NAA

ARCHAEOLOGICAL WATCHING
BRIEF REPORT

Northern Archaeological Associates Ltd

Marwood House
Harmire Enterprise Park
Barnard Castle

Co. Durham
DL12 8BN

t: 01833 690800

f: 01833 690801

e: mt@naa.gb.com

w: www.naa.gb.com

NENTHEAD LEAD MINES, NENTHEAD, CUMBRIA

on behalf of

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and

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Text: Ben Turner

Illustrations: Catherine Chisman, Dawn Knowles, Kate Chapman

Edits: Matt Town

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		Name	Ben Turner	Matt Town	Hannah Russ

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NENTHEAD LEAD MINES, NENTHEAD, CUMBRIA

ARCHAEOLOGICAL WATCHING BRIEF REPORT

SUMMARY

This document presents the results of a programme of watching briefs for archaeological monitoring undertaken at Nenthead Lead Mines, Nenthead, Cumbria (NGR NY 7865 4325). Nenthead Mines was designated a Scheduled Monument in 1982 under the provisions of the Ancient Monuments and Archaeological Areas Act of 1979, with additional elements being added in September 1997. The Scheduled Monument covers 48 hectares.

A professional team, headed by Countryside Consultants, undertook a programme of conservation and consolidation at the site on behalf of Cumbria County Council, with the support of Natural England. This programme was based on a Conservation Management Plan and Schedule of Works produced by Countryside Consultants, which directed the conservation works undertaken.

As a result of the high archaeological potential of the site, a programme of archaeological recording was agreed with English Heritage (under Scheduled Monument Consent), which was implemented during the consolidation works. In most cases, this took the form of an archaeological watching brief. The archaeological monitoring was undertaken to ascertain the extent, condition, character and date of any archaeological remains identified, in accordance with the National Planning Policy Framework, Policy 12.

The consolidation works carried out onsite have been successful in conserving these areas for future generations and also making these areas safe for visitors.

As a direct result of the consolidation work a number of future recommendations for further consolidation have been made. These are largely focussed on features in and around the Smelt Mill complex and are discussed above. Although not immediately urgent these features will require remedial work, which could probably be undertaken by local volunteers.

The consolidation work carried out around Smallcleugh washing floor and culvert further demonstrates the high archaeological potential of the site as a whole. The area around Smallcleugh washing floor in particular has never been subject to archaeological investigation prior to the current phase of consolidation. As a direct result of the remedial work carried out we have been able to further reinforce our understanding of the dressing floor complex around Smallcleugh

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Project Background

1.1 A programme of conservation and consolidation was carried out at Nenthead Lead Mines, Alston Moor, Cumbria (NGR NY 7865 4325, Figure 1), by a professional team, headed by Countryside Consultants, on behalf of Cumbria County Council, and with the support of Natural England. This programme was based on a Conservation Management Plan and Schedule of Works produced by Countryside Consultants (Countryside Consultants 2013), which directed the conservation works undertaken. Nenthead Mines was designated a Scheduled Monument in 1982 under the provisions of the Ancient Monuments and Archaeological Areas Act of 1979, with additional elements being added in September 1997. The Scheduled Monument covers 48 hectares.

1.2 As a result of the high archaeological potential of the site and its designated status, a programme of work was agreed upon with Historic England (under Scheduled Monument Consent), which provided a programme of archaeological recording that was implemented during the consolidation works. In most cases, this took the form of an archaeological watching brief. The archaeological monitoring was undertaken to ascertain the extent, condition, character and date of any archaeological remains identified, in accordance with the National Planning Policy Framework, Policy 12.

Historical Background

1.3 The first documented mining activity on Alston Moor (the modern civil parish where the Nenthead mining complex is located) dates from the 12th century, with the rental of a silver mine in the year 1130-31 (Summerson 1993). Although most of the lead mining and smelting carried out during this period was primarily for the refining of the or for its silver content, there was a growing demand for the base metal as a building material, particularly for use in the roofing and plumbing of religious houses and castles (Town 2013).

1.4 By the 13th century, Alston Moor fell within Scottish territory and the mine came into the ownership of the Kings of Scotland. Smelting disappeared from Alston Moor during the 13th century, as the number of trees available for fuel diminished. Little is known of mining activity during the 14th century. An inquest after the death of Nicholas de Vetriponte in 1315, who at the time was in possession of Alston Moor, identified a total of 68 tenants which may have formed a population of 500 or 600 people.

1.5 There is little documentary evidence for lead mining on Alston Moor between the late 15th and early 17th centuries, although it is likely that some limited exploitation by surface workings and shallow pits continued throughout this period. The Alston Moor Estate was held by the Vetriponte family until the beginning of the 17th century, at which point the estate passed, by marriage, to the Hilton's of Hilton Castle, Durham. The mines were surveyed in 1611 and were reported as being almost exhausted.

1.6 The estate was subsequently sold to Sir Francis Radcliffe, Earl of Derwentwater, in 1618 for £2,500.

The Radcliffes encouraged the working of the Alston Moor mines, leading to an apparent increase in lead production by the latter half of the 17th century. Lead mining prior to 1700 was probably limited to surface workings and small underground pits.

1.7 Mining rights on Alston Moor were leased by small companies and individuals, a pattern that continued into the 18th century. The first vein to be exploited to any extent at Nenthead was the Rampgill Vein, which commenced in 1690. In 1692, the 'Governor and Company for Smelting Down Lead with Pit Coal and Sea Coal ', was formed in London, being granted a very important charter for the smelting of lead with coal. In 1704, the Ryton Company and the 'Governor and Company' merged to form a new concern, which became known as the London Lead Company (also known as the 'Quaker Company' as many shareholders were Quakers).

1.8 In 1735, George II granted the estate to the Royal Hospital for Seamen at Greenwich in London. In 1736, 31 of the remaining mining leases on Alston Moor were let to Colonel George Liddle and partners, who formed a company that began trials on the Rampgill Vein and built the first smelt mill at Nenthead in 1736. In 1745, the London Lead Company obtained the transfer of the Liddle and other leases, as well as that relating to Nenthead Mill, which had been constructed by the Colonel. The company therefore became the largest mining concern in the area and the major employer.

1.9 By the middle of the 18th century it had developed most of the mine workings at Nenthead, and these were all in full operation by 1780. In common with many of the mines under their operation, the company increased the infrastructure needed to support their expanding mining activities, and as a result, mines were modernised and a unified system of exploration, development and mining evolved. The London Lead Company were also keen to use the latest developments to increase productivity. They employed mining engineers and chemists and subsequently were able to improve smelting and metal recovery operations. The mines became a major source of employment for the rural populations in the North Pennines, and although the London Lead Company continued to operate at a profit until the late 19th century, its Alston Moor mines had reached their production peak by the 1820s.

1.10 The London Lead Company operated at Nenthead until 1882, when the leases on the mines, which still had between fifty and sixty years to run, and the freehold of the Priorsdale Estate, were sold to the Nenthead and Tynedale Lead and Zinc Company. The company aimed to produce 5000 bings (2030 tonnes) of ore a year from the mines, which would yield 1550 tonnes of lead and 12,000 ounces of silver from the smelt mill.

1.11 Although the company's expectations were therefore good, unfortunately the projections proved inaccurate. The value of lead slumped in 1889, followed by silver in 1894. The mine therefore became increasingly reliant on the production of zinc, which formed 80% of the metal sales. However, the cost of processing the zinc was much higher than that for lead and in 1895, the zinc value had also slumped. The combination of the disastrously low zinc, lead and silver prices were too much. In 1895, the lease on the Tindale spelter expired, and was not renewed following disputes

with the landowner, the Earl of Carlisle, over the activities of the company. The works were dismantled in 1896, and the company was liquidated in the same year.

1.12 In 1896, the Vielle Montagne Zinc Company of Belgium took up the Nenthead leases for 42 years, and by October 1897, considerable changes were being made to the running of the mines. The company modernised zinc and lead production. Traction engines and locomotives were used for haulage, and acetylene lamps replaced candles in the mines. The Vielle Montagne Zinc Company reworked the old London Lead Company workings for zinc and drove extensive new levels into the mines, developing the large networks served by the Rampgill and Capelcleugh levels at Nenthead, from which a considerable quantity of zinc ores as well as galena was gained. Between 1897 and 1913, the Vielle Montagne Zinc Company produced 8,135 tons of lead ore, 48,215 ounces of silver and 87,235 tons of zinc ore.

1.13 Both above and below ground operations by the company on Alston Moor ceased in 1921, although the re-processing of old spoil heaps continued through to the Second World War. During the Second World War, following the Nazi occupation of Belgium, the mines became cut off from their head office, with currency and export restrictions crippling the business.

1.14 In February 1949, Anglo-Austral Mines Limited, a subsidiary of the Imperial Smelting Corporation Limited, took control of the former assets of the Vielle Montagne Zinc Company. They were mainly concerned with reworking the spoil for fluorspar, as well as developing the mines at Nentsberry for zinc production. In December 1961, the smelt mill was sold to the Rampgill Mine Company, who were interested in the recovery of lead and zinc from the dumps of mine-waste around the site. The enterprise was short-lived and their operations ceased in 1963.

1.15 In 1970, the British Steel Corporation leased the whole of Alston Moor to explore for fluorspar. The smelt mill site was largely intact until the early 1970s when demolition of the surviving remains was undertaken to salvage the building material; the café at Hartside was built from the remains of the smelt mill (Town 2013)

Previous Work

1.16 The Nenthead mines have been subject to a number of archaeological excavations over the last three decades. The first excavations at the site were undertaken by David Cranstone in 1987 and 1988, at the site of an 18th century water-powered stamp mill to the southeast of the car-park (Cranstone 1988a and 1988b).

1.17 The North Pennines Heritage Trust (NPHT) was set up in 1987 and became actively engaged in the conservation and interpretation of the Nenthead site. Works progressed in that period from small-scale emergency repairs with limited recording, to a full-scale conservation programme. Some of the buildings on the site, particularly those related to the later phases of activity, were in a good state of preservation and survived as roofed structures; others, such as the former mine compound buildings at Rampgill (adjacent to the car park), required some repair work. Most of the mineshafts and level

entrances were in a reasonable condition, although many were fenced off or gated for reasons of public safety. As a direct result of the conservation programme, significant data was accrued concerning the phased development of several of the standing buildings on the site.

1.18 In 1994, the first major conservation works were undertaken on the Rampgill compound, and all the buildings were investigated. An archaeological watching brief also recorded a number of structures and culverts within service trenches, some of which may form part of a wider water management system (Hedley and Cranstone 1995).

1.19 In 2005, a field school, the Nent Valley Archaeological Project, was set up at the mines. The Smallcleugh Project, which formed part of this, was undertaken in 2006 and 2007, focussing on the Smallcleugh and Middlecleugh mines to the southeast of the Nenthead mining complex. The works comprised the recording and consolidation primarily of mine shops and other buildings (the 2006 season is reported in Sowerby 2006).

1.20 The Nenthead mines have also benefited from a number of detailed surveys, commissioned either by the NPHT, the Countryside Commission, English Heritage and/or Cumbria County Council. Archaeological works began in 1985, when detailed non-intrusive ground surveys were carried out by Liverpool University's Environmental Advisory Unit (LUEAU nd) and subsequently in 1993, by the Royal Commission on the Historical Monuments of England (RCHME 1993). Both surveys mapped or planned all surface features at a variety of scales and produced a gazetteer of site components and features. The RCHME report contains basic textual descriptions of the components and collates, as far as possible, all existing survey work.

1.21 Cumbria County Council's Economic Development Unit also undertook a detailed 1:500 scale contour survey of the site in the same year. In 1995, Barton Howe Warren Blackledge (BHWB 1995) was commissioned by NPHT to produce a draft management plan for the lead mining complex at Nenthead, which also mapped the surface archaeology in detail. The survey undertaken by BHWB was supplemented by further survey work in 1997, by the Lancaster University Archaeological Unit (LUAU 1997). This examined two defined areas of landscape (an area to the south-east of the main smelt mill complex and the Dowgang Burn and Hush) and identified a further 22 features in those areas.

1.22 In 2008, English Heritage commenced the Miner Farmer Landscapes Project, an innovative, multi-disciplinary research initiative begun with the intention of furthering the understanding, conservation and public enjoyment of the historic environment within the North Pennines Area of Outstanding Natural Beauty (AONB). The project was undertaken with support from the AONB partnership, local experts and volunteers, universities and other government agencies (Frodsham and Town 2014).

1.23 Between January and May 2011 North Pennines Archaeology Ltd undertook a survey of an 18km^2 upland area (known as Block 2A), as part of the wider Miner Farmer Landscapes Project being undertaken by English Heritage. The survey area covered the southeast part of Alston Moor, together with the settlements and historic mining complexes at Garrigill and Nenthead. A total of 2548 sites

were identified during the field survey, with the vast majority of the sites being of post-medieval date and directly related to lead mining (Railton and Wooler 2012).

2.0 AIMS AND OBJECTIVES

2.1 The purpose of the archaeological monitoring was to record any archaeological fabric, features and deposits that were uncovered during the course of the consolidation work. The main objectives were:

- to provide a detailed record of any archaeological remains in advance of their loss through the proposed works; and
- to recover and assess any associated structural, artefactual and environmental evidence.

3.0 METHODOLOGY

3.1 A schedule of works was produced by Countryside Consultants, which listed 12 separate areas where work within the Scheduled Monument was required. Contractors referred to this document and its accompanying figures throughout the consolidation scheme. The works required for the conservation of these different areas had significantly different scales of impact, which varied according to: the areas of the site being worked, and the attendant access issues; the level of previous archaeological recording undertaken; and the scale of the works proposed.

3.2 It should be noted that, as the work progressed, other unforeseen issues arose which required archaeological responses. A constant dialogue between contractor and archaeologist was maintained to minimise any threats to the archaeological resource.

Consultation

3.3 Prior to the commencement of works, the monitoring archaeologist visited the site, accompanied by the contractor and the conservation architect, in order to establish: safe access routes across sensitive archaeological areas; a clear understanding of the archaeological requirements listed in the Schedule of Works; and clarification of any areas where archaeological recording was required which was picked up as part of the Schedule of Works.

Photographic Survey

3.4 A general photographic survey was undertaken of all the structural elements listed as requiring this, using a digital SLR camera at a resolution of 10 megapixels. Photography was undertaken before consolidation as a pre-intervention record, and after, in order to record the form of the alterations undertaken. All detailed photographs contained a graduated photographic scale of appropriate dimensions. This photographic record has been used to illustrate the report. A full catalogue of all features was included within the site archive. A block plan has been provided illustrating the position of the photographs taken.

Watching Brief

3.5 The consolidation works required the dismantling of some structures, the clearance of deposits in some areas, and limited areas of excavation. Where required, these works were undertaken under the constant supervision of the monitoring archaeologist. If the monitoring archaeologist was not present, and/or the site contractors noticed significant archaeological remains during the consolidation works, the archaeologist was informed immediately. Areas of turf-cutting for soft capping were also monitored as a matter of course, as there was potential for earlier features (particularly dressing floors).

3.6 Where structures, finds, soil features or layers of archaeological interest were exposed or disturbed by the ground works, the archaeologist was provided with the opportunity to observe, clean, assess, excavate by hand where appropriate, sample and record these features and finds. Hand cleaning and excavation of selected archaeological features or structures was undertaken in order to characterise the site's archaeology and facilitate recovery of artefactual and environmental evidence.

3.7 Significant building remains, in particular the faces of walls and vaults of tunnels exposed during consolidation works, were cleaned and characterised. Excavation of building remains was limited so that important relationships and significant building elements were not removed. Complex remains encountered required additional excavation and/or mitigation, which was agreed before consolidation work began.

Recording

3.8 Significant archaeological remains were located using a GPS or a total station theodolite linked to a pen computer using real-time mapping software. Information was transferred to AutoCAD software and reproduced for incorporation within the final report. All levels are tied in to Ordnance Datum.

3.9 A drawn record of all archaeological features was made at an appropriate scale. Sections/profiles/elevations were drawn at a scale of 1:10 and their location accurately identified on the appropriate trench plan. Plans were drawn at a scale of 1:20. Drawings also include appropriate data on levels relative to Ordnance Datum. Written descriptions of archaeological features/deposits were recorded on pro forma context sheets, which employ standard archaeological recording conventions.

4.0 SMELT MILL COMPLEX AND SPINEWALL

4.1 The smelt mill complex at Nenthead is a complicated structure, which has developed organically since at least the middle of the 18th century until the present day. The complex comprised at least nine buildings, paved courtyards and passageways, the bingsteads, and the spine wall, the latter two elements being the largest upstanding remains within the complex. Previous reports (e.g. Town 2005) have used a system of letters for naming the individual buildings. This system was developed historically, and is still used to a certain extent on site today. These letters are used where relevant in this report. The individual history of each building will also be discussed where known. The position of all features discussed within the smelt mill complex can be found in Figure 2.

Plate 1: Smelt Mill Feature 1 pre-intervention image of section of wall to be dismantled and rebuilt.

History: Smelt Mill

4.2 George Liddle was responsible for erecting the first smelt mill at Nenthead in 1737. Details of the mill are included in Liddle's account book, written in Alston on May 26th of the same year. A few years later the smelt mill was sold to the London Lead Company. The exact date of the smelt mill being reopened is unclear; a date of August 1746 is given (Fairbairn 1993, 179), and the smelt mill was certainly in use by 1750 (Almond 1977, 28).

4.3 The current smelt mill building is likely to be the original Liddle smelt mill; there is some debate as to whether the smelt mill was in fact entirely rebuilt and that the current structure could represent a later mill building constructed by the London Lead Company. The smelt mill built by Liddle was a

new building, only eight years old, and it would have been an unnecessary expense to demolish and rebuild a functioning smelt mill, though this possibility cannot be totally discounted (Town 2005).

Plate 2: Smelt Mill Feature 2 pre-intervention.

Results: Smelt Mill

Smelt Mill Feature 1

4.4 Smelt Mill Feature 1, Plate 1, was located directly adjacent to the northwest of the wheel pit and encompasses a section of low wall butting up against the stone footing for the axle of the wheel pit (Countryside Consultants 2013, fig. 28). The structure had suffered significant loss of mortar and had become highly vulnerable to further degradation.

4.5 The wall was constructed of randomly coursed roughly faced limestone blocks of various sizes. It measured 2.50m in length by 0.35m wide and stood 0.45m high. A low timber post was set into the end of the wall which is possibly the remnants of a timber shrouding that would have covered the wheel pit.

4.6 It was proposed that the structure was to be completely dismantled and approximately 2.1 by 0.5 by 0.5m was to be rebuilt using the same stone. The structure was dismantled under archaeological supervision and rebuilt in 0.5m stages in order to retain the original structure. During dismantling it was apparent that the timber post was cut into the flagged flooring and that the wall sat on top of the flags. No features of further archaeological interest were uncovered during the consolidation works.

Smelt Mill Feature 2

4.7 Smelt Mill Feature 2, Plate 2, was located at the south-western end of the smelt mill wheel pit and encompasses a small square structure approximately 1.17m by 1.04m by 0.15m (Countryside Consultants 2013, fig. 28). The structure had suffered a complete loss of mortar and had become vulnerable to further loss through natural erosion.

4.8 The structure was visible as two courses of brick on the southwest and southeast sides and a course of sandstone blocks on the northwest side. The brick courses were arranged unusually as headers and the second course of bricks are notably heat affected. The structure represented the remains of an ore hearth.

4.9 A watching brief took place on the 17th of July 2014 to monitor the clearance of loose debris from around this structure. It was proposed that 20 bricks were to be uplifted and re-bedded back into their original position. The top course of brick was removed down to a solid bearing and the loose bricks re-bedded back into place using lime mortar, Plate 3. No features of further archaeological interest were uncovered underneath the top coursing of brick.

Plate 3: Smelt Mill Feature 2 post-intervention.

Smelt Mill Feature 3

4.10 Smelt Mill Feature 3, Plate 4, was located immediately adjacent to the southeast side of the wheel pit in the main smelt mill complex and is highlighted in the management plan (Countryside Consultants 2013, fig 28). Similarly to the rest of the structures in and around the wheel pit this feature had suffered a loss of mortar causing the top courses of brick to come loose and had become highly vulnerable to collapse and further degradation.

4.11 The structure was built in brick and butted up against the footing for the axle of the wheel pit on the

southeast side. The southeast wall of the structure curved away from the wheel pit; it measured 1.62m in length and stood six courses high. Opposite the curving wall was a similar partial wall approximately 1.21m in length and also stood six courses high. Presumably this wall would have curved outwards similarly to the opposite wall, but now no longer survived. The structure comprised the inlet for the air-blast from the fan located adjacent to the wheel pit.

Plate 4: Smelt Mill Feature 3 prior to consolidation.

4.12 In the centre of the structure was a pit like feature measuring 0.36m by 0.50m by 0.47m deep and was filled by modern debris and bordered by a separate course of bricks laid in a different coursing pattern to the two walls coming off the structure. On the southeast face of the pit was an iron plate approximately three courses down.

4.13 Reconsolidation of this feature was carried out without an attending archaeologist. Subsequent conversations with contractors from William Anelay revealed only further coursing was uncovered under the course of bricks removed. However, more of the iron plate discussed above was revealed and then re-covered by the re-bedding of the above courses of brick. Approximately 12 bricks were uplifted to sound bedding and re-bedded using lime mortar. The curved section of the southeast wall was not consolidated due to the improper placement of the supporting scaffolding for the spine wall, which has caused the mortar on this section of wall to crack (Plate 5).

Plate 5: Reconsolidation of structure with scaffolding to the right.

Smelt Mill Feature 4

4.14 Smelt Mill Feature 4, Plates 6 and 7, was located to the northeast of the wheel pit at NY 78430 43293 (Countryside Consultants 2013, fig 33). A large pile of fallen masonry from the spine wall was highlighted for removal under archaeological supervision to identify any features present underneath and to enable further consolidation work to be carried out on this section of wall.

4.15 This structure comprised an original doorway leading up to the upper level via a staircase. The structure was deliberately in-filled and bricked up along its south western face. A timber door frame survived either side of the entrance which stands approx 1.5m tall. The presence of a tenon joint at the top of the timber beam suggests there would have been a timber lintel across the top at some stage.

4.16 After consultation with contractors from William Anelay it was decided that loose masonry from inside the structure was to be removed and any bricks that were obviously part of the structure on the back face were to be left *in situ*.

Plate 6: Smelt Mill Feature 4 showing bricked up door and timber frame.

Plate 7: Smelt Mill Feature 4 debris clearance.

4.17 Under closer inspection of the cleared structure of it was apparent that no further consolidation was required as the area was stable.

Plate 8: Smelt Mill Feature 5. Note two voids either side of ranging pole. Wall of Building A butting against.

Smelt Mill Feature 5

4.18 Smelt Mill Feature 5, Plate 8, was located against the northwest corner of the smelt mill building adjacent to Building A at NY 78412 432887 (Countryside Consultants 2013, fig. 33). Some concern was raised with this section of wall as to whether the voids highlighted were a structural feature or a defect in the wall likely to cause future damage to the northeast wall of the smelt mill.

4.19 Under further consultation between William Anelay it was apparent that these voids were in fact defects in the wall and not structural. The wall itself had undergone numerous phases of rebuilding and repair, possibly associated with the addition of Building A.

4.20 Due to time and weather constraints this section of wall was not consolidated. It was not considered that this section of wall was in immediate danger and was stable. However, future consolidation was recommended.

Smelt Mill Feature 6

4.21 Smelt Mill Feature 6, Plate 9, was located to the northeast of the wheel pit and measured 2.71m by 0.54m and was located at NY 78418 43293 (Countryside Consultants 2013, fig. 29). The wall had suffered significant loss of mortar and had become highly vulnerable to further degradation.

4.22 The structure was visible as two courses of roughly faced limestone blocks of various sizes arranged in a roughly squared coursing pattern. The wall butts up against the central wall of the smelt mill complex and was part of the fume hood overlying the ore hearth. Unusually the end of the structure has been squared off, possibly rebuilt, in bricks of various different types indicating that the wall has undergone at least one other building phase.

Plate 9: Smelt Mill Feature 6 pre-intervention.

Plate 10: Smelt Mill Feature 6 post-intervention.

4.23 The top course of this structure was dismantled under archaeological supervision and re-bedded into its original position, Plate 10. No further features of archaeological interest were uncovered beneath the top course of the wall. Only further coursing in a similar style was revealed underneath.

Smelt Mill Feature 7

4.24 Smelt Mill Feature 7, Plate 11, was located butting up against the northwest face of the spine wall adjacent to the archway at the northeast end of the smelt mill at NY 78425 43296 (Countryside Consultants 2013, fig. 44).

4.25 The wall consisted of four courses of roughly faced limestone blocks of various sizes arranged in a roughly squared coursing pattern bonded with lime mortar. The top course is made up of noticeably larger limestone blocks.

4.26 A large quantity of fallen masonry from a previous collapse of the spine wall was covering the top of this small structure. It was proposed that this debris was to be removed, and the wall top inspected with the remaining wall built up to same height as the left side, which had survived relatively unscathed.

4.27 After the clearance of the fallen spine wall debris it became clear that no other features of archaeological interest were present and the remainder of the collapsed wall was rebuilt to the same height and specification as the surviving left corner, Plate 12.

Plate 11: Smelt Mill Feature 7 showing wall butting against northwest face of spine wall.

Plate 12: Smelt Mill Feature 7 post-intervention.

History: Building A

4.28 Building A measured 25.0m by 7.6m, and incorporated the northern wall of the smelt mill within its construction. The walls only survive to a few courses in height, and little is known of the original openings. The building was accessed through the south western elevation by a large double-door, with a smaller door to the south-east, and a rectangular central window, with a drain beneath. The north-western side of the building included at least seven further windows, whilst the south-east wall included two archways, connecting the building with the smelt mill. These archways were bricked and walled up, probably around the time of the installation of the fans in the smelt mill. The arrangement at the north eastern end of the building is unknown, as it is obscured by a large stone hopper constructed in 1961 by the Rampgill Mine Company, but never used (Peter Jackson pers. comm.).

4.29 Only one original hearth now survived in this building, comprising a brick structure measuring 3.0m by 1.5m, made of similar brick to that used in the smelt mill and therefore of late 19th century date. The air-blast was via an outlet to the rear of the hearth, and connected to the fan within the smelt mill building. The position of two further hearths or furnaces can be inferred from the position of two inlets through the south-eastern wall, broadly in the location of the blocked arching between the smelt mill and Building A. The flags in this area are badly heat-affected, and some evidence of brick structures is evident adjacent to this area, suggesting a furnace or furnaces stood in the centre of the building at this point. There are no other obvious internal features within the building, other than a concrete machine-base (probably of early 20th century date) and some evidence of brick infilling where an unidentified internal feature (possibly another machine base) has been removed.

Results: Building A

Feature A1

4.30 Feature A1, Plate 13, was located on the southeast wall of Building A at the northeast end of the structure and measured 2.8m by 1.5m. It was located at NY 78421 43297. The structure had suffered significant loss of mortar and had become highly vulnerable to further degradation.

4.31 This feature was the only surviving hearth within Building A and dates from the 19th century. It was bordered on three sides by bricks laid on stretchers then beds with the central area consisting of bricks and half bricks laid on beds, all of which are heat-affected.

4.32 A watching brief was carried out on June 24th 2014 to monitor the removal of loose material and the re-bedding back into original positions. Bricks were removed down to a solid bearing and re-bedded into their original positions using lime mortar, Plate 14. No further features of further archaeological interest were uncovered beneath the top coursing of bricks.

Plate 13: Feature A1 pre-intervention.

Plate 14: Feature A1 post intervention.

History: Building B

4.33 Building B measured 10.0m by 7.35 m and was constructed along the spine wall, which formed the northern wall of the structure, Plate 15. The original use of Building B is not known, though it was probably constructed to house a furnace, as there is a 1.0m wide area of heat-affected burnt stone

that runs the full height of the Spine Wall, located in the centre of the building. The survey carried out by Lancaster University Archaeological Unit (LUAU) states that the shape of the burning, coupled with the occurrence of two recesses to the southwest and one to the northeast, suggests a free-standing flue held in position by timbers would have been housed in these recesses (LUAU, 1997, 81). This suggests that a flue was affixed to the outside of the wall, and turned inwards to the main flue carried by the spine wall just above the surviving lip. These flues may have been metal ducts (Almond 2003a). The type of furnace in this building is not known; Almond (2005) suggests that it later housed a large refractory furnace for cupellation, a process for separating silver from lead ore through treatment under extremely high pressure and temperatures. Although the surviving archaeological evidence for this is scanty, some features of the building do accord with this interpretation.

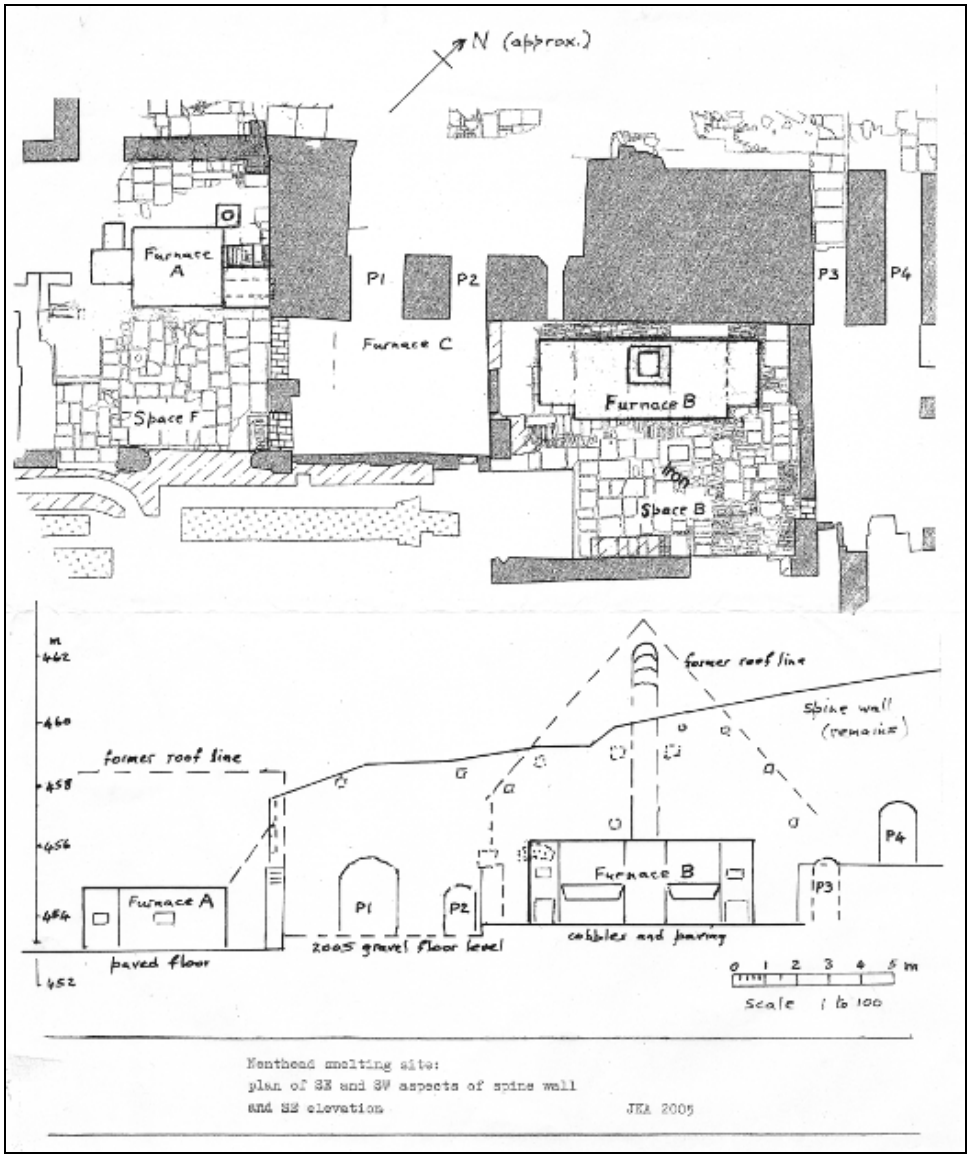

Plate 15: Plan and elevation of Building B (after Almond 2005).

4.34 Structurally the building is a simple stone construction, with some evidence of repairs and rebuilds in brick. The south eastern wall incorporated a large cart entrance noted in historical photographs, with a central stone door-stop and sockets indicating it held double-doors. The south western wall also incorporated a small doorway into Building F/B, which was subsequently blocked up. Building B is floored with rectangular stone flags which are mostly well-preserved, but there are several patches of sub-rounded cobbles that appeared to be later insertions or repairs. Of particular interest are a large patch of cobbles situated centrally in the room, immediately adjacent to the spine wall and directly beneath the burnt wall marking the location of a now-lost vertical flue. It is likely that the patch of cobbles marked the location of a robbed out furnace. The floor surface here is relatively high and it was suggested that that any remains of the furnace may have been buried by the later raising of the floor level, with spaces between the cobbles suggesting that there are voids below this cobbled floor.

4.35 In the southwest corner of the building is a large sunken area, revetted with stone-built walls which represented a purpose-built loading bay inserted into the building at a later date. The loading bay led into the Lancashire Boiler House (Building H); in the 20th century, the building was used as a coal store (as evidenced by the clinker in between the cobbles) and the bay was to allow easy loading of the boiler from this building.

Plate 16: Feature B1 showing loose bricks not consolidated.

Results: Building B

Feature B1

4.36 Feature B1 was located on the southwest end of Building B adjacent to the loading bay and measured 1.21m by 0.60m and 0.95m high, Plate 16. It was located at NY 78431 43282 (Countryside Consultants 2013, fig. 8)

4.37 This structure represented a blocked up door way into buildings B-F and had suffered significant loss of mortar. After consultation with William Anelay it was recommended that this structure be reconsolidated as it stands in the future.

4.38 No further consolidation was carried out on this structure, as it is mostly stable except for a few loose bricks on top which do not look to be part of the original structure.

History: Building C (Pattinson House)

4.39 Building C (Pattinson House) measured 23.2m in length by 11.3m in width, and now only exists as very low bases of walls, apart from the south-eastern wall, which survived to 2m in height. The building is named after Hugh Lee Pattinson, who discovered in 1829, initially by accident, then through a series of experiments, a process for desilvering lead, to which he gave his name (Forster 1883, 203), and which he patented in 1833 (Tylecote 1971, 9).

4.40 The building was still standing in the 1960s, as it was used by the Rampgill Mine Company as a store for the reprocessing of materials. Access to Building C was gained by means of a ramp, built up on the demolished remains of the Rozan House (Building D, see below). In the 1970s, Fairbairn (1998) noted that the roof structure consisted of highly-modified king post trusses and the roof was covered in Welsh slate, not introduced to the area until the late 1830s (Fairbairn 1998, 68). By the early 1970s, it was fully demolished, and was not uncovered again until the area was stripped in March 2001, and recorded in 2005.

Results: Building C (Pattinson House)

Feature C1

4.41 Feature C1, Plate 17, was located at the southern corner of Building C (Pattinson House) at NY 78406 43269 and measured 0.75m by 0.55m by 0.84m high (Countryside Consultants 2013, fig. 24). The structure had suffered severe loss of mortar and was vulnerable to loss through natural erosion.

4.42 The chimney structure consisted of up to thirteen courses of lime mortar bedded Walker Corbridge bricks up to a height of 0.45m. The outer skin of the chimney was constructed of roughly faced limestone blocks of various sizes arranged in a roughly squared coursing pattern.

Plate 17: Feature C1 (Pattinson House) pre-intervention.

Plate 18: Feature C1 post-intervention.

4.43 It was proposed that approximately 1.0m² of the chimney structure be rebuilt and consolidated. A lack of suitable bricks to reconstruct 1.0m² of the structure meant that the chimney was instead

consolidated as it stood. Unfortunately a large limestone slab was re-bedded directly on top of the chimney structure. It is unclear why this block was added as it does not belong as part of the structure.

Feature C2

4.44 Feature C2, Plate 19, was located at the southeast end of Building C (Pattinson House) at NY 78406 43269 (Countryside Consultants 2013, fig. 24). A bulge in the outer skin of the chimney and a general loss of mortar was identified.

4.45 The structure consisted of an outer limestone block skin standing up to 1.2m and roughly 15 courses high. This was constructed of roughly faced limestone blocks of various sizes arranged in an even coursing pattern. Inside the outer skin of limestone blocks is a brick built chimney of the same height using Walker Corbridge bricks. The inner brick built chimney structure measured 0.5m by 0.7m by 1.75m and is probably contemporary with the brick chimney in Feature C1.

4.46 No consultation was undertaken prior to the consolidation of this structure. As a result the outer skin of limestone blocks has been partially rebuilt to 1m high exposing a large section of the inner chimney. The chimney itself has suffered extensive mortar loss and is vulnerable to further loss, Plate 20.

Plate 19: Feature C2 pre-intervention.

Plate 20: Feature C2 post intervention.

History: Building D (Rozan House)

4.47 The Rozan House (Building D): the Rozan House measured 16.4m by 14.3m, with walls standing to approximately 2m on the northwest side, sloping down to 1m on the southeast side. The southwest wall was mostly robbed down to ground level. The reason for the relative survival of this building, in comparison to (for example) the Pattinson House, was that the walls were pulled down and the interior levelled up to form a ramp by the Rampgill Mine Company, in order to allow material to be tipped into the Pattinson House, which was used for the reprocessing of spoil.

4.48 The building is named the Rozan House, because it was used to house a major new process for desilvering lead, introduced to Nenthead in 1882. By 1901, the Rozan House, and parts of the smelt mill, had been converted for the use as a steam powered compressor plant, to be used in case of a failure of the hydraulic system. It formed part of the hydraulic compressor system, which was introduced by the Vielle Montagne Zinc Company between 1903 and 1915 to power mechanised drills which were used in their workings. This conversion effectively removed all the interior workings related to the Rozan Steam Process.

Results: Building D (Rozan House)

Feature D1

4.49 Feature D1, Plate 21, was located at the eastern corner of Building D adjacent to the compressor bases at NY 78417 43259 and measured 0.44m by 0.30m by 1.10m high (Countryside Consultants 2013, fig. 21). The corner of this structure had suffered a collapse due to loss of mortar.

Plate 21: Feature D1 pre-intervention showing doorway into Building H.

4.50 This structure forms part of a doorway leading into Building H on its southwest side. The wall stands up to 14 courses high at 0.9m and is constructed of roughly faced limestone blocks of various sizes arranged in a roughly squared coursing pattern. The corner of this structure, shown in the above plate, had been rebuilt at some stage using a mixture of Corbridge and Tyne stamped bricks. It is possible that this section of brick rebuild represented the remnants of a blocked up door way. After the construction of the Lancashire Boiler in Building H the archway directly to the northwest was bricked up using the same type of brick. It is possible that this doorway was bricked up, presumably to limit access to the chimney and possible drain (discussed in Feature H2) from the Rozan House.

4.51 The section of collapsed corner was taken down to a solid bearing and rebuilt using bricks salvaged from the immediate area that looked as if they has originally come from this section of wall. It was unclear how extensive this rebuild originally was. Judging by the amount of nearby fallen brick it was decided to rebuild the entirety of the corner up to the top of the existing limestone wall, Plate 22.

Plate 22: Feature D1 post intervention

History: Building F

4.52 Building F measured 10.5m by 9.2m and was constructed against the south western end of the spine wall. The original building depicted on the 1859 First Edition Ordnance Survey map appears to have been slightly smaller, but was expanded to the southwest between 1859 and 1882, in order to utilise the walls of the Pattinson House and Rozan House. The building survived, albeit latterly in a semi-roofed and derelict condition, until circa 1970. The roof of Building F was one of several that were recorded by Fairbairn in 1974 prior to their demolition. Fairbairn noted that the roof structure consisted of a ridge beam, supported by king post trusses, with additional posts and two through purlins on each side. The roof ridge ran parallel to the spine wall, and comprised kingposts with additional posts, covered in grey slate (Fairbairn 1998, 68).

Results: Building F

Feature F1

4.53 Feature F1, Plate 23, was located at the southwest end of the spine wall that incorporated the north-western wall of Building F at NY 78417 43279. This elevation was considered under threat because of a general lean forward by 200mm. The masonry on the whole was in good condition bar the top courses around the chimney flue which were subsequently re-bedded prior to the consolidation work on the main face of the wall.

4.54 It was proposed that this face of the spine wall was to be restrained using cintec anchors and pattress

plates. A program of watching briefs and monitoring was initially put in place for the installation of the cintec anchors. However, due to the number of holes and size of the holes being drilled, a full watching brief was not possible and only a small number of holes were monitored. Some concern was raised that the drilling work may come across addition flues or other features within the spine wall. Under close inspection of this end of the spine wall no other features could be determined other than the bricked up furnace and associated chimney.

Plate 23: Building F1. Southwest end of spine wall prior to anchor installation.

History: Building H (Lancashire Boiler House)

4.55 The Lancashire Boiler House (Building H) measured 17.3m in length and 4.5m in width. The walls, which appear brick-built, have been largely removed to foundation level, though the north side, which incorporated some stone-work from Buildings F and FB, stands to about 1.2m in height. The building is depicted on the later editions of Ordnance Survey mapping, and was constructed by the Vielle Montagne Zinc Company in the early 20th century. The boiler house housed the Lancashire boiler which was used to power the McCulloch compressor that had once been located in the Rozan House.

Results: Building H

Feature H1

4.56 Feature H1, Plate 24, represented the north-eastern face of the chimney associated with the Lancashire boiler at NY 78421 43262. The area above the arch of the chimney measured

approximately 1.4m by 1.4m was identified for re-pointing Countryside Consultants 2013, fig. 19).

Plate 24: Feature H1 pre-intervention.

Plate 25: Feature H1 post intervention.

4.57 The structure represented the remnants of the chimney for the Lancashire boiler house. It stood roughly 20 courses high at 1.5m tall and was constructed solely of Tyne stamped bricks. At the base a bricked up arch can be seen, which represented the draw of the chimney.

4.58 Under further consultation between Countryside Consultants, William Anelay and Northern Archaeological Associates, it was decided to undertake addition work on this section of the chimney around the bricked up arch. A further 0.5 by 0.5m section of the arch was reconsolidated as concerns were raised that the poor condition of the underlying brick work would cause the recently re-pointed section to collapse, Plate 25.

Plate 26: Drain structure beneath Feature H2.

Feature H2

4.59 Feature H2, Plate 26, represented the wall butting the back of the chimney associated with the Lancashire boiler and the north east wall of Building D at NY 78421 43262 (Countryside Consultants 2013, fig. 20).

4.60 The structure was 23 courses high in an even coursing pattern. At approximately 1m from the base of the wall a timber lintel was present. It was not apparent what the purpose of the timber lintel was as there are no slots or nails to indicate a purpose.

4.61 The wall butted the back face of the chimney and Building D and therefore was inserted after the construction of the chimney. The wall also seems to butt up against the bricked up draw of the chimney suggesting the wall was inserted after the chimney had fallen out of use. It is uncertain as to why this wall was inserted in this position, but it could possibly be related to the drain linking the void behind the chimney to Building D. To allow the consolidation work to be carried out, the

suspended timber floor was investigated to facilitate access to the back wall.

Plate 27: Feature H3 northwest elevation pre-intervention.

Feature H3

4.62 Feature H3, Plate 27, represented the northwest elevation of the side of the chimney associated with the Lancashire boiler house at NY 78417 43261 (Countryside Consultants 2013, fig. 20).

4.63 The side of the chimney was in a similar state to the front face of the chimney discussed in Feature H1. The structure had suffered significant mortar loss causing deep open joints in the wall. The bottom corner of the structure had collapsed entirely, putting the structure as a whole in significant danger of collapse.

4.64 The collapsed area was subsequently raked out, cleaned off down to a solid bearing and the whole structure re-pointed. The bottom corner was rebuilt using the bricks from the debris around the chimney, Plate 28.

Plate 28: Feature H3 post intervention.

Results: Spine Wall

4.65 The spine wall represented the largest structure within the smelt mill complex and was used to support the flue system. It also held a number of integrated chimneys and flues associated with the various buildings of the smelt mill. As well as the integrated flues, numerous free standing flues were supported by the spine wall specifically around Building B.

Spine Wall Feature 1

4.66 Spine Wall Feature 1, Plate 29, was located on the northwest face at the northeast end of the spine wall adjacent to the inspection chamber at NY 78436 43294. It incorporated a section of the outer skin of the spine wall approximately 3.2m long and 2m high.

4.67 It was comprised of 19 courses of even coursed large well dressed stone. Although not specifically highlighted in the management plan (Countryside Consultants 2013) it was felt that this section of the spine wall posed significant threat to the underlying structures. A section of the spine wall immediately to the southwest had previously collapsed causing a great deal of damage to the structures beneath (see Smelt Mill Feature 4)

Plate 29: Spine Wall Feature 1 pre-intervention.

4.68 This section of wall was dismantled by hand under archaeological supervision, taking great care not to drop rubble onto the structures beneath. This approach was later abandoned due to the nature and instability of the rubble interior of the spine wall.

4.69 It was later decided that this section of spine wall be consolidated as part of the cintec anchor installation discussed below.

Spine Wall Feature 2

4.70 Spine Wall Feature 2, Plate 30, was located along the south eastern face of the spine wall around buildings B and B-F. A large number of voids in the face of the spine wall were identified (Countryside Consultants 2013, fig. 51).

4.71 It was proposed that a number of these voids be filled up by deep tamping. Under further inspection of these voids it became clear that they were of an archaeological origin and not defects in the face of the spine wall. A number of these voids, specifically those around the heat effected red section of the spine wall, were actually used to house a free standing flue taking waste gases away from Building B and into the horizontal flue. The majority of the remainder of the voids represent the old roof line of Building B sloping down to the arched entrance to the southwest of the building.

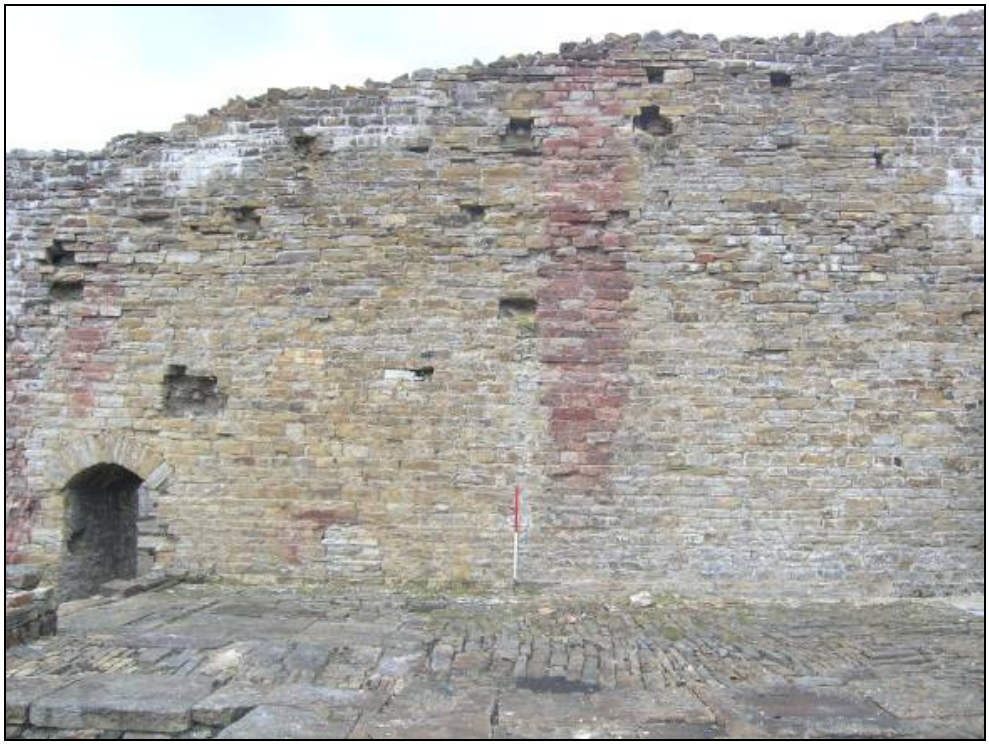

Plate 30: Spine Wall Feature 2 pre-intervention.

4.72 In total only one of the fifteen voids identified was deemed not of archaeological interest and was subsequently blocked up using sandstone blocks and lime mortar.

Spine Wall Feature 3

4.73 Spine Wall Feature 3, Plate 31, was located at the very north-easterly limit of the spine wall adjacent to the track way at NY 78440 43298 (Countryside Consultants 2013, fig. 48). The structure had suffered loss of mortar and was vulnerable to further loss through natural erosion.

4.74 The structure stood up to 11 courses high at 1.22m and was constructed of roughly faced limestone blocks in a roughly squared coursing pattern. In the centre of the wall was an opening approximately 1.02m wide which housed a staircase.

4.75 An extensive amount of work was scheduled (Countryside Consultants 2013, fig. 48) for this section of spine wall. The northwest corner and a section of the wall to the left of the staircase had open joints and as a result were highly vulnerable to collapse.

Plate 31: Spine Wall Feature 3 pre-intervention.

4.76 Further to the consolidation work on the areas mentioned above, it was proposed that the material infilling the staircase be removed to inspect the underlying structure. An archaeological watching brief took place to monitor the removal of debris from the staircase, Plate 32. The exposure of the staircase revealed that the structure had been deliberately blocked up, which is backed up from photography from 1975 (see Plate 33).

4.77 The staircase infill was composed of fine grained bluish grey silt and a slightly oily yellow residue with coarse rubble at the top. The grey and yellow residue had bonded securely to the bottom three steps whereas the coarse rubble sat loosely on top suggesting these two layers were deposited separately.

Plate 32: Spine Wall Feature 3 showing cleared staircase.

Plate 33: Photograph showing blocked up staircase.

Spine Wall Feature 4

4.79 Spine Wall Feature 4, Plate 34, was located on the southeast face of the spine wall at the northeast end opposite the bingsteads at NY 78443 43304 (Countryside Consultants 2013, fig. 49). This section of spine wall had suffered loss of mortar and was vulnerable to further loss through natural erosion.

4.80 This section of wall stood up to twelve courses high down to four courses at its lowest point and incorporated an area of approximately 8.25m by 1.15m. The wall consisted of faced limestone blocks in an even coursing pattern.

4.81 Approximately nine courses of the wall were rebuilt up to 1m from the ground level, Plate 35. No features of further archaeological interest were uncovered during the dismantling of this section of the spine wall, other than rubble infill consistent to that observed elsewhere.

Plate 34: Pre-intervention image of Spine Wall Feature 4 to be rebuilt.

Plate 35: Spine Wall Feature 4 post intervention.

Spine Wall Feature 5

4.82 Spine Wall Feature 5, Plate 36, was located on the northwest face of the spine wall adjacent to the inspection area at the northeast end of the spine wall at NY 78436 43294 (Countryside Consultants 2013, fig. 40). This feature incorporated three separate areas each highlighted in the management plan (Countryside Consultants 2013, fig 40), comprising two corners and a section of wall. The wall, shown in Plate 36, had suffered a general loss of mortar and the joints around both corners had opened up causing a large crack that ran across the wall. The wall face in general had also suffered a general loss of mortar and was highly vulnerable to further loss through natural erosion. This section of wall was not dismantled as it was not deemed necessary, but instead re-pointed *in situ*.

4.83 A watching brief took place on the 17th of July 2014 to monitor the corner depicted in Plate 37, (Countryside Consultants 2013, fig. 40) as the corner was dismantled ready for re consolidation. No features of further archaeological interest were uncovered behind this corner, only further rubble infill was observed.

Plate 36: Spine Wall Feature 5 - wall - post intervention.

Plate 37: Spine Wall Feature 5 – corner - during dismantling.

Plate 38: Spine Wall Feature 5 post intervention.

4.84 A further watching brief was due to take place on the opposite corner, Plate 39, (Countryside Consultants 2013, fig. 40). Due to the placement of the scaffolding supplied to install the cintec anchors, a watching brief did not take place. During a site visit on the 21st October 2014 it was noted that the corner had been taken down ready for re-consolidation. Under further inspection of the area removed, no features of archaeological interest were apparent and only further rubble infill was observed, which was consistent with the remainder of the structure.

Plate 39: Site visit 21/10/14 showing dismantled corner.

Plate 40: Rebuilt corner and face of spine wall.

Spine Wall Feature 6

4.85 Spine Wall Feature 6, Plate 41, was located on the northwest face of the spine wall towards the southwest end opposite the smelt mill wheel pit (Countryside Consultants 2013, fig. 43). Numerous voids together with an area of bulging were visible in the face of the spine wall and it was proposed that the wall be dismantled around the bulge and built back up again once a solid bearing had been established.

4.86 The outer skin of the spine wall was taken down and rebuilt around the sections that were bulging, Plate 42. It was thought that there may have been the remnants of a flue behind this area, however only rubble infill was observed at this point.

Plate 41: Spine Wall Feature 6. Section of bulging spine wall above archway with series of voids.

Spine Wall Feature 7

4.87 Spine Wall Feature 7 incorporated the entirety of the outer skin of the spine wall on the north western face. This area in particular had suffered significant areas of collapse in the past causing large scale damage to numerous features below.

4.88 It was proposed that the entirety of the unstable outer skin of the wall was to be taken down to a solid bearing and rebuilt using reclaimed stone, making sure the rubble infill was also consolidated to prevent further collapses. It became immediately apparent after starting to dismantle the outer skin of the spine wall that the rubble infill was incredibly unstable. This made it unfeasible to dismantle

the wall due to health and safety concerns. It was then decided that this section of wall would be consolidated after the installation of the scaffolding for the installation of the cintec anchors.

Plate 42: Spine Wall Feature 6 post intervention (area at top of image).

Plate 43: Turf removal for spine wall soft capping.

Spine Wall Feature 8: Soft Capping

4.89 Spine Wall Feature 8 incorporated the pre-existing hard capping covering the top of the spine wall. The hard cap installed in 1998 had subsequently failed causing water penetration leading to a collapse of masonry on the northwest elevation of the spine wall. The failed hard capping was to be rectified by the installation of a soft capping across the entirety of the spine wall.

4.90 The main benefit of the soft capping is that it provides a thermal blanket for the underlying stonework, which prevents moisture fluctuations. In turn this prevents the freeze and thaw effect, which can cause structures to deteriorate rapidly, particularly in exposed areas such as Nenthead.

4.91 An archaeological watching brief was carried out for the removal of turf on land in between Smallcleugh Level and Handsome Mea reservoir, Plate 43 (Countryside Consultants 2013, figs. 56 and 56A). This area of land was thought to be the location of a dressing floor.

4.92 In total 10 areas were stripped of turf measuring roughly 4m by 1m and aligned perpendicular to the downhill slope as to not create gullies leading into the main watercourse. No features of any archaeological interest were uncovered during turf stripping in this area due to the shallow depth of the cuttings.

Plate 44: Installation of spine wall soft capping.

Spine wall: Cintec anchor installation

4.93 A brief program of watching briefs was undertaken for the installation of the Cintec anchors into both faces of the smelt mill spine wall, Plate 45 (Countryside Consultants 2013, fig 43). The installation involved the drilling of holes through the face of the spine wall. A watching brief was deemed

necessary as there was the potential for the discovery of unseen flues relating to the processing of ore at the smelt mill.

4.94 Due to the small size and large quantity of holes to be drilled into the spine wall, only a small sample of holes were monitored. No features of further archaeological interest were discovered during monitoring of the drilling for these holes.

Plate 45: Section of spine wall facing northwest showing series of anchor holes.

5.0 SMELT MILL FLUE

History

5.1 The flue is shown in its current form by the time of the First Edition Ordnance survey mapping in 1859. In the late 19th century, probably at the time of the commencement of tenure by the Vielle Montagne Zinc Company, the flue could be seen extending directly from the smelt mill as a flat topped, above ground, structure, leading to a series of large square settling tanks. This was presumably the course of the original flue as constructed in the early 19th century. From the settling tanks onwards, the course of the flue becomes more sinuous as it follows the line of the hillside, and terminates at the chimney far up on the hillside.

5.2 The flue became redundant following the cessation of smelting in 1896; sections have collapsed and been progressively robbed of stone since then. In 1988, the chimney was recorded by Done as being c. 60 feet high ((BHWB 1995, appendix 1/8, 105). The chimney collapsed in November 1991.

Results

5.3 The scope of consolidation work carried out on the smelt mill flue was fairly robust as the majority of the standing structure was in a poor state of repair. In total six sections of the flue were consolidated with two sections of the flue omitted due to time and weather constraints.

5.4 Consolidation on the smelt mill flue required a significant amount of extra work. Initially it was thought that the sections of flue could be consolidated *'in situ'* but in reality the collapses were much more complex than originally thought. The two sections excavated through the flue bank can be found in Figure 3 along with their positions.

Flue 01

5.5 Flue 01 was located at NY 79287 42932 adjacent to the collapsed chimney stack at the northeast end of the line of the flue (Countryside Consultants 2013, fig. 68) and represented an access tunnel or crawl space/manhole used to access the inside of the flue for cleaning. The north eastern wall of the access tunnel had washed away causing the lintel capping to fall inwards completely blocking the structure, Plate 46.

Plate 46: Removal of fallen lintel to expose collapsed wall.

5.6 The interior walls were constructed seven courses high of roughly faced limestone blocks of various sizes arranged in a roughly squared coursing pattern and bonded with lime mortar. On top of the supporting walls lay four rectangular lintels measuring 1.20m by 0.40m by 0.10m. The base of the structure consisted of a thick bluish grey silty clay, which was probably in situ flue waste. The whole structure tapered inward slightly measuring 0.60m at the outside entrance and 0.90m inside the flue.

It was unclear if this tapering was a deliberate feature of the structure or as a result of the collapsing supporting walls.

5.7 A watching brief took place on the 20th August 2014 where a JCB using a toothless ditching bucket was used to strip the natural soft capping, which was placed to one side for re-instatement. The underlying topsoil was removed by machine and the collapsed lintel was lifted using a strap attached to the ditching bucket to reveal the collapse underneath. The underlying structure was then cleaned off by hand and photographed to reveal the full extent of the consolidation work required.

5.8 The damaged section of the north eastern wall was taken down to a solid bearing and rebuilt up to the level of the opposite wall using locally sourced limestone blocks. The collapsed lintel was then put back in place and the soft capping reinstated.

Plate 47: Exposed vaulting and supporting wall.

Flue 02

5.9 Flue 02 was located at NY 79051 43125 and represented a well preserved section of vaulted flue, Plate 47 (Countryside Consultants 2013, fig. 72). A lack of natural ground cover, as a result of livestock movement, had exposed areas of masonry around both portals of this section of vaulting. On top of the flue numerous voussoirs had been punched through also as a result of livestock movement. A further void in the vault arch around the southeast wall of the flue was also noted.

5.10 A timber former was installed to support the vault and the slipped voussoirs pushed back into position. In addition to this, it was recommended that the void be filled up using a selection of the fallen voussoirs from inside the vault. This was achieved by excavating through the exterior bank to

expose the vault on the outside face and inserting the missing voussoir.

5.11 The slipped voussoirs were pushed back into place under archaeological supervision during the installation of the timber former. However the void in the south eastern side of the flue resulted in additional work.

5.12 A watching brief for the excavation of the bank material took place on the 21st of August 2014. A JCB with a toothless ditching bucket was used to strip the existing soft capping to be stored separately and reinstated after backfilling. The underlying material was stripped by machine up to 0.10m away from the vault arching. The remaining material was excavated by hand to avoid damaging the vault structure and the exposed masonry was cleaned off by hand. The base of the bank was excavated down to natural bedrock, which the supporting wall was built upon. The vault arching and wall were recorded via photographic record and a 1:10 section was drawn of the bank material.

5.13 The section through the bank, Plate 48, showed that it was built in numerous phases. The first phase was the construction of the supporting walls cut into the natural bedrock. The material from cutting into the bedrock was cast to one side above the natural boulder clay. Above this layer the bank starts to take shape. A layer of mixed limestone gravel (**027**) was lain down followed by a dump of thick bluish grey clay (**028**) in a lozenge shape which forms the bank shape. Above this deposit are layers of gravel material (**029**) and mixed gravelly re-deposited subsoil. Interestingly it seems that the original bank for the flue only reached as far as the supporting wall for the arch. The vault may have been left exposed for a period of time possibly during construction. A separate phase of bank building fills in the gap between the bank and the vault completely enclosing the flue.

Plate 48: Section through flue bank.

Flue 03

5.14 Flue 03 incorporated two sections of deteriorating flue wall (Countryside Consultants 2013, fig. 75). The earthen bank to the side on both sections of the wall was producing pressure on the outside face, causing it to slowly collapse over time. Both sections of wall had suffered greatly from natural erosion as a result of animal burrowing and livestock movement also.

5.15 The western wall was constructed of roughly faced limestone blocks of various sizes arranged in a roughly even coursing pattern with no bonding and survived up to six courses high at 0.5m. The eastern wall survived in a similar state and was constructed of roughly faced limestone blocks of various sizes arranged in a roughly even coursing pattern with no bonding and survived up to eight courses high at 0.5m.

5.16 It was proposed that the soft capping around both structures be removed to expose the entirety of both walls. Both structures were dismantled down to a solid bearing and rebuilt back up to the original height using salvaged blocks from nearby.

5.17 A watching brief took place on the 20th of August 2014 to monitor the soft cap removal around both structures. A JCB with a toothless ditching bucket was used to strip back the soft capping for reinstatement after the consolidation had been completed, Plate 49. No further features of archaeological interest were uncovered during the watching brief.

Plate 49: Soft capping removal to expose the extent of wall.

Flue 05

5.18 Flue 05 was located at NY 79057 43117 and represented a large section of poorly preserved flue vaulting (Countryside Consultants 2013, fig. 71). Similarly to Flue 02, this section of flue had numerous issues. The main issue with this section of flue was a sizeable bulge and missing voussoirs in the right side wall. Also similarly to Flue 02 a number of voussoirs had been punched through as a result of livestock movement above the vault.

5.19 The flue consisted of two supporting walls with the vaulted section spanning both walls. The wall exposed during consolidation was constructed of roughly faced limestone blocks of various sizes arranged in a roughly even coursing pattern and survived up to ten courses high up to 1m in height. The side wall at this point is noticeably larger than the wall exposed in flue 02. This is probably in response to the slope of the ground and the depth of the bedrock.

5.20 A timber former was inserted into the flue to support the vaulting and the loose voussoirs were pushed back into place. The bank exterior was machined away to expose the sections of missing voussoirs and the bulging section. Similarly to flue 02 this required a more detailed archaeological response due to the machining through the flue bank. The wall and exposed vaulting were recorded by photographic record and the bank was recorded in section at a scale of 1:10. The remainder of the flue was reconstructed around the timber former, Plate 50.

Plate 50: Flue 05 being rebuilt around timber former.

5.21 The bank was constructed in the same manner as described in flue 02. It should also be noted that the greater depth of the supporting wall at this point along the flue meant that the trench had to be

stepped outwards to prevent collapse. The section recorded through the flue bank can be found on Figure 3 along with its position.

Flue 06

5.22 Flue 06, Plate 51, was located at NY 79044 43159 (Countryside Consultants 2013, fig. 74). This section of flue was in a moderately poor condition due to two substantial areas of subsistence around the main body of the vault and the downhill portal. Similarly to the rest of the flue sections this area had suffered from loss of ground cover around both portals due to livestock movement.

5.23 A watching brief took place to monitor the removal of the soft capping and underlying deposits around the area to be consolidated. A timber former was inserted into the flue, the top of the arch dismantled and then rebuilt around the former. The side walls for this section of flue were in good condition so it was not necessary to machine the bank away down the side. As a result no features of further archaeological interest were uncovered during the monitoring of this section of flue.

Plate 51: Flue 06 downhill portal showing areas of subsistence.

6.0 SMALLCLEUGH CULVERT

6.1 The consolidation work at Smallcleugh was focused specifically on two areas of the culvert at the mouth of the downstream portal and around the upstream portal to the southeast. Both areas of Smallcleugh culvert were deemed highly vulnerable as any collapse would cause substantial blockages to Old Carr's Burn and potentially causing damage to the surround structures.

6.2 The bulk of the consolidation work was centred around a section of culvert, to the southeast, which had been previously repaired by North Pennines Heritage Trust (NPHT) by nailing a sheet of

plywood on the inside to support the collapsing voussoirs (Plate 52). This had subsequently caused the overlying track way to subside, creating a slight dip. It was proposed that the repair work to the culvert be achieved by propping the structure with a series of timber formers and excavating material above the collapsed section of culvert (approx 1m deep). The supported culvert could then be safely dismantled and rebuilt in place.

6.3 The second area of consolidation was focused around the downstream portal where the culvert arch and retaining wall were starting to collapse due to the fact the entrance was constructed off centre, causing the arch and retaining wall to lean slightly, Plate 53. It was proposed that this work be achieved by propping the culvert with a series of timber formers and excavating material above the culvert entrance (approx 1m deep by 2m). The supported culvert could then be safely dismantled and rebuilt in place.

Plate 52: Collapsed voussoirs and side walls with previous NPHT repair above.

Plate 53: Downstream culvert entrance showing off centre arch.

History

6.4 The culvert at Smallcleugh measured 28.3m in length, and approximately 2.5m in width at its widest point; Old Carr's Burn flows through the culvert from southeast to northwest. The culvert was constructed to provide a broad working area in front of Smallcleugh Level, which was the third of the principal underground haulage ways in the 19th century, and extended for a distance of 6.8km. The level entrance lies approximately 6m from the original eastern edge of the burn, and is excavated into the hillside, running north eastwards. Without the culvert it would have been very difficult to utilise the level for anything other than drainage, and as such the culvert was probably constructed immediately around the time the level was first driven (Town 2013).

Plate 54: Construction of Smallcleugh culvert.

Previous Work

6.5 In November 2006, North Pennines Archaeology Ltd undertook an archaeological watching brief during the excavation of a trench for a drainage pipe between the level entrance and the north-west end of the culvert. The work was undertaken in order to assist water runoff and aid drainage of the Smallcleugh Level, due to the failure of the original leat. No features of archaeological note were identified, and the excavation work showed that the ground around Smallcleugh Level is mostly made up of re-deposited mine waste.

6.6 In July 2008, the Smallcleugh mine shop was excavated, recorded and fully consolidated as part of the Smallcleugh Project, a field school run by the North Pennine Heritage Trust at the mines. A trench was also excavated across the site of the smithy. The works remain unpublished, but excavations within the mine shop uncovered the remains of a blacksmith's hearth, with its associated tuyere for a bellows, quenching tank (bosh), and setting for an anvil. This may suggest that the building known as the 'smithy' may have had a different function.

Results

6.7 The position and plan of Smallcleugh culvert can be found on Figure 4.

6.8 A significant amount of extra work was undertaken at the south eastern end of the culvert due to the nature of the collapsed section. Due to the position of the collapse directly adjacent to the smithy the trench excavated to get down onto the collapsed culvert had to be excavated at an oblique angle to avoid disturbing any further archaeology. The depth of the trench was far greater than expected also. The nature of the collapse was fairly similar to what had occurred in the smelt mill flue. As a result

the consolidation approach was very similar. The overlying material was excavated by machine to expose the culvert structure. Once the archaeology exposed was recorded, it was then removed by hand under archaeological supervision to allow access to the base of the culvert. This was done to facilitate the rebuilding of the side wall of the culvert which supports the arching.

6.9 The limited reach of the JCB made it necessary to dig the trench longer than expected to allow the JCB to get into the trench and extend its downward reach. Because of this, the trench to expose the collapsed section of culvert was a lot larger than originally stated.

6.10 The southeast section of the culvert was machined down to the top of the surviving archaeology, taking care to avoid the 'smithy' building. The wall (**017**), running parallel to the culvert arch, was observed at approximately 0.5m deep (Plate 55).

*Plate 55: Exposed wall (**017**) running parallel to culvert.*

6.11 The wall exposed in this section was visible as three courses of large faced limestone blocks in an even coursing pattern with no bonding. At either end of the trench the wall appears up to five or six courses high. Initially it was thought that this wall represented the earlier retaining wall for the leat that passed through this area before it was culverted. However, the wall exposed is faced on the outside meaning that it could not be part of the original leat. It is therefore more likely that this wall is a retaining wall inserted during the construction of the culvert, shown in Plate 54.

6.12 In between the culvert vault and the retaining wall (**017**) the structure is infilled by large angular limestone blocks (Plate 55). It is likely that the void between the retaining wall and culvert arch would have been filled in at some stage to aid structural integrity.

6.13 At a later stage the trench was extended to the southeast slightly to facilitate better JCB access. This

exposed a further length of retaining wall. This exposed section of wall (**022**) represented an earlier building phase, possibly an earlier south eastern outflow for the culvert. What is clear from the junction between the two sections of walls is that the long section of exposed wall (**017**) butts up against wall (**022**) (Plate 56). Interestingly a datum level was observed at the junctions of the two walls. Most likely this was used in the construction of wall (**017**) to keep the wall level.

Plate 56: Earlier phase of wall to the right of image with datum level in between both walls.

6.14 Once both walls were recorded it was necessary to remove wall (**017**) by hand, under archaeological supervision, to allow access into the collapsed culvert, Plate 57. No further features of archaeological interest were uncovered after the removal of the wall, only more rubble infill and collapsed sections of vaulting were encountered. Once the bed of the culvert was established the vaulting was rebuilt around the timber former and wall (**017**) was reinstated.

Plate 57: Wall (017) removed down to the bed of the culvert.

7.0 STAGG CONDENSER WHEEL PIT

7.1 The scope of the consolidation work at the Stagg wheel pit, Plate 58, was fairly limited due to the fact that the structure is well preserved with little threat to the surviving structure. The sole area of consolidation was centred on the existing modern perimeter fence stopping visitors getting too close to the deep wheel pit. The existing fence was to be uplifted and the post holes re-used to install a sturdier iron fence.

Plate 58: Stagg Condenser wheel pit.

History

7.2 In 1842, Joseph Dickinson Stagg (1815-1851) was appointed as the 'manager of the mills, washing floors and counting houses' (Almond 1977, 39) after a promising early career as an assistant to his father Joseph Stagg, who was a Superintendent for the London Lead Company at Eggleston Mill in 1832 (Raistrick 1938, 146). His greatest achievement at Nenthead was the creation of the Stagg Condenser, a fume condenser which he patented in 1843 (Patent No. 9920). The condenser, which features in Percy's Metallurgy (Percy 1870, 441) represented one of the earliest and most important forms of condenser constructed; the one at Nenthead is the best surviving example.

Results

7.3 A watching brief took place to monitor the removal of fence posts ahead of the installation of a new iron fence around the perimeter of the Stagg wheel pit, Plate 59. Due to the small size of the fence post holes no features of further archaeological interest were uncovered during monitoring.

7.4 However, it was later decided under further consultation that the fence would not be cut into the ground at the north-eastern end in order to keep the railings level. Instead the railings were stepped up at this point to avoid disturbing any archaeological remains underneath.

Plate 59: Photograph taken during fence installation.

8.0 RAMPGILL BURN CULVERT

8.1 The scope of work at Rampgill culvert incorporated two sections of culvert walls to the west of the quarry track (Countryside Consultants 2013, figs. 63-65). Similarly to the Smallcleugh washing floor and retaining wall, this area is environmentally sensitive as the walls are holding back toxic material.

8.2 Both sections of culvert wall were in serious state of disrepair due to water runoff from the quarry track which had washed out sections of the culvert wall foundations, Plate 60. Similarly to Smallcleugh washing floor, a large quantity of material from behind the culvert wall was excavated by machine to facilitate the rebuilding of the culvert wall whilst minimising the amount of toxic material entering the watercourse.

History

8.3 The history of Rampgill Burn Culvert is directly linked to Firestone Level which is located approximately 110m to the northeast of the culvert.

8.4 Rampgill Burn culvert exists for a short distance to the northeast of the Stagg wheel pit adjacent to the quarry track. It was constructed to carry water from Rampgill Burn to the east underneath an extensive area of mine waste dumping associated with Firestone Level and Smallcleugh washing floor. Underneath the track way to the east the culvert exists as a modern concrete cylinder.

Plate 60: Water runoff from quarry track with collapsed section of culvert in foreground. Note large quantities of material behind remains of culvert wall.

Results

8.5 The first stage of work at Rampgill culvert was focussed at the eastern edge next to the culverted section that flows underneath the track way (Countryside Consultants 2013, fig. 64). It was proposed that the existing culvert walls be dismantled down to a good bearing and rebuilt to the same width as the culvert arching.

8.6 The collapse of the culvert walls at this point had been caused by numerous issues. Water from the surrounding area, adjacent to the track way had carved a path downhill and into the side of the culvert. This had caused the culvert wall to wash out gradually over time and collapse.

8.7 Further to this it was noted that a large amount of the cobbled base was missing at the mouth of the culvert (Plate 61). As a result water was pooling in large quantities around the culvert exit which washed away the footing for the wall on the northeast side.

Plate 61: Section of washed out cobbled base with washed out wall footing at bottom of image.

Plate 62: Photograph taken during rebuilding of collapsed wall. Machined section to the left of the image.

8.8 In order to rebuild this section of culvert a large quantity of mine waste was removed under archaeological supervision using a JCB with a toothless ditching bucket, Plate 62. This was done to

facilitate the dismantling of the wall whilst minimising contamination to the burn. No features of further archaeological interest were uncovered during machining. This is not surprising as the area was primarily used to dump mine waste from Firestone Level and Smallcleugh washing floor and no structures were expected to be encountered.

8.9 Once the damaged section of wall was dismantled, the clearance of the river bed began. The same JCB was used to remove the fallen masonry, taking care not to disturb the underlying cobbled base. During monitoring of the removal of the debris from the river bed, two timbers were uncovered in the base of the culvert, Plate 63. Each timber was set into the footing for the culvert walls. It is unclear as to the purpose of these timber beams, but it is possible that they were inserted as an attempt to catch debris in the base of the culvert as it flowed through.

8.10 These timbers were removed by hand as to not destroy them during excavation of the remainder of the culvert base. Once the removal of debris was finished the beams were bedded back into their original positions taking care to reincorporate them back into the footing of the culvert wall.

Plate 63: In situ timber set into wall footing.

8.9 A second watching brief took place on the western section of the culvert, Plate 64. This section of culvert, although smaller, had suffered the same issues as the larger section discussed above (Countryside Consultants 2013, fig. 64). Similarly to the larger section of the culvert, it was proposed that the existing culvert walls be dismantled and then rebuilt to the same height and width of the existing culvert arching.

Plate 64: Western section of Rampgill Burn culvert pre-intervention.

9.0 SMALLCLEUGH WASHING FLOOR AND RETAINING WALL (FIGURE 5)

9.1 Initially this section of retaining wall and washing floor (Countryside Consultants 2013, fig. 79) did not fall under the scope of an archaeological watching brief. However, as consolidation work progressed it became apparent that the material directly behind the retaining wall had to be excavated away to facilitate the rebuilding of the retaining wall. This was done to prevent material falling into the River Nent as the retaining wall was dismantled.

9.2 The area around the retaining wall has not been subject to previous archaeological investigation, so it was not known what sort of archaeology would be encountered. For this reason it was decided that all extra work on the retaining wall be monitored as the potential for archaeological remains relating to the washing floor was very high. In the immediate area the partial remains of timber chutes, later pipe work, walls, remains of crushing plant, a wheel pit and possible buddle tanks, all relating to the dressing of lead ore, could be seen.

Plate 65: Section of retaining wall to left of image pre-consolidation. Note consolidated retaining wall to the right of the image.

9.3 The damage to the retaining wall had largely been caused by burrowing animals undercutting the structure. Another major contributing factor was to do with the construction of the wall itself. The wall is built directly on top of the natural bedrock outcrop, which undulates fairly significantly across this area. The wall spans these undulations in places, specifically in the area highlighted for consolidation. Where the wall spans these undulations it has started to sag and collapse.

9.4 The consolidation of the retaining wall was of major importance as the immediate area is environmentally sensitive as the retaining wall was holding back a large quantity of toxic tailings from falling into the River Nent.

History

9.5 A washing floor, immediately north-west of, and serving, Smallcleugh Level, was located along the western banks of the River Nent from the late 18th century. This area of mine workings was associated with Errington and Wilkinson from 1770, but it is not clear at what point the washing floor moved northwards onto the north east side of the River Nent, just north of its junction with Old Carr's Burn, though dressing was almost certainly occurring in that area in the 18th century. There are at least six shallow shafts immediately east of the dressing floor, which may have provided the initial impetus for its location; these are all undated, but probably originate in the 18th century.

Results

9.6 The position of all features discussed relating to the washing floor and retaining wall can be found on Figure 5.

9.7 Numerous watching briefs were undertaken along this section of wall. Initially the top layer of hill washed material was removed using a JCB with a toothless ditching bucket. As this deposit was removed two timber posts were observed immediately behind the retaining wall. Care was taken not to disturb these posts as they were believed to form part of a larger structure underneath. Machining stopped once the top of a timber chute was revealed and the area was subsequently cleaned by hand to expose the full length of the structure, Plate 66.

Plate 66: Timber chute looking northwest towards smelt mill complex.

9.8 Further to the timber chute being revealed, a series of stone slabs were uncovered headed towards the buddling area to the southeast. These stone slabs are thought to be bedding stones for the timber chute, presumably now lost, and can be traced as far as the buddle to the southeast. To the northwest bedding stones can be traced up to the edge of the retaining wall where the material would have been cast over the side into the River Nent.

9.9 The chute originally would have been capped by planks, which can be partially seen in the above plate. Only one of the capping planks survived *in situ*, but a number of similar sized planks of wood were found within the top hill washed deposit and were likely related to the capping for the chute.

9.10 The fill of the sludge chute was sampled according to NAA sampling techniques and the interior of the chute was subsequently excavated to facilitate the removal of the chute to be re-instated after the consolidation of the retaining wall.

Plate 67: Timber structure butting against sludge chute on north-western end. Note two timber posts observed before machining commenced.

9.11 The timber structure adjoining the northwest end of the chute probably supported a super-structure that would have controlled the intake of material into the chute from the side, Plate 67. Three entrances into the side of the chute were observed (two of which can be seen in the above plate) with a series of post holes either side. It is likely that the chute was fed from the side at this point. Once the chute fill was excavated, scratch marks on the base of the chute were noted radiating outward further suggesting material was entering the chute at this point (Plate 68).

9.12 Once the chute fill was sampled, excavated and recorded the structure was removed by hand and transported to Smallcleugh Level where it has been stored for reinstatement into the dressing floor at some stage in the future. A lack of suitable storage onsite meant that Smallcleugh Level was the best possible storage solution for the chute. The level entrance is constantly damp which will help to preserve the chute. It is recommended that more suitable temporary storage is found for the chute with some urgency, as Smallcleugh Level is often used for mine tours.

Plate 68: Radiating scratch marks at base of chute at side intake.

9.13 After the removal of the chute a number of inscriptions were noted on the side and base. The inscription on the base reads "NRI KCXIV". "NRI" likely relates to initials of the carpenter or an area, "CXIV" relating to the roman numerals for 114. It is unclear as to the meaning of the K, but it likely relates to some numbering system related to the processing of the planks. The inscription on the side of the chute is difficult to read as it has been truncated once the plank was cut to fit the chute. What is left of the inscription reads "KCXIVV NRI". "CXIVV" does not make sense as a roman numeral but if split up could mean 114, 5 and the "NRI" likely relates to initials again.

9.14 It is likely that these inscriptions were used as carpenter's marks to number and initial the planks of wood before they were used in the construction of the chute. The inscriptions did not occur after the construction of the chute as the side inscription is cut in half laterally.

Plate 69: Base of chute at top of image with side inscription underneath.

9.15 Running parallel to the chute is a section of horizontal retaining wall, which butts up against and ties into the main retaining wall for the dressing floor, Plate 70.

9.16 This retaining wall was likely put in to counteract the pressure from the side intakes of the chute from pushing the chute over the edge of the dressing floor. The wall itself consisted of roughly faced limestone blocks laid on edge up to six courses wide in places that slope down and ties into the main retaining wall. The horizontal retaining wall stretches for the entirety of the length of the timber chute, which suggests the chute was not under pressure from the side past this point.

Plate 70: Retaining wall for chute.

9.18 Interestingly the horizontal retaining wall sits on top of a large deposit of angular limestone blocks, Plate 71. This is significant as it either means that this section of the dressing floor has collapsed, prior to the building of the main retaining wall, and has been patched up by dumping a large quantity of blocks and building the retaining wall against it. Or, this section of ground has been added prior to the construction of the main retaining wall to accommodate the washing floor area.

Plate 71: Large deposit of limestone blocks used to repair edge of dressing floor.

9.19 The deposit of large angular blocks was recorded and machined away under archaeological supervision down to natural bedrock where the retaining wall was then dismantled and rebuilt. No further archaeological features were encountered beneath the large angular blocks.

10.0 DISCUSSION

10.1 In conclusion, the consolidation works carried out onsite across the smelt mill complex and flue, Rampgill Burn, Stagg wheel pit and Smallcleugh washing floor and culvert have been successful in conserving these areas for future generations and also making these areas safe for visitors.

10.2 As a direct result of the consolidation work a number of future recommendations for further consolidation have been made. These are largely focussed on features in and around the Smelt Mill complex and are discussed above. Although not immediately urgent these features will require remedial work, which could probably be undertaken by local volunteers.

10.3 The consolidation work carried out around Smallcleugh washing floor and culvert further demonstrates the high archaeological potential of the site as a whole. The area around Smallcleugh washing floor in particular has never been subject to archaeological investigation prior to the current phase of consolidation. As a direct result of the remedial work carried out we have been able to further reinforce our understanding of the dressing floor complex around Smallcleugh

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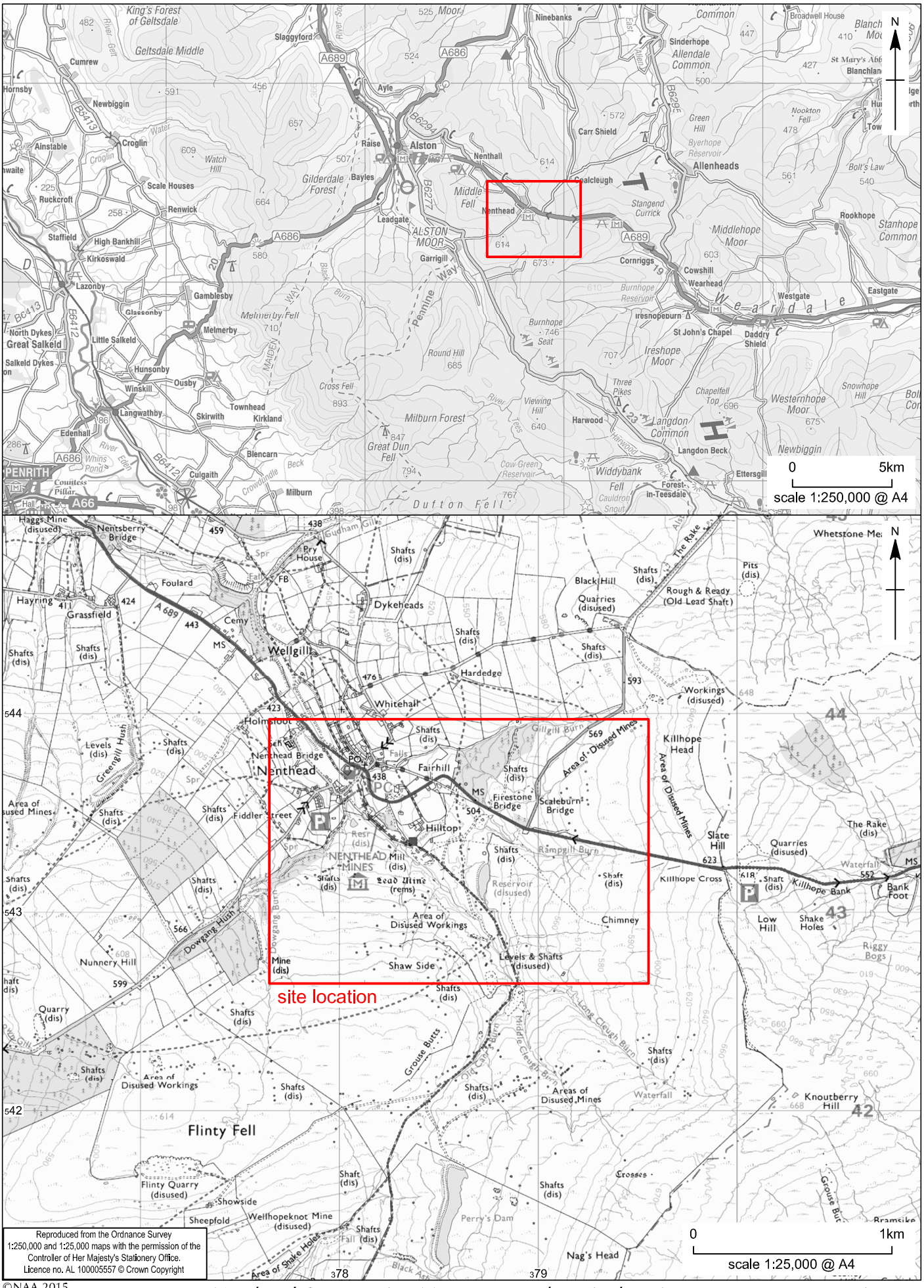
Maps/Plans

Ordnance Survey (OS) First Edition 25" to 1 mile Cumberland Sheet XLII.3, 1859

12.0 Appendix A: Context catalogue

Context	Interpretative description	Trench/Area	Notes	Finds and sample information
001	Fill of 002	Retaining wall/dressing floor		Sample 001 AA x 4 tubs bulk.
002	Timber chute filled by 001	Retaining wall/dressing floor		
003	Stone base setting in line with channel 002	Retaining wall/dressing floor		
004	Stone base setting in line with channel 002	Retaining wall/dressing floor		
005	Timber structure possibly part of chute 002	Retaining wall/dressing floor		
006	Layer chute is sat on	Retaining wall/dressing floor		
007	Mixed rubble layer	Retaining wall/dressing floor		
008	Timber structure butting chute with post holes cut into.	Retaining wall/dressing floor		
009	Gravelly deposit	Retaining wall/dressing floor		
010	Mixed sandy deposit	Retaining wall/dressing floor		
011	Retaining wall	Retaining wall/dressing floor		
012	Silty clay deposit	Retaining wall/dressing floor		
013	stone deposit	Retaining wall/dressing floor		
014	Layer (latest deposit)	Retaining wall/dressing floor		
015	Layer stone section of chute sat on	Retaining wall/dressing floor		
016	Rubble dump	Retaining wall/dressing floor		

Context	Interpretative description	Trench/Area	Notes	Finds and sample information
017	Culvert wall	Smallcleugh culvert		
018	Culvert arch	Smallcleugh culvert		
019	Rubble infill between arch and wall	Smallcleugh culvert		
020		Smallcleugh culvert		
021	Mine waste covering arch and wall	Smallcleugh culvert		
022	Curved culvert wall	Smallcleugh culvert		
023	Dark material underneath wall 017	Smallcleugh culvert		
024	bed rock	Smallcleugh culvert		
025	boulder clay natural	Flue		
026	Yellow sandy rubble flue bank	Flue		
027	Gravel	Flue		
028	Thick blue grey clay	Flue		
029	sandy gravel	Flue		
30	Mixed yellowish grey bank material	Flue		
31	Grey brown bank deposit	Flue		
32	Flue wall	Flue		
33	Mixed yellowish brown rubble bank deposit	Flue		
34	White sandy deposit	Flue		
35	Blue grey clayed depsit	Flue		
36	Mixed brown bank deposit	Flue		
37	Flue arch wall	Flue		
38	Flue vault	Flue		
39	Construction cut for flue wall 32	Flue		



Nenthead Conservation Management Plan: site location *Figure 1*

KEY

spine wall

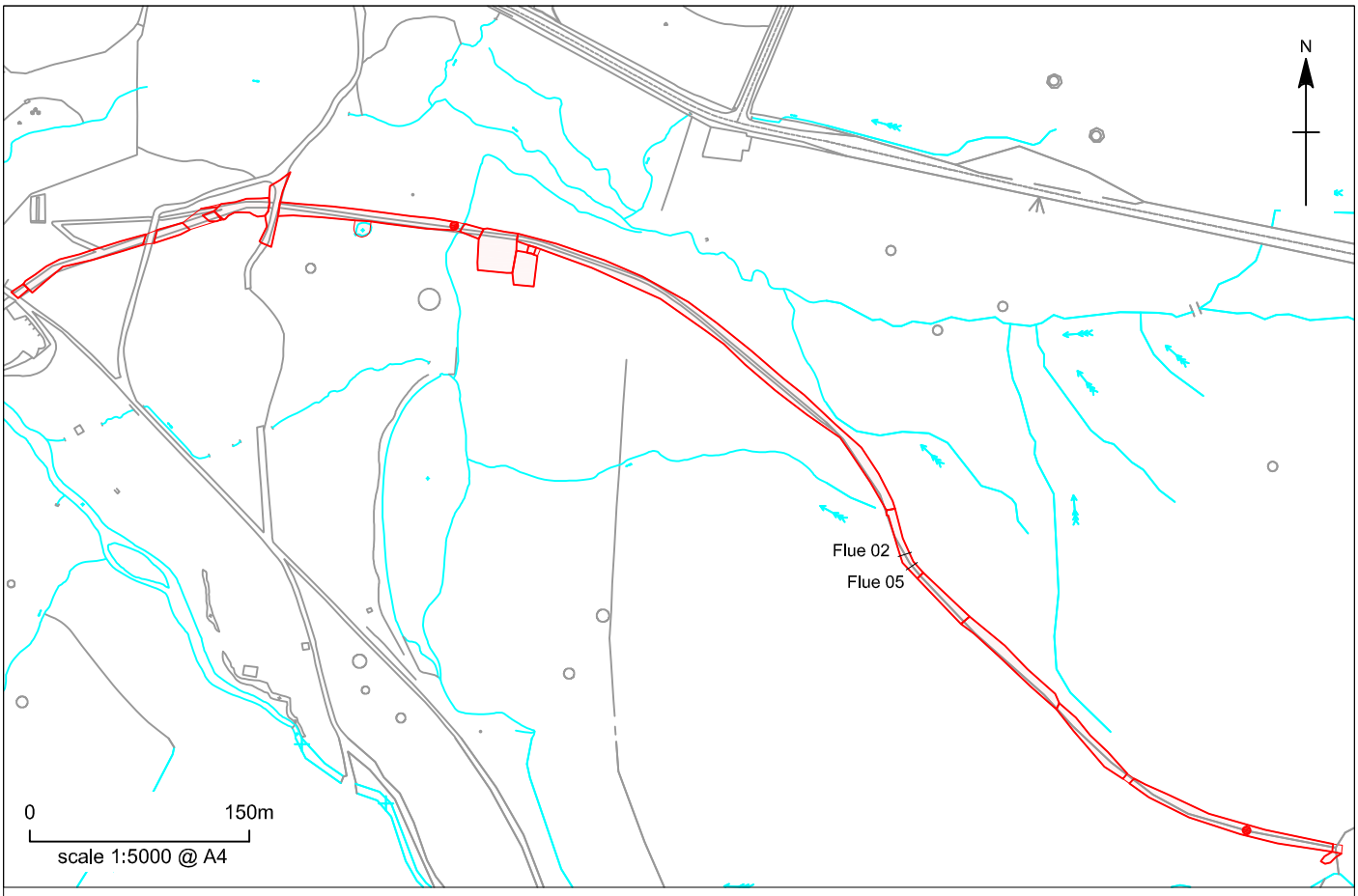
outline of buildings

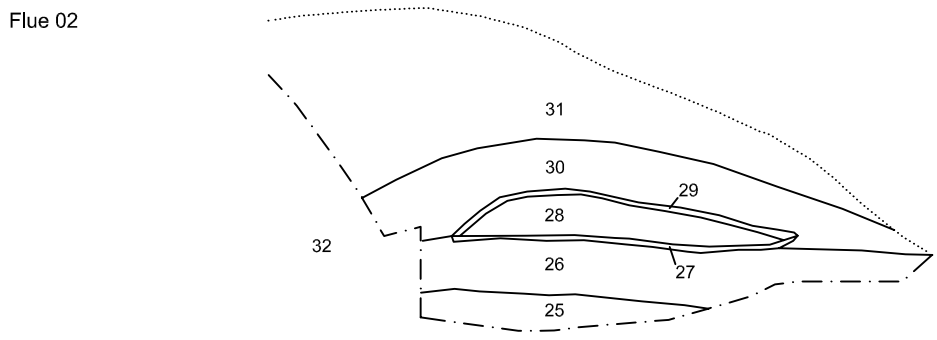
position of features refered to in the text

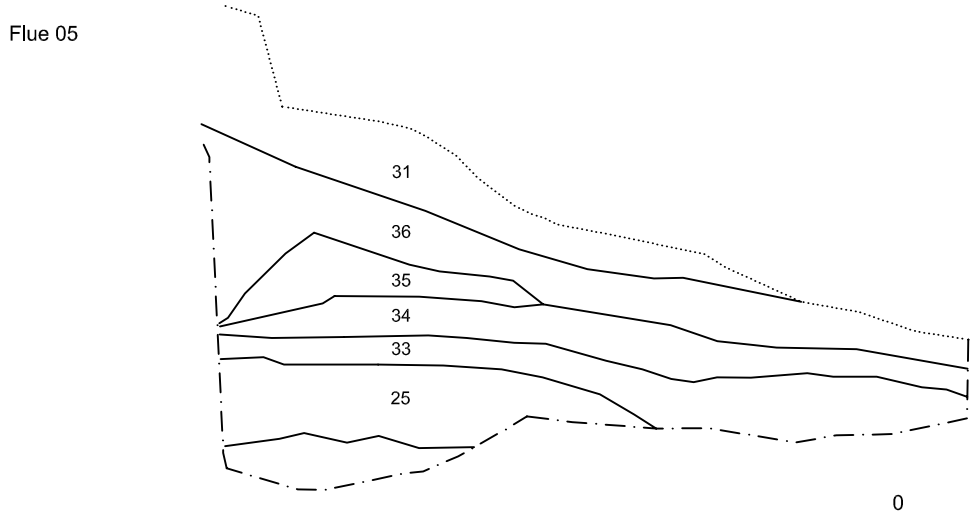
1 smelt mill feature 1
2 smelt mill feature 2
3 smelt mill feature 3
4 smelt mill feature 4
5 smelt mill feature 5
6 smelt mill feature 6
7 smelt mill feature 7
8 feature A1
9 feature B1
10 feature C1
11 feature C2
12 feature D1
13 feature F1
14 feature H1
15 feature H2
16 feature H3
17 spine wall feature 1
18 spine wall feature 2
19 spine wall feature 3
20 spine wall feature 4
21 spine wall feature 5
22 spine wall feature 6

Nenthead Conservation Management Plan: plan of smelt mill complex

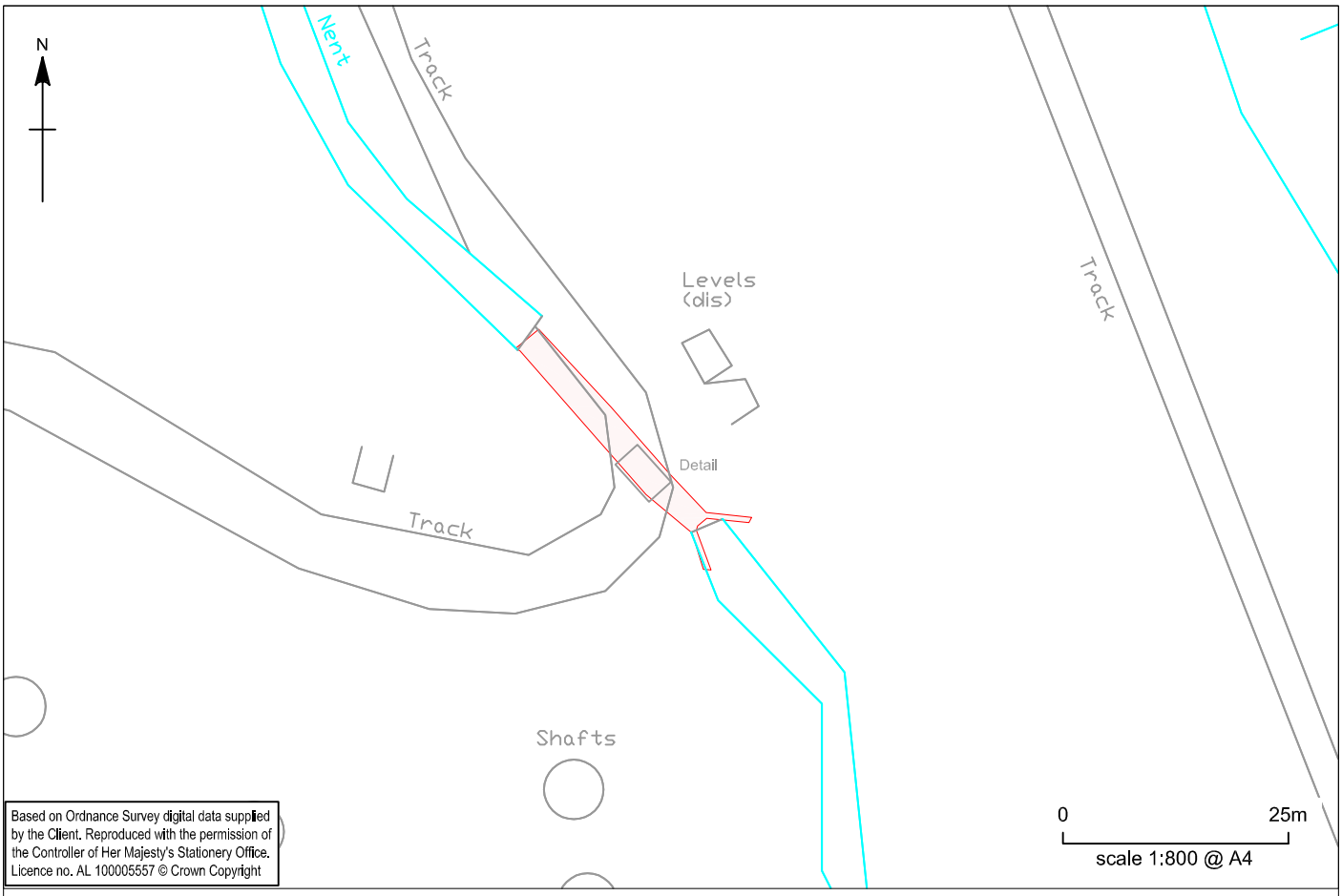
Figure 2







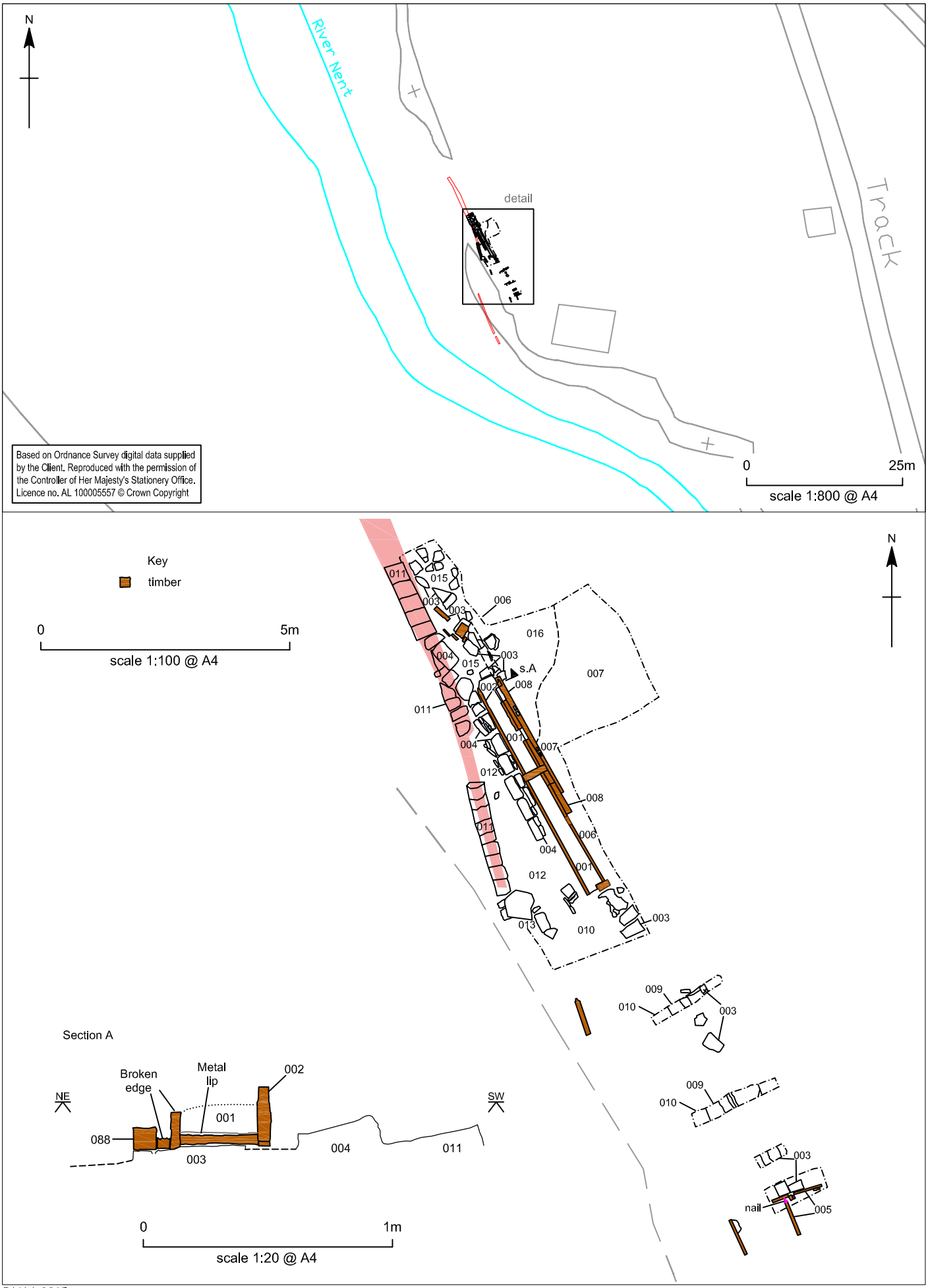
Nenthead Conservation Management Plan: sections of flue bank *Figure 3*



0 1m
scale 1:40 @ A4

Nenthead Conservation Management Plan: Culvert, Smallcleugh Level, location of surveyed features

Figure 4



Nenthead Conservation Management Plan: Smallcleugh washing floor, plan of chute and profile

Figure 5