DALE BECK SMELT MILL, CALDBECK AND ULDALE COMMON, CUMBRIA

Archaeological Survey

Client:
Caldbeck Commoners Association

NGR: 330134 536181

February 2012

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Non-Technical Summary

An archaeological survey of the remains of Dale Beck smelt mill was carried out by Greenlane Archaeology in February 2012 as part of a Higher Level Stewardship scheme (HLS) for Caldbeck and Uldale Common in the northern Lake District. The survey of the mill and its associated features provides an accurate record of the site in its current condition and forms a basis for the future conservation and management of the site.

The general area around the site contains archaeological remains from a number of periods, from the Neolithic onwards, but from at least the medieval period it is dominated by lead and copper mining, although this was carried out against a well-established background of pastoral agriculture. A number of previous studies suggest that the smelt mill was constructed in *c*1849, probably following the taking of the lease on the mines by the Roughtongill Silver, Lead and Copper Mining Co. During a period of perhaps 14 years the mines were very prosperous, but a series of problems, primarily brought about by mismanagement, led to a decline in the mid 1860s. At this timer, perhaps as early as 1866, the former smelt mill was converted into houses for mine workers. The census records that 91 people were living there in 1871, and, perhaps as a result of this massive overcrowding, there were a considerable number of deaths between 1869 and 1874. The cottages were abandoned by at least 1881, and in 1888 the building was converted for use as a barytes works, which remained in operation until 1894, after which the site was effectively abandoned and quickly fell into ruin.

The Level 2 survey recorded the smelt mill and all of the earthworks and other features within a survey area around it. These included a number of other elements, many of which clearly related, directly or indirectly, to the smelt mill, while others represent elements of the semi-natural and agricultural landscape in which it was situated.

A discussion of the phases and working of the site revealed that most can be fitted to the known documentary history, although some reconstruction of the operation of the smelt mill can be made and it is suggested that in order to accommodate the vast numbers of people living at the site, the dwellings built in the 1860s must have been similar in form to back-to-back houses more typical in industrial cities. A consideration of significance of the site suggests that individually few of the sites within the survey area are of great significance, apart from the smelt mill, but collectively they form an interesting and significant group of related features. Suggestions for further management of the site are also presented, based on an assessment of the threats to the site and its likely potential. These include increased information and information for visitors and land users, but also a programme of consolidation, possible further investigation, but at the same time a degree of restricted access to the site. Applying to have the smelt mill and associated features designated as a Scheduled Monument is considered to be potentially a very important step in achieving a greater level of protection and long-term management for the site.

Acknowledgements

Greenlane Archaeology would like to thank the Caldbeck Commoners Association for commissioning the project. Further thanks are due to John Hodgson, Senior Archaeology and Heritage Advisor with the Lake District National Park Authority (LDNPA), for issuing the project brief, and Holly Beavitt-Pike, Archaeology and Heritage Advisor at the LDPNA, for providing information held in the HER, and Rosemary Long, GIS Officer at the LDNPA for providing mapping information. Thanks are also due to Alyson Rogers, Lucinda Walker, and Katherine Bryson, at the National Monuments Record, the staff of the Cumbria Record Offices in Carlisle, Barrow-in-Furness and Whitehaven, North Yorkshire Record Office in Northallerton, Oxford University Museum of Natural History, and Ulverston Library for their help in accessing their sources. Further thanks are due to David Beale and Graham Brookes for providing useful information about the site and Les Gilpin for pointing out a valuable source, Anne and Tim Cartmell for their hospitality and interest in the project, and special thanks are due to Warren Allison for his interest, comments, and support.

The project was managed by Dan Elsworth and carried out by Dan Elsworth and Tom Mace, both of whom also wrote the report. The illustrations were produced by Tom Mace and the report was edited by Jo Dawson.

1. Introduction

1.1 Circumstances of the Project

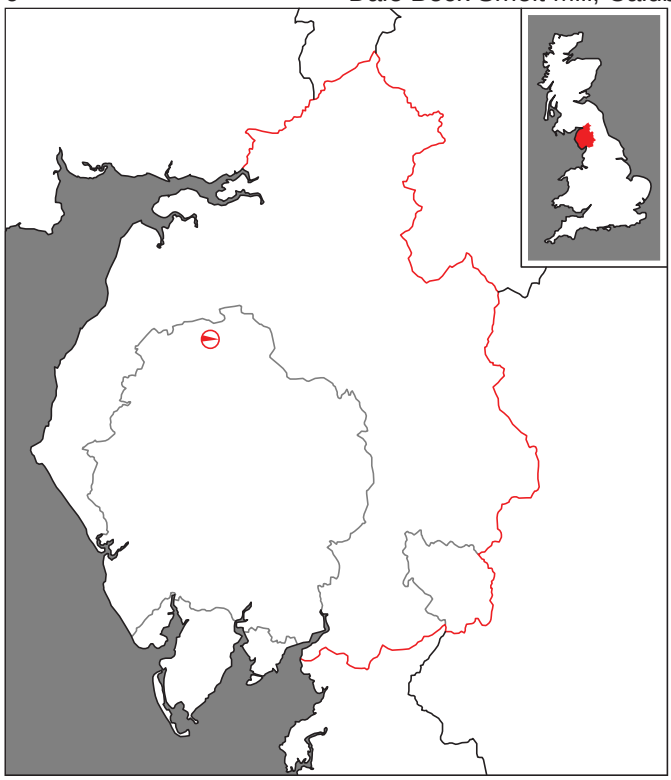
1.1.1 Funding became available through the existing Environmentally Sensitive Area (ESA) for an archaeological survey of the remains of Dale Beck smelt mill (centred approximately on NGR 330134 536181) as part of a Higher Level Stewardship scheme (HLS) for Caldbeck and Uldale Common in the northern Lake District. This survey provides an accurate record of the site in its current condition and forms a basis for the future management and conservation of the site.

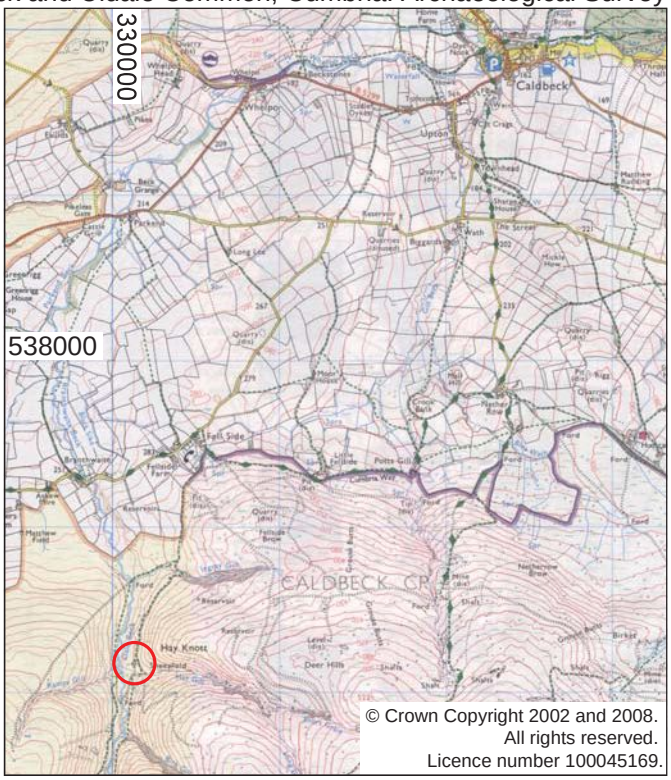
1.1.2 The smelt mill was constructed *c*1850 by the Roughton Gill Silver, Lead and Copper Mining Company and used to smelt lead from the mines in the Caldbeck Fells, although it had gone out of use by 1867 and was subsequently converted into cottages for mine workers (LDNPA 2011). The site was reused from 1887 for processing barites from Potts Gill Mine (ibid). The remains comprise the smelt mill, which was a single storey building *c*20m by 6m, with a free-standing annex at the west end. Two smaller buildings, housing four roasting furnaces, were located at the opposite end and there was a separate smelting furnace attached to a flue, running upslope for *c*150m, associated with which are features relating to water management (ibid).

1.2 Location, Geology, and Topography

1.2.1 The smelt mill lies approximately 875m to the east of Dale Beck on the north-west side of the Caldbeck Fells in the Lake District National Park (Ordnance Survey 2008; Figure 1). The mill is located at approximately 300m above sea level approximately 12.5km north of Keswick in the Cumbria High Fells, roughly equidistant from the market towns of Cockermouth (20km to the west-south-west) and Penrith (22km to the east-south-east) and the city of Carlisle (23km to the north-east) (Figure 1). The area is characterised by smooth and steep-sided glaciated valleys, carpeted in expanses of rough grassland and heather moorland, and has the most rugged mountain scenery in England (Countryside Commission 1998, 31); the site is largely open fell grazing but is crossed by a metalled track (LDNPA 2011).

1.2.2 The underlying solid geology forms part of the Eycott Volcanic Group of Middle Ordovician (Llanvirn) age, which overlies the largely mudstone and siltstone sedimentary rock formations of the Skiddaw Group and is in turn typically overlain by glacial debris, including scree and glacially derived boulder clay (Moseley 1978, plate 1; Countryside Commission 1998, 33). The bedrock contains veins of copper, lead, and zinc among other metals and old quarries and disused mine shafts are characteristic of the surrounding landscape (Countryside Commission 1998, 33; see Figure 1).





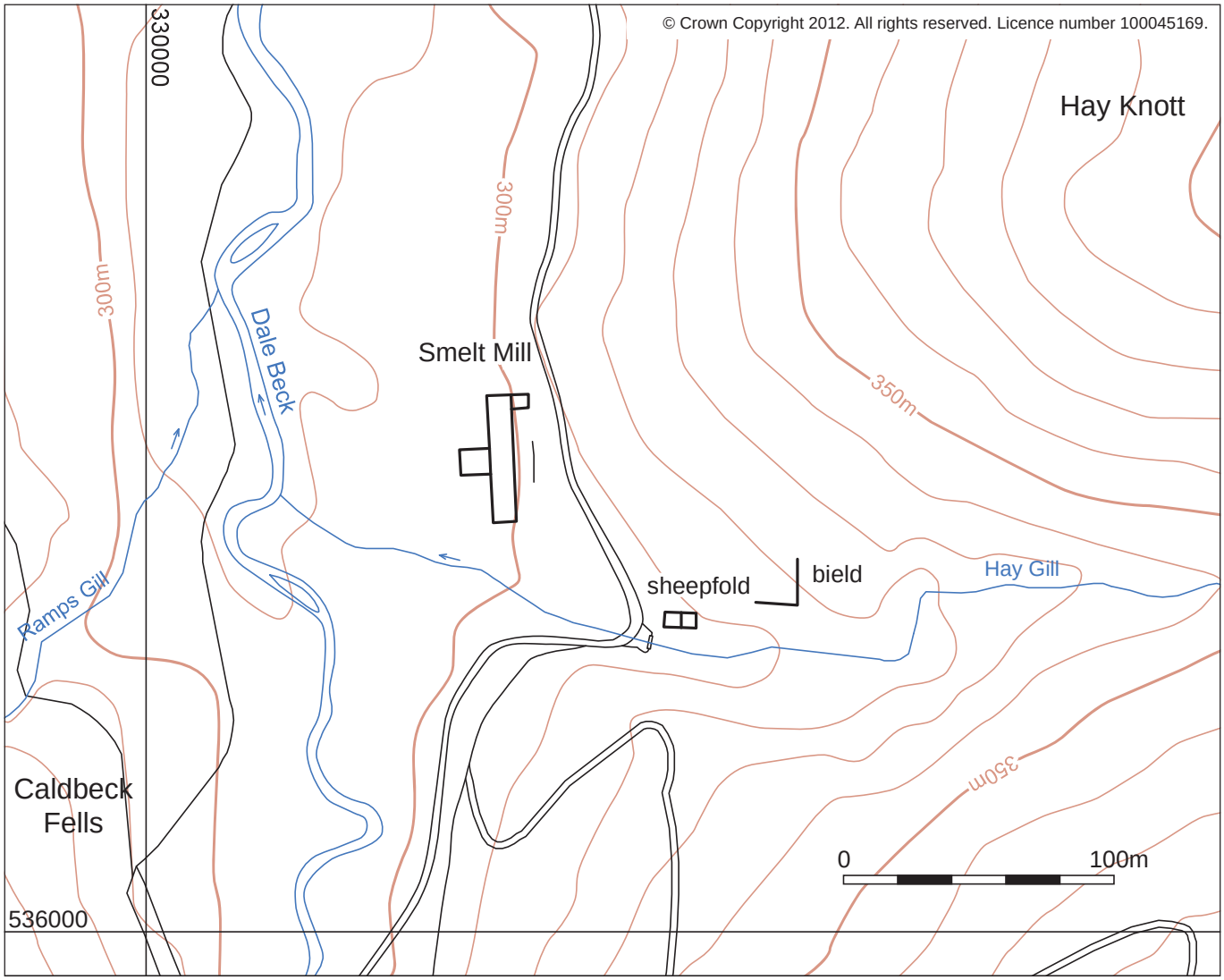


Figure 1: Site location

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2. Methodology

2.1 Introduction

2.1.1 The landscape survey comprised three separate elements, all of which were carried out in February 2012: a desk-based assessment, a rapid Level-1 walk-over survey of the whole site, and a Level-2 survey of the features identified therein. The methodology used for each element of the assessment is detailed below. All of the work was carried out in accordance with the project design, and a suitable archive was compiled to provide a permanent paper record of the project and its results in accordance with English Heritage and IfA guidelines (English Heritage 1991; Brown 2007).

2.2 Desk-Based Assessment

2.2.1 The desk-based assessment was carried out in accordance with the guidelines of the Institute for Archaeologists (IfA 2008a). This principally comprised an examination of early maps of the site and published secondary sources. A number of sources of information were used during the desk-based assessment:

- ***Lake District Historic Environment Record (HER)***: this is a list of all the known sites of archaeological interest within the county, which is maintained by the Lake District National Park Authority (LDNPA) and is the primary source of information for an investigation of this kind. All of the known sites of archaeological interest within 500m of the survey area were examined; each identified site comes with a grid reference, description and source and any additional information which was referenced was also examined as necessary. In addition, unpublished reports of archaeological investigations in the vicinity of the site were examined;
- ***Cumbria Record Office, Carlisle (CRO(C))***: this was visited principally in order to examine early maps and plans of the site, but other documentary sources, and published records were also consulted in order to gather information about the historical development of the site and its environs, and also information about the archaeology of its immediate environs;
- ***National Monuments Record (NMR)***: copies of documents and records held by the NMR relevant to the site, specifically aerial photographs, were obtained. These were generally used to more clearly identify the extent and form of the various elements of the site;
- ***Cumbria Record Office, Barrow-in-Furness (CRO(B))***: this was visited in order to examine relevant secondary sources, although some early maps were also consulted;
- ***Cumbria Record Office, Whitehaven (CRO(W))***: this consulted in order to identify whether any additional maps or sources were available;
- ***Ulverston Library***: a number of secondary sources were consulted here;
- ***Oxford University Museum of Natural History***: this was consulted in order to obtain copies of plans of the area by the geologist William Smith, although these did not prove to be relevant to the site;
- ***North Yorkshire Record Office (Northallerton)***: this has a very large collection of documents relating to the Roughtongill mines, which was too large to examine within the scope of this project, but a copy of one relevant document was obtained in order to inform the historical background;
- ***Individuals***: a number of individuals with an interest in the industrial heritage of the area were also consulted, as detailed in the Acknowledgements section;
- ***Greenlane Archaeology library***: additional secondary sources, used to provide information for the site background, were examined.

2.3 Level 1 Survey

2.3.1 A rapid walk-over survey of the whole site was carried out prior to the more detailed survey being carried out. This was intended to broadly identify the different elements making up the site, as already revealed during the desk-based assessment, as well as identify any elements not already identified. No records were made at this stage although the different elements present were allocated separate numbers.

2.4 Level 2 Survey

2.4.1 Analytical survey, to Level 2-type standards (English Heritage 2007) and in accordance with the guidelines of the IfA (IfA 2008b), was carried out of the structures and earthworks forming the smelt mill and all other features of historical or archaeological interest within the survey area, several of which were not evidently connected to the smelt mill. This is a relatively detailed form of survey, including analysis of the site's development, as well as a record of its core elements (English Heritage 2007, 23), and comprises three types of recording:

- ***Drawn Record***: the topographic features of the site were be recorded using a total station coupled to a portable computer operating TheoLT and AutoCAD, which enabled the production of an AutoCAD .dwg file on site at a scale of 1:1. This was then plotted out at a scale of 1: 200 and detail added through hand-measurement to produce a hard copy drawing in pencil on drafting film. A profile though the monument was also be created through instrument survey but this did not require any further annotation;
- ***Written Record***: descriptive records of the various elements of the monument were made on Greenlane Archaeology *pro forma* record sheets. These records describe their plan, form, dimensions, function and age (where known), and construction materials, and have been used to produce the descriptive account of the monument used in the production of this report (see *Section 5.2* below);
- ***Photographic Record***: photographs in black and white print film and colour digital format were taken. These include both general shots of the monument, showing its topography and general spatial arrangement, especially in relation to other features of interest in the immediate landscape, and detailed shots of individual elements of archaeological interest. A written record was kept of all of the photographs that were taken detailing the direction, size of scale, date, and identity of the photographer. The digital photographs have also been used for illustrative purposes within the report.

2.5 Archive

2.5.1 A comprehensive archive of the project has been produced in accordance with the project design (see *Appendix 2*), and current IfA and English Heritage guidelines (Brown 2007; English Heritage 1991). The paper and digital archive and a copy of this report will be deposited in the Cumbria Record Office in Carlisle on completion of the project. Three copies of this report will be provided for the client, one for the HER, and a copy will be retained by Greenlane Archaeology. In addition a record of the project will be made on the OASIS scheme.

3. Results

3.1 HER Sites

3.1.1 A total of 31 sites of archaeological interest already recorded in the HER were present within the study area, as defined in *Section 2.2* above (summarised in Table 1 below), typically of medieval and post-medieval date, although some are uncertain. Of these, HER site 11108 relates to the smelt mill subject to the detailed survey. A summary of the sites recorded in the HER within the study area is presented in Table 1 below while the sites recorded during the detailed survey are described in *Section 5*.

HER Site No.	Name	NGR	Type	Period
878	Ellerbeck Common Dyke	328900 538150	Dyke (defence)	Medieval
8943	Fell Side - North Quarry	330800 538150	Quarry	Uncertain
8976	Caldbeck, Fellside Farm Broad Ridge and Furrow	330430 537330	Broad ridge and furrow	Medieval
8984	Deer Hills North Mining Remains	331260 536530	Bield and mine	Uncertain
8987	Short Grain Headwaters Stock Enclosure	331570 535730	Stock enclosure	Modern
8988	Short Grain Enclosure	331290 535880	Enclosure	Uncertain
8989	Stone Grain - North Bield	331080 535940	Sheep fold and bield	Uncertain
8990	Long Grain Enclosure	331070 535720	Enclosure	Uncertain
8991	Hay Gill Enclosure	330500 536100	Enclosure	Uncertain
8992	Caldbeck Enclosure	330830 537500	Enclosure	Uncertain
8998	Bield on Caldbeck Fells	331420 536640	Bield	Uncertain
8999	Low Fellside Quarries	331030 537100	Quarry	Uncertain
11011	Ramps Gill south Mining Remains	329850 535700	Mine	Post Medieval
11096	Fell Side Quarry	330920 538170	Quarry	Post Medieval
11106	Fellside Brow Quarry	331040 537100	Quarry	Post Medieval
11107	Potts Ghyll Dismantled Railway	332020 537150	Railway	Post Medieval
11108	Dale Beck Lead Smelt Mill	330150 536190	Smelt mill	Post Medieval
11109	Potts Ghyll Mines	331900 536400	Lead mine	Post Medieval
12421	Hay Knott Mine Levels	330300 536100	Mine	Post Medieval
12422	Hay Knott Level	330650 536030	Mine	Uncertain
12423	Fell Side Pit	330500 537150	Mine	Uncertain
17944	Hay Gill Copper Mine, Caldbeck	330800 535900	Copper mine	Post Medieval
30641	Branthwaite Beck, Branthwaite, Ridge and Furrow	329960 538000	Ridge and furrow	Uncertain
30814	Stack Stands, N. Nether Row	332320 537860	Stack stand	Uncertain
30815	Stack Stands, S. Nether Row	332300 537785	Stack stand	Uncertain
30941	Mine at Ineray Gill, Caldbeck	330190 536520	Mine	Post Medieval
30941	Mine at Ineray Gill, Caldbeck	330190 536520	Mine	Post Medieval
32591	Old Potts Gill Copper Mine	331838 537035	Mine	Post Medieval
32693	Clay Gap Field System, Caldbeck	329299 538266	Ridge and furrow	Medieval
32694	Branthwaite Field System, Caldbeck	329609 537780	Ridge and furrow	Medieval
32695	Branthwaite Field Boundary, Caldbeck	329536 537756	Field boundary	Post Medieval

Table 1: Summary of archaeological sites recorded in the study area by the HER

3.2 NMR Sites

3.2.1 A further 11 sites are also recorded by the NMR, two of which (1311814 and 1311853) comprise elements forming parts of the smelt mill and a number of which are evidently the same as those also recorded by the HER. All of these sites were recorded as part of large scale landscape mapping projects carried out by English Heritage (in particularly EH 2000a but also EH 2000b), although many were presumably already known, including the smelt mill. Basic documentary research such as the examination of early maps was also evidently carried out as part of these projects. In addition the track

running through the survey area and up Dale Beck towards the mines (1344508) was recorded in a similar manner.

NMR Unique Identifier	Name	NGR	Type	Period
1311634	Birk Gill	33040 53550	Mines	Post-medieval
1311652	Brae Fell	32980 53367	Mines	Post-medieval
1311711	Birk Gill	33047 53549	Mine level or trial	Post-medieval
1311814	Hay Gill	33013 53618	Smelt mill	Post-medieval
1311853	Hay Gill	33013 53618	Baryte dressing plant	Post-medieval
1321647	Hay Gill	330258 53609	Mine level	Post-medieval
1343856	Birk Gill	33015 53573	Mine level	Post-medieval
1344508	Dale Beck Valley	33000 53500	Road	Post-medieval
1350430	Caldbeck	33040 53647	Prospecting trenches	Post-medieval
1352401	Caldbeck	32966 53633	Peat cutting	Post-medieval
1352405	Caldbeck	32987 53602	Hush	Post-medieval

Table 2: Summary of archaeological sites recorded in the study area by the NMR

3.3 Level 1 Survey

3.3.1 Within the survey area 13 individual sites were identified during the initial Level 1 survey, some of which were already recorded by the HER and NMR as being elements of the smelt mill. These 13 sites were then subsequently subject to Level 2 recording. Some of these are evidently directly associated with the smelt mill but others are apparently unrelated.

3.4 Discussion

3.4.1 In general the sites that are already recorded within the study area reflect the two major factors that have shaped the local historic environment; upland agricultural practices, most probably primarily sheep farming, and mining, largely for lead. Both of these activities are likely to have their origins in the medieval period at least, although the surviving remains are primarily post-medieval in date. A discussion of the wider history of the environs, which puts these remains in their local context, is presented in *Section 6*.

4. Desk-Based Assessment Results

4.1 Introduction

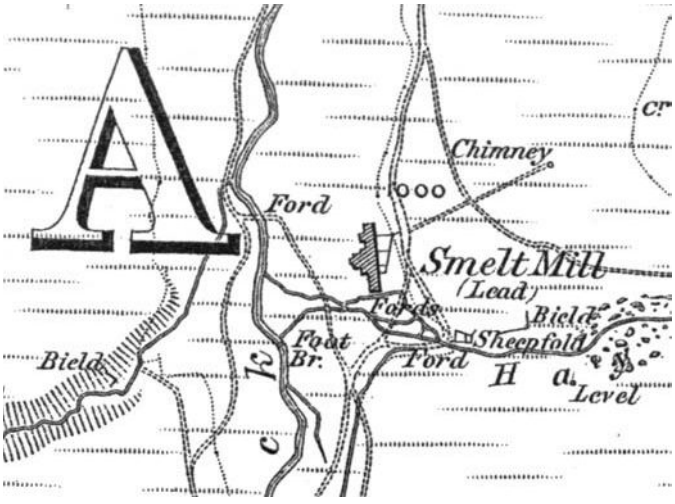
4.1.1 The results of the desk-based assessment have been used to produce two separate elements. Firstly details of all the sites of archaeological interest already recorded within the study area were collected (these are summarised in *Section 3*). This information was utilised to better understand the history of the survey area and put it in context, and, in turn, the information relating to sites that had already been recorded that were within the survey area was enhanced during the more detailed Level 1 and Level 2 surveys.

4.1.2 The second purpose of the desk-based assessment was to produce a background history of the site. This is intended to cover all periods, in part to provide information that can be used to assess the significance of the site in its wider historical and archaeological context, but more importantly to present the documented details of any sites that are known (see *Section 6*).

4.2 Map Regression

4.2.1 ***Introduction***: a number of early maps and plans of the site were examined to see the way in which the site has developed over time and the nature of the structures within its different parts as well as providing specific detail about certain elements. The site is not shown on Donald's 1774 map of Cumberland; the earliest known map to show any real detail of the area are the Ordnance Survey maps 1867, which were surveyed in 1863.

4.2.2 ***Ordnance Survey, 1867***: although the 1: 10,560 scale map limits the amount of detail that can be shown it reveals a number of important details about the mill and the surrounding area (Plate 1). The main north/south aligned section of the smelt mill is clearly marked; the structure has various jutting sections along its west side and various sections of flues are shown leaving the east side of the building and connecting to a single flue leading to a chimney in a field some distance to the north-east of the main site. There are various fords, paths and footbridges shown to the west and south sides of the mill and a sheepfold and bield (shelter) are located to the south-east. Similar detail is shown on a *c*1867 Ordnance Survey map at a scale of 1: 2,500 (Plate 2). The smelt mill building is labelled '27' but none of its internal divisions are shown.



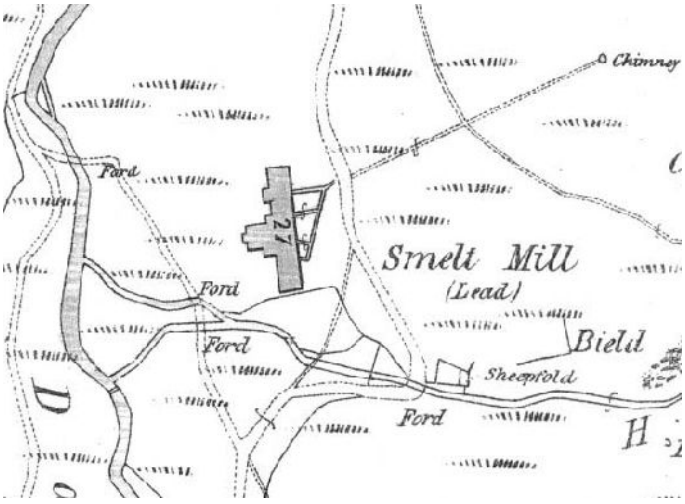


Plate 1 (left): Extract of Ordnance Survey map of 1867

Plate 2 (right): Extract of Ordnance Survey map of *c*1867

4.2.3 ***Ordnance Survey, 1900***: the smelt mill is shown but labelled as disused by 1900 (Plate 3) and neither the chimney nor the various flues or channels which previously entered the east side of the mill remain. Some of the minor fords and footpaths are no longer marked, presumably because they have fallen out of use, although some of the others are shown. The shape of the mill appears simplified: it now

only has a single jutting section to the south of centre on the west side, and there is a jutting section to the north end on the east side, which was not present on the earlier edition of the Ordnance Survey mapping *c*1867.

Plate 3: Extract of the Ordnance Survey map of 1900

4.2.4 ***Ordnance Survey, 1957***: this was the next available map after that of 1900. It is very small in scale and as a result shows little of interest, but it is notable the smelt mill is not even depicted at this date.

4.3 Previous Investigation

4.3.1 The smelt mill has not been previously examined in detail, although several historians have made reference to it (see *Section 6.5*). Survey work has been carried out in the area immediately around the site by English Heritage (2000a; 2000b) but this included only limited investigation and recording of the smelt mill and its environs (see *Section 3.1*). An archaeological desk-based assessment, walk-over survey, and watching brief were also carried out in the vicinity of Hesket Newmarket and Caldbeck (OA North 2002a), but this is also of little relevance to the site or study area.

4.4 Aerial Photographs

4.4.1 Copies of relevant aerial photographs, both vertical and oblique, held by the NMR were obtained and examined in order to further identify elements of historical and archaeological interest present within the survey area. The most detailed of these are a series of oblique views taken by the NMR in 2000, presumably as part of English Heritage's survey work at that time (NMR 2000). These show the entire site much as it presently is and do not show any additional detail of particular interest, apart from a narrow linear feature (perhaps a track) running from the east end of the flue, where the chimney would have been, to towards the south-east. Another, vertical, photograph from 1995 (Ordnance Survey 1995), again provides little additional detail, although it suggests that the main part of the smelt mill was in a similar condition to its present state. The site can also be seen in its wider context, with additional tracks evident as earthworks running to the north and south and the additional leat running from the south where it met Dale Beck to where it meets the current track (see *Section 6.5.2*). Vertical photographs from the 1970s (Ordnance Survey 1970; 1973) show much of the same detail; it would appear that the walls of the smelt mill were standing to a greater height at this point, although it was still essentially ruinous. The earliest aerial photographs to be of any use in examining the site are verticals from 1953 (RAF 1953). These seem to indicate that the walls of the smelt mill were surviving to a much greater extent at this time, although the scale makes detailed interpretation difficult.

5. Survey Results

5.1 Level 2 Survey

5.1.1 The Level 2 survey, which was carried out between the 13th and 15th February 2012, primarily resulted in the detailed topographic plan and profile of the structures and earthworks comprising the smelt mill and its environs, as shown in Figure 2 and Plate 4. In addition, the written descriptions made during the survey provide a further descriptive account of the various elements.

Plate 4: General view of the survey area, from the east

5.1.2 The initial Level 1 survey had identified 13 principal elements within the study area, only some of which obviously related directly to the smelt mill. These are each described below.

5.1.3 ***Site 01***: this comprises a relatively flat terrace at the bottom of the valley adjacent to Dale Beck, which is to the west. Alongside the beck it forms a bank at least 2m tall (Plate 5), which turns back on itself towards the south-east. At this point a narrow trench cuts through it, orientated approximately north-west/south-east, which is evident as a patch of reeds but remaining as a 1m wide and 0.7m deep channel that peters out to the south-east (Plate 5). This is presumably a hollow way, and is augmented by a further shallow channel to the north, orientated east/west at the north-west end running between the beck and **Site 05**.

Plate 5 (left): The bank along the side of Dale Beck forming the west side of Site 01

Plate 6 (right): The hollow way, evident as a patch of reeds, within Site 01, viewed from the south-east

5.1.4 ***Site 02***: this comprises a short weir forming a ford across Hay Gill. It is presumably of stone construction – the front (west) face is obscured by moss and flowing water, while the top is finished with gravelly concrete (Plate 7). It is *c*1m tall and 2m wide and has some upright timbers at the base against it (Plate 8), although these too were obscured by moss.

Plate 7 (left): The weir (Site 02), viewed from the south

Plate 8 (right): The weir (Site 02), viewed from the west

5.1.5 ***Site 03***: this forms the remains of what is evidently a former river channel, comprising a tall bank on the south-east side, over 2m tall (Plate 9), and shallower bank to the north-west, closer to 1m tall. The resulting channel is *c*4-5m wide. There is no evidence of how it originally connected to the extant Hay Gill, and the ground is relatively high were they meet, suggesting that it has been deliberately blocked.

Plate 9 (left): The south-east side of the former channel (Site 03), viewed from the north-east

Plate 10 (right): The return of the terrace (Site 04), viewed from the north-west

5.1.6 ***Site 04***: this is an upper terrace above (east) of **Site 01**. It too is formed by an approximately L-shaped break of slope, orientated approximately north/south and east/west, merging into the semi-natural ravine (**Site 05**) and features relating to the smelt mill (**Site 07**) to the east. The bank is up to 2m tall (Plate 10) and there is a collection of large boulders at the base of the north/south section.

5.1.7 ***Site 05***: this is essentially a natural ravine formed by a tall slope to the north ranging from less than 1m high to the west and up to 5-6m high to the east. The south side is essentially formed by elements of **Sites 01, 04** and **07**. There is a slight turn to the north mid-way along the north slope and at the base of the slope there are amorphous piles of material, perhaps representing slumps or even landslides. Beyond these, to the south and south-west, it is very boggy, perhaps a remnant of the tail race from the wheel pit to the east.

Plate 11 (left): The north/south face of the upper terrace (Site 04)

Plate 12 (right): General view of the ravine (Site 05) from the west

5.1.8 ***Site 06***: this is an amorphous earthwork of uncertain purpose and date. It comprises a central section of apparently orthostatic wall, *c*3m long and 1m thick, orientated north-south, with a slight return to the east at its south end. Up to three courses (0.8m) of this wall remain standing, which includes some very large boulders (Plate 13 and Plate 14), and it appears to continue as an earthwork to the south and south-east, where there are further large boulders; indeed, there are considerably more boulders in this area than anywhere else on the site (Plate 15). The whole structure covers an area of approximately 6m in diameter and it is no more than 1m tall (Plate 16).

Plate 13 (left): Orthostatic walling forming part of Site 06, viewed from the east

Plate 14 (right): Walling forming part of Site 06, from the north

Plate 15 (left): General view of the eathworks and boulders making up Site 06, viewed from the north-west

Plate 16 (right): General view of the walling and eathworks making up Site 06, viewed from the east

5.1.9 ***Site 07***: this comprises the structure of the actual smelt mill, which survives essentially as earthworks and collapsed rubble (Plate 17) but has some sections of standing wall bonded with a gritty lime mortar. Bricks of various types are evident within the rubble, the most common forms being hand-made perforated bricks of orangey-red colour (at least one waster or badly warped example of these was also present), firebricks in gritty vitrified orange and yellow clay, some evidently hand-made but some with frogs (with an illegible maker's mark) and many with vitrified surfaces and some little more than tiles, and standard hand-made red bricks. One of the yellow firebricks was marked 'TICKLE' (Plate 18); these are thought to have been made by William and George Tickle who were based at Birkby in the 1860s-1870s and Cumwhinton in the 1870s (Davies and Davies 2011, 16). In addition, dressed stone of various sizes was present amongst the rubble, typically in red, pink or yellowish sandstone, often in the form of slabs, but also some large blocks with broaching and cross-broaching. A large slab of red sandstone in the deeper pit (probably the early wheel pit) to the north had the remains of a circular hole cut into it, and was presumably part of the bearing for the water wheel's axle or served some similar function (Plate 19). Some fragments of grey roofing slate are also present amongst the rubble to the north of the building.

Plate 17 (left): General view of the smelt mill (Site 07) from the north-east

Plate 18 (right): Selection of typical bricks from the rubble of the smelt mill (Site 07): top: firebrick marked 'TICKLE'; top-left: orange firebrick with frog; top-right; red hand-made brick; bottom-left: firebrick tile; bottom-right: perforated red brick

Plate 19: Dressed sandstone slab with a round hole, probably for an axle bearing in the rubble of north of the smelt mill (Site 07)

5.1.10 The main section is rectangular and orientated north/south (Plate 20 and Plate 21) between the ravine (**Site 05**) to the north and the slope to the south, with a small projection from the centre of the west side, and another from the north end of the east elevation, which extends up the slope towards the track. The north end drops into a deeper hollow forming part of **Site 05**, which was evidently the location of the wheel pit. The walls of the main rectangular section are typically difficult to identify amongst the rubble, but there are sections in the centre that stand to *c*1m tall, with two to three courses of masonry visible (although more must be hidden by the collapsed rubble). The standing section to the west has one side of an evident aperture visible as two courses of well-dressed quoins (Plate 22). To the south of these a large slab of uncertain function is built into the wall, and to the north what is probably the jamb opposing the quoined opening is evident with the aperture, which originally must have been approximately 1m wide, thus obviously blocked. The standing wall to the east also has the line of a jamb for an opening evident, although the opposing side is not visible (Plate 23). The centre of the building

area has a number of low 'platforms' surviving as earthworks, varying in size and typically standing less than 0.3m high.

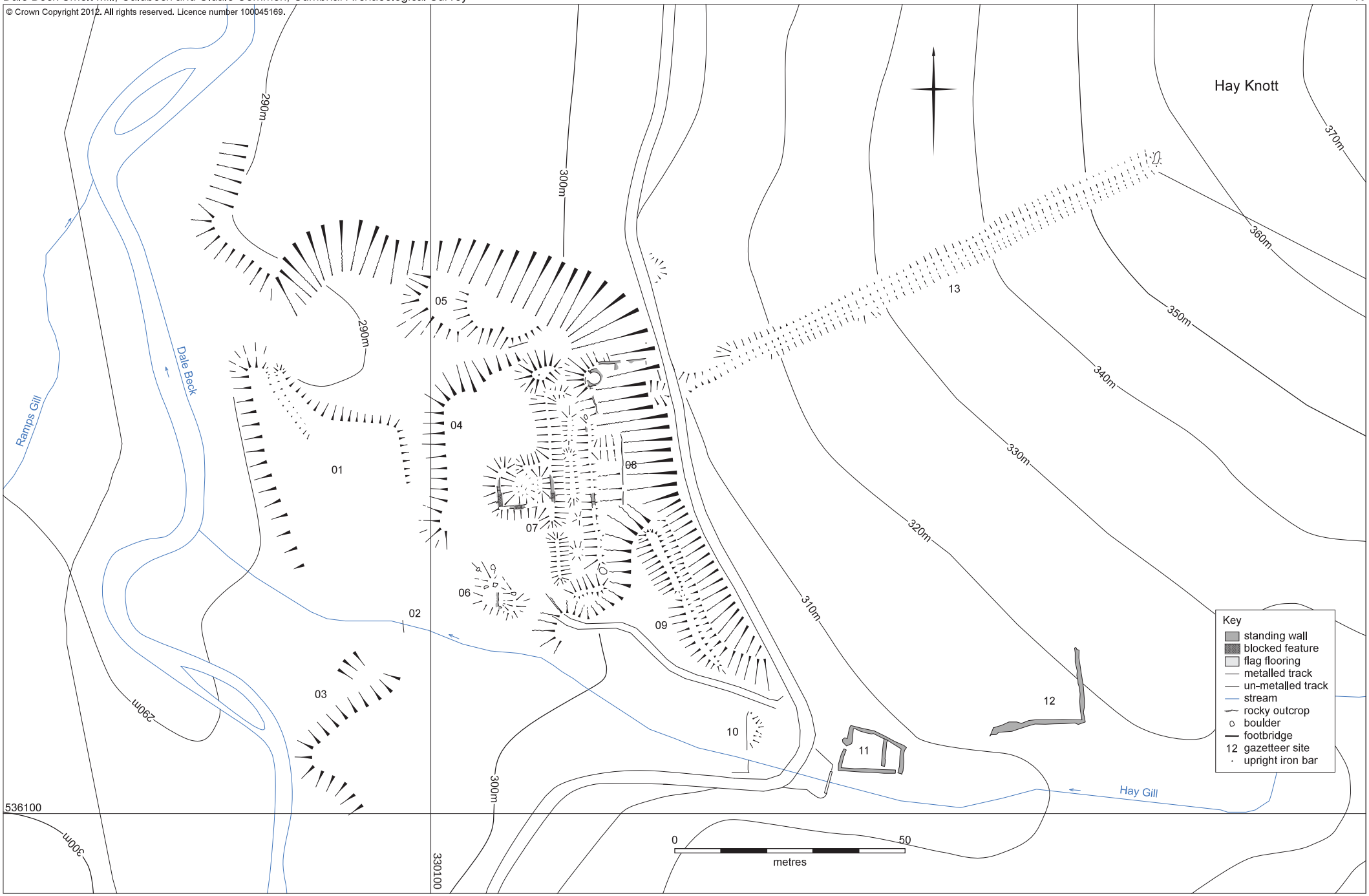
Plate 20 (left): General view of the main section of the smelt mill (Site 07), viewed from the south

Plate 21 (right): General view of the main section of the smelt mill (Site 08), viewed from the north

Plate 22 (left): Quoins denoting opening in the standing walling in the west side of the main part smelt mill (Site 07), viewed from the east

Plate 23 (right): Blocked opening evident in the standing walling in the east side of the main part of the smelt mill (Site 07), viewed from the west

5.1.11 Immediately west of the probable wheel pit to the north a short section of wall remains, perhaps forming part of the tail race. It is *c*2m long and two courses are visible. The wheel pit is otherwise totally choked with masonry, including some very large fragments, although there is much finer scree up the slope to the east. Within the rubble to the south-west of the wheel pit a large iron bar 1m tall is stood upright (Plate 24); the lower half is square in section while the upper is round and has the remnants of a screw thread at the top. At the top of the slope to the east another iron bar or bolt is just visible projecting through the turf, with a flat square head (Plate 25).



Client: Caldbeck Commoners Association

Figure 2: Survey of the Dale Beck Smelt Mill

Figure 3: Detailed plan of the Smelt Mill

Client: Caldbeck Commoners Association

Plate 24 (left): Iron barn in rubble adjacent to wheel pit, viewed from the south

Plate 25 (right): Iron bolt inserted in the ground to the east of the wheel pit, viewed from the north-east

5.1.12 The western extension to the main part of the building has sections of standing wall at the west end and on the south side, and an opening in the rubble delineating the north wall, perhaps a doorway. The west wall has up to five courses remaining (slightly less than a maximum height of 1m), within which the jambs of an opening, *c*1.2m wide, are visible on the south side while to the north the top of an extant but very low opening with an arched top (perhaps a fireplace) is visible (Plate 26). The full width of this opening is uncertain but it is at least 0.5m wide; both of these openings have been blocked. The southern section of walling has up to six courses standing (again approximately up to 1m tall), and the jambs of an aperture *c*1.2m wide and blocked with stone are visible within it (Plate 27).

Plate 26 (left): Standing walling at the west end of the west extension of the smelt mill (Site 07) with the arched opening visible, viewed from east

Plate 27 (right): Standing walling in the south side of the west extension of the smelt mill (Site 07), viewed from the north

5.1.13 The extension at the north end of the east elevation climbs up the steep slope. Although some sections of walling survive to a considerable height, the overall plan of this part of the building is generally difficult to discern. The lowest section comprises a large round tank, built of dressed stone but mostly lined with brick internally and finished with a skim of concrete (Plate 28). The scar of a pipe, preserved in the mortar, projects from its base on the south-west side (Plate 29) and there are remnants of possible flag flooring to the south, although this is very poorly preserved. To the east are further sections of walling, the most substantial forming the north wall of this extension, orientated east/west and standing up to 2m tall, with a short return to the south at its east end and two low retaining walls to the north. Further low sections of north/south orientated wall are present to the east, with small sections of possible associated flooring.

Plate 28 (left): Interior of the round section in the east extension to the smelt mill (Site 07) showing the brick lining, viewed from the north-west

Plate 29 (right): Walling forming the south side of the round section in the east extension to the smelt mill (Site 07) showing the pipe, viewed from the south-west

Plate 30 (left): Standing wall along the north side of the east extension to the smelt mill (Site 07), viewed from the south-west

Plate 31 (right): Standing wall along the north side of the east extension to the smelt mill (Site 07), viewed from the north-west

5.1.14 ***Site 08***: this forms a low retaining wall built against the slope to the east of the smelt mill (**Site 07**). It is orientated approximately north/south and stands up to six courses (0.7m high). There is a missing section in the centre and the north and south ends disappear into the slope. There is an exposed section of bedrock to the north of the north end of the wall, comprising a thin band of laminated orangey-red sandstone.

Plate 32 (left): Retaining wall (Site 08), viewed from the north-west

Plate 33 (right): Bedrock exposed to the north of Site 08, viewed from the north-west

5.1.15 ***Site 09***: this comprises a large bank with a ditch to the east, which, along with the slope to the east, forms a water channel linking to the dam to the south (**Site 10**), where there must have originally been a pond. The bank is up to 1m tall and 2m wide at the base, with a broken section near the centre (perhaps erosion caused by sheep?) (Plate 34 and Plate 35). It peters out at both the north and south ends.

Plate 34 (left): Bank and ditch forming Site 09, viewed from the south

Plate 35 (right): Bank and ditch forming Site 09, viewed from the north

5.1.16 ***Site 10***: this is the former dam across Hay Gill, which comprises a thick wall with up to five courses (1m) surviving, including some very large stones (Plate 36), although it is broken through in the centre where the water flows through (Plate 37). The north end is backed by an earth bank 2m thick, while the south end turns to the west where it forms a revetting wall against the track.

Plate 36 (left): Walling forming the dam (Site 10), viewed from the north-west

Plate 37 (right): Walling forming the dam (Site 10), viewed from the west

5.1.17 ***Site 11***: this is an extant sheepfold, of drystone construction and evidently well-maintained, the long axis of which is orientated approximately east/west. The walls are typically of eight or nine courses (1m) tall (Plate 38), although it is built into the slope on the north side. It is an irregular quadrilateral in plan, with a wall dividing it into two unequal compartments (Plate 39), and there are doorways in the south-east corner, the centre of the west wall, and at the south end of the internal wall.

Plate 38 (left): Sheepfold (Site 11), viewed from the west

Plate 39 (right): Sheepfold (Site 11), viewed from the north-east

5.1.18 ***Site 12***: this is a partially ruined bield to the east of the sheepfold (**Site 11**). The walls are up to 1m tall (seven to eight courses) and it is a slightly irregular L-shape in plan, one arm approximately north/south the other east/west (Plate 40).

Plate 40 (left): Bield (Site 12), viewed from the west

Plate 41 (right): Flue (Site 13), viewed from the top of the slope to the east

5.1.19 ***Site 13***: this comprises the remains of the flue running from the former smelt mill (**Site 07**) up the steep slope to the east (Plate 41). It survives only as a shallow ditch approximately 1m wide and less than 0.3m deep, with a slight bank on either side. At the top it terminates at an approximately circular end with some rubble but no real evidence for the footings of the chimney (Plate 42). Immediately east of this is a large and apparently natural boulder (Plate 43). Running away from this boulder on a north-west/south-east alignment, is a shallow depression in the grass forming a linear feature, presumably the remnants of a track (see *Section 4.4*). The west end of the flue widens slightly where it meets the track

and is evident on the other side of this, but wider still and slightly less regular, where it almost meets the smelt mill (Plate 44).

Plate 42 (left): Top (east end) of the flue (Site 13), viewed from the west

Plate 43 (right): Boulder at the top (east end) of the flue (Site 13), viewed from the north-west

Plate 44: The west end of the flue (Site 13) where it widens to meet the track, viewed from the west

6. Site History

6.1 Prehistoric Period (c11,000 BC – 1st century AD)

6.1.1 While there is some limited evidence for activity in the county in the period immediately following the last Ice Age, this is typically found in the southernmost part on the north side of Morecambe Bay. Excavations of a small number of cave sites have found the remains of animal species common at the time but now extinct in this country and artefacts of Late Upper Palaeolithic type (Young 2002). Again, the county was also clearly inhabited during the following period, the Mesolithic (*c*8,000 – 4,000 BC), as large numbers of artefacts of this date have been discovered during field walking and eroding from sand dunes along the coast, but these are typically concentrated in the west coast area and on the uplands around the Eden Valley (Cherry and Cherry 2002). Similar locations elsewhere, along river valleys and in coastal areas, are also likely to have seen substantial activity during the Mesolithic period, based on examples from elsewhere (Hodgson and Brennand 2006, 26).

6.1.2 In the following period, the Neolithic (*c*4,000 – 2,500 BC), large scale monuments such as burial mounds and stone circles begin to appear in the region and one of the most recognisable tool types of this period, the polished stone axe, is found in large numbers across the county, having been manufactured in vast quantities at Langdale (Hodgson and Brennand 2006, 45). A recently discovered and rare monument thought to belong to this period, a causewayed enclosure, has been identified at Green How to the south of the study are (Horne and Oswald 2000; Horne *et al* 2002). There has also been some reconsideration of the 'hillfort' on Carrock Fell, to the east of the study area, which has suggested that it too might in fact represent a Neolithic causewayed enclosure (Pearson and Topping 2002), although without excavation this remains difficult to prove. During the Bronze Age (*c*2,500 – 600 BC) monuments, particularly those thought to be ceremonial in nature, become more common still, and it is likely that settlement sites thought to belong to the Iron Age have their origins in this period. These are not well represented in the environs of the study area, although a group of enclosures of this type is present on Aughertree Fell to the west (Bellhouse 1967). Stray finds of Bronze Age date are known across the county, although none are recorded within the study area. Sites that can be specifically dated to the Iron Age (*c*600 BC – 1st century AD) are very rare; the 'classic' site of this period, the hillfort', is typically small and simple in form relative to examples in other parts of the country, and few have been dated (Barrowclough 2010, 195). There are, however, many smaller settlement sites, including the enclosures at Aughertree Fell but also large numbers revealed as cropmarks on the lower ground to the north, which are likely to have flourished in the Iron Age (Huiham 1982), although a number of these probably have earlier origins. There is also, however, likely to have been a considerable overlap between the end of the Iron Age and the beginning of the Romano-British period; it is evident that in this part of the country, initially at least, the Roman invasion had a minimal impact on the native population in rural areas (Philpott 2006, 73-74).

6.2 Romano-British to Early Medieval Period (1st century AD – 11th century AD)

6.2.1 While the general immediate environs of the survey and study area have relatively little evidence for activity of this date, the area of lower ground to the north was well-occupied during the Roman period, by both the Roman military and 'native' people (Higham 1982). There was a fort close to Wigton, known as 'Old Carlisle' or 'Red Dial', which despite having an extensive civilian settlement and well preserved earthworks has seen little excavation; it is thought unlikely to date any earlier than the late 1st century AD (Shotter 2004, 62). It has been suggested that the road between Hesket Newmarket and Parkend, running approximately east/west to the north of the study area, has Roman origins based on early references and the use of the term 'street' in association with it (Allen 1987, 10), but this remains unproven.

6.2.2 The early medieval period is not well represented in the area in terms of physical archaeological remains, which is a common situation throughout the county. The one site in the local area that has significant early medieval connections is the parish church at Caldbeck, which is dedicated to St Kentigern and said to have been established by him in the 6th century AD (Lees 1883; Cowper 1900).

There is, typically, little physical evidence to support this proposition, and it is also considered possible that the dedication relates to a later period when there was a revival of interest in this saint due to the writings of Jocelyn of Furness in the 12th century (Whiddup 1981). Nevertheless, the local place-names indicate that at least some of the local settlements have early medieval origins, with Norse elements (dating perhaps to the 10th century) very common, for example in Caldbeck, which means 'cold stream' and Hesket Newmarket, in which 'hesket' means 'horse race course' (Gambles 1994; Lee 1998). Even Roughtongill, Dale Beck and Hay Gill themselves share similar origins (see Armstrong *et al* 1950, 17).

6.3 Medieval Period (11th century AD – 16th century AD)

6.3.1 As already mentioned many of the local settlements have early medieval origins and are recorded in the medieval period and it is likely that the area had been extensively exploited by at least this time. Following the Norman Conquest and the eventual taking of Cumberland at the end of the 11th century the area around Caldbeck was largely made up of forest and waste-land, controlled by Waldeve, Baron of Allerdale below Derwent (Hutchinson 1794). It was situated on the southern edge of the royal forest of Inglewood (Phythian-Adams 1996), in a remote and hazardous area. As a result the Priory at Carlisle was granted licence to build a hospital to aid travellers in the mid-12th century – this is thought to have been in the vicinity of Caldbeck, perhaps on the site of what is now Friar Hall or Friar Row, but evidence confirming this is uncertain (Wiseman 1987). Caldbeck remained the property of the Lords of Allerdale until it passed, through inheritance, to the Percys of Northumberland in the later part of the medieval period before being taken by the crown in the 16th century and sold (Nicholson and Burn 1777). The friary was dissolved in the early 13th century and the land given to the church (*ibid*) but elsewhere in the area this was a period of gradual development, although there were severe periods of decline during the 14th century (Winchester 1987), with new areas taken into cultivation (Summerson 1993). As early as the 14th century copper and silver were successfully prospected in the Caldbeck Fells (Allison and Murphy 2010, 35-36), and recent work has revealed evidence for mining activity in Silver Gill perhaps as early as the 11th century (Allison 2008, 116; Allison and Murphy 2010, 50).

6.4 Post-Medieval (16th century AD – present)

6.4.1 From the 16th century onwards the immediate environs of the survey area became dominated by mining, building on the activity of the medieval period, but perhaps continuing a tradition that began much earlier. German miners, brought into the area by the Company of Mines Royal in 1563 were working in Caldbeck by 1566 (Allison 2008, 108). Although the exact location of their mines was always assumed to be in the Roughtongill area (Cooper and Stanley 1990, 58), this has not been demonstrated with any certainty until quite recently, with investigations discovering not only the mine workings but also the remains of a timber rail- or wagon-way within (Allison 2008, 111-116). Documentary references referring to the mines at Roughtongill are remarkably sparse, however, the earliest apparently only being in 1794 in connection with the building of a smelt mill (Postlethwaite 1913, 129 – the original source for this is not given) – this is almost certainly the one situated at Haltcliffe on Carrock Beck to the east of the survey area (Warren Allison pers comm.; see plan drawn by William Smith: OUMNH 462-smith/Out-of-sequence, box 3/6 1822). By the early 19th century the major mine in the area, at Roughtongill, was certainly being extensively worked and it is in this context that the smelt mill at Dale Beck developed.

6.4.2 ***Dale Beck Smelt Mill***: the origins of the smelt mill are uncertain, although a principal source suggests that it was built following the taking of the lease for the mines at Roughtongill by the Roughtongill (or Roughtengill) Silver, Lead and Copper Mining Co in 1849 (Cooper and Stanley 1990, 60-61; Tyler 2009, 98. In other cases it seems to have been confused with the earlier smelt mill (Shaw 1972, 42)). Another lease dated 1848, which was not taken up, lists elements present at the mine without including a smelt mill, but it gave the lessees the right to build '*Cottages or Huts… Engines Cupolas Furnaces Stacks Smelting Mills Ore Houses…*' (CRO(C) D/Ric/63 1848), so it seems likely that the Roughtengill Silver, Lead, and Copper Mining Co were operating to similar terms. However, it has also been suggested that the smelt mill was not built until *c*1860 and only operated for three years (Richard Smith pers comm. via Warren Allison). In either case, the smelt mill was said to have been constructed at a cost of £3,652 (Adams (1995, 73) says £3,000) and had a capacity of 100 tons per month (Tyler 2009, 98). At the same time the road down the valley was improved (Adams 1995, 73) and,

perhaps at an early stage, the water supply was increased by the addition of a wooden launder connected to a dam across Dale Beck, at the foot of Birk Gill, to the south (Cooper and Stanley 1990, 61n). A number of additional details are also given by Tyler (2009, 98), although no source for these is given and some appear to be based on the extant remains rather than any historical sources:

'*The building was constructed with local stone, obtained from three nearby rock outcrops, two in Hay gill just a couple of hundred yards away, and the others across Dale Beck, for which a rough road was constructed. The furnace area and other integral parts were constructed out of red clay bricks and dressed sandstone, and the roof was fashioned out of Welsh slate. The building was a single story around 100ft long by 21ft wide and, in the centre to the west was an annex room 30ft x 21ft, possibly the office and assay room, which stands proud of the main building. Opposite on the eastern side are two parallel buildings 9ft wide and 21ft and 12ft long, which housed the four roasting furnaces. At the northern end is the main furnace area, which is 8ft in diameter. From the furnace the stone arched flue runs 165yards up the steep fell side, where it dispersed the fumes from all the furnaces. The wheel pit is situated beside the north wall. Water was taken from Dale Beck and Hay Gill and, to ensure a constant supply, dams were built at Hay Gill with a leat running straight into the site for the water wheel, together with a header dam across Dale Beck, 200 yards to the south, which brought a further supply to the Hay Gill reservoir*'.

6.4.3 Under the management of the Roughtongill Co the mine was extremely successful throughout the 1850s and early 1860s, with a peak in production in 1851 of 659 tons of lead and an average of 400 tons in the ten years after that (Cooper and Stanley 1990, 61). The lease of the mines was subsequently taken on by James Dixon and Samuel Merryweather (1855-1863) (*ibid*), who sold it on as a going concern for £14,000 (Adams 1995, 73) and John and James Tustin (1863-1865) '*all of whom made fortunes*', although they appear to have carried out little or no further improvement or development, instead concentrating their efforts on '*removing the rich and easily won ores*' (Cooper and Stanley 1990, 61). In 1865 the newly formed Caldbeck Fells (Consolidated) Lead and Copper Mining Company took the lease, anticipating a continuation of its earlier profitability (*op cit*, 62). However, despite various attempts at new workings serious managerial problems meant that the company failed, although it managed to stave off bankruptcy until 1878 (*ibid*). Early in their tenure the smelt mill at Dale Beck appears to have gone out of use; Tyler (2009, 114) states that it had become ruinous by 1867, much of the slate and stone having been cannibalised for other buildings, and was becoming a dangerous liability. As a result the Caldbeck Fells Company, having already been considering the idea for some time, spent £800 converting it into cottages, although this was apparently not completed until 1869 (*op cit*, 118; Cooper and Stanley suggest that the conversion of the smelt mill into cottages occurred in 1865 (1990, 61n)). The available documentary evidence proves that the conversion of the smelt mill cannot have occurred before May 1866: an advertisement for contractors to carry out the work was placed in the Carlisle Journal on the 16th May 1866, and it is clear from correspondence relating to this that proposals had been made beforehand to remove the walls and roof, presumably for reuse elsewhere, although concerns were made that the landowner had not been informed of the proposal (NYRO ZLB/8/3/33 1866). The option of conversion was considered ultimately to be more beneficial, '*as it will be* [a] *great advantage and convenience to the miners and others employed in the mines, and likewise by doing so it will not diminish the value of the property but will greatly enhance it*' (*ibid*). Unfortunately, this would prove to be far from the case.

6.4.4 As if the financial woes of the mines were not proving difficult enough at the time, between 1869 and 1874 19 people, including several children, living in the cottages at the converted smelt mill died (Tyler 2009, 125). The cause was unknown but it may have been an infectious disease such as scarlet fever or typhoid (although the outbreak of cholera was a constant concern in areas of similarly dense settlement in urban areas (Miller 2007, 31)), as the area was effectively quarantined and coffins left at the gate to Fellside for collection (Tyler 2009, 125). The census return from 1871 shows that there were a total of 91 people living at what is referred to as 'Smelt Mills' (RG10/5232 1871), all of which were connected to lead or copper mining in some manner. They are divided in the census into 14 households, between them including 45 children less than 16 years of age. This population seems impossible given the size of the building but it is perhaps unsurprising that it was subject to such a devastating rate of mortality. It is tempting to think that the financial value of the former smelt mill, alluded to in 1866, had

been placed above the welfare of its occupants. After 1874 the cottages and the smelt mill may well have been abandoned, at least for a while. The 1881 census lists 'Smelt Mills' but it is shown as unoccupied (RG11/5169 1881).

6.4.5 Between 1888 and 1894 the existing mines and their spoil were for a short period worked for umber and barytes, and china clay was extracted, the site having been taken over by the Cleator Iron Ore Company (Shaw 1972, 74). As a result the smelt mill was given a new lease of life as a barytes works (the resulting product was used in paint), used in grinding and purifying the ore (Cooper and Stanley 1990, 53). A near contemporary account describes how the location being favourable, the '*long disused*' former miners' cottages, '*the walls of which were… in a sound condition*' were utilised (Addison 1890, 287; see Plate 45 to Plate 47). The former smelt mill was thus adapted and a new addition made extending to the east from the north end of the existing building towards the road at the top of the slope (*ibid*). The floor of this new building was stepped into the slope into order to provide secure footings for the machinery used in the plant and a new water wheel, 36 feet in diameter, was added (*ibid*). For processing the barytes was brought from the mine along the road above the former smelt mill and deposited in a depot at the top of the stepped addition, and from this it was fed downhill through a series of crushers and rollers and finally a circular '*flat-stone mill*' where a constant stream water was fed through it, before being processed, essentially as a liquid, through steadily finer grinders (*op cit*, 288). Afterwards the liquid went through a process of agitation in tanks and bleaching, before being boiled with sulphuric acid and eventually dried and pressed into cakes (*op cit*, 290-291).

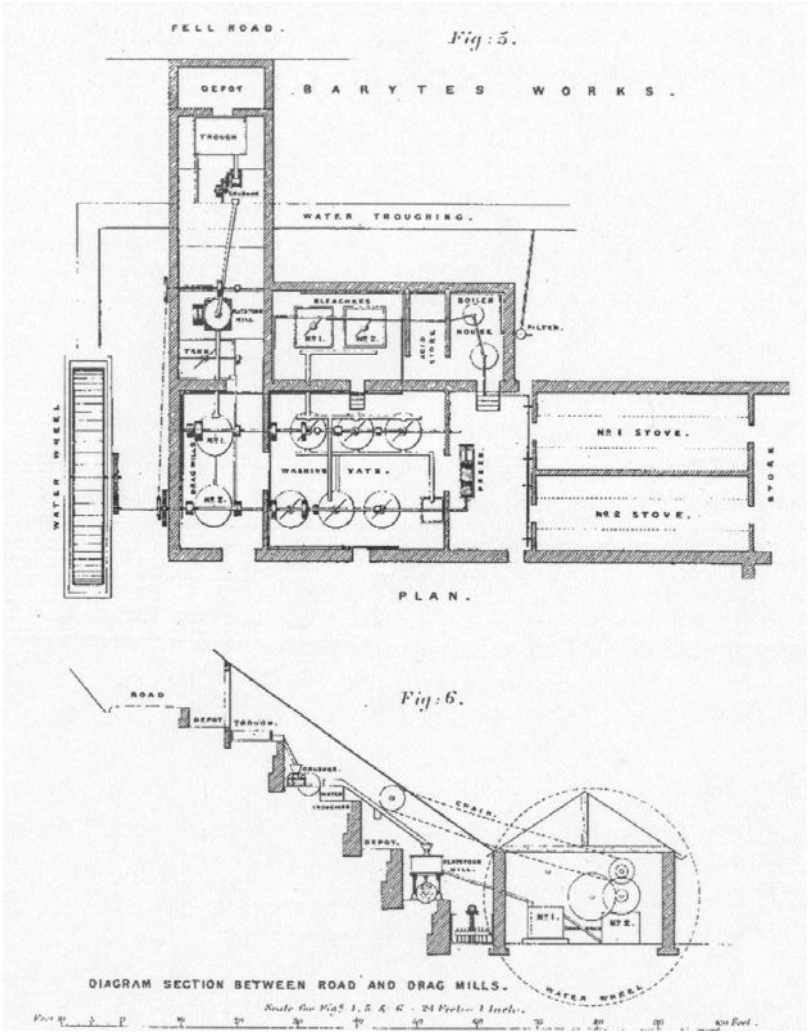
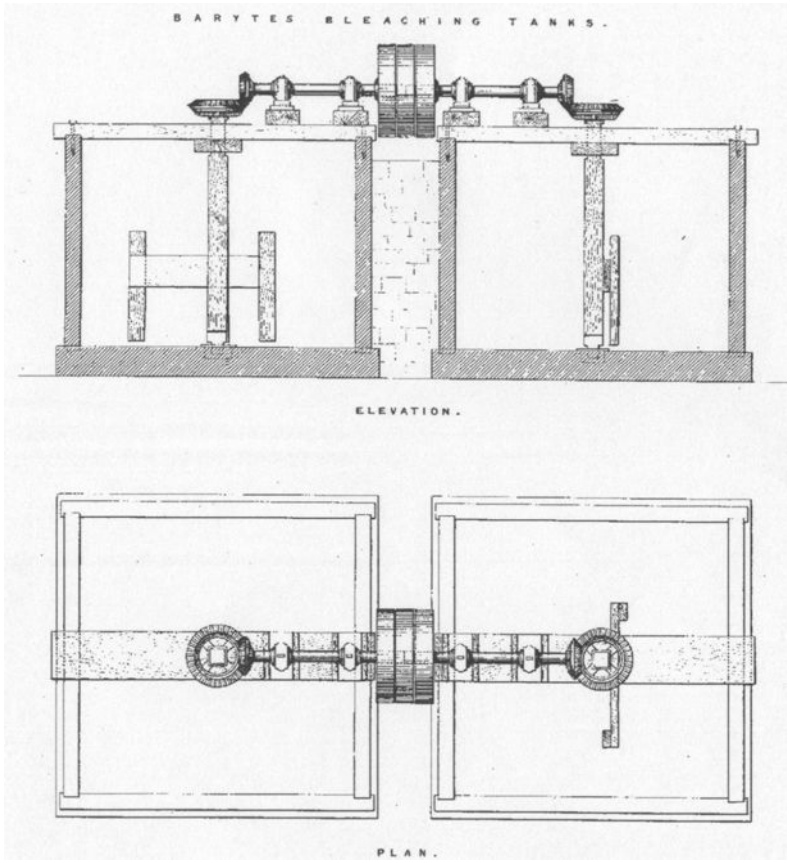


Plate 45: Plan and section of the barytes works (After Addison 1890, figs. 5 and 6)



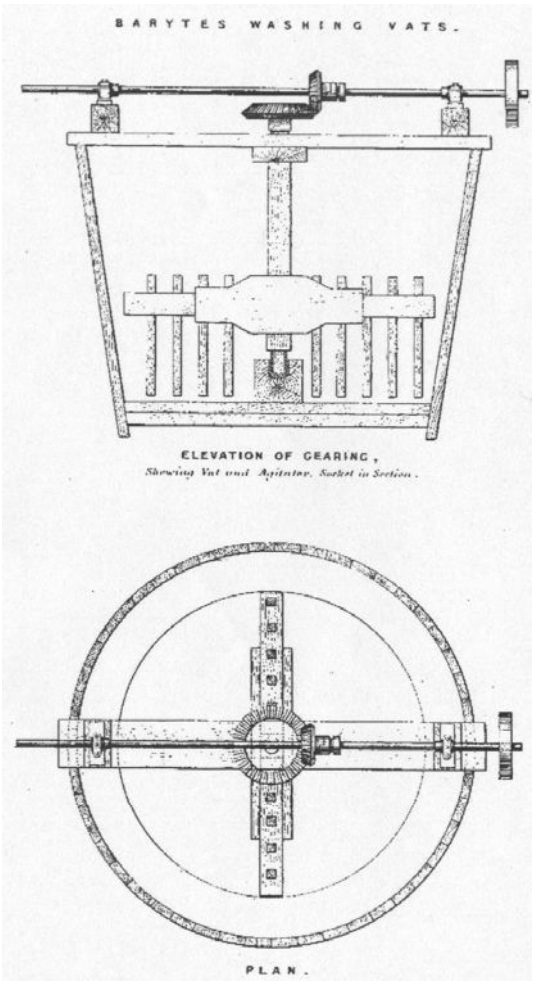


Plate 46 (left): Plan and section of the bleaching tanks within the barytes works (after Addison 1890, fig. 7)

Plate 47 (right): Plan and section of washing vats within the barytes works (after Addison 1890, fig. 8)

6.4.6 This re-use of the former smelt mill was restricted to the north end (as shown in Plate 45). The 1891 census reveals that part of it was also being used as a dwelling, and was at that time occupied by Joseph Gill, a blacksmith, as well as his brother, two other visiting members of his family, a boarder and a lodger (RG12/4299 1891). Also living there, in an apparently separate household, was an Edwin Goodall, described as a 'colour manufacturer', who presumably worked at the barytes work (*ibid*). The entire mining complex essentially went out of use by 1894 and was abandoned soon after (Cooper and Stanley 1990, 62). A massive flood in 1895 reputedly caused a massive amount of damage to the whole area, washing a large amount of material from the mine dumps into Dale Beck (*op cit*, 63). The 1901 census records the existence of the smelt mill, but shows that it was, once again, unoccupied (RG13/4877 1901). In 1913 the mine was acquired by Carlisle Urban District Council in order to make use of the water supplies that were available (Cooper and Stanley 1990, 62), but there is little information about the smelt mill during this period. An undated photograph of perhaps early to mid 20th century date (Tyler 2009, 154) shows the smelt mill much as it is now, almost entirely ruined apart from the extension to the west, although this is only partially standing, and the roof has gone. It seems likely that material was deliberately removed from the smelt mill for use elsewhere, resulting in a rapid process of decay.

7. Discussion

7.1 Context and Significance

7.1.1 The remains recorded within the survey area at Dale Beck, as with much of the local landscape, can be divided almost equally into two main elements: features likely or certainly relating to the smelt mill, and features relating to the wider, agricultural and semi-natural landscape. All of these remains are likely to be post-medieval in date, although some of the agricultural elements could be earlier (**Site 06** in particular), although this does not totally preclude the possibly of earlier remains being present on the site (they are certainly known in the wider environs of the study area) but not visible above ground. A summary of this is presented in Table 3 and Table 4 below:

Site No.	Type
04	Terrace
07	Smelt mill
08	Retaining wall
09	Water channel
10	Dam
13	Flue

Table 3: Elements within the survey area relating to the smelt mill

Site No.	Type
01	Terrace and hollow way
02	Weir
03	Former river channel
05	Ravine
06	Orthostatic walling and associated earthworks
11	Sheep fold
12	Bield

Table 4: Elements within the survey area relating to the agricultural landscape

7.1.2 The context of the smelt mill is therefore of a structure added to an existing agricultural landscape, albeit one that had already been shaped by at least 300 years of mining. Many of the features relating to the smelt mill are clearly visible on the first Ordnance Survey map (Plate 1), but strangely not the water channel (**Site 09**) that runs between the dam (**Site 10**) and the smelt mill (**Site 07**). The dam is shown as part of a larger area of linear features, apparently shown as being water courses (Plate 1), although around the same time they are also depicted more like field boundaries (Plate 2), none which appear to have survived, and curiously no associated pond is shown. The smelt mill (**Site 07**) and flue (**Site 13**) are clearly shown, while the terrace on which the smelt mill is situated (**Site 03**) and retaining wall (**Site 08**) are not shown, but given their scale and nature this is perhaps not surprising.

7.1.3 The remaining agricultural and semi-natural features are, by comparison, almost all depicted on the early maps, with the exception of the ravine (**Site 05**), although this is largely natural. The terrace (**Site 01**) is not in itself depicted but the hollow way that cuts through it is clearly shown as a track, which connects to a ford approximately in the location of the weir (**Site 02**). The former river channel (**Site 03**) was evidently extant until at least 1900. The sheep fold (**Site 11**) and bield (**Site 12**) are clearly shown too, and were obviously in existence from at least 1863. The section of apparently orthostatic walling and associated earthworks (**Site 06**) are more enigmatic. They potentially correspond to the area of irregular linear features shown in this area, apparently as water courses (Plate 1) or perhaps field boundaries forming a group of small enclosures and apparently incorporating the wall of the dam (Plate 2), and are perhaps the only remnant of this to now remain. However, their form, utilising large boulders, is likely to represent an early period of field clearance (Rollinson 1991, 8), which in this area would be unlikely to be earlier than the medieval period. If so this feature may pre-date the other elements within the survey area by several centuries. Without further investigation this is difficult to substantiate, however.

7.1.4 The smelt mill is arguably only a small part of the wider landscape but is significant as an example of its type as few, if any, of the smelt mills in the local vicinity have been examined in comparable detail (see Tyler 2001, 99-101 for a general discussion of smelt mills in Cumbria). All of the individual elements within the survey area can be related to the smelt mill or to the wider local landscape, which has been primarily shaped by agriculture. They are all therefore significant in terms of their group value, while individually they are arguably not as important. In all cases they are perhaps of limited potential to reveal further detail about themselves or the site as a whole, although, in the case of the smelt mill and its associated elements, there is potentially more information that can be found out through documentary sources.

7.2 The Development of the Smelt Mill

7.2.1 The documentary evidence presented in *Sections 4.2* and *6.5* provide a good basis for the understanding of the remains present on site, which, in their current condition, are difficult to more fully understand. Nevertheless, elements present within the building are suggestive of periods of alteration and, combined with the historical research, these allow an understanding of the phasing to be developed.

7.2.2 ***Phase 1 – pre-early 19th century***: it is apparent that the smelt mill was constructed in a landscape already shaped by centuries, if not millennia, of human activity, more specifically mining and agriculture. There is no specific evidence for any industrial activity taking place on the site of the smelt mill prior to its construction, although the convenient location on a low terrace and in the catchment area of water from both Hay Gill and Dale Beck, means it is not inconceivable that an earlier structure such as a mill could have made use of the site, all trace of which was destroyed by later building. Hints of this can be found in two elements of the site – the complex arrangement of water courses shown on the earliest mapping, which do not appear to be connected with the supply used by the smelt mill and perhaps included the bifurcation of Hay Gill where it meets Dale Beck (represented by **Site 03**), which would seem unlikely to have formed entirely naturally. These features may be associated with the apparent section of orthostatic walling (**Site 06**) the purpose and full form of which is unknown, but which seems likely to pre-date the smelt mill, perhaps by several centuries. In addition the series of tracks and fords shown on the earliest mapping, and represented by the hollow way across **Site 01** and **Site 02**, are also likely to form elements of an agricultural landscape pre-dating but operating in parallel with the industrial one. The mapping carried out by English Heritage showed considerable areas of hollow ways (English Heritage 2000a), which presumably connected the farms on the lower ground to the higher pasture, but may also have been used by workers travelling to the early mines.

7.2.3 ***Phase 2 – mid 19th century***: the construction of the smelt mill appears to have taken place by *c*1849 or at least by *c*1860. The former date, or something close to it, appears in several published sources and is perhaps logical as it fits with the dating of the new lease taken up by the Roughtongill Silver, Lead, and Copper Mining Co in 1849. Regardless of the exact date, the early mill most probably comprised, as a minimum, the main rectangular section orientated north/south, with a wheel pit at the north end powered by water brought from a pond formed by the dam (**Site 10**) via the channel (**Site 09**) and then probably a timber launder, perhaps supported by the retaining wall below (**Site 08**). There were presumably a row of hearths along the east side. Tyler's suggestion that there were 'two parallel buildings' to the east containing the hearths (2009, 98; and *Section 6.5.2*) seems unfounded as there is no evidence for any additional buildings on this side, although there are remains that might have related to the flues (see below), and in any case these buildings would surely have been shown on the Ordnance Survey plans of 1867. The hearths must have been connected to the main flue, and the earliest Ordnance Survey maps show four connecting sections indicating that there were four hearths. This is similar in arrangement to the very well preserved remains of Augill Smelt Mill near Brough, which had four stone-built 'hoods' set into the wall, each corresponding to a hearth (OA North 2002b, 16). The size, dating, and arrangement of the smelt mill at Dale Beck is generally very similar to that at Augill, although the latter formed a single linear range, with the offices/assay house incorporated at one end (OA North 2002b). At Dale Beck the extension to the west is likely to have served as an office, assay house, or similar; the arched opening in the west elevation, potentially a fireplace, would also suggest that this section of the building had a more 'domestic' or polite function. This element appears to have

been added slightly later, although the evidence for this is not conclusive and this could simply represent the manner of building or that it was lower than the main section.

7.2.4 It is not clear when the smelt mill went out of use; the collapse of the Caldbeck Fells (Consolidated) Lead and Copper Mining Company in 1878 forms a date at which this certainly must have occurred, but it must have been some time before this given its conversion into cottages in the 1860s (see *Section 7.2.4* below). It has been suggested that it only operated for three years; but this is on the basis that it was constructed in *c*1860. The early mapping certainly indicates that it was still operating in 1863, and so, if it has in fact been constructed in *c*1849, it would potentially have been working for approximately 14 years.

7.2.5 ***Phase 3 – 1860s – 1870s***: it is apparent that the smelt mill was unoccupied for some time as by 1866 plans had clearly been made to effectively demolish it. It was saved, however, by being converted into a row of dwellings, which perhaps occurred as early as 1866. While this will undoubtedly have had some impact on the remains that are present today, evidence for this is limited; given the level of survival of the structure this is perhaps not surprising. The numerous blocked apertures evident within the sections of standing wall could relate to this period of reorganisation, but it is difficult to be certain. The incredibly large number of people apparently living in the converted smelt mill suggests, assuming that there were no other, perhaps prefabricated, buildings also erected, that what was built was similar in style to the back-to-back houses found in many industrial cities across the country (Muthesius 1982, 106-107). Where examples of these have been examined a floor space of less than $5m^2$ was not uncommon (for example in the newly created industrial suburb of Ancoats, in Mancester: Miller 2007, 30-31 and Miller *et al* 2007, 60). However, the floor plan could cover an area as small as 10-15 feet square (little more than $3\text{-}4.5m^2$), in which case the footprint of the former smelt mill, including the extension to the west, could have perhaps accommodated 20 single story 'back-to-back' style houses. The problems inherent in such housing were so apparent in cities such as Manchester that they were effectively banned by the passing of the Manchester Police Act in 1844, but elsewhere their construction was not prohibited until 1909 (Miller 2007, 31). The central platforms evident within the building might, if this form of construction had been used, represent the dividing spine wall. The only piece of building discovered on site that could arguably belong to this phase is the brick marked 'TICKLE', which apparently dates to the 1860s-1870s (Davies and Davies 2011, 16), and would therefore correspond to this period.

7.2.6 ***Phase 3 – late 19th century***: for a short period the smelt mill must have been abandoned again, it was certainly extant but empty in 1881. Its second conversion, in 1888, into a barytes processing works, will again have led to a number of alterations. These too are difficult to identify within the main part of the standing building, although the blocked openings could equally belong to this phase. Similarly, the platforms within the main part of the building could correspond to the positions of machinery shown on the plan of 1890 (Plate 45). The one certain part of the standing remains that belongs to this phase is the addition at the north end of the east elevation. This can be clearly compared with the plan of 1890, although little now survives. The circular structure still remaining clearly coincides with the position of the 'flatstone mill', although the surviving structure is apparently considerably larger than that shown in the plan. The remaining sections of this extension are more difficult to identify on site, although what appears to be a short section of wall projecting to the east south of the round 'flatstone mill' might be the end wall of an area shown as containing bleachers on the 1890 plan, that was clearly added as part of this development.

7.2.7 ***Phase 4 – 20th century***: this period is primarily one in which the building decayed, although it seems likely that the rate at which this happened was artificially enhanced. The barytes works had apparently gone out of use by 1894, and it is likely that the machinery and plant remaining in the building at that time were removed for sale or scrap. The removal of this and abandonment of the building may well have necessitated or resulted in the partial demolition of the building. The substantial lack of remaining fabric is certainly indicative of deliberate robbing of the site of what would have been valuable materials, particularly elements such as the roof. The flue running up the hill and corresponding chimney (**Site 13**) were also presumably, to some degree at least, deliberately demolished and material taken away, as very little of this now remains. The flood that affected the valley in 1895 is also likely to have enhanced the more gradual decay evident elsewhere on the site, such as the broken dam (**Site 10**)

7.3 Condition

7.3.1 It is clear that the building has decayed at a remarkable rate since it was finally abandoned in *c*1894. The available evidence suggests that within perhaps 50 years it was a roofless ruin, all of which is indicative of a deliberate process of demolition. As has been stated this is likely to, at least in part, be the result of the removal of plant from the barytes works and re-use of building material elsewhere. As a result, the present condition is arguably worse than it otherwise would have been if natural processes of decay had taken place. The flue and chimney in particular seem to have been deliberately robbed of stone as little now survives, including any substantial amounts of rubble. Only a few small sections of wall now (visibly) stand more than a few courses high, with the exception of the circular section within the later extension to the east. In a sense, therefore, the condition of the former smelt mill, and the other features within the survey area, is probably now relatively stable, after a period of very active decay. When the robbing of material from the site stopped is difficult to ascertain, because it is uncertain what it was being robbed for. The earliest aerial photographs suggest that most of the damage had been carried out perhaps by 1953, although the short section of rough track recorded as running down to the site from the main track to the south-east near the ford over Hay Gill, might indicate that wheeled vehicles have been accessing the area of the smelt mill more recently, although for what purpose is uncertain.

7.3.2 What is remarkable about the site is the lack of evidence for waste deposits, such as slag from the lead smelting or material washed out during the processing of barytes, although without excavation this is difficult to ascertain with any certainty. The large terrace to the west of the smelt mill (**Site 04**) might have developed as a result of tipping material in this direction, and in effect therefore be a flattened slag bank, but there was no apparent evidence for this on site.

7.4 Management Recommendations

7.4.1 ***Threats***: the site of the smelt mill and the earthworks and other structures in its environs, related or otherwise, are subject to a number of threats, principally as a result of their exposed and remote location. Four main threats to the site can be identified:

- ***Weather*** – there is historical evidence of at least one period of extreme flooding in Dale Beck, and events such as this are likely to have affected remains of archaeological interest, both through the damaging of upstanding remains and burying of others. In addition, rainfall and cold weather, particularly the effects of frost, will continue to erode earthworks and cause damage to standing remains;
- ***Access*** – the whole site is publically accessible and there is evidence that deliberate demolition took place in the past. While this is unlikely to happen again on the same scale further robbing on either a causal or deliberate basis is a potential issue. In addition, movement across the site by wheeled vehicles has clearly taken place quite recently and this, together with the potential for pedestrian access, is liable to cause further erosion of the extant remains;
- ***Land use*** – although essentially an issue connected to access, the use of the land is also a potential threat. The relatively low impact manner in which the land is used does not preclude the likelihood of further erosion being caused by sheep, indeed there is some evidence that this has already taken place. Of particular concern would be the positioning of sheep feeders on the site, although there is no specific evidence that it has previously taken place;
- ***Vegetation*** – the site is extensively colonised by bracken, the roots of which will undoubtedly be causing considerable damage to underlying deposits and standing remains.

7.4.2 ***Potential***: the site has considerable potential in terms of its archaeological and historical interest, in particular the smelt mill and related structures, but also elements such as **Site 06**, which are of uncertain date and origin. The site in general also has the potential to provide further information relevant to the wider industrial and agricultural landscape, while further investigation of the smelt mill could reveal information about the development of these types of monuments. Three main areas of potential can be identified:

- ***Documentary research*** – it is clear that there is considerable potential for further documentary information relevant to the smelt mill to be contained in the North Yorkshire Record Office in Northallerton, as well as other locations (Warren Allison pers comm.). Further examination of these sources may prove useful in better understanding the site, although this is likely to be a lengthy task;
- ***Below-ground remains*** – the site of the smelt mill has great potential for below-ground remains of archaeological interest to be present. The site has never been excavated and went through at least three main phases of development, each quite different to the last. Only through excavation could these be better understood, and such examination could reveal a considerable amount about the manner in which it originally operated, the form of its conversion into houses and the lives of the people who lived there, and ultimately how the barytes works modified the site once more;
- ***Visitors*** – the area is relatively well-visited but at present there is little readily available material interpreting the smelt mill and its associated earthworks, or, indeed the mines more generally, on site. While increasing the visitor numbers significantly would perhaps be undesirable in terms of the potential threat to the site (see *Section 7.4.1* above), some interpretation would be beneficial (see below).

7.4.4 ***Recommendations***: taking into account the various threats to the site and its potential seven management recommendations can be made:

- ***Designation*** – applying for the remains of the smelt mill and the associated earthworks (which would essentially encompass all of the survey area) to be designated a Scheduled Monument is perhaps the most direct way of increasing its protection, as this would prohibit the removal of material from it, prevent unauthorised excavation, and establish a mechanism for regular monitoring and perhaps even maintenance;
- ***Monitoring*** – if this site were Scheduled then some form of regular monitoring would presumably be carried out. However, if the site is not Scheduled a programme of monitoring should be drawn up in order to assess the state of erosion of the earthworks, degree of collapse of the remaining walls, and the extent of vegetation across the site, in particular in order to prevent the growth of larger shrubs and trees;
- ***Minimise access*** – in order to reduce the potential for decay to the remains caused either by deliberate removal of material or more generally through increased erosion, efforts to minimise access are desirable. At present the site is probably rarely accessed by visitors to the fell, and as the best position to view the remains (of the smelt mill at least) is from the track running up the valley, this should be encouraged (see the recommendation for 'Interpretation' below). However, restricting the access to vehicles via the temporary track that runs down toward the smelt mill from the metalled track, through blocking with the positioning of boulders or similar, is recommended. The placing of stock feeders on any part of the site should also be prohibited, through agreement with the land users;
- ***Consolidation*** – some consolidation of the site is certainly recommended, even if it is restricted to stabilising the tallest sections of standing wall in the eastern extension (the circular structure and adjacent wall). Consolidation elsewhere is unlikely to be feasible without clearance of some of the rubble, although this could be carried out as part of a programme of further investigation (see below). As a minimum consolidation need only comprise the repointing of standing walls in an appropriate fashion rather than extensive rebuilding;
- ***Information*** – the land users and visitors to the fell should be informed of the importance of the remains of the smelt mill and associated features to the industrial history of the valley and encouraged to minimise access to the site and not carry out any potentially damaging activities. This information could be easily supplied to the land users utilising the information contained in this report, while visitors would need to be told via interpretation on site (see below);

- ***Interpretation*** – some interpretative information outlining the history of the site is recommended as this will facilitate a number of the issues identified. Ideally, this should be carried out as part of a wider programme of interpretation dealing with the mining heritage of the Caldbeck Fell, although it is appreciated that this is clearly a far larger piece of work and has many health and safety implications. However, the placing of a small interpretation panel adjacent to the road overlooking the smelt mill to the north, or perhaps more practically near the ford and footbridge to the south, would probably be sufficient. Keeping any interpretation material off the remains themselves and close to the track will also act to decrease any tendency for visitors to stray onto the site to investigate;
- ***Further investigation*** – while the potential for further documentary research has been mentioned above, the form in which this might take is difficult to ascertain. Ideally an indexed transcript of the extensive collection of material held at Northallerton and further examination of material held elsewhere would be extremely useful to those researching the area. Since the collection at Northallerton is apparently on microfilm obtaining a copy of this for deposition in the Archive Centre in Carlisle (if possible) would, as a minimum, be very useful. In terms of further investigative work on site, only excavation, even limited to just clearance of the worst of the rubble to more fully reveal the wall lines, is likely to provide any particularly useful additional information. More extensive targeted excavation of parts of the site would also provide new insights into the smelt mill building, but could also be used to explore other elements of the site such as the apparently orthostatic walled structure (**Site 06**). Areas perhaps most worthy of further investigation include the north end of the main section of the smelt mill, which is likely to show evidence for all three phases of development, the wheel pit, which might have deep and potentially waterlogged deposits, and the possible assay house, which might contain a more interesting assemblage of artefacts.

8. Bibliography

8.1 Primary and Cartographic Sources

CRO(C) D/Ric/63, 1848 *Lease, Unexecuted for 21 Years to GH Head, John Jameson and George Rimington (both of Penrith) of Roughtengill and Silver Gill Lead and Copper Mines*

Ordnance Survey, 1867 *Cumberland Sheet*, **47**, 1: 10,560, surveyed 1863

Ordnance Survey, *c*1867 *Cumberland Sheet* **47.7**, 1: 2,500, surveyed 1863

Ordnance Survey, 1900 *Cumberland Sheet*, **47 NE**, 1: 10,560

Ordnance Survey, 1957 **Sheet NY33**, 1: 25,000

Ordnance Survey, 2002 *The English Lakes North-Eastern Area: Penrith, Patterdale, and Caldbeck*, **OL5**, 1:25,000

Ordnance Survey, 2008 *The English Lakes North-Western Area: Keswick, Cockermouth, and Wigton*, **OL4**, 1:25,000

OUMNH 462-smith/Out-of-sequence, box 3/6, 1822 *A plan of the buildings, erections, etc.... at Caldbeck Smelt Mill, Sept. 30, 1822*

RG10/5232, 1871 *Census*

RG11/5169, 1881 *Census*

RG12/4299, 1891 *Census*

RG13/4877, 1901 *Census*

8.2 Secondary Sources

Adams, J, 1995 *Mines of the Lake District Fells*, 2nd edn, Skipton

Addison, PL, 1890 Description of the Cleator Iron Ore Company's Barytes and Umber Mines and Refining Mills in the Caldbeck Fells, *Proc Inst Civil Engineers*, **102**, 283-291

Allen, M, 1987 *Caldbeck*, Penrith

Allison, W, 2008 German Mines of Caldbeck and the Discovery of the Earliest Primitive Railway, *The Mine Explorer*, **6**, 108-117

Allison, W, and Murphy, S, 2010 The German Mines of Caldbeck and the Discovery of an Early Primitive Wagonway, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 3rd ser, **10**, 35-54

Armstrong, AM, Mawer, A, Stenton, FM, and Dickins, B, 1950 *The Place-Names of Cumberland Part 1: Eskdale, Cumberland and Leath Wards*, English Place-Names Soc, **20**, Cambridge

Barrowclough, D, 2010 *Prehistoric Cumbria*, Stroud

Bellhouse, RL, 1967 The Aughertree Fell Enclosures, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **67**, 26-30

Brown, DH, 2007 *Archaeological Archives: A Guide to Best Practice in Creation*, *Compilation, Transfer, and Curation*, IfA, Reading

Cherry, PJ, and Cherry, J, 2002 Coastline and Upland in Cumbrian Prehistory, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 3rd ser, **2**, 1-20

Cooper, MP, and Stanley, CJ, 1990 *Minerals of the English Lake District: Caldbeck Fells*, London

Countryside Commission, 1998 *Countryside Character, Volume 2: North West*, Cheltenham

Cowper, HS, 1900 The Influence of the Roman Occupation upon the Distribution of Population in Cumberland and Westmorland, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 1st ser, **16**, 16-41

Davies, E, and Davies, S, 2011 A Small Collection of Local Bricks, *CIHS Bulletin*, **81**, 14-16

English Heritage, 1991 *The Management of Archaeological Project*s, 2nd edn, London

English Heritage, 2000a *Skiddaw Massif Recording Project*, unpubl

English Heritage, 2000b *Roughtongill and Silver Gill Mine Survey*, unpubl

English Heritage, 2007 *Understanding the Archaeology of Landscapes: A Guide to Good Recording Practice*, Swindon

Higham, NJ, 1982 'Native' Settlements on the North Slopes of the Lake District, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **82**, 29-34

Hodgson, J, and Brennand, M, 2006 The Prehistoric Period Resource Assessment, in M Brennand (ed), The Archaeology of North West England – An Archaeological Framework for North West England: Volume 1 Resource Assessment, *Archaeology North West*, **8**, 23-58

Hutchinson, W, 1794 *The History of the County of Cumberland*, Carlisle

Gambles,R, 1994 *Lake District Place Names*, Skipton

Horne, P, MacLeod, D, and Oswald, A, 2002 The Seventieth Causewayed Enclosure in the British Isles?, in G Varndell and P Topping (ed), *Enclosures in Neolithic Europe*, Oxford, 115-120

Horne, P, and Oswald, A, 2000 *A Probable Causewayed Enclosure on Green How, Cumbria*, unpubl rep

Institute for Archaeologists (IfA), 2008a *Standard and Guidance for Archaeological Desk-Based Assessment*, revised edn, Reading

IfA, 2008b, *Standard and Guidance for Archaeological Field Evaluation*, revised edn

Lake District National Park Authority (LDNPA), 2011 *Brief for an Archaeological Survey of Dale Beck Smelt Mill, Caldbeck and Uldale Common*, unpubl

Lee, J, 1998 *The Place Names of Cumbria*, Streford

Lees, T, 1883 St Kentigern and his Dedications in Cumberland, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 1st ser, **6**, 328-338

Miller, I, 2007 Ancoats: The Development of a New Industrial Townscape, in I Miller and C Wild, *A & G Murray and the Cotton Mills of Ancoats*, Lancaster Imprints **13**, Lancaster, 25-32

Miller, I, Wild, C, and Little, S, 2007 The Development of Ancoats: Archaeological Case Studies, in I Miller and C Wild, *A & G Murray and the Cotton Mills of Ancoats*, Lancaster Imprints **13**, Lancaster, 33-60

Moseley, F (ed), 1978 *The Geology of the Lake District*, Yorkshire Geological Society, occ publ **3**, Leeds

Muthesius, S, 1982 *The English Terraced House*, London

Nicholson, J, and Burn, R, 1777 *The History and Antiquities of the Counties of Westmorland and Cumberland*, London

OA North, 2002a *Caldbeck to Hesket Newmarket Watermain, Cumbria: Archaeological Assessment, Walk-Over Survey and Watching Brief*, unpubl rep

OA North, 2002b *Augill Smelt Mill, Cumbria: Archaeological Building Investigation*, unpubl rep

Pearson, T, and Topping, P, 2002 Rethinking the Carrock Fell Enclosure, in G Varndell and P Topping (ed), *Enclosures in Neolithic Europe*, Oxford, 121-127

Philpott, R, 2006 The Romano-British Period Resource Assessment, in M Brennand (ed), The Archaeology of North West England – An Archaeological Framework for North West England: Volume 1

Phythian-Adams, C, 1996 *Land of the Cumbrians: A Study of British Provincial Origins AD 400-1120*, Aldershot

Postlethwaite, J, 1913 *Mines and Mining in the (English) Lake District*, 3rd edn, Whitehaven

Rollinson, W, 1991 *Lakeland Walls*, 5th edn, Clapham

Shaw, WT, *Mining in the Lake Counties*, Clapham

Shotter, D, 2004 *Romans and Britons in North-West England*, 3rd edn, Lancaster

Summerson, H, 1993 *Medieval Carlisle: The City and the Borders from the late Eleventh to the Mid-16th Century*, Stroud

Tyler, I, 2001 *Cumbrian Mining*, Keswick

Tyler, I, 2009 *Roughton Gill and the Mines of the Caldbeck Fells*, Keswick

Whiddup, HL, 1981 *The Story of Christianity in Cumbria*, Kendal

Winchester, AJL, 1987 *Landscape and Society in Medieval Cumbria*, Edinburgh

Wiseman, WG, 1987 The Medieval Hospitals of Cumbria, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 2nd ser, **87**, 83-101

Young, R, 2002 The Palaeolithic and Mesolithic Periods in Northern England: An Overview, in Brooks, C, Daniels, R, and Harding, A, (ed), *Past, Present and Future: The Archaeology of Northern England*, Architect Archaeol Soc Durham Northumberland, res rep **5**, 19-36

8.3 Aerial Photographs

NMR, 2000 NY3036/5-8, Frames 17466/10, 17466/31-33, 17458/31-32 and 17459/01-02

Ordnance Survey, 1970 OS/70219, Frames 106-107

Ordnance Survey, 1973 OS/73132, Frames 2-4

Ordnance Survey, 1995 OS/95131m, Frames 56-57

RAF, 1953 RAF/58/1093 F21, Frames 329-331 and 392

Appendix 1: Project Brief

Brief for an Archaeological Survey

of

Dale Beck Smelt Mill,

Caldbeck and Uldale Common

December 2011

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Client: Caldbeck Commoners Association

Brief for Archaeological Survey

Location: Dale Beck Smelt Mill, Caldbeck and Uldale Common, Lake District

Proposed: Archaeological survey for conservation purposes

Summary

A Higher Level Stewardship Plan (HLS) agreement is being prepared for the Caldbeck and Uldale Common in the northern Lake District. The remains of Dale Beck Smelt Mill are located on the Caldbeck and Uldale Common. There is an opportunity to carry out an archaeological survey with funding through the existing Environmentally Sensitive Area (ESA) in order to provide a basis for future conservation work and protection for the site through Higher Level Stewardship (HLS) funding.

Location

The Dale Beck Smelt Mill is located within the Lake District National Park and is centred on national grid reference NY 30130 36180 in the parish Calbeck. The total area of the site is approximately 1 hectare (see Map 1). The site is largely open fell grazing but is crossed by a metalled track which can be used for access.

1. Purpose of commissioning the Archaeological Survey and

The purpose of the archaeological survey will be to provide an accurate record of the site in its current condition and to provide information, including a measured plan, to inform future conservation and management under the HLS agri-environment grant scheme.

2. Background to the site

2.1 The Dale Beck smelt mill was built c. 1850 by the Roughton Gill Silver, Lead and Copper Mining Company to smelt lead from mines in the Caldbeck Fells. The mill had a capacity of around 100 tons per month and is located at the bifurcation of Hay Gill and Dale Beck, which provided a water supply. The buildings were constructed using local stone, with red brick and dressed sandstone for the furnace, and Welsh slate for the roof.

2.2 The single storey building housing the smelt mill was c. 20m long by 6m wide with a free-standing annex at the west end which was possibly the office and assay room. Two further buildings were located opposite the smelt building which housed four roasting furnaces. The smelt furnace is at the northern end of the site and is c. 2.5m diameter with the remains of a flue running upslope for about 150m. A wheel pit is located by the north wall and water was taken from Dale Beck and Hay Gill via a leat, with dams across both water courses (Tyler 2009, 98).

2.3 The smelt mill had gone out of use and become derelict by 1867 when it was converted into six cottages for miners' families. 19 of the inhabitants, many of them children, died between 1869 and 1874, possibly from typhoid or scarlet fever (Tyler 2009, 118 and 125).

2.4 In 1887 the Cleator Iron Ore Company reused the Dale Beck site to construct a mill to process barytes from Potts Gill mine, one mile to the east (Tyler 2009, 149).

3. Previous research

3.1 The Dale Beck Smelt Mill has been the subject of limited research by the Mines of Lakeland Exploration Society (MOLES) and Cumbria Amentiry Trust Mining History Society (CATHMS) (see publications listed in Bibliography).

3.2 Dale Head Smelt Mill is recorded in the Lake District HER as No. 11108.

Further details of the site can be obtained from the Lake District National Park Authority, Murley Moss, Oxenholme Road, Kendal, LA9 7RL. Tel. 01539 792712/Fax. 01539 740822/Email archaeology@lakedistrict.gov.uk

4. Statutory designation, ownership and other factors

4.1 Dale Head Smelt Mill is:

- located within the Lake District National Park;
- on registered Common Land with open access under the Countryside and Rights of Way Act (CROW) 2000 Act**;**
- within the Skiddaw Group SSSI;
- covered by the Caldbeck Fells Minerals Collecting Permit system (administered by the Lake District National Park Authority);
- owned by the Lake District National Park Authority.

5. Analytical Archaeological Survey

5.1 The survey will establish the extent of the site and any previously unrecorded archaeology, and record the state of preservation and significance of the features included within the survey area.

5.2 It is envisaged that the following work would be required:

Desk based assessment

5.3 This should collate available archaeological information, to determine as far as is reasonably possible from the existing records, the nature of the archaeological resource within the study area and the archaeological potential of the site.

5.4 The desk based assessment should include an area within a 0.5km radius around the monument boundary as depicted in Map 1. This is in order to give consideration not only to the site, but also to the surrounding landscape, in order to place the site in its archaeological and historical context.

5.5 The desk based assessment must be made of all known and available sources of information relating to the study area, including (where appropriate):

- Data in the Lake District Historic Environment Record;
- The Lake District Historic Landscape Characterisation (HLC);
- Maps (printed and manuscript);
- Place and field name evidence;
- Aerial photographs in both local and national collections;
- Other photographic and illustrative evidence;
- Published and unpublished documentary sources;
- Local museum catalogues and artefact evidence;
- Oral evidence;
- Engineering and borehole data;
- Geological and soil surveys;

5.6 Organisations to be consulted should include:

- Cumbria Record Office;
- Cumbria County Council Historic Environment Service (which holds collections of aerial photographs);
- Cumbria Amenity Trust Mining History Society;
- Natural England;
- British Geological Survey;

Survey techniques

5.7 The survey should provide a descriptive and analytical record of the archaeological features at Dale Beck Smelt Mill. It should be carried out to Level 2 as specified in English Heritage (2007) and should be metrically accurate and depict the landscape context of the archaeological remains. It should also gather sufficient information to establish the location, extent, character, period, condition, fragility and significance of the surviving or previously extant archaeological and historical features on the site.

The survey should include:

- Close field walking of the entire survey area where physically possible;
- Recording of the location and extent of all archaeological and historic features at a scale of 1:500. The plan should relate to topographical features and to modern features such as field boundaries whether they are depicted on the OS maps or not;
- Recording of significant features at an appropriate scale (1:50 or 1:100) that will allow depiction of archaeological detail;
- A written description and assessment of all features including the type (classification) of each monument and its period where possible. The Thesaurus of Monument Types (EH 1998; http://thesaurus.english-heritage.org.uk/) should be used.
- A photographic record of features.

5.8 The selected recording techniques should be cost effective and the survey control must be located to an accuracy of at least +/- 0.5 metres.

6. Project Management

6.1 Timetable and management

6.1.1 **The Survey, including final report, must be completed, invoiced and paid for by the end of February 2012.**

6.1.2 The project will be commissioned on behalf of the Caldbeck and Uldale Commoners and will be managed for them by John Hodgson (Senior Archaeology and Heritage Adviser, LDNPA). Other staff from the LDNPA, English Heritage and Natural England will review the final report.

7. Procurement

7.1 Commissioning the Survey and Conservation Plan

7.1.1 Prospective contractors should prepare a project design and costing to include the following:

- A methods statement, timetable and information on how the archaeological survey will be managed;
- The range of professional skills which will be applied to the project, including the names and CVs of proposed team members;
- Previous experience of the organisation and personnel proposed, including the project leader;
- The extent of professional indemnity cover.

7.2 Contractor skills

7.2.1 The project team should be headed by a member of staff with expertise in archaeological survey and project management.

7.2.2 The work should be under the direct management of either an Associate Member of the Institute of Archaeologists, or equivalent.

8. The Report

8.1 Format and number of copies

8.1.1 The survey report will be required in hard copy and digitally (in PDF format). Reduced copies of maps and plans should be provided in the text. One set of full size copies should also be provided.

8.1.2 A total of 3 hard copies of the report will be required and one digital copy on CD/DVD.

8.2 Copyright

10.2.1 Copyright for the work will be owned by Natural England. The Contractor should ensure that copyright for any illustrations or other material used should be cleared with owners

8.3 Archiving

8.3.1 Any new archival material gathered during the preparation of the survey and conservation plan will be passed to the Lake District HER.

Bibliography

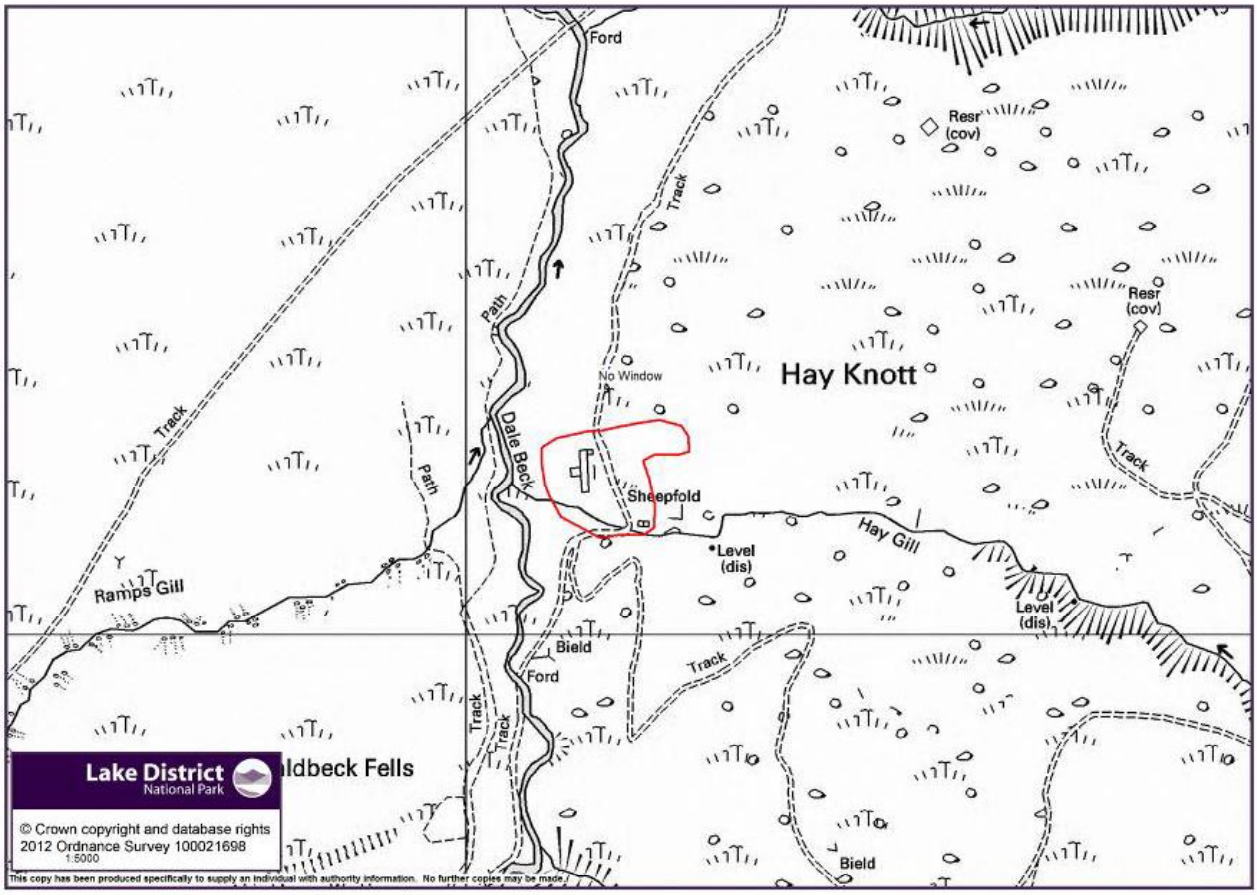
Adams, J. 1988. Mines of the Lake District Fells. Clapham: Dalesman.

Cooper, M P and Stanley C J. 1990. Minerals of the English Lake District. Caldbeck Fells. London: Natural History Museum

English Heritage. 2007. Understanding the Archaeology of Landscapes.

Shaw, W T 1983. Mining in the Lake Counties. Clapham: Dalesman.

Tyler, I. 2009. Roughton Gill and the Mines of the Caldbeck Fells. Keswick: Blue Rock Publication



MAP 1 Dale Beck Smelt Mill survey area

PHOTO 1. GENERAL VIEW OF DALE BECK SMELT MILL (DECEMBER 2011)

PHOTO 2. THE REMAINS OF DALE BECK SMELT MILL AND FLUE (DECEMBER 2011)

Appendix 2: Project Design

ARCHAEOLOGICAL SURVEY OF DALE BECK SMELT MILL, CALDBECK AND ULDALE COMMON, CUMBRIA

Tender and Project Design

Client: Lake District National Park Authority

January 2012

Company number: 05580819

Commercial in confidence

1. Introduction

1.1 Project Background

1.1.1 As part of a Higher Level Stewardship scheme (HLS) for Caldbeck and Uldale Common, there is the opportunity for funding to be available to allow an archaeological survey of the remains if Dale Beck smelt mill, through the existing Environmentally Sensitive Area (ESA). This will inform future management and conservation of the remains and enable their future protection.

1.1.2 The smelt mill was constructed *c*1850 by the Roughton Gill Silver, Lead and Copper Mining Company and used to smelt lead from the mines in the Caldbeck Fells, although it had gone out of use by 1867 and was subsequently converted into cottages for mine workers (LDNPA 2011). The site was reused from 1887 for processing barites from Potts Gill Mine (*ibid*). The remains comprise the smelt mill, which was a single storey building *c*20m by 6m, with a free-standing annex at the west end. Two smaller buildings, housing four roasting furnaces, were located at the opposite end and there was a separate smelting furnace attached to a flue, running upslope for *c*150m, associated with which are features relating water management (*ibid*).

1.2 Greenlane Archaeology

1.2.1 ***Introduction***: Greenlane Archaeology is a private limited company based in Ulverston, Cumbria, and was established in 2005 (Company No. 05580819). Its directors, Jo Dawson and Daniel Elsworth, have a combined total of over 18 years continuous professional experience working in commercial archaeology, principally in the north of England and Scotland. Greenlane Archaeology is committed to a high standard of work, and abides by the Institute for Archaeologists' (IfA) Code of Conduct. The desk-based assessment and survey will be carried out according to the appropriate Standards and Guidance of the Institute for Archaeologists (IfA 2008a; 2008b; 2008c).

1.2.2 ***Experience***: Greenlane Archaeology has undertaken a wide variety of project types since its establishment, ranging from open area excavations and watching briefs, to landscape survey, building recording, and desk-based assessments. Greenlane Archaeology has extensive experience in the survey and recording of structures and landscapes of most periods and types. Relevant projects include the topographic survey and evaluation of part of the High Street Roman Road in Kentmere (Greenlane Archaeology 2006; Whitehead and Elsworth 2008), desk-based assessment and walk-over survey of an estate associated with a Georgian mansion in Urswick (Greenlane Archaeology 2010a), desk-based assessment and rapid walkover survey of land to the south of Kendal (Greenlane Archaeology 2010b), desk-based assessment of a large urban area in Skipton town centre (Greenlane Archaeology 2011), and walkover survey of an area of former common land near Oxenholme, Kendal, associated with Level 2 recording of a hill fort (Greenlane Archaeology forthcoming).

1.3 Project Staffing

1.3.1 The project will be managed and supervised by ***Daniel Elsworth (MA (Hons), AIfA)***. Daniel graduated from the University of Edinburgh in 1998 with an honours degree in Archaeology, and began working for the Lancaster University Archaeological Unit in 1999, which became Oxford Archaeology North (OA North) in 2001. Daniel ultimately became a project officer, and for over six and a half years worked on excavations and surveys, building investigations, desk-based assessments, and conservation and management plans. These have principally taken place in the North West, and Daniel has a particular interest in the archaeology of the area. Since establishing Greenlane Archaeology in 2005 he has been involved in the management and running of a wide variety of projects including building recordings of various sizes, desk-based assessments, topographical surveys, watching briefs, and excavations. Prior to that, while employed at OA North, he worked on a number of large-scale walk-over surveys in North Yorkshire, North Wales, and the Lake District National Park. He had also carried out personal research of a similar form on a large area of common land in Ulverston (Elsworth 2005).

1.3.2 Dan will be assisted during the survey by Tom Mace **(BA (Hons), MA, MIfA**), who will also produce detailed on-site drawings and illustrations for the report. Tom has extensive experience of working on a variety of archaeological projects, especially watching briefs, but also excavations, evaluations, and building recordings, as well as report writing and illustration production. He joined Greenlane Archaeology in 2008 having worked for several previous companies including Archaeological Solutions and Oxford Archaeology North. While working at Greenlane Archaeology he has become responsible for the production of all illustrations, for both unpublished reports and published articles, and was formerly a Member of the Association of Archaeological Illustrators and Surveyors (MAAIS) prior to its recent merger with the IfA.

2. Objectives

2.1 Desk-based Assessment

2.1.1 To examine relevant primary and secondary sources, particularly early maps of the sites and any other documents in order to better understand the dating and development of the survey areas, and set them in their historic context.

2.2 Survey

2.2.1 To undertake a programme of archaeological survey to a Level 2-type standard (English Heritage 2007) of the survey area identified in the project brief.

2.3 Report

2.3.1 To produce a report detailing the results of the desk-based assessment and survey, which will outline the character, form and, where possible, date each of the sites recorded, and discuss their significance.

2.4 Archive

2.4.1 Produce a full archive of the results of the project.

3. Methodology

3.1 Desk-based Assessment

3.1.1 An examination of easily available sources, particularly maps, relating to the survey area will be carried out. The information collected during the desk-based assessment will be used to inform the survey carried out on each of the four sites (see *Section 3.3.1* below) and will be used in their interpretation. It will include the following sources:

- ***LDNP Historic Environment Record (HER)***: records relating to known sites of archaeological interest within the woodland survey areas will be obtained from the HER. These records will provide a location related to the national grid for each site, a description, and details of the sources that were used to identify it, which will be examined where available. In addition any other relevant records held by the Cumbria County Council HER will also be examined, in particular aerial photographs, where suitable;
- ***Cumbria Record Office (Carlisle)***: the majority of original and secondary sources relating to the survey areas are deposited in the Cumbria Record Office in Carlisle. Of principal importance are early maps, particularly those produced by the Ordnance Survey. These will be examined in order to establish the date of any structures present at each site, the form and extent of them and any other features such as field boundaries, any evident periods of alteration, and, where possible, their function and use in order to set them in their historic context. In addition, any details of owners and occupiers will be acquired where available, and information relating to previous archaeological investigations of the survey areas;
- ***National Monument Record (NMR)***: copies of any information held at the NMR will be obtained as well as any relevant aerial photographs, which will enhance the understanding of the survey area and the identification of remains present within it;
- ***Greenlane Archaeology***: a number of copies of maps and local histories are held by Greenlane Archaeology. These will be consulted in order to provide information about the local history of the area, as well as provide useful comparative information that will aid the interpretation of the sites.

3.2 Survey

3.2.1 ***Walkover***: an initial walkover survey of the entire survey area will be carried out in order to indentify the number of sites of archaeological interest within it, their form and extent. This will be carried out through walking transects across the study area, typically 5m-10m apart, but depending on local topography. Each site will be numbered and marked and located using a hand-held GPS (accurate to within *c*5m) so that it can be located during the subsequent more detailed survey (see *Section 3.3.2* below).

3.2.2 ***Level 2***: an analytical survey to Level 2-type standards (English Heritage 2007) is required for each site identified within the survey area during the initial walkover survey. Level 2 is a relatively detailed survey technique, including analysis of the site's development, as well as a record of its core elements (*op cit*, 23). It will include the following techniques:

- ***Drawn Record***: the topographic features of each site will be recorded using a total station coupled to a portable computer operating TheoLT and AutoCAD (which will enable the production of an AutoCAD .dwg file on site at a scale of 1:1). This information will then be plotted out on paper at a suitable scale (no more

than 1:500) and hand-annotated onto draughting film to produce a finished drawing, which will then be digitised for inclusion as a figure in the report;

- ***Written Record***: an account of each site will be produced, comprising a descriptive record of the various elements of the monument will be made on Greenlane Archaeology *pro forma* record sheets or record sheets provided by the client, as appropriate. These records will describe their plan, form, dimensions, function and age (where known), and construction materials. They will then be used to produce a descriptive account of it for use in the report and they will enable an assessment of the significance of the monument to be made;
- ***Photographic Record***: photographs in colour digital format will be taken. These will include both general shots of the entire monument, showing its topography and general spatial arrangement, especially in relation to other features of interest in the immediate landscape, and detailed shots of individual elements of archaeological interest. In addition, high level digital photographs will be taken, through the use of an extending pole, at each site. Through reference to the other survey techniques used it will then be possible to rectify these images and ultimately use them to produce a further drawn record. The digital photographs will also be used for illustrative purposes within the report, and a written record will be kept of all of the photographs that are taken detailing the direction, size of scale in the photograph, date, and identity of the photographer.

3.3 Report

3.3.1 The results of the desk-based assessment and survey will be compiled into a report, which will provide a summary and details of any sources consulted. It will include the following sections:

- A front cover including the appropriate national grid reference (NGR);
- A concise non-technical summary of results, including the date the project was undertaken and by whom;
- Acknowledgements;
- Project Background;
- Methodology, including a description of the work undertaken;
- Results of the desk-based assessment, illustrated as appropriate, for example with extracts from early maps;
- Results of the survey including a descriptive account of each site, with photographs as appropriate, including a brief discussion of their significance;
- Discussion of the results, including a description of the development of each site and the local landscape, based on the evidence from the desk-based assessment and survey;
- Bibliography;
- Illustrations at appropriate scales including:
  - a site location plan related to the national grid;
  - individual plans showing the results of each site recorded.

3.4 Archive

3.4.1 The archive, comprising the drawn, written, and photographic record of the site, formed during the project, will be stored by Greenlane Archaeology until it is completed. It will specifically include copies (either digital or hard copy) of historical sources consulted as part of the desk-based assessment. The archive will be compiled according to the standards and guidelines of the IFA (Brown 2007), and in accordance with English Heritage guidelines (English Heritage 1991). In addition details will be submitted to the Online AccesS to the Index of archaeological investigationS (OASIS) scheme, with the client's consent. This is an internet-based project intended to improve the flow of information between contractors, local authority heritage managers and the general public.

4. Work timetable

4.1 Greenlane Archaeology will be available to commence the project from the **16th January 2012**, or at another date convenient to the client. It is envisaged that the project will comprise tasks in the following order:

- ***Task 1:*** desk-based assessment;

- ***Task 2***: completion of level 2 survey;
- ***Task 3***: production of draft report including illustrations;
- ***Task 4***: feedback, editing and production of final report – to be completed before February 22nd;
- ***Task 5***: finalisation and deposition of archive.

5. Other matters

5.1 Access

5.1.1 Access to the site will be organised through co-ordination with the client and/or their agent(s). Greenlane Archaeology reserves the right in increase the price if part or all of the survey area is inaccessible for any reason during the walk-over survey and this results in additional visits to complete the work.

5.2 Health and Safety

5.2.1 Greenlane Archaeology carries out risk assessments for all of its projects and abides by its internal health and safety policy and relevant legislation. Health and safety is always the foremost consideration in any decision-making process.

5.3 Insurance

5.3.1 Greenlane Archaeology has professional indemnity insurance to the value of **£500,000**. Details of this can be supplied if requested.

5.4 Environmental and Ethical Policy

5.4.1 Greenlane Archaeology has a strong commitment to environmentally and ethically sound working practices. Its office is supplied with 100% renewable energy by Good Energy, uses ethical telephone and internet services supplied by the Phone Co-op, is even decorated with organic paint, and has floors finished with recycled vinyl tiles. In addition, the company uses the services of The Co-operative Bank for ethical banking, Naturesave for environmentally-conscious insurance, and utilises public transport wherever possible. Greenlane Archaeology is also committed to using local businesses for services and materials, thus benefiting the local economy, reducing unnecessary transportation, and improving the sustainability of small and rural businesses.

5.5 Equality and Access Policy

5.5.1 Greenlane Archaeology abides by the by-laws of the Institute of Field Archaeologists, whose *Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology* requires that: '*The archaeologist shall recognise the aspirations of employees, colleagues and helpers with regard to all matters relating to employment, including career development, health and safety, terms and conditions of employment and equality of opportunity*' (IFA 2002, 1).

6. Bibliography

Brown, DH, 2007 *Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer and Curation*, Archaeological Archives Forum

Elsworth, DW, 2005 *Hoad, Ulverston, Cumbria: Archaeological Landscape Investigation*, unpubl rep

English Heritage, 1991 *The Management of Archaeological Projects*, 2nd edn, London

English Heritage, 2007 *Understanding the Archaeology of Landscapes: A Guide to Good Recording Practices*, London

Greenlane Archaeology, 2006 *Kentmere Horseshoe, Lake District National Park, Cumbria: Archaeological Evaluation*, unpubl rep

Greenlane Archaeology, 2010a *Bankfield Hall and the Coot, Great Urswick, Cumbria: Archaeological Desk-Based Assessment, Building Recording, and Walk-Over Survey*, unpubl rep

Greenlane Archaeology, 2010b *Land to the South of Scroggs Wood, Kendal, Cumbria: Archaeological Desk-Based Assessment*, unpubl rep

Greenlane Archaeology, 2011 *9 High Street and Land to the Rear of the Town Hall, Skipton, North Yorkshire: Archaeological Desk-Based Assessment*, unpubl rep

Greenlane Archaeology, forthcoming *The Helm, Oxenholme, Kendal, Cumbria: Archaeological Landscape Survey*

IfA, 2002 *By-Laws: Code of Approved Practice for the Regulation of Contractual Arrangements in Field Archaeology*, revised edn

IfA, 2008a *Standard and Guidance for Archaeological Desk-Based Assessment*, revised edn

IfA, 2008b *Standard and Guidance for Archaeological Field Evaluation*, revised edn

IfA, 2008c *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings and Structures*, revised edn

Lake District National Park Authority, 2011 *Brief for an Archaeological Survey of Dale Beck Smelt Mill, Caldbeck and Uldale Common*, unpubl

Whitehead, S, and Elsworth, D, 2008 Investigation of Part of the High Street Roman Road in Kentmere, *Trans Cumberland Westmorland Antiq Archaeol Soc*, 3rd ser, **8**, 241-246