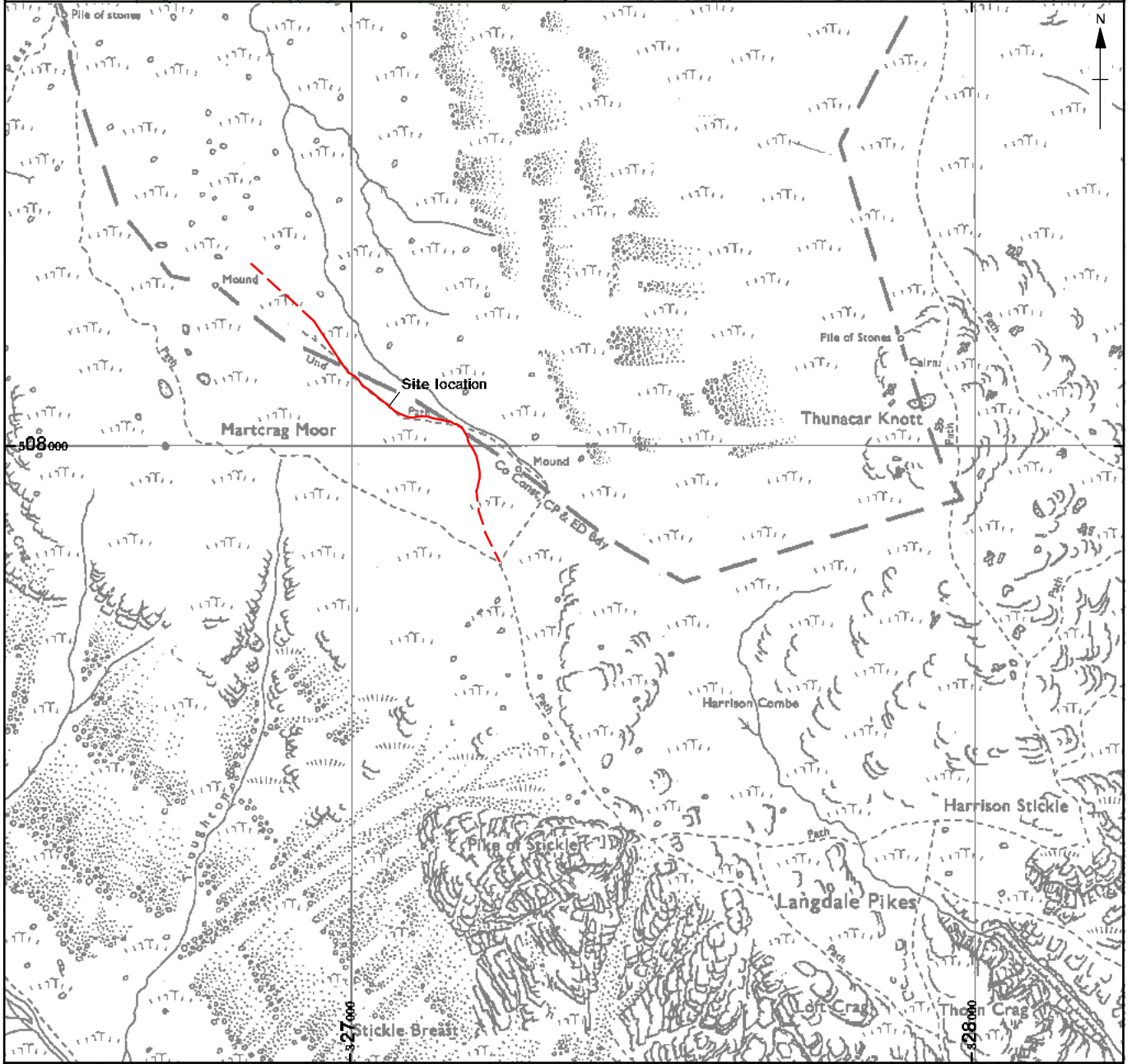
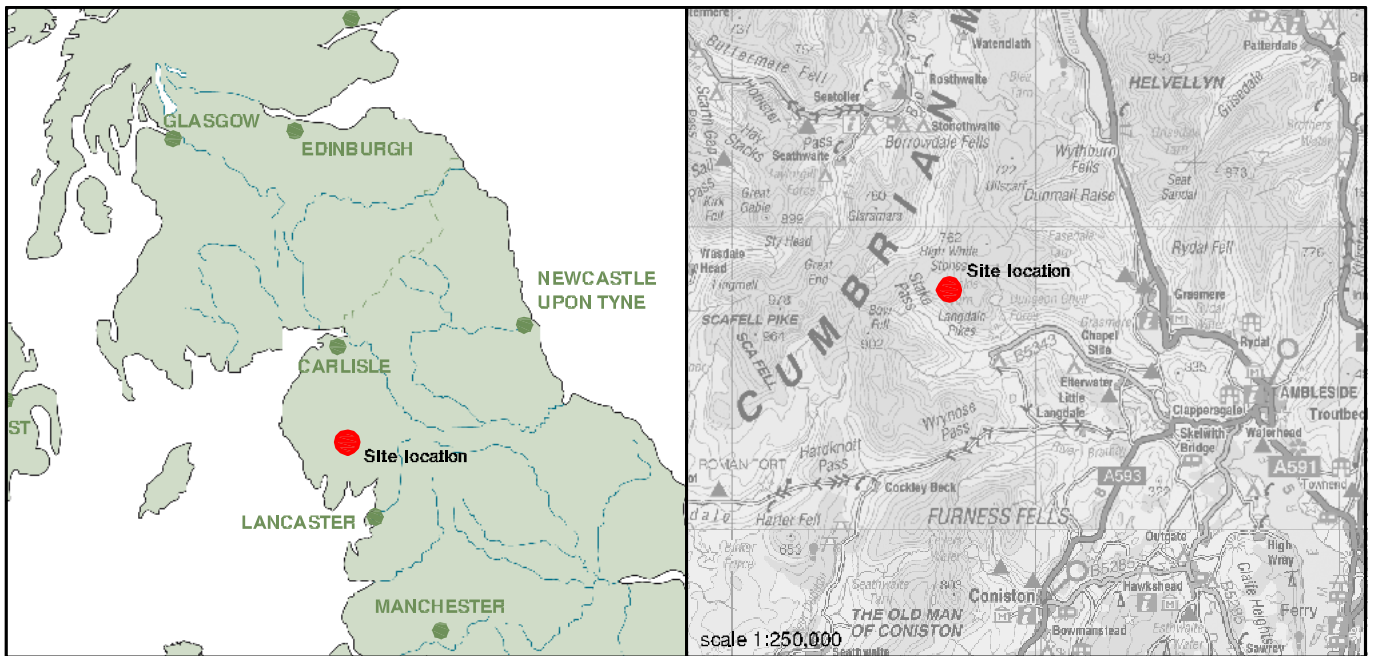
Plate 13: Exposed axe working site (MC 7) looking south-east

Plate 14: Detail of axe working site (MC 7) looking south-east

Plate 15: Exposed axe working site (MC 8) looking north-west

Plate 16: Detail of axe working site (MC 8) looking north-east

Plate 17: Axe rough-outs recovered from Martcrag Moor



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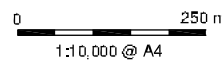
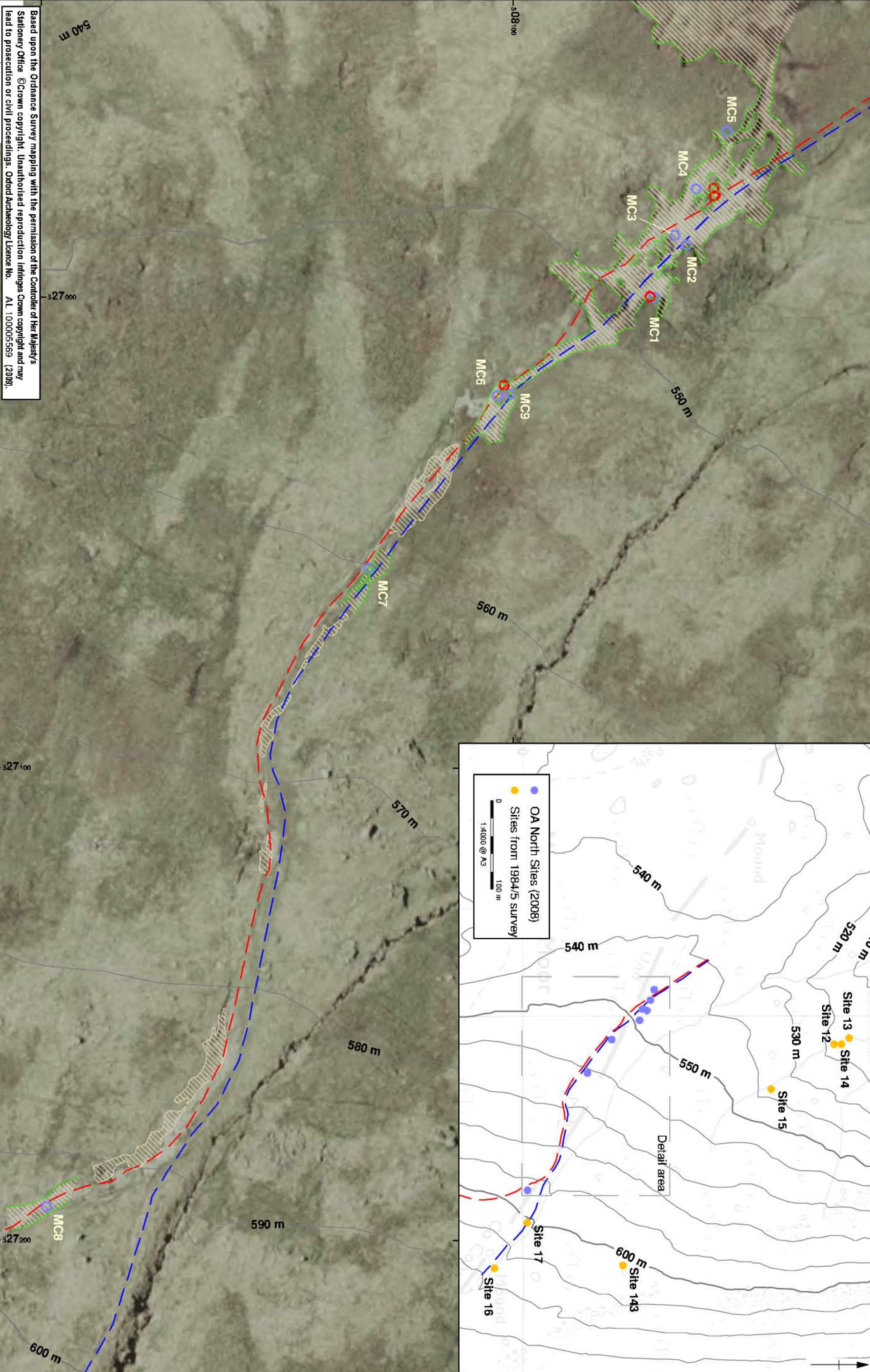


Figure 1: Site location





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- - - Line of present footpath
- - - Line of former footpath
- ▨ Edge of surveyed Peat hag
- ▨ Area of severe peat erosion
- OA North site
- OA North Axe roughouts

- OA North Sites (2008)
  - Sites from 1984/5 survey
- 0 100 m  
1:4000 @ A3

Figure 2: Exposed axe working sites at Martincrag Moor, Great Langdale



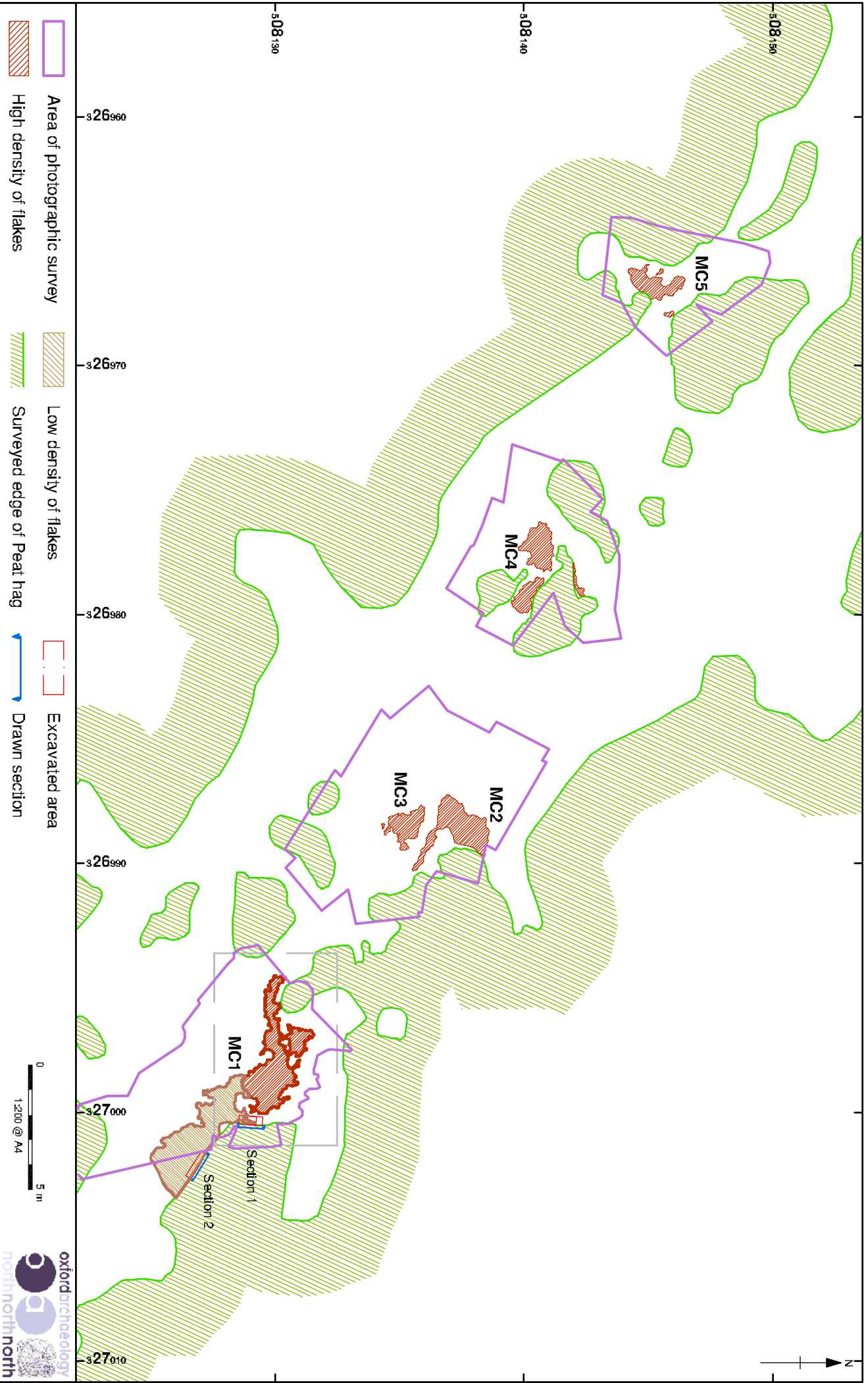


Figure 3: Detail of axe working sites subject to photographic survey

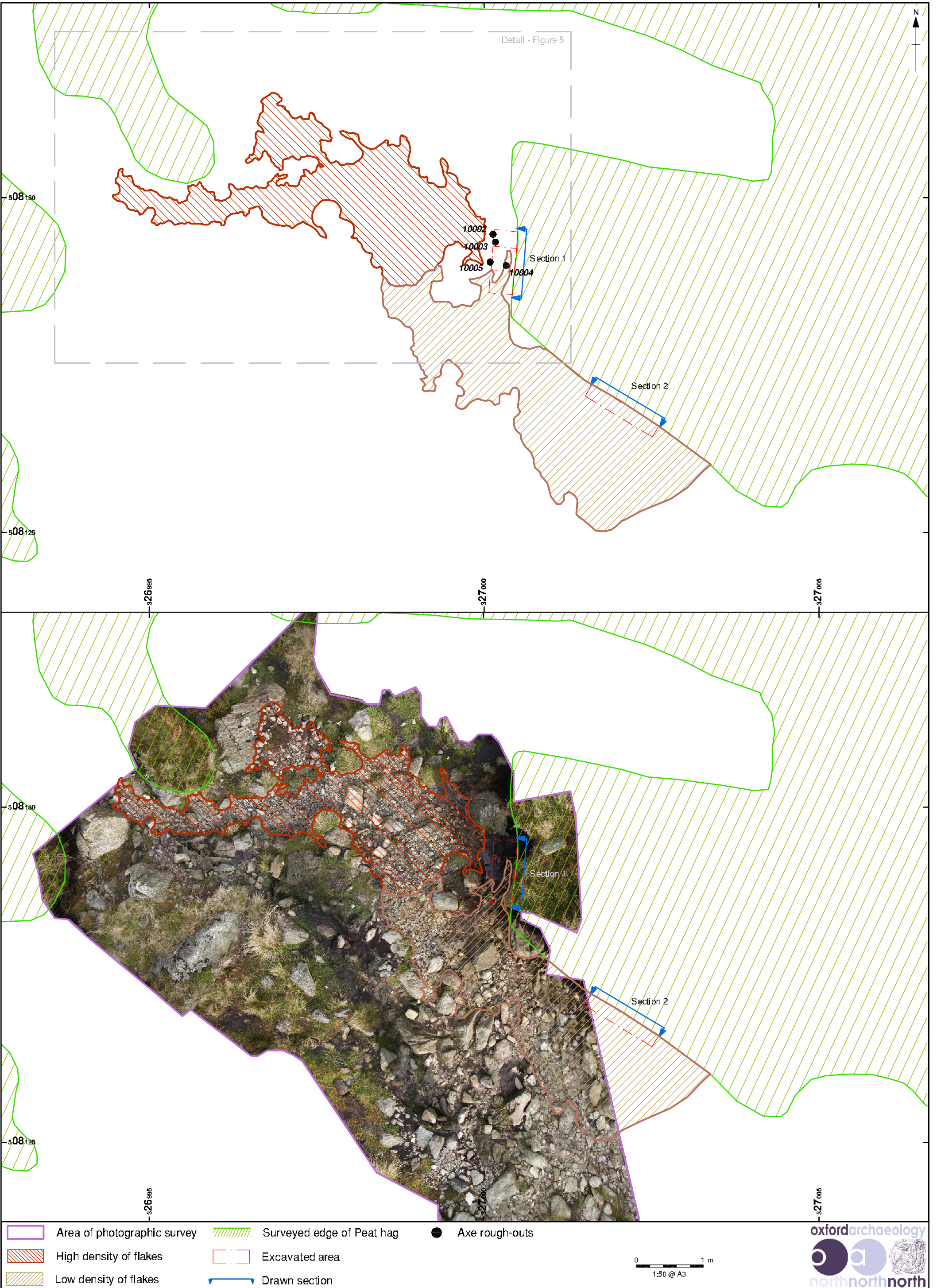


Figure 4: Detail of axe working site MC1



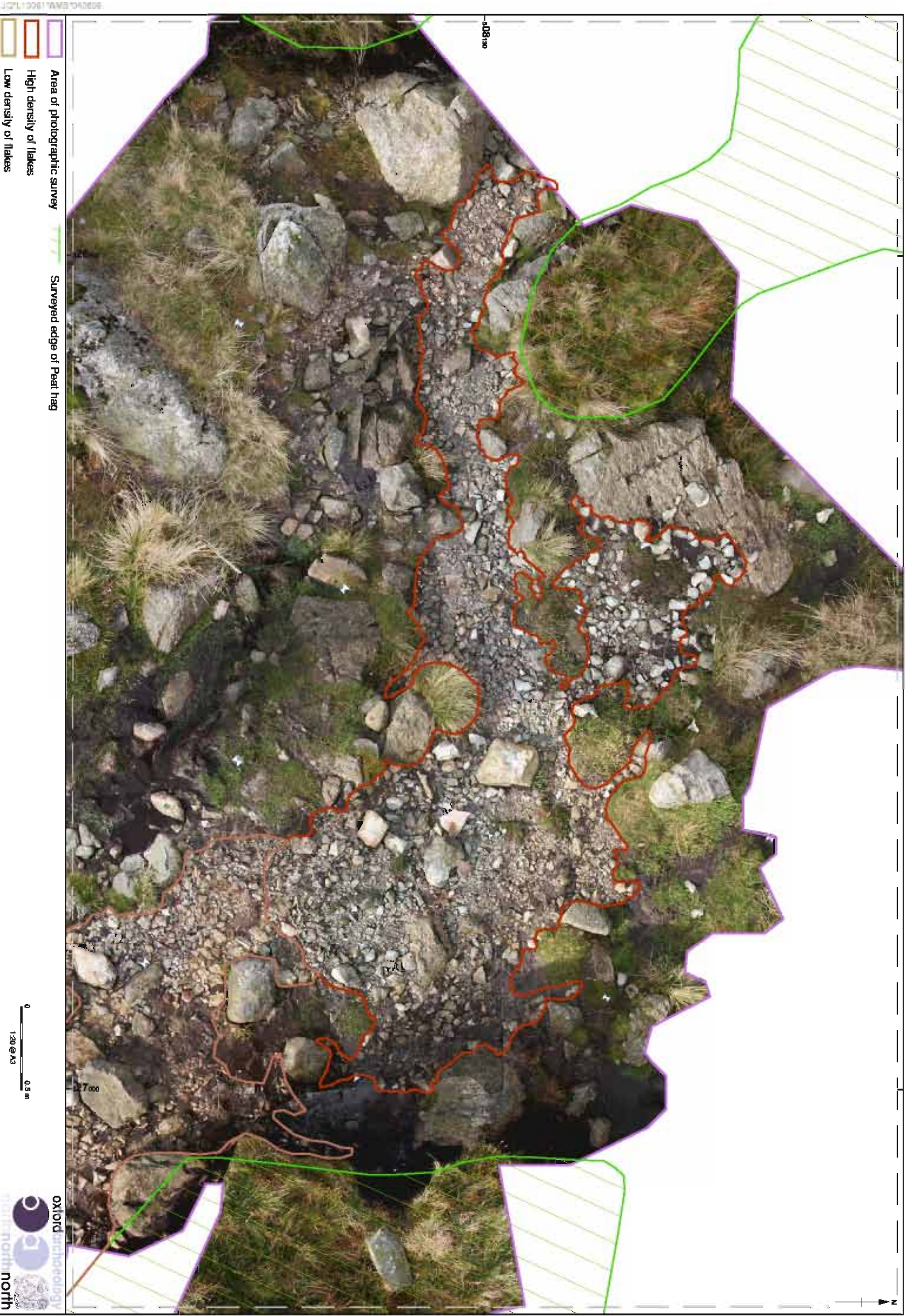


Figure 5: Close-up detail of axe working site MC1



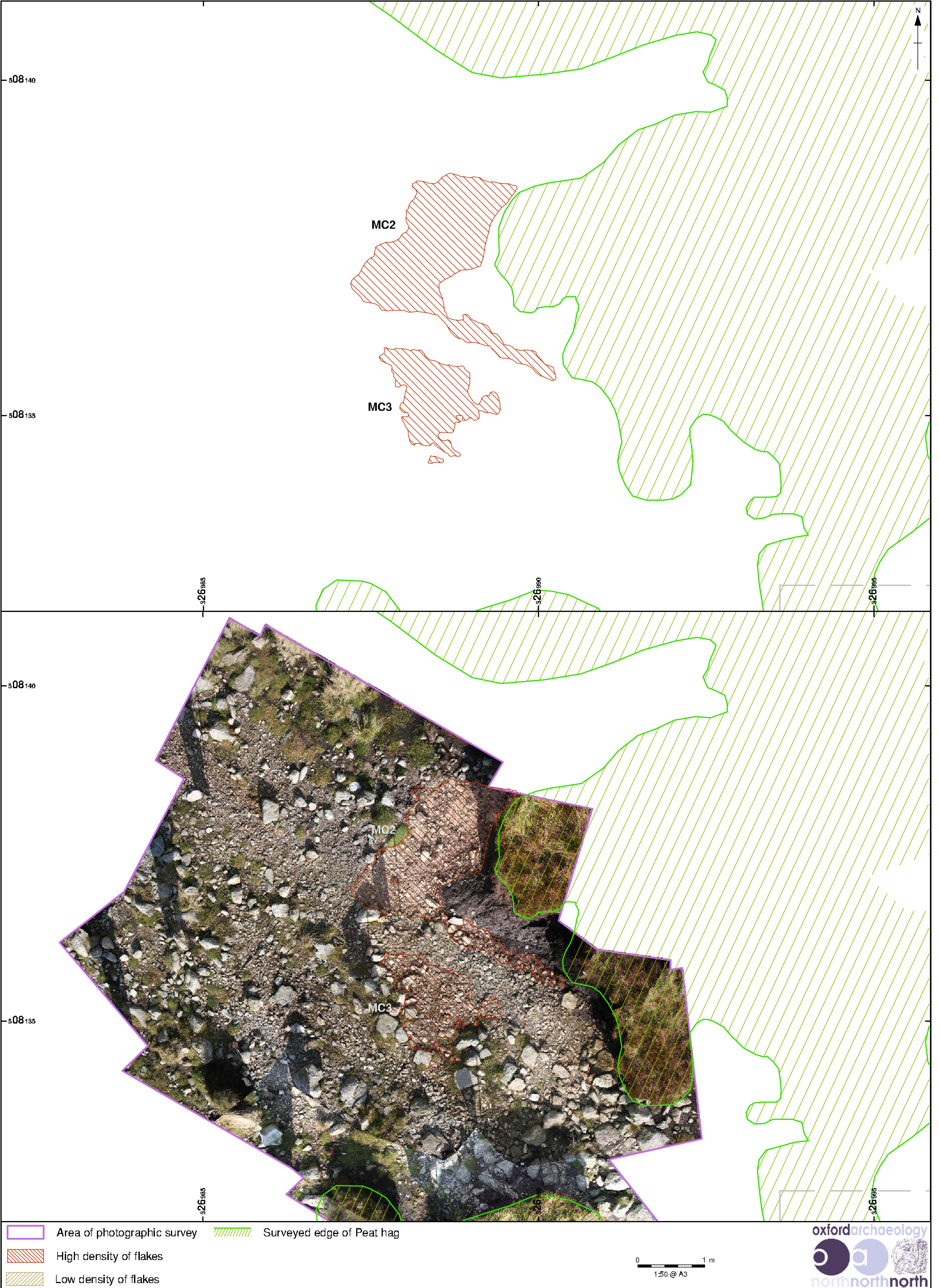
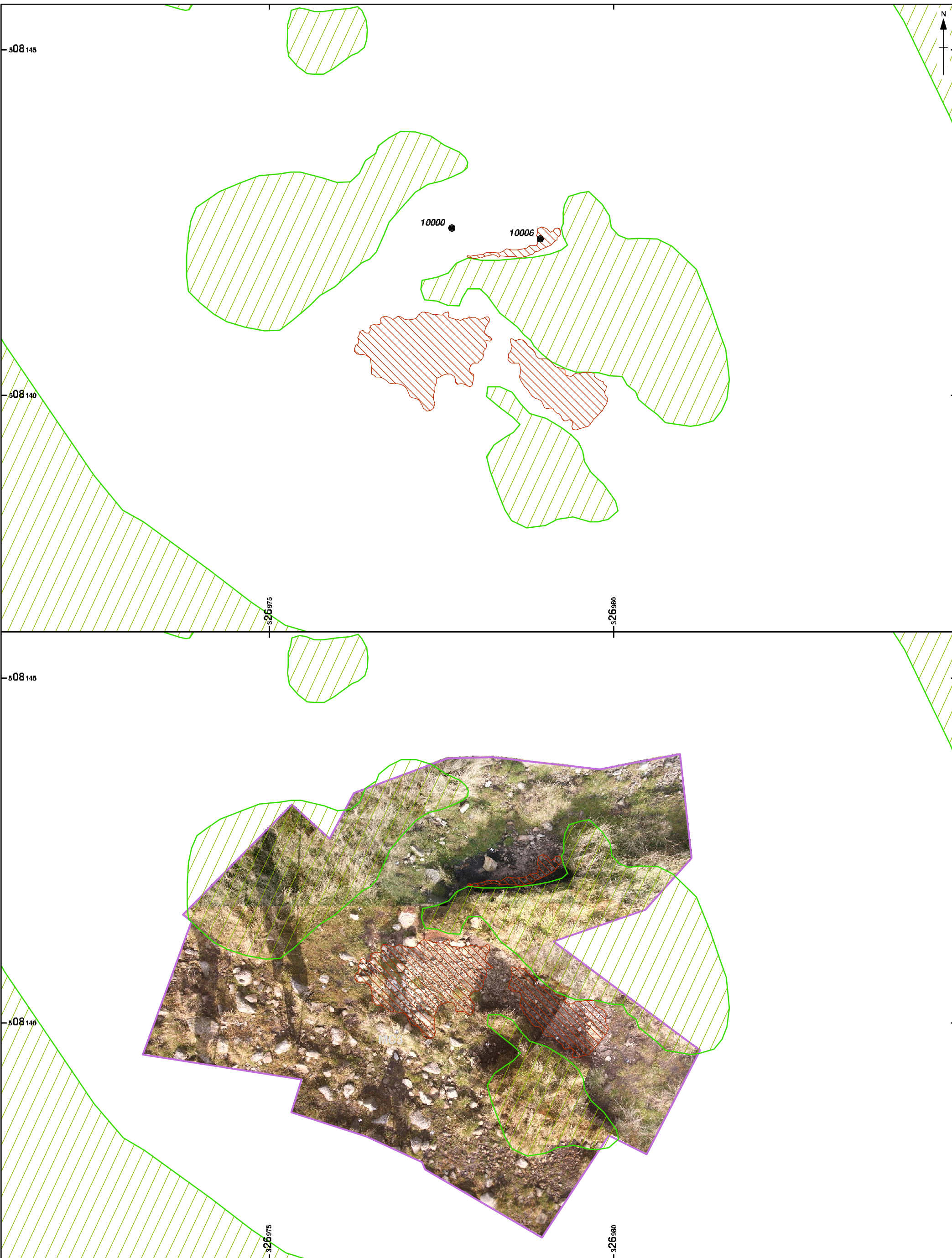


Figure 6: Detail of axe working sites MC2 and MC 3





- Area of photographic survey
- Surveyed edge of Peat hag
- High density of flakes
- Axe rough-outs
- Low density of flakes

0 1 m  
1:50 @ A3

Figure 7: Detail of axe working site MC4



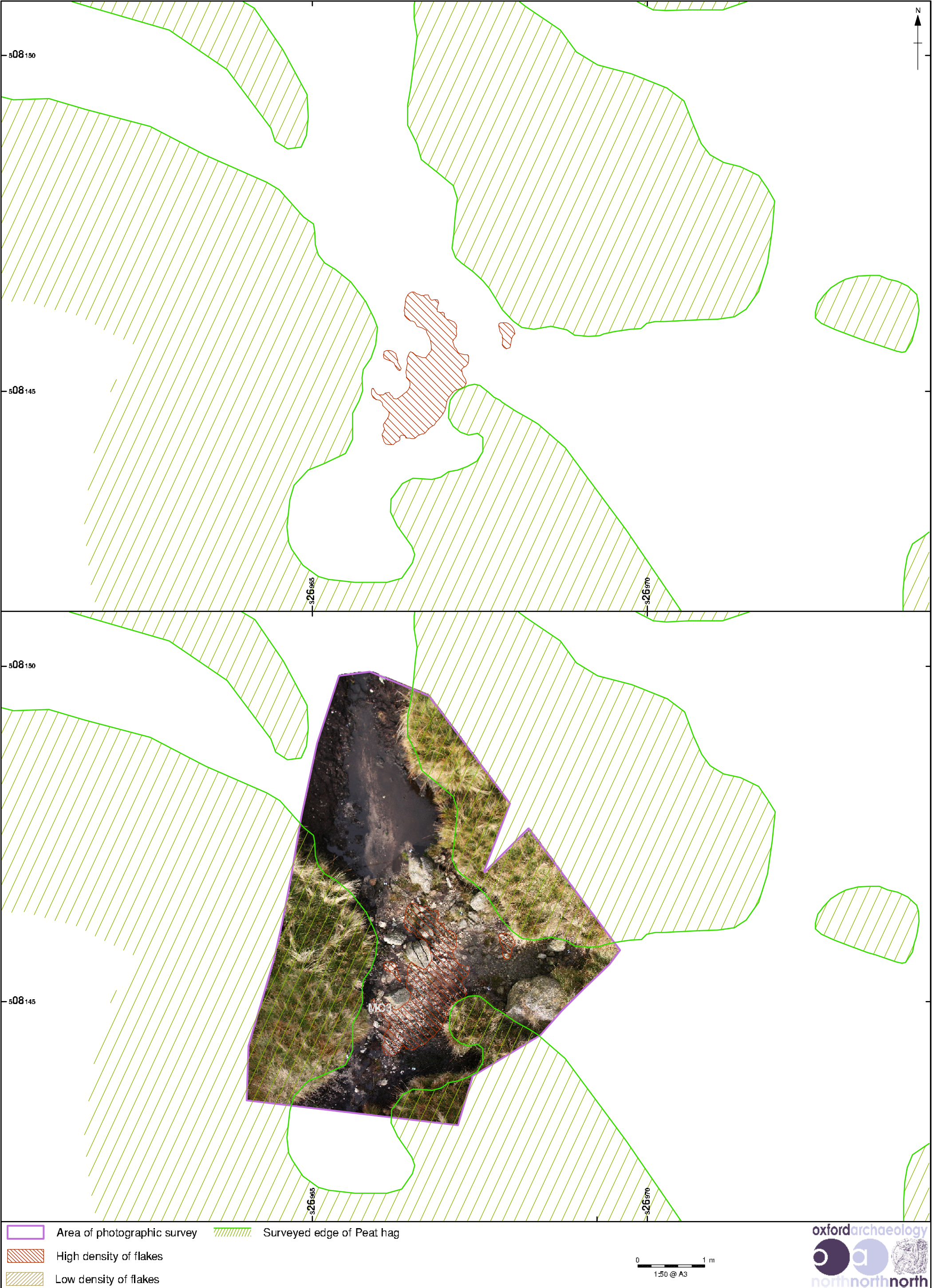


Figure 8: Detail of axe working site MC5

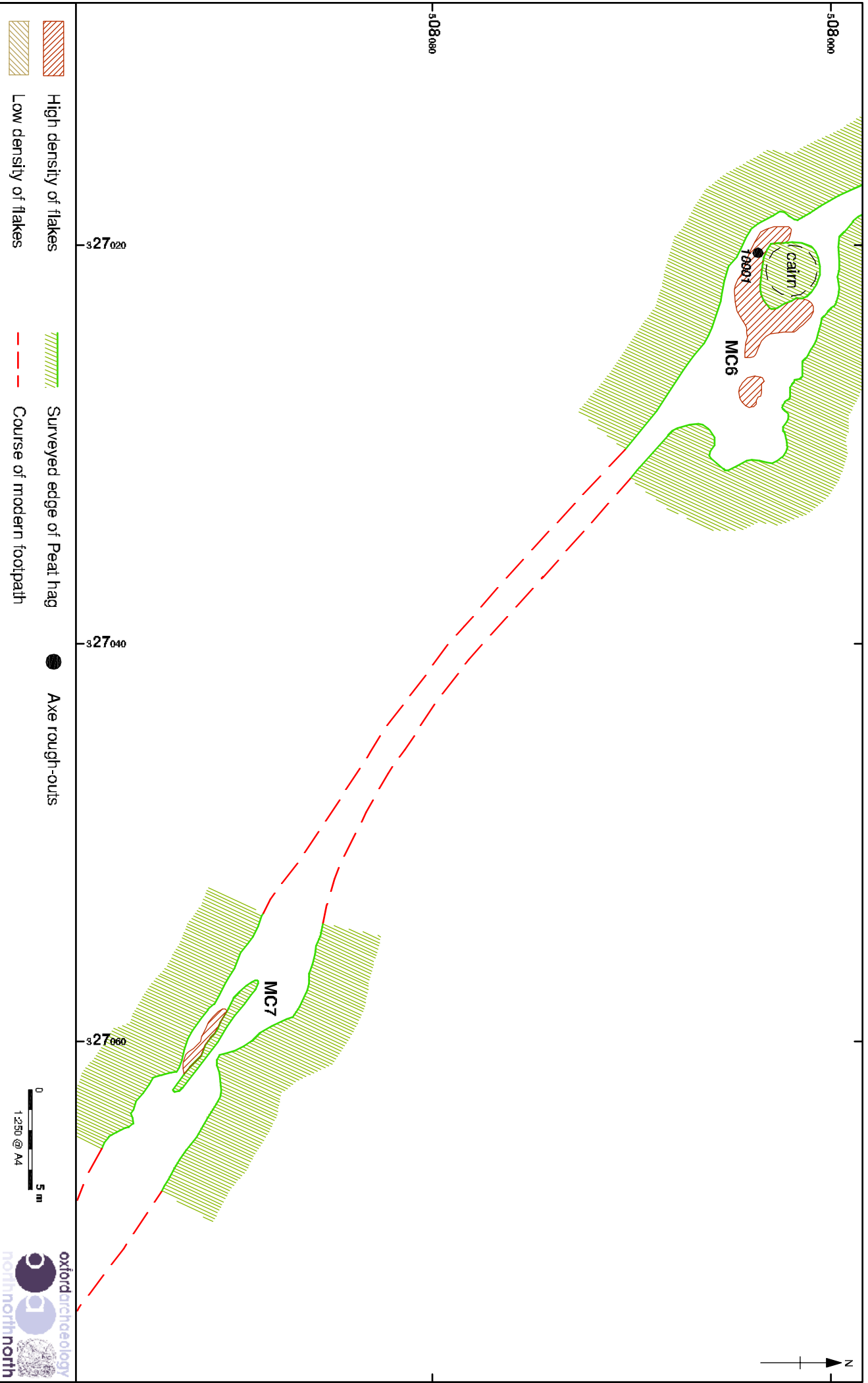


Figure 9: Detail of axe working sites MC6 and MC7

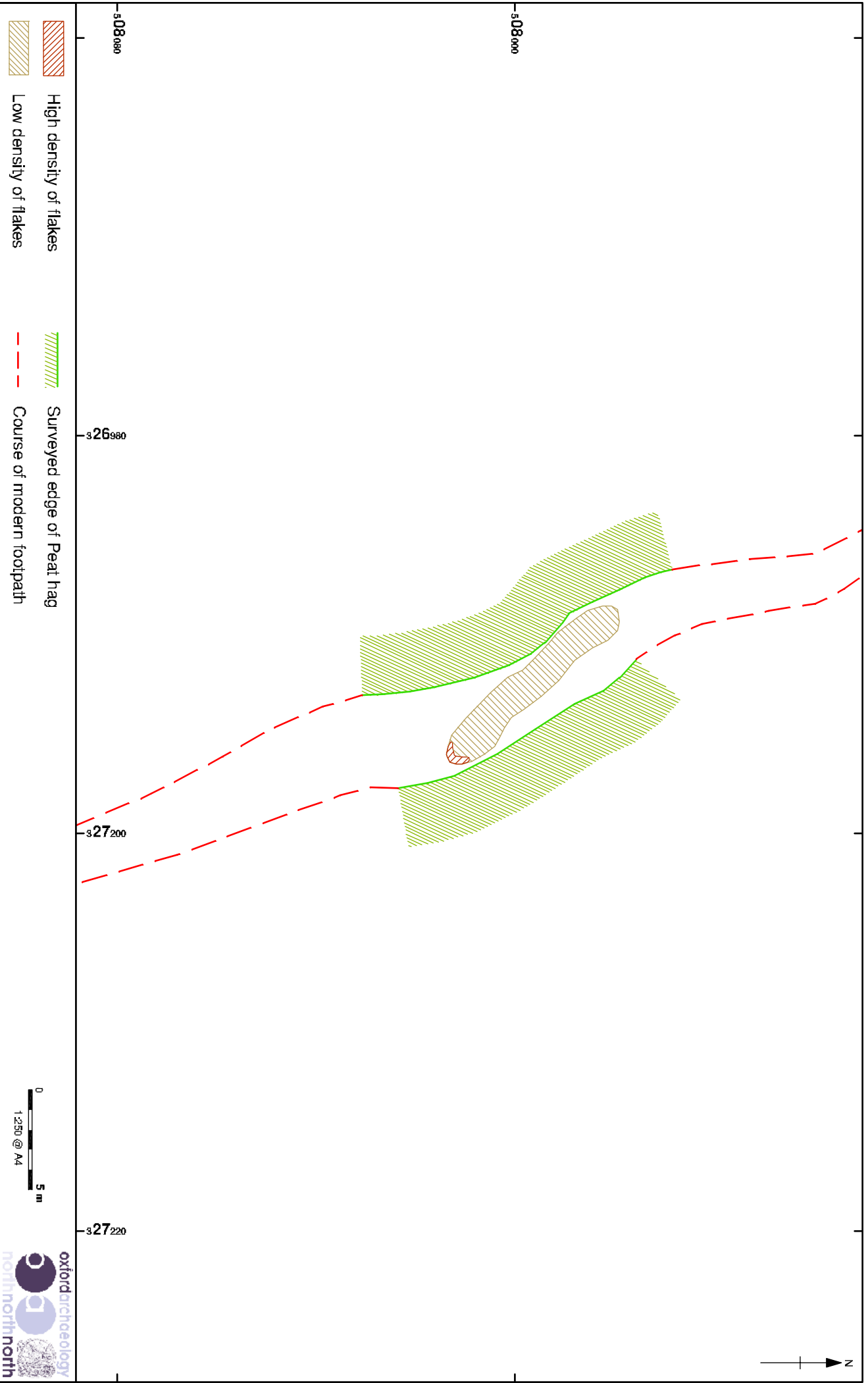


Figure 10: Detail of axe working site MC8

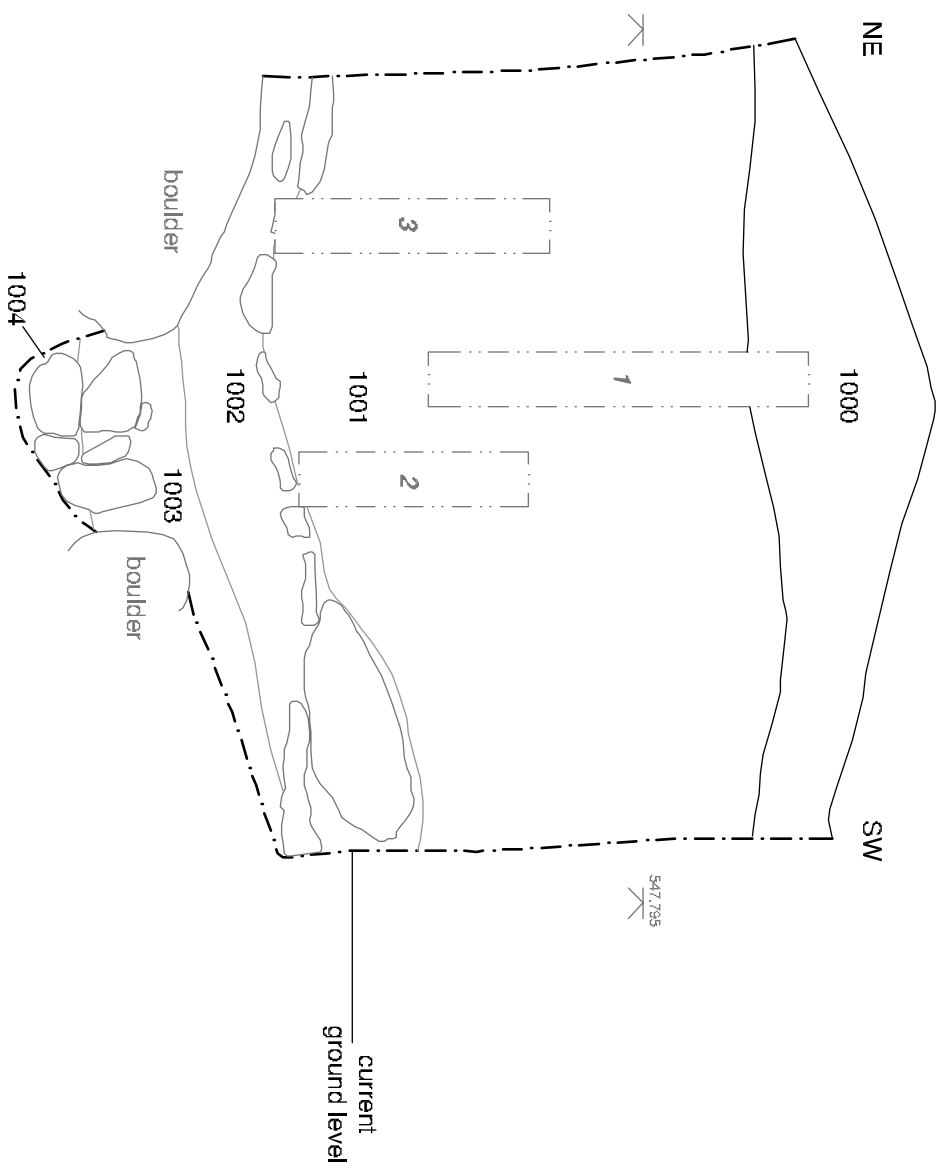


Figure 11: North-west facing section 1 of MC1

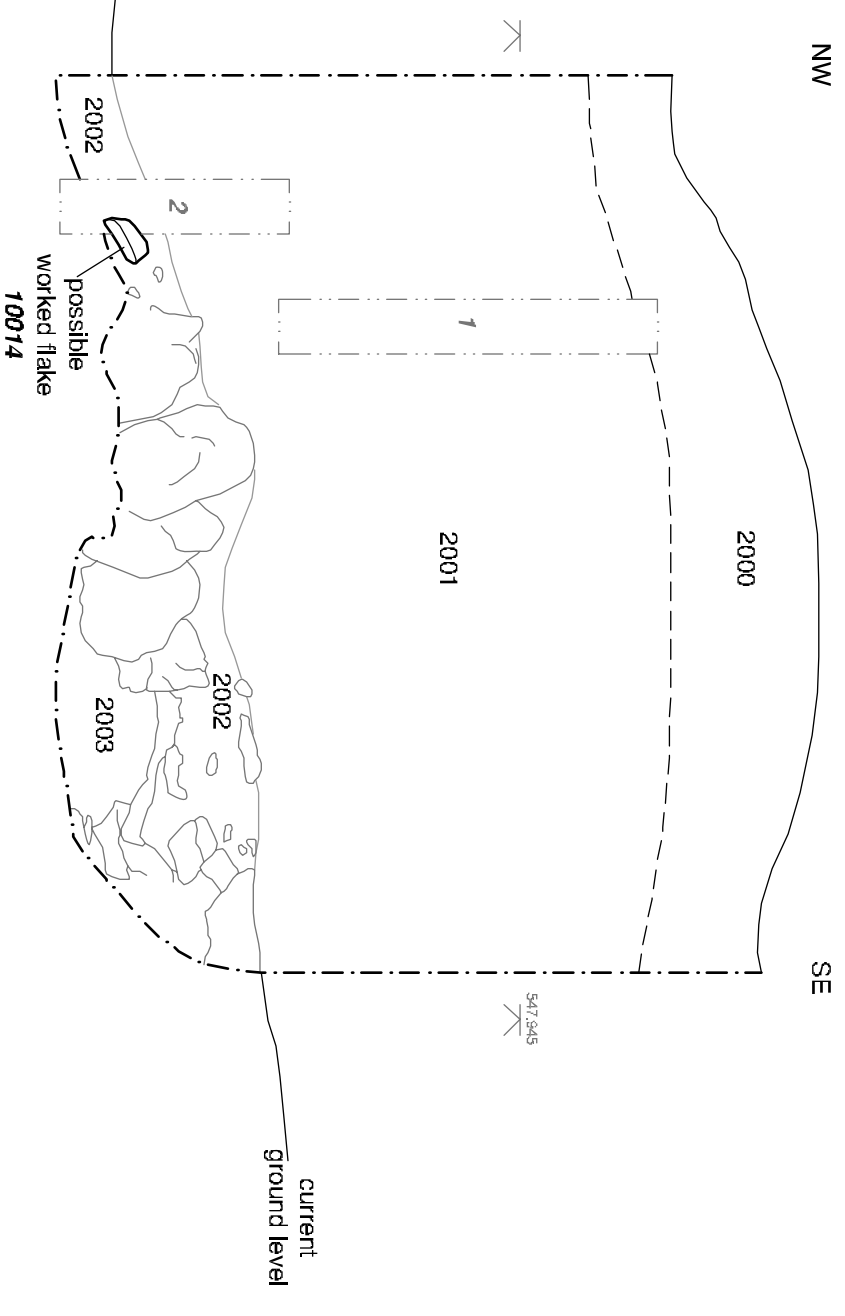





Figure 12: South-west facing section 2 of MC1

-  Limit of excavation
-  Stone
-  Environmental sample

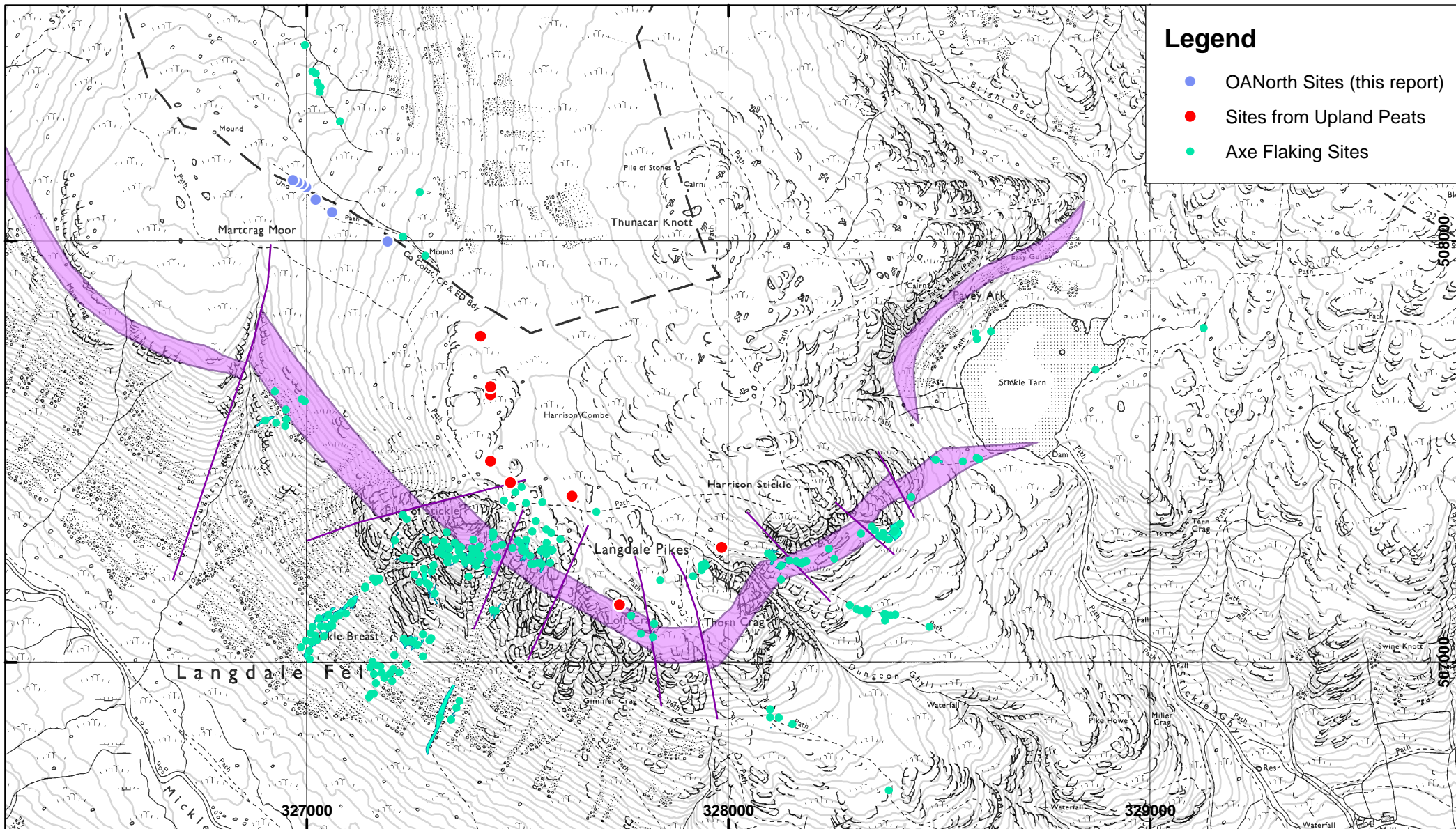
1:0.56 Level in m a OD

0 0.25 m  
1:10 @ A3









- Legend**
- OANorth Sites (this report)
  - Sites from Upland Peats
  - Axe Flaking Sites

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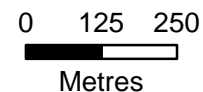
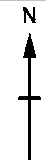


Figure 14: Distribution of all axe flaking sites at Great Langdale and extents of fine grained tuff outcrop



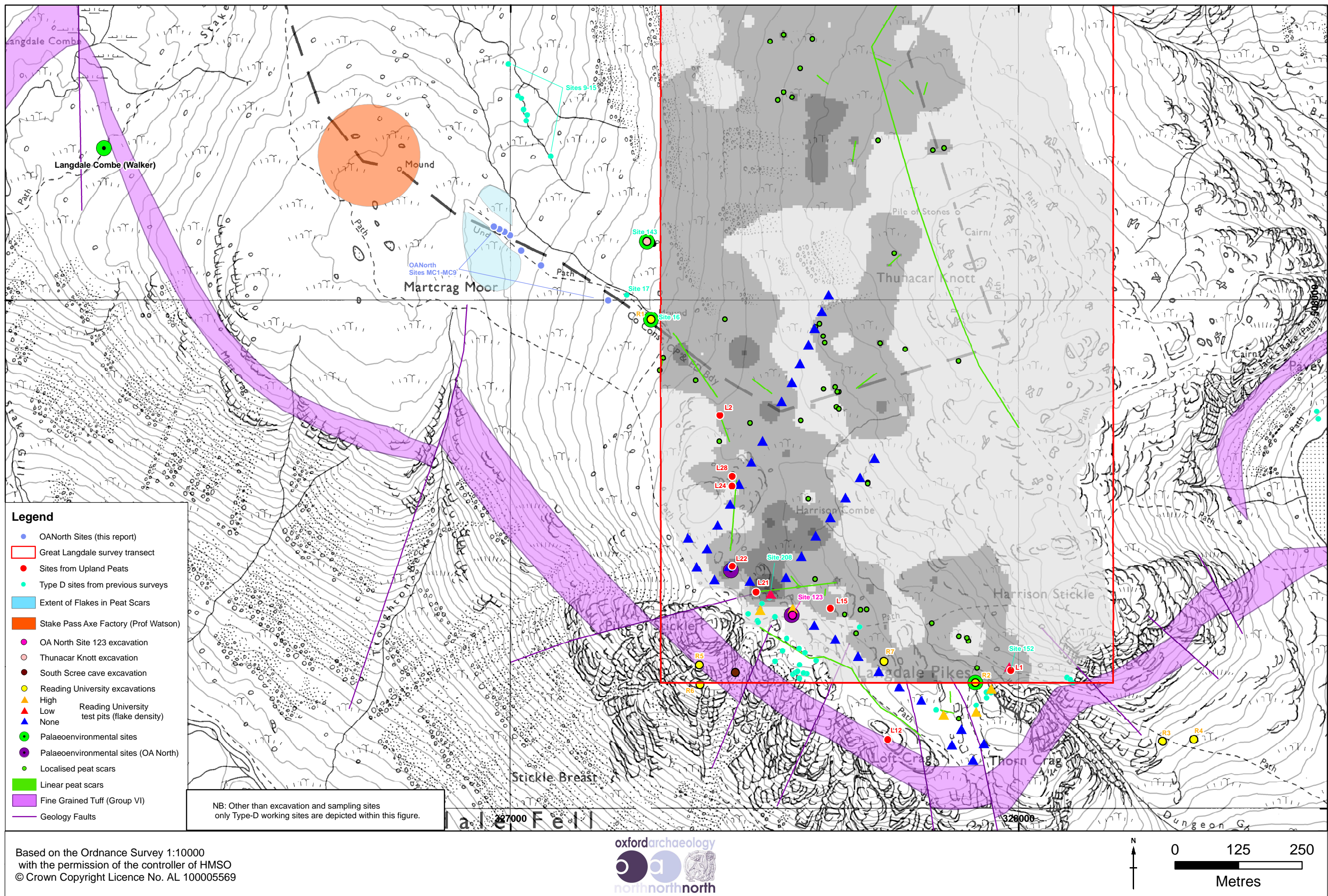


Figure 15: Martcrag Moor sites in context with previously surveyed Type D sites, excavated sites, test pits and palaeoenvironmental sites at Great Langdale, superimposed on extrapolated peat depths



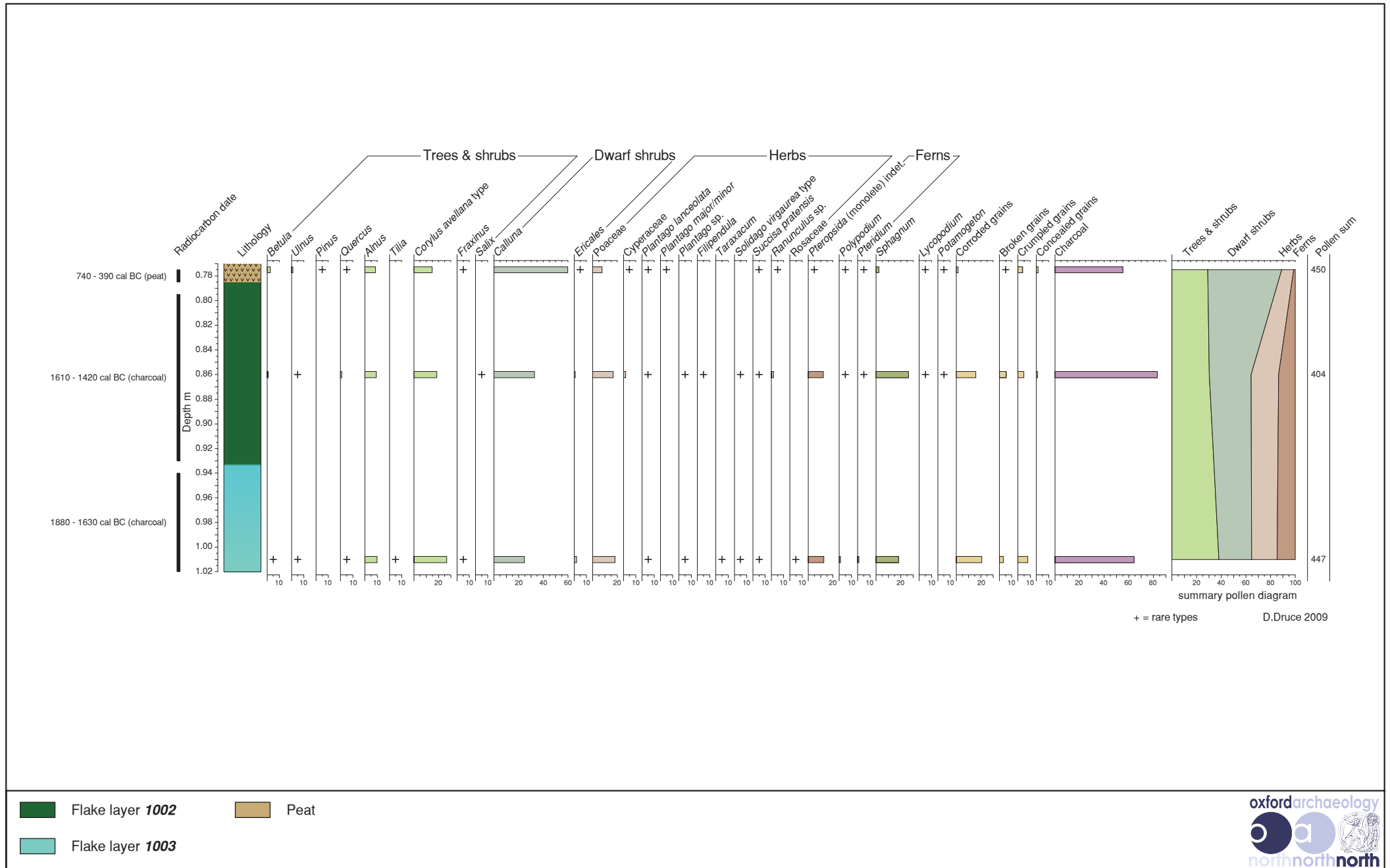


Figure 16: Pollen diagram from Martcrag Moor, site MC1, section 1

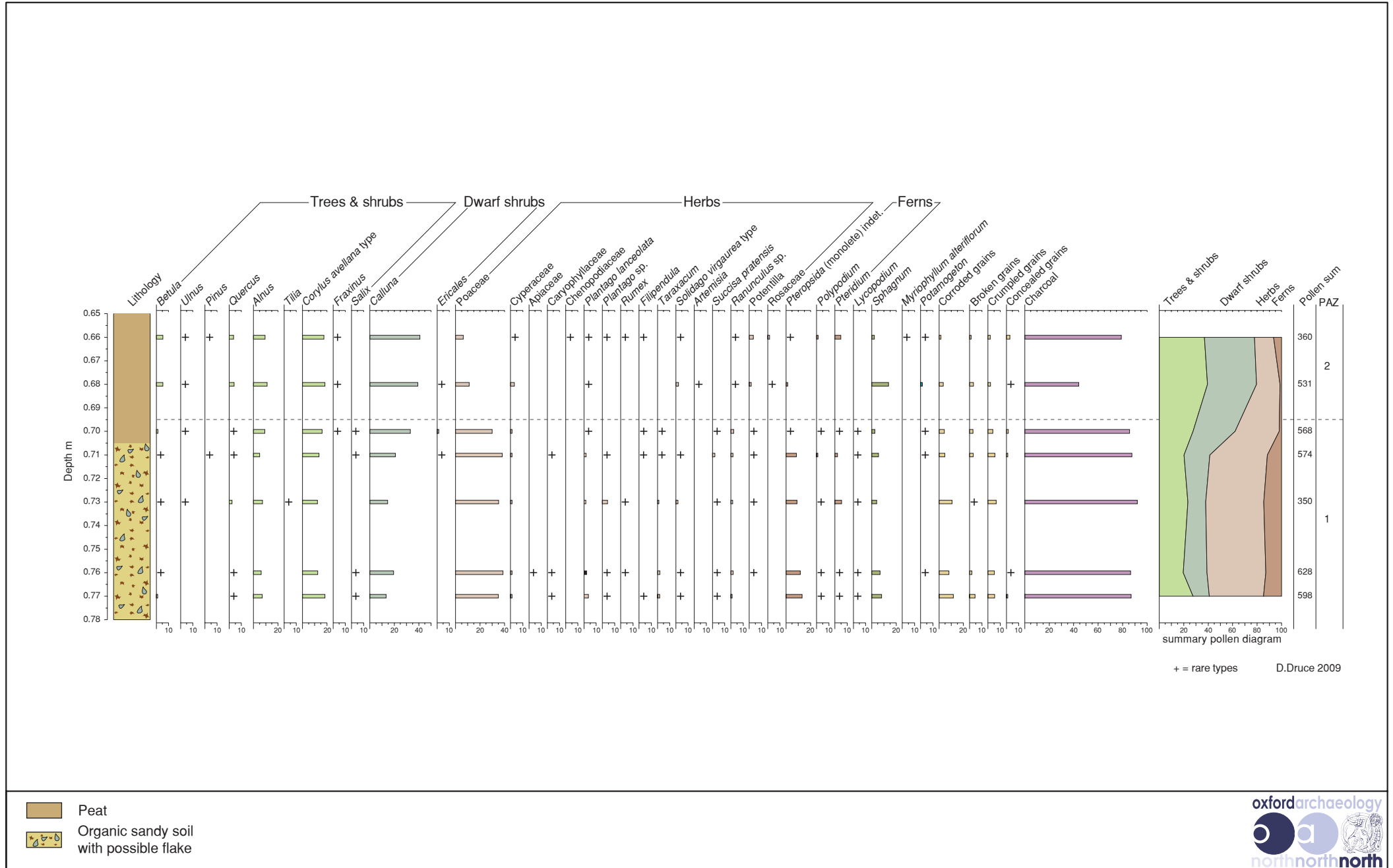


Figure 17: Pollen diagram from Martcrag Moor, site MC1, section 2



Plate 1: General view of footpath erosion on Martcrag Moor looking south-east



Plate 2: Exposed axe working site (MC 1) looking south-east





Plate 3: Four rough-out axes exposed at axe working site (MC1) looking south



Plate 4: General view of the two sections recorded at axe working site (MC1) looking south-east





Plate 5: Martcrag Moor (MC1) Section 1, looking south-east



Plate 6: Martcrag Moor (MC1) Section 2, looking north-east





Plate 7: Exposed axe working site (MC 2) looking south-east

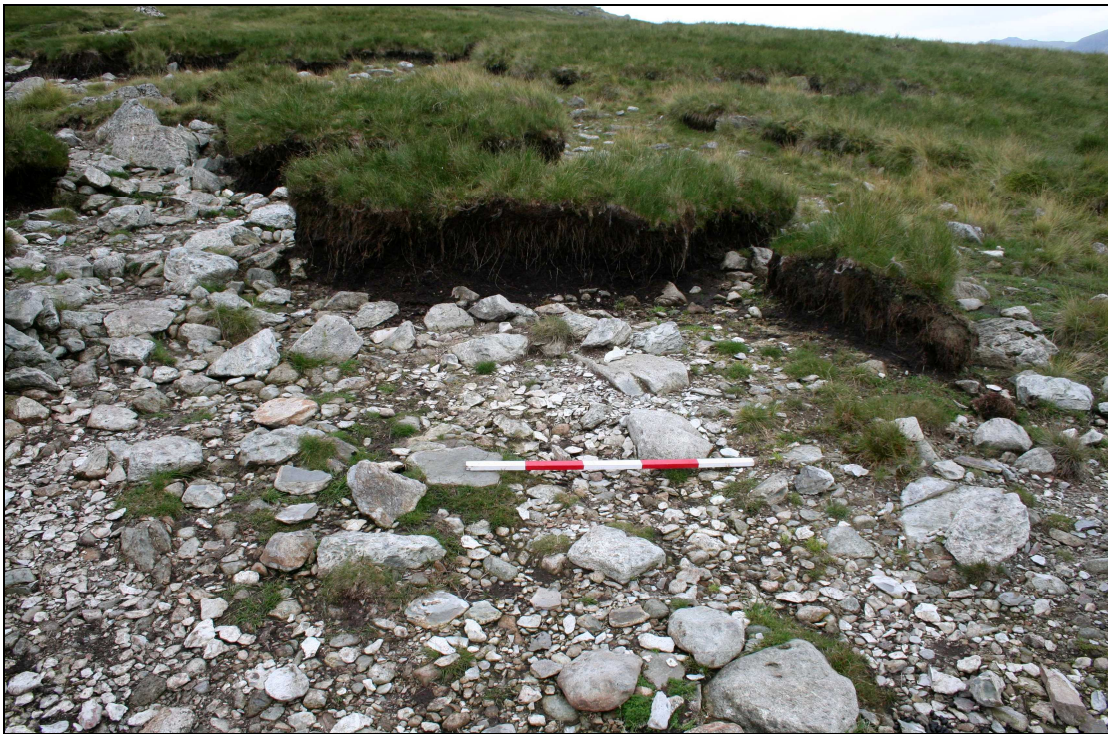


Plate 8: Exposed axe working site (MC 3) looking south





Plate 9: Exposed axe working site (MC 4) looking south-east



Plate 10: Two rough-out axes exposed at axe working site (MC4) looking south





Plate 11: Exposed axe working site (MC 5) looking south-west



Plate 12: Exposed axe working site and cairn (MC 6 and MC 9) looking north-west





Plate 13: Exposed axe working site (MC 7) looking south-east



Plate 14: Detail of axe working site (MC 7) looking south-east





Plate 15: Exposed axe working site (MC 8) looking north-west



Plate 16: Detail of axe working site (MC 8) looking north-east



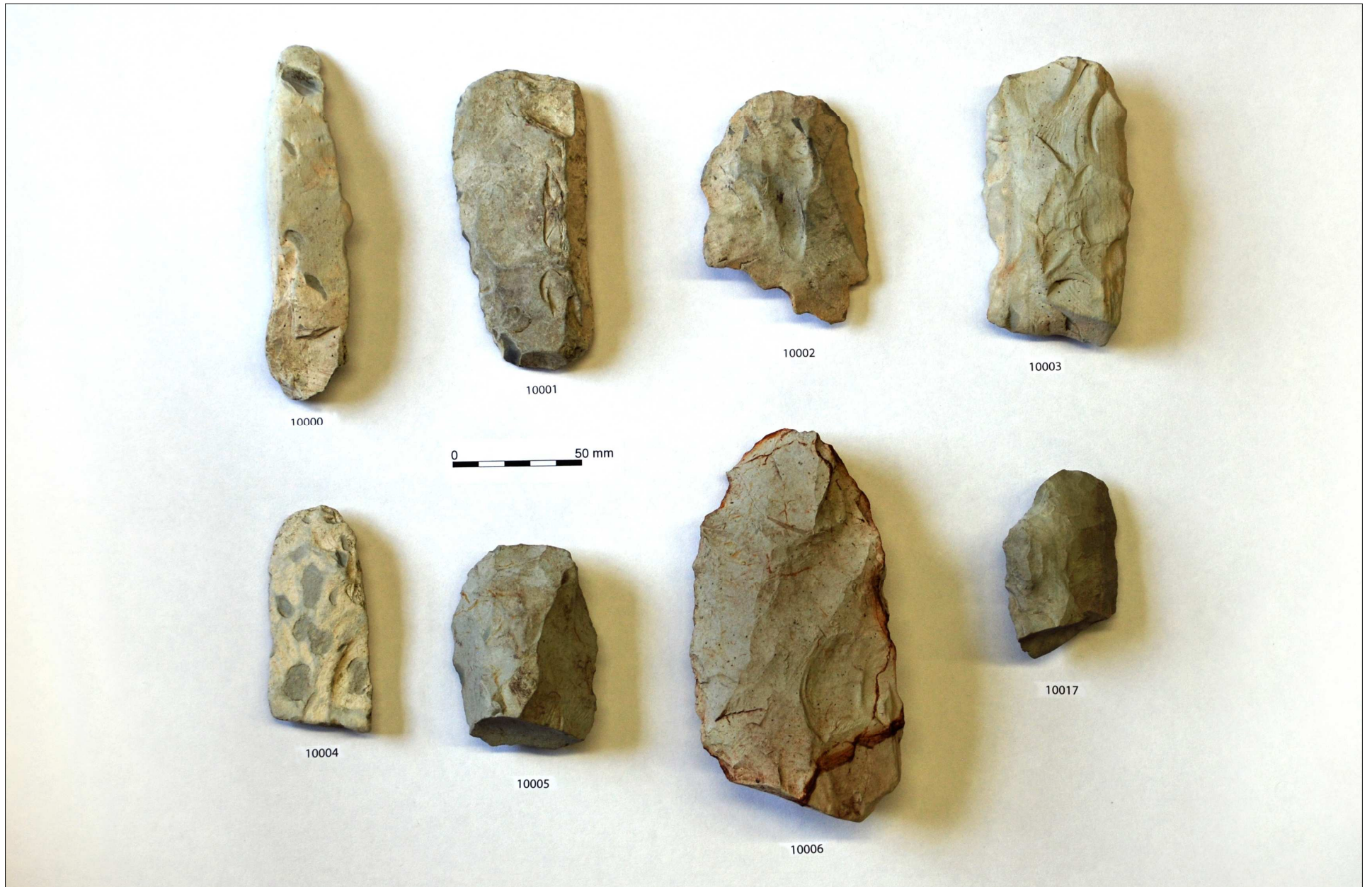


Plate 17: Axe rough-outs recovered from Martrcrag Moor



#### **OA South**

Janus House  
Osney Mead  
Oxford OX2 0ES

t: +44 (0) 1865 263 800  
f: +44 (0) 1865 793 496  
e: [info@oxfordarch.co.uk](mailto:info@oxfordarch.co.uk)  
w: <http://thehumanjourney.net>

#### **OA North**

Mill 3  
Moor Lane Mills  
Moor Lane  
Lancaster LA1 1GF

t: +44 (0) 1524 541 000  
f: +44 (0) 1524 848 606  
e: [oanorth@thehumanjourney.net](mailto: oanorth@thehumanjourney.net)  
w: <http://thehumanjourney.net>

#### **OA East**

15 Trafalgar Way  
Bar Hill  
Cambridgeshire  
CB23 8SQ

t: +44 (0) 1223 850500  
f: +44 (0) 1223 850599  
e: [oaeast@thehumanjourney.net](mailto: oaeast@thehumanjourney.net)  
w: <http://thehumanjourney.net>

#### **OA Méditerranée**

115 Rue Merlot  
ZAC La Louvade  
34 130 Maugeio  
France

t: +33 (0) 4.67.57.86.92  
f: +33 (0) 4.67.42.65.93  
e: [oamed@thehumanjourney.net](mailto: oamed@thehumanjourney.net)  
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**Director:** David Jennings, BA MIFA FSA



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