



Milton Ironworks Community Excavation Archaeological evaluation

Archaeological evaluation
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Report on Community Archaeology at Milton Ironworks

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NON-TECHNICAL SUMMARY

In July 2018 ArcHeritage were commissioned by Great Place Wentworth and Elsecar in partnership with Elsecar Heritage Action Zone to undertake a two week community archaeology research project at Milton Forge Recreation Ground. This was undertaken to locate and excavate archaeological remains of the former Milton Ironworks. The initial strategy entailed two evaluation trenches located on a possible foundation base for a blast furnace. The location was based on historic mapping, and a series of magnetic anomalies discovered during a magnetometry survey of the recreation ground undertaken by Historic England.

Trench 2 did not contain significant archaeological remains so a third trench was opened in the second week to investigate another geophysical anomaly of potential archaeological significance. In addition two extensions were made to Trench 1 in order to further expose and better understand structures uncovered during the first week.

The structure and the well-preserved deposits associated with in Trench 1 are interpreted as the remains of a Calcining Kiln; a structure for primary processing of iron ore prior to smelting in a blast furnace. The discovery of the Calcining Kiln was not expected as it was not recorded on any maps or plans of Milton Forge. Based on the evidence from the excavations the kiln appears to date to the early days of the Milton Ironworks.

1 INTRODUCTION

ArcHeritage were commissioned by Great Place Wentworth & Elsecar in partnership with Elsecar Heritage Action Zone to undertake a community archaeology research project at Milton Forge recreation ground. The evaluation was undertaken to investigate the location of the former Milton Ironworks.

2 LOCATION, GEOLOGY AND TOPOGRAPHY

The site, centred on NGR SE 37616 00193, is situated approximately 6 miles southeast of Barnsley between Hoyland and Elsecar, and is located within an extensive public park known as Milton Forge Recreation Ground (Figure 1). The recreation ground is bounded to the west by Milton Road, to the north by Millhouses Street, and to the south by an unmetalled road and bicycle track. The eastern recreation ground boundary is formed by allotments and a railway.

The underlying solid geology consists of the Carboniferous Middle Coal Measures Pennine Formation comprising mudstone, siltstone, sandstone, coal, ironstone and ferricrete. The overlying superficial geology is Quaternary till. The topography of the site consists of an upper western plateau and a lower eastern level, with a sharp slope down from Millhouses Street the northern edge of the site. Although former reservoirs within the boundaries of the site were infilled in the 20th century, developing irregularities in the current ground surfaces are attributed to gradual settling of the backfilled areas.

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

This section summarises the information provided in the document 'Milton Ironworks Project Design' (Clement & Roberts 2018) and additional information provided by Dave Went from Historic England (Went, Rimmer and Jessop 2019, in press)

Milton Forge recreation ground was formerly the site of Milton Ironworks. Documentary evidence records this as operating from the late 1790s until the early 1880s. The land was owned by the Fitzwilliam family, who resided at nearby Wentworth Woodhouse. The site, as well as much of the surrounding landscape, appears to have been undeveloped until the late 18th century.

Following the success of the nearby Elsecar Ironworks, an agreement to create a second ironworks was made in 1797 between William Fitzwilliam, 4th Earl Fitzwilliam, and Rotherham ironmasters Joshua Walker & Co. The new works was named the Milton Ironworks after the Earl's heir, Viscount Milton.

New housing was built around the ironworks during the first half of the 19th century. The new workers' housing created a new settlement which also became known as Milton. The settlement included a number of double fronted back-to back housing, clustered in groups of four, which still survive today.

The Walker's initially only operated one blast furnace at Milton, and in the early stages it is likely that they were mainly producing iron to supply their existing works at Masborough. However, they soon expanded production – applying to the Earl for permission to build a

second furnace in 1810. The Walker's works at Masborough was known for producing ordnance, including cannons, cannonballs, mortar and shot. From the late 1780s onwards, the company was also involved in building iron bridges, including Southwark Bridge in London, designed by John Rennie.

Walker & Co. surrendered their lease at Milton in 1821 when the firm entered into bankruptcy. The Earl Fitzwilliam then leased the site out to a new partnership of Sheffield businessmen comprising Hartop, Littlewood and Sorby. They continued to produce ironwork for bridges, most notably two large suspension bridges for the Ille de Bourbon designed by Marc Brunel. The partnership however was short lived, and Littlewood and Sorby left in 1824, with Henry Hartop entering into a new partnership with London iron masters, William and Robert Graham. This partnership was also short lived, and, after a bitter legal dispute, the Grahams took sole charge of the works in 1829. They continued to run the works until 1848, whilst Hartop was appointed by the Earl Fitzwilliam to manage the nearby Elsecar Ironworks.

An intense rivalry ensued between the two sites, with ongoing disagreements, including over the introduction of new hot blast techniques from the early 1830s onwards. Hartop maintained that hot blast produced an inferior quality iron to the more traditional cold blast. The Grahams disagreed and by 1836 had installed two hot blast furnaces at Milton (Went, Rimmer and Jessop 2019 – in press).

During this period a network of waggonways was constructed to connect Milton Ironworks to the Elsecar canal basin to the east, and to the ironstone mines at Tankersley to the west. The waggonway infrastructure was manufactured by Grahams' at the Milton Ironworks and featured two inclined planes, one of which borders the recreation ground and is part of the Trans Pennine Trail.

The Graham brothers gave up their lease at Milton in 1848, after a downturn in trade left them on the verge of bankruptcy. In the following year the 5th Earl Fitzwilliam leased both the Milton Ironworks and the Elsecar Ironworks to George and William Dawes, iron manufacturers from Staffordshire. The two works operated in tandem until their eventual closure in the 1880s.

The Milton furnaces were decommissioned in 1883, with the Elsecar Ironworks suffering the same fate in 1884. Part of the Milton site was leased as a smaller-scale iron and brass foundry to a company registered as 'Ashforth, Hall and Hawthorne Ltd' in 1898. The foundry closed in 1905 although at least some of the buildings remained standing until the mid 20th century. Part of the site was used as a rifle range for a short period from 1911. The central part of the site was used as a municipal tip from the 1950s, with the bottom two ponds and the lower part of the site being infilled with domestic waste. The site was landscaped in the 1970s to create a playing field.

There is very little visible evidence of the ironworks surviving, with the exception of two large furnace ponds at the west end of the recreation ground site, a distinct scarp in the middle of the playing field where the natural hill side has been artificially stepped, possibly to create a charging platform above the main area of the iron works, and the waggonway incline plane to the south.

4 AIMS AND METHODOLOGY

Work was undertaken to the methodology detailed in the project design written by Great Place Wentworth & Elsecar and the Heritage Action Zones officer (Appendix 8).

4.1 Aims

The specific aims of the archaeological excavation were:

- To engage members of the local community and local school children with their local heritage and provide an enjoyable and engaging heritage-led experience;
- To assess the extent, condition, character, importance and date of any below-ground archaeological remains present;
- To compare the archaeological remains with the geophysical survey carried out in 2017;
- To provide information that will enable the remains of the Milton Ironworks to be placed within its local, regional and national context, and for an assessment of the significance of the archaeology of the proposal area to be made.

4.2 Trench Rationale

The original project design required excavation of two trenches, although a third trench was added (Figure 2) during the early stages of fieldwork. Trench 1 was targeted on a potentially interesting series of approximately linear magnetic anomalies M5/M6 discovered during the 2017 geophysical survey (Figure 3).

Trench 2 targeted anomaly M8/M9 as depicted on Figure 3, which did not appear to correspond with any features depicted on historic maps.

Trench 3 was targeted on the location of the blast furnace depicted on the 1840s sale plan; the area is depicted as blank on the results of the geophysical survey.

5 RESULTS

Following initial mechanical excavation of Trenches 1 and 3, the decision was made by the project team to open a third trench located on magnetic anomalies M8/M9. The numbering sequence is intended to reflect the order of backfilling; Trench 3 was backfilled first, whereas trenches 1 and 2 remained open until the end of the project.

5.1 Trench 1

The original project design stipulated that Trench 1 was to measure 10 metres by 5 metres. Due to the proposed trench location, it became apparent during the setup phase of the project that this would lead to excavating in close proximity to the root system of an adjacent tree. The trench dimensions were adjusted to accommodate for this constraint. The adjusted size of Trench 1 as originally excavated was 8 metres by 6.5 metres, and the main body of the trench was orientated northwest-southeast. The trench was extended twice during the second week of the project in order to better understand and define the extent of the emerging structures.

5.2 Preliminary Excavation

The trench was opened with a JCB 3CX mechanical excavator under the close supervision of an archaeologist. Excavation began at the northwest end and continued to the southeast. Following removal of topsoil (101) and underlying mixed clay made ground (102)/(103), a substantial deposit of re-deposited red-orange clay (104) was exposed in the west corner of the trench. The sharp contrast between (104) and the looser, darker matrices of the overlying contexts immediately suggested that the beginning of a properly stratified archaeological sequence had been encountered. Mechanical excavation ceased at the top of deposit (104) and continued to the south following the surface of 104. This led to the discovery of a short segment of sandstone structure in the south corner of the trench. Preliminary excavation determined that the stone wall (Plate 1) comprised two structures; a straight wall [105] oriented southwest to northeast, and a second structure [109] of indeterminate alignment which appeared to abut the southeast face of [105]. Both structures continued beyond the original southwest limit of excavation (Figure 4). On completion of the initial stage of mechanical excavation, the decision was made to assess the apparent disparity between the stratified sequence of deposits and structures exposed in the southwest half of the trench, and the less coherent sequence of made ground deposits exposed in the northeast half. To this end, a large sondage was excavated into the base of the trench to the southeast of structure (105) and deposit (104). This sondage exposed a section that showed a continuation of the stratified deposits at a lower level to the northeast (Figure 5, T1 section 3; plate 2), and a very clear episode of truncation impacting upon those deposits (Plate 3).

5.3 Secondary Excavation

Trench 1 was extended twice during the second week of the project in order to better determine the condition and extent of the small sandstone structures [105] and [109] exposed during preliminary excavation in the first week.

5.4 Structures

Structure (105) consisted of a truncated linear foundation wall constructed from roughly-shaped sandstone constituents with a rubble core (Figure 6). The blocks were of irregular sizes, roughly dressed and bonded with sparse applications of hard pale grey mortar. The structure was primarily orientated east to west, with a return to the south off the west end (Figure 6). The preliminary excavation of (105) at the east end of the structure established that only one course remained preserved *in situ* (Figure 7, section 1), although subsequent excavation along the west elevation of the return established the structure was of greater vertical extent to the south (Plate 4). The southern end of (105) was shown to consist of at least two substantial courses of faced sandstone constituents with an excavated vertical extent of at least 0.2 metres; the time constraints on the fieldwork precluded the possibility of any deeper excavation in this area to reach the base of (105).

The north-south return of (105) measured 3.15m in length. The south end of the structure appeared to have been truncated. A sondage was excavated to investigate the apparent discontinuity, this established that the far south end of the structure actually consisted of a different phase (141) of the overall structure. The two sections of wall shared the same alignment, but the sandstone constituents of (141) had been discoloured to a reddish-pink

colour as a result of prolonged proximity to an intense heat source. This was interpreted as evidence for the relative stratigraphical relationship between (141) and (105); the evidence for the prolonged *in situ* heat-affection of (141) suggests that it represents an earlier, or even original phase of the structure. Structure (105), therefore, was interpreted as a re-build or secondary phase of the original structure.

Structure (109) proved to be curvilinear, almost semi-circular in plan. Although the boundaries between (109)/(105) were at certain points indistinct, (109) appeared to butt up against the 'internal' elevations of (105), rather than being keyed into it. The east end of structures (105)/(109) appeared to have partially truncated by demolition in the past. These structures were interpreted as the remains of a Calcining Kiln (see discussion section 6).

Any distinction between (141) and a putative continuation of (109) at the southern limit of excavation could not be definitively established. This was probably due to the more dilapidated condition of the structures at the south end of the trench.

In the course of excavating structures (105) and (109), it was determined that the space between the angle of the return in (105) and the curve of (109) had been intentionally filled with a rubble deposit (138). Excavation demonstrated that the deposit was composed of 80% firebrick rubble and inclusions of metalliferous waste within a very limited matrix of silt and sandstone rubble. The comparatively 'clean' nature of this context, and its singular occurrence only within the confines of the gap between (105) and (109) led to the interpretation that deposition took place following construction in order to provide structural stability, rather than deposition in an *ad hoc* manner as part of later demolition. Due to the marked contrast between (138) and all surrounding contexts, and the high volume of what appeared to be partially vitrified firebrick which had potentially originated from the Ironworks, the context was completely excavated and subsequently assessed by a specialist Archaeometallurgist (see Appendix 3. The context was found to contain inclusions of drossy slag and a single fragment of dense iron-rich slag, both of which probably derived from the blast-furnace process.

The complete excavation of context (138) also established that the context immediately underlying both deposit (138) and structures (105-109) was compositionally identical to the extensive deposit (107) immediately to the north of the structures, and was therefore ascribed the same context number. Further excavation directly to the east of the structures, within the area of the curve delineated by structure 109 established that deposit 107 was sealed by stratified deposits (127) and (139), which will be discussed in more detail in the following section.

5.5 Stratified Deposits

Most of the stratified deposits investigated within Trench 1 comprised a sequence of thin, level contexts which were stratigraphically related to the two main structures described above, and are described in the following paragraphs. However, the bulk clay deposits excavated to the west and north of the kiln structure also merit some attention, and will be discussed first.

Along the west edge of the calcining kiln a clear contrast between red heat-affected clays and pale yellow clays was discernible (Plate 5). The boundary between the two types of clay deposit appeared to coincide with the gap between structures (141) and (105) as described in the preceding section. It is reasonable to interpret the contrast between the clays as

complementary evidence for the phased reconstruction of the kiln structure; the red clay (142) represents the primary phase along with structure (141) and was discoloured by continued prolonged heating. The paler clay (143) to the north of (142) represents a phase of reconstruction. This interpretation implies that none of the clay deposits to the west of (105) are original *in situ* geological deposits, but were deposited following construction and reconstruction of the kiln structure. The presence of red clay contexts (108) and (104) overlying (107) to the north is interpreted as further evidence of this process. It is likely that both (108) and (104) were removed from their original location around the primary phase of the kiln and redeposited during reconstruction associated with structure (105) as can be seen from the way (108) butts up against (105) (see Figure 7, section 2).

Context (107), which was exposed upon removal of the overlying red clay context (104) and associated context (112), was found to be extensive within the trench, running beneath structures (105/109), (Plate 6) and continuing north ultimately beyond the northern limit of excavation. This context consisted of a fine-grained matrix of pale orange-yellow sand containing inclusions of metalliferous waste. The highly impacted nature of this deposit precluded the possibility of extensive excavation, but the small amount of excavation possible established that (107) was of very limited vertical extent, and quite similar in composition to contexts (115) and (119) as excavated in the main sondage in the base of the trench (Figure 5, section 3). Each of these contexts consisted of a similar compacted pale orange sandy matrix, with small inclusions of charcoal or coke. The degree of compaction was the main difference between these three contexts; the lowest of the three (119) was relatively soft in comparison to (115) and (107). This implies that all of these contexts were derived from the same source material and were therefore interpreted as successive episodes of consistent and deliberate construction and operational activity within a working foundry, possibly representing the re-use of waste material from secondary processes as levelling material to deliberately create a raised level platform stable enough to provide a foundation pad for a calcining kiln. The deposits were sampled for archaeometallurgical assessment.

Context (107) was interpreted as a relic of the foundry process; given the continuation of the context beneath (105/109) and the unusually level nature of the context, it was interpreted as evidence of a more extensive range of 'hot works' activities that may be implied from the fairly limited structural remains present within the trench. It is quite possible that the calcining kiln represented by (105/109) was only one of a range of similar structures extending to the north. At the very least, context (107) represents a 'thermal footprint' indicating the area within which metalworking activities took place.

The fine laminated nature of the sandier contexts (107/115/119) was a vivid contrast to the interleaving lamina contexts such as (117) and (121), which were much darker in colour and of a grittier, coarser texture and highly compacted. The sample from (121) was found to comprise a matrix of dark brown-black sand containing inclusions of spheroidal slag inclusions (see Appendix 3), which are likely to have originated from the casting process, and may have come from a casting floor within the foundry. This again points to the continued re-use of waste or surplus material generated by foundry processes for the improvement of structures concerned with primary ore processing.

In addition, the archaeometallurgical assessment of samples from contexts (114) and (115) determined that both those contexts contained inclusions of iron ore 'fines', or small particles which are typically produced by crushing or milling lower-grade iron ores before smelting.

In contrast to the deposits described above, archaeometallurgical assessment of (116), an intermediate levelled deposit between (115) and (117), found that this particular context contained a very low abundance of ore fines. Context (116) comprised a mixture of fine cinders, coal and earth. The comparative absence of iron ore fines within one particular context in a laminated sequence of similar contexts with a rich abundance of iron ore fines has interesting implications for the formation processes of the archaeological sequence in Trench 1. The evidence from excavation and subsequent interpretation of the metallurgical assessment points to deliberate and structured deposition of material from different areas or phases of activity within the ironworks site in order to create made ground to specific requirements for the construction of the calcining kiln.

The excavated section through this sequence of deposits was not completed down to the underlying natural deposits due to time limitations and the compacted nature of the contexts in question. Excavation was curtailed part way through the excavation of context (126), which was composed of approximately 50% inclusions of partially oxidised shale fragments in a dark brown silty clay matrix. This material could be interpreted as waste residues derived from imported iron ore-bearing deposits; the locally-occurring iron ore Siderite is commonly found as a diagenetic mineral deposit within shales or sandstones. However, given the close connections between this site and local collieries it is equally possible that the shales became incorporated into context (126) via a pathway completely unrelated to the delivery of iron ore from Tankersley.

A further assessment of the deposits immediately surrounding the east end of the structure (105/109) was undertaken in light of the unusually well-stratified deposits exposed by the main sondage described above (Figure 5, Section 3). It became apparent that the depositional sequence had been subject to some degree of secondary truncation and re-deposition. Instead of the uninterrupted succession of thin and generally level contexts as seen in Figure 5, section 3, the deposits in Figure 7, sections 2 and 3 demonstrated a transition between the similarly thin and level stratified deposits (112-140-110) immediately beneath structure (109-105) to the north and the less coherent and stonier contexts (128-137) to the south (Plate 7). This sequence of deposits became increasingly incoherent as excavation continued into the internal space delineated by the arc of structure (109), rapidly losing all traces of horizontal coherence and becoming increasingly clast-like in nature (Plate 8). Excavation of these deposits established that all of the contexts recorded in section in the area directly in front of structure (109) had been redeposited, but sealed one of the main stratified contexts (107). This sequence of deposits, therefore, was interpreted as a result of truncation or demolition activities after the calcining kiln had fallen into disuse (Plate 9), and the deposits associated with this event were ascribed context numbers (127) and (139). While some of the material included within these contexts may well have been generated by the calcining kiln or other foundry processes nearby, their original stratigraphical integrity has been compromised by a combination of continued working processes and final episodes of demolition. Archaeometallurgical assessment determined that both tap slag and foundry slag was present as inclusions within these contexts (see appendix 3). Of particular relevance are the presence of both drossy slag and glassy slag

within these two contexts. The drossy slag was present in much greater quantities than the glassy slag, although the presence of any glassy slag at all can be considered to be highly significant in the context of this particular site as it constitutes evidence of 'cold blast' iron manufacture; the transition from 'cold blast' to 'hot blast' iron manufacture was a pivotal moment in the development of the Milton Ironworks which may have been as much the product of conflict between different personalities as a straightforward metallurgical issue. The small fragments of slag waste sealed within these contexts represent echoes of a bitter disagreement between local ironworker Henry Harthop and the new business partners from London, William and Robert Graham.

5.6 Trench 2

This trench was located towards the northern edge of the proposal area, and orientated north-south. The trench was located to examine the underlying cause of the unusual magnetic anomaly M8/M9 delineated on the geophysical survey undertaken by Historic England prior to the commencement of fieldwork. The excavation of the trench was undertaken to make use of the resources available during the excavations after determining that further excavations in Trench 3 were not justified (see below).

Trench 2 was excavated to a depth of 1.9m below ground level with appropriate stepping of the trench sides (Figure 8, Plate 10). Beneath the topsoil (201) and clay capping (202) deposited during 20th century landscaping lay a substantial bulk deposit (203), which was composed exclusively of early 20th-century landfill material, including a plethora of modern glass bottles, plastic and a substantial quantity of sheet galvanised metal which may well have been responsible for the unusual magnetic anomaly depicted on the geophysical survey. The quantity of modern refuse was so high that no true soil matrix was discernable within context 203 during excavation.

The results from this trench, if representative, would suggest that much of the north side of the upper plateau of the recreation ground is the product of 20th-century refuse disposal. This does prompt some interesting questions regarding the ultimate depth at which archaeology may be present beneath substantial deposits of tipping and landscaping; the presence of modern tipping to a depth of 2 metres below ground level in this area does not automatically preclude the possibility of the presence of archaeology preserved *in situ* at a deeper level, but it does raise some practical concerns regarding the location and the potential for effective excavation of any preserved archaeology at such a depth.

5.7 Trench 3

Trench 3 was situated in an attempt to locate the foundation structures pertaining to the remains of the blast furnace for Milton Ironworks, as depicted on the lease plan drawn up during the 1840s (Figure 3). The primary trench was orientated east-west (Figure 9, Plate 11), and was excavated to a depth of 1.98m below ground level (92.22m AOD), with an additional sondage to a depth of 2.38m below ground level (91.81m AOD). No stratified archaeological structures or deposits were impacted upon during the primary excavation of Trench 3. The stratigraphic sequence was initially similar to that encountered during the preliminary excavation of Trench 1. A thin deposit of silty-clay light brown topsoil (301) overlay a thicker consistent deposit of yellow-grey silty clay (302), which was interpreted as similar to the made

ground deposit (102) in Trench 1, although in this case (302) was between 1 and 1.4m thick, and had been subjected to a greater degree of disturbance, as shown by the inclusion of both modern plastics and 19th century ceramics, as well as frequent inclusions of coal, cinder and fragments of demolition rubble such as roofing slate and red brick fragments. The distribution of yellow silty clay throughout (302) was inconsistent, with coarse and poorly defined clay lenses visible during excavation. It is unclear if this results from multiple dumping and landscaping events or a continuous process of dumping with variation in the clay content of the brought in material.

The underlying context (303) was similar in composition to (302), although the soil matrix contained none of the yellow clay seen in the overlying context. The matrix of (303) consisted of a dark grey clayey silt with frequent inclusions of demolition rubble and 19th-century pottery. In addition, several larger fragments of sandstone with adhering white lime mortar were also present within the loose matrix of (303). These fragments were randomly distributed within (303). Their presence within this context suggests that (303) was at least partially a product of localised demolition and dumping activity. To this end, a secondary sondage was excavated into the base of Trench 3 to a final depth of 3.28m below ground level (90.92m AOD). No *in situ* structures were encountered during this final stage of excavation, and the depth of the base of (303) could not be ascertained.

6 DISCUSSION

6.1 Structural Interpretation

The major discovery of the Calcining Kiln in Trench 1 was quite unexpected. Prior to excavation, the distribution of ancillary ironworking structures and processes was largely unknown, particularly those pertaining to early phases of Milton Ironworks. Ultimately the interpretation of the structure discovered in Trench 1 was the result of discussions between the author, Tegwen Roberts (HAZ officer) and Dave Went (Historic England). It was concluded that the structure was more likely to be a calcining kiln than a blast furnace or a coke oven. This was based on comparison other sites and on available information on the site. The kiln foundations exposed within Trench 1 were inconsistent with those known from blast furnaces of a similar period. The known distribution of the coke ovens on site, based on documentary evidence, were not within the vicinity of Trench 1.

The presence of iron ore 'fines' (fine-grained particulate residues) is considered to be good supporting evidence for the primary processing of raw iron ore in the vicinity of this structure. Although some of the samples subjected to archaeometallurgical assessment probably originated from a casting floor, their presence within the laminated sequence of contexts (114-126) is interpreted as the result of re-deposition, as primary deposits of casting sand within a foundry are typically much more extensive than the thin layers excavated in Trench 1. Nevertheless, the presence of carefully laminated deposits preserved *in situ* and within close proximity to the kiln structures demonstrates an excellent degree of preservation of an under-represented primary process directly relating to iron manufacture at Milton Ironworks.

6.2 Significance of the Calcining Kiln

It must be clearly stated that calcining kilns are under-represented in the archaeological record; typically, they are indicative of a singular process which is often located closer to the site of ore extraction to enable greater transport efficiency as the degree of organisation within the entire industry increases. Therefore, later phase iterations of this type of industrial structure are built in greater numbers near to quarries or mines so that the refined ores can be transferred to the intended ironworks more easily, maximising both logistical efficiency and profit. However, this would imply a degree of control and choice over the extracted raw materials that may not have been available to the operators of the Milton Ironworks. As they were the tenants of Fitzwilliam, accepting whatever raw materials were extracted from the Earl's iron ore mines in the Tankersley area may well have been part of the lease conditions. This opens up a range of fascinating questions regarding the relationship between leaseholder and landlord and the perhaps uneasy dynamic between the two, and indeed what real aims the Earl was intending to fulfil with the creation of an ironworks at Milton. Rather than an interest in the particular efficiency of the Milton Ironworks or the profits of his tenants, the Earl may have simply seen the works providing an end use for the output of his ironstone mines.

The development of calcining technology at Milton may therefore have been essential to the operation of the ironworks as whole. Iron ore occurs naturally in various different chemical compositions; haematites and magnetites are the purer oxides which can be fed directly into blast furnaces, whereas siderites are iron carbonates which have a lower percentage of iron and require pre-roasting to drive off the carbonate before use in blast furnace. The geology of the Tankersley Ironstone deposits consists entirely of siderite (BGS 2006)

If the calcining kiln at Milton is from the earliest stages of the works, it could represent one of the earliest post-medieval examples of its type in the country. One of the best-known Ironworking sites with associated Calcining Kilns in the country is Rosedale in Cleveland, North Yorkshire (NHLE ID 1018981). It is currently understood that the Cleveland iron ore deposits were first exploited in the 1830s, by which time the tenure of Walker & Co had already drawn to a close at Milton.

The evidence for the potential re-construction of the calcining kiln at Milton may also be interpreted as supporting evidence that the structure in question may have been somewhat experimental, at least from the point of view of those tasked with its construction and maintenance. It appears that the structure excavated in Trench 1 may have been subjected to prolonged thermal stresses which contributed to its collapse and, crucially, resulted in re-building rather than abandonment, as demonstrated by the use of demolition rubble (112) redeposited as a levelling layer for the reconstruction of the kiln (141) as (105-109). The carefully-controlled deposition of (112) suggests that the original foundations of the kiln may not have been sufficiently level, and that fine adjustments were deemed necessary before the re-construction took place.

As mentioned in section 5.14, the extensive nature of context (107) represents a substantial 'thermal footprint', suggesting that a range of hot works occurred over a substantial period of time, and within a substantial area which continued beyond the limit of excavation. Given the fact that (107) ran beneath the footings of (105), it is reasonable to conclude that a continuous

range of calcining kilns could have been present to the north and possibly to the south of the limited foundations recorded in Trench 1.

If the remains of the Calcining Kiln excavated in Trench 1 do pertain to the original phase of works, as built and operated by Walker & Co prior to the 1830s, historical evidence would suggest that the use of calcining kilns at Milton became a substantial part of the works, rather than an ephemeral process which became sidelined to quarries as the business grew. According to a historical source from the 1870s and quoted in a historical summary of the site currently in preparation, Tankersley Park Ironstone for both the Milton Ironworks and the Elsecar works was calcined at Milton in 'five huge kilns, each capable of containing about 150 tons' (Went 2018, quoting a newspaper clipping from the John Goodchild collection at Wakefield Archives)

6.3 Absolute Chronology

No artefacts were recovered during the excavation of Trench 1 that could have assisted in ascribing a precise chronology to the stratigraphical sequence, which makes the results of the archaeometallurgical assessment of particular significance in this instance. The presence of glassy slag with pale blue banding within context (139) is identified in the assessment of the industrial residues (Appendix 3) as coming from coke fired blast furnaces that used cold blast. As (139) was a deposit of limited extent directly overlying (107) and sealed beneath the end-stage backfill deposits (127) within the semi-circular space defined by (109), it may well offer the best evidence of a typical sample of general inclusions present throughout the works at or around the final days in the life of this calcining kiln. It is understood from historical sources (Went 2018, Roberts pers comm.) that the use of Cold Blast at Milton was very much a hallmark of the earlier days of iron production, with a gradual and highly contentious shift to Hot Blast during the 1830s. At the very least, the results of the archaeometallurgical assessment of the slag residues demonstrates that the evidence for Cold Blast is much less common than the evidence for Hot Blast, in terms of the relative weights of the recovered samples. Further work in the immediate vicinity may provide a more detailed picture, but the presence of any cold blast slag at all within the excavated contexts suggests the interpretation that deposition must have occurred close to, if not during, the transition from Cold Blast to Hot Blast in the late 1820s or the early 1830s.

6.4 Phasing Summary

This section concludes with a summary of the archaeological phases described and discussed in the previous sections, based on the results of the evaluation and subsequent interpretation.

Phase 1: Precise construction encompassing creation of incredibly solid laminated made ground. Contexts (114-126).

Phase 2: Primary construction of kiln structure. Remains *in situ* as the truncated structure (141).

Phase 3: Primary use of kiln structures as shown by extensive context (107), a thermal by-product of the repeated and relatively long-lasting use of the kiln to roast iron ore.

Phase 4: Repair and reconstruction of kiln structure as represented by (105/107), demonstrated by differential stages of heat affection across full extent of structure (141), also the use of demolition rubble (112) as a repair/levelling layer to provide a levelled foundation for the

rebuilt (105). It is during this phase of operation that the metalliferous inclusions within contexts (127) and (139) were most likely created.

Phase 5: Demolition of kiln range; again, structured and precise, as demonstrated by the redeposition of red clay (104) over (107). The final deposition and stratigraphical 'sealing' of contexts (127) and (139) takes place.

Phase 6: Landscaping, as shown by the very neat truncation of deposits at the northwest edge of T1 and replacement with clay capping (102) and topsoil (101).

7 CONCLUSIONS

This project has demonstrated that despite the deliberate demolition of the ironworks in 1883 and the subsequent use of the site as a waste disposal area, tantalising islands of preserved archaeology dating to the early development of Milton Ironworks are present beneath the surface of the Milton Forge Recreation Ground.

It is recommended that any future archaeological trenching undertaken at Milton Forge Recreation ground should consider the results from Trench 1, where it has been demonstrated that a unique interrelating sequence of structures and deposits are preserved *in situ* in a zone running parallel to the inclined plain. Although the total area of Trench 1 was not particularly extensive in the context of the site a whole, the shallow nature of the archaeological horizon represents a relatively straightforward target for establishing both the definitive extent of the structures interpreted as Calcining Kilns, and by extension the total amount of archaeological structures and deposits that may still survive *in situ* along the southwest edge of the recreation ground.

Although no evidence was found of any surviving remains of the blast furnace within Trench 3, the maximum depth of the trench was in all probability unable to reach the archaeological horizon in question. The potential for further archaeological remains sealed at greater depth must not be ruled out on the basis of the results of this evaluation.

8 ACKNOWLEDGEMENTS

The excavation was supervised by the author with invaluable assistance from Susie Matthewson and Jessica Midlane. Enthusiastic and extensive on-site support and advice was constantly provided by Megan Clement and Dr Tegwen Roberts. John Tanner and the rest of the project team from Great Place Wentworth & Elsecar willingly provided additional funding for the trench extensions in the second week.

The project would not have been possible without the support of the local community:

- Exactly 100 members of community took part in the excavation, over the 8 days it was open.
- 317 volunteer hours were given: 55 school children took part from 3 different schools (2 primary and 1 secondary) and the home educating network.
- Over 360 people visited on a day-to-day basis.

- Over 150 people attended the open day¹.

The participants in the community excavation gave up their free time to work solidly through the relentless heat of what will no doubt become known as the hottest summer in living memory.

We would also like to thank the local dog walkers whose interest and support added an extra dimension of engagement and involvement that we could not have bargained for, but came to rely on as a means for disseminating information and fostering further interest in the project.

Brad, the landlord of The Furnace public house, very kindly supplied extra water for finds washing, and insisted on providing cold drinks free of charge to parched archaeologists.

The author is indebted to Dave Went from Historic England for indispensable advice and expertise, and for his permission to use a draft copy of his excellent historical summary of Milton Ironworks.

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¹ Engagement data collated and provided by Megan Clement of WE Great Place

PLATES



Plate 1: Preliminary excavation of [109] (left) and [105] (right). Viewed facing west, 1m scales



Plate 2: Section through contexts (114-126), see Figure 5. Viewed facing southwest, 1m scales



Plate 3: Sections through the made ground of Milton Ironworks with later truncation. Viewed facing west, 1m scales



Plate 4: The east profile of the Calcining Kiln showing walls 109 (front) and 105 (rear) on top of surface 107. Viewed facing west, 1m & 0.5m scales



Plate 5: The partially excavated Calcining Kiln, showing contrast between red and yellow clays (142 & 143).
Viewed facing west, 1m scales



Plate 6: Continuation of surface 107 beneath foundations of structure 105. Viewed facing south, 0.5m scale



Plate 7: Partially stratified contexts 128-137 immediately west of 109 (Figure 7). Viewed facing southwest, 0.5m scale.



Plate 8: Northeast-facing section through the area seen in Plate 6; note clast-like nature of deposits in contrast to the laminated contexts seen in Plate 6 and Figure 7 et al. Viewed facing southwest, 0.5m scale



Plate 9: The Calcining Kiln, showing curved structure 109 and outer wall 105. Viewed facing east, 1m & 0.5m scales

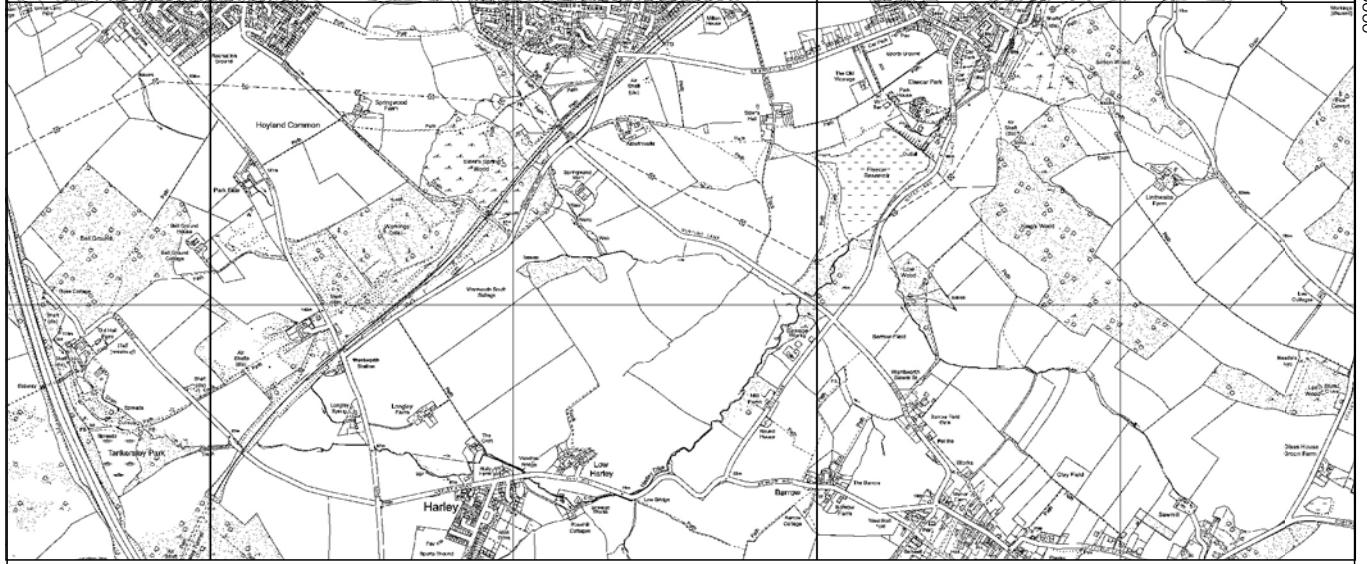


Plate 10: Trench 2 viewed facing northwest. 1m scales



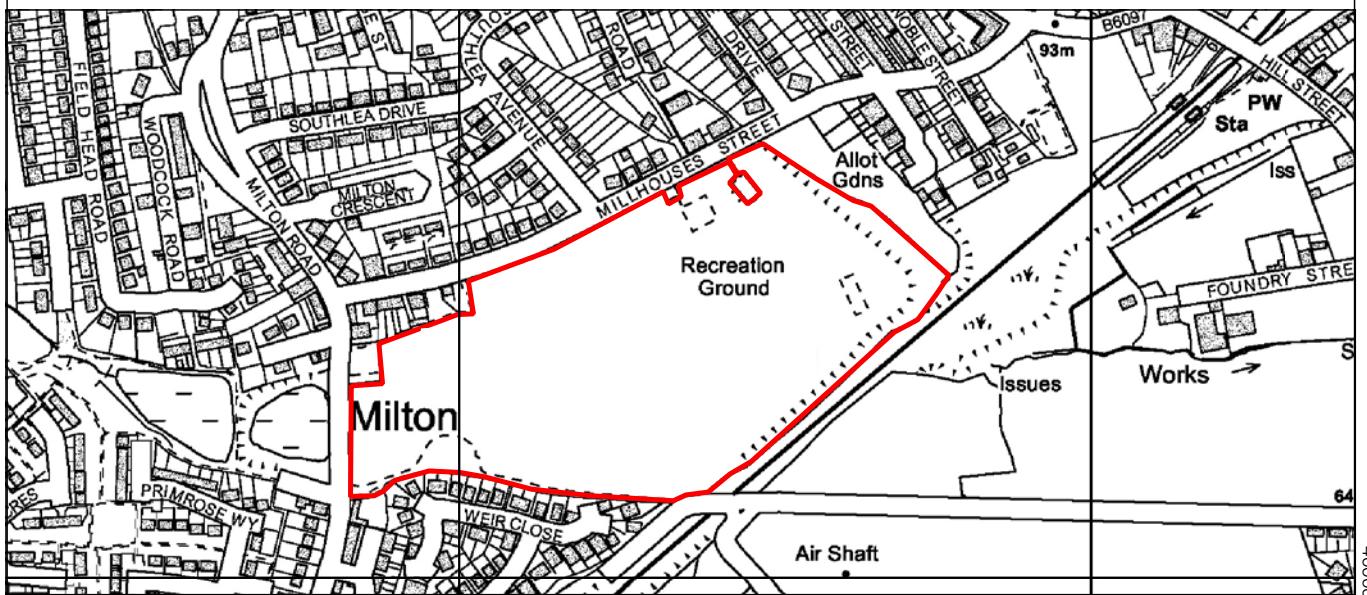
Plate 11: Trench 3, viewed facing east. 1m scales

FIGURES



436000

438000



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Figure 1: Site location

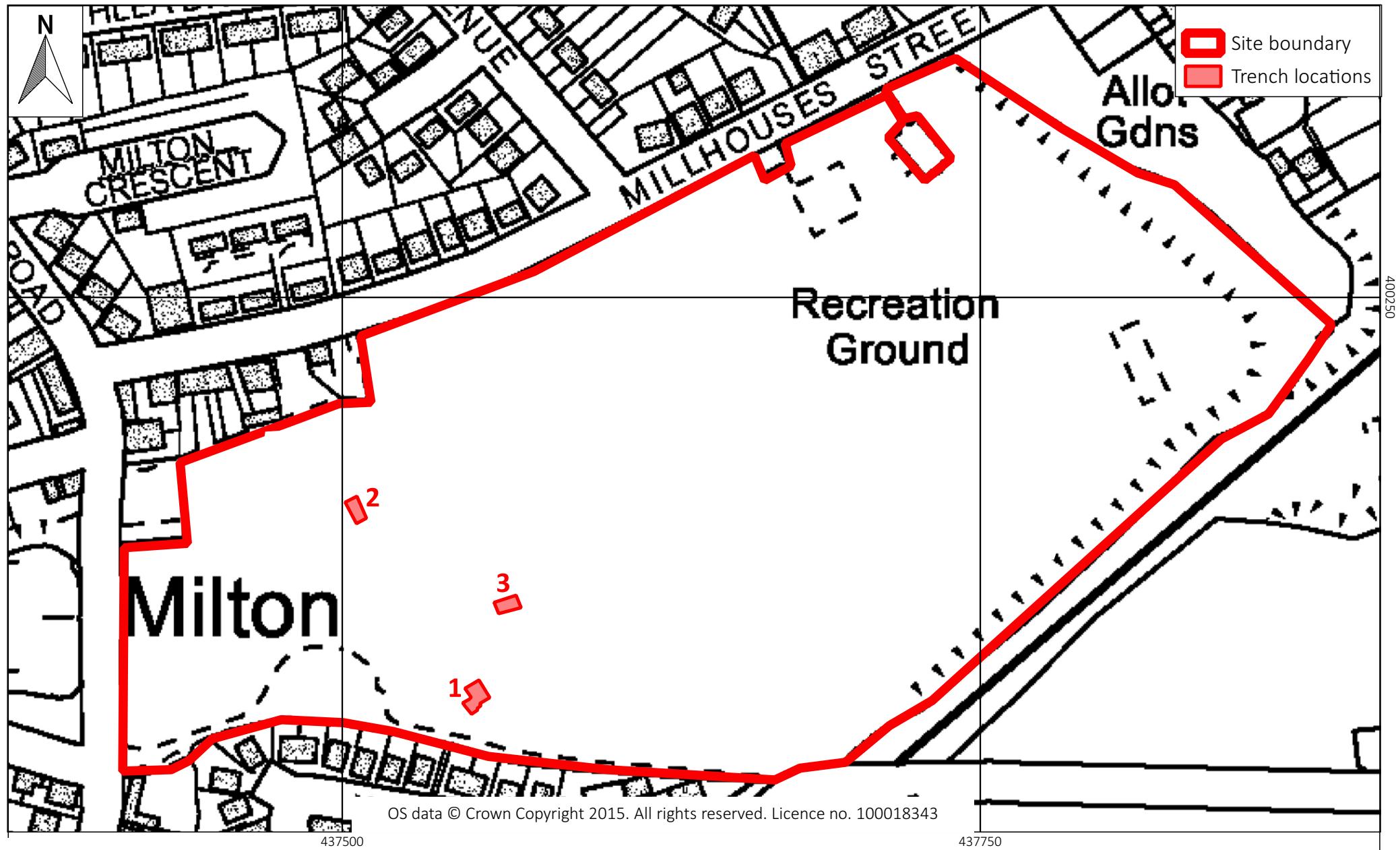


Figure 2: Trench location plan

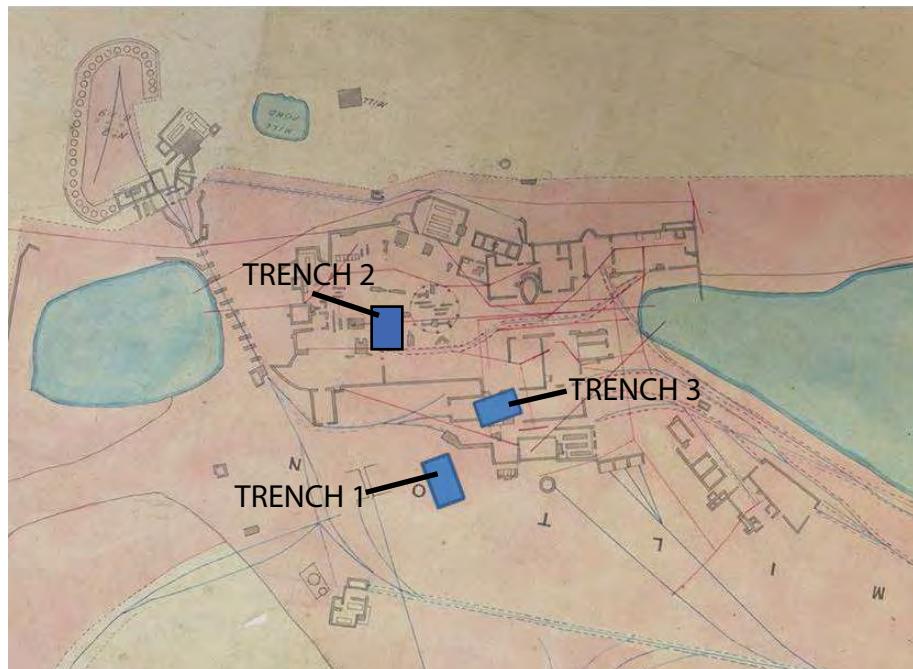
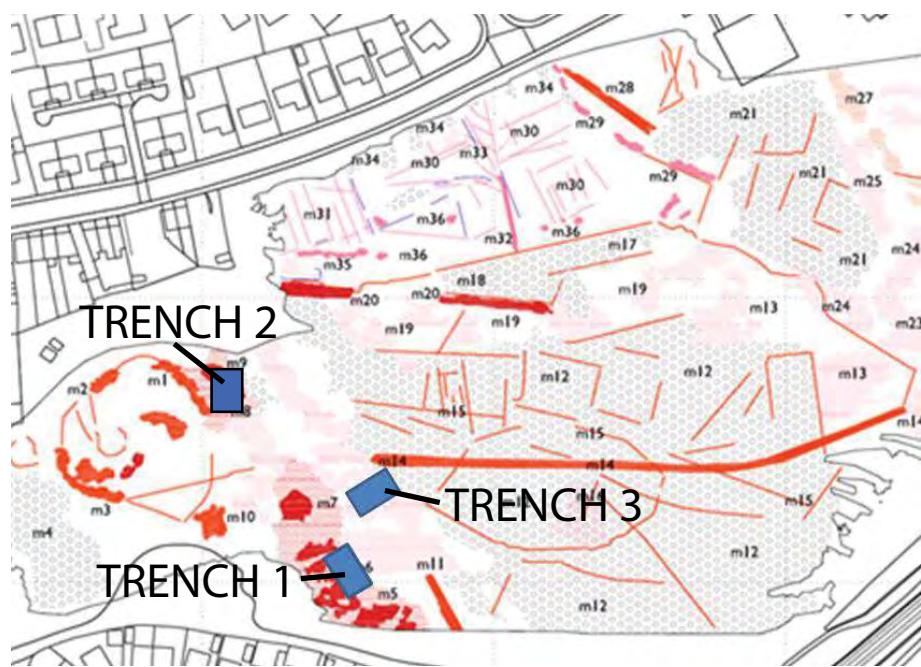
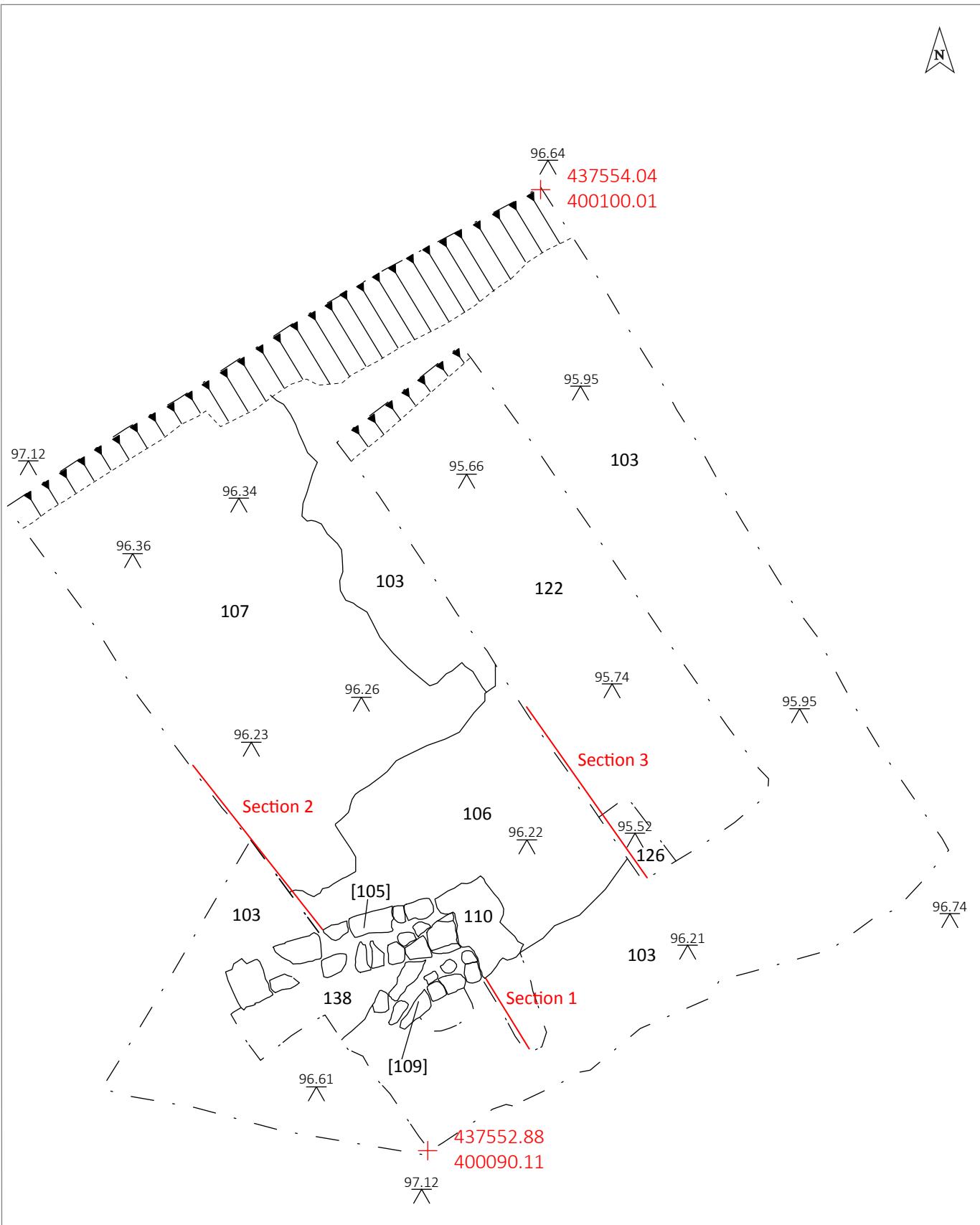


Figure 3: Trench locations overlaid on geophysical survey results (top) and 1840s sale plan (bottom)





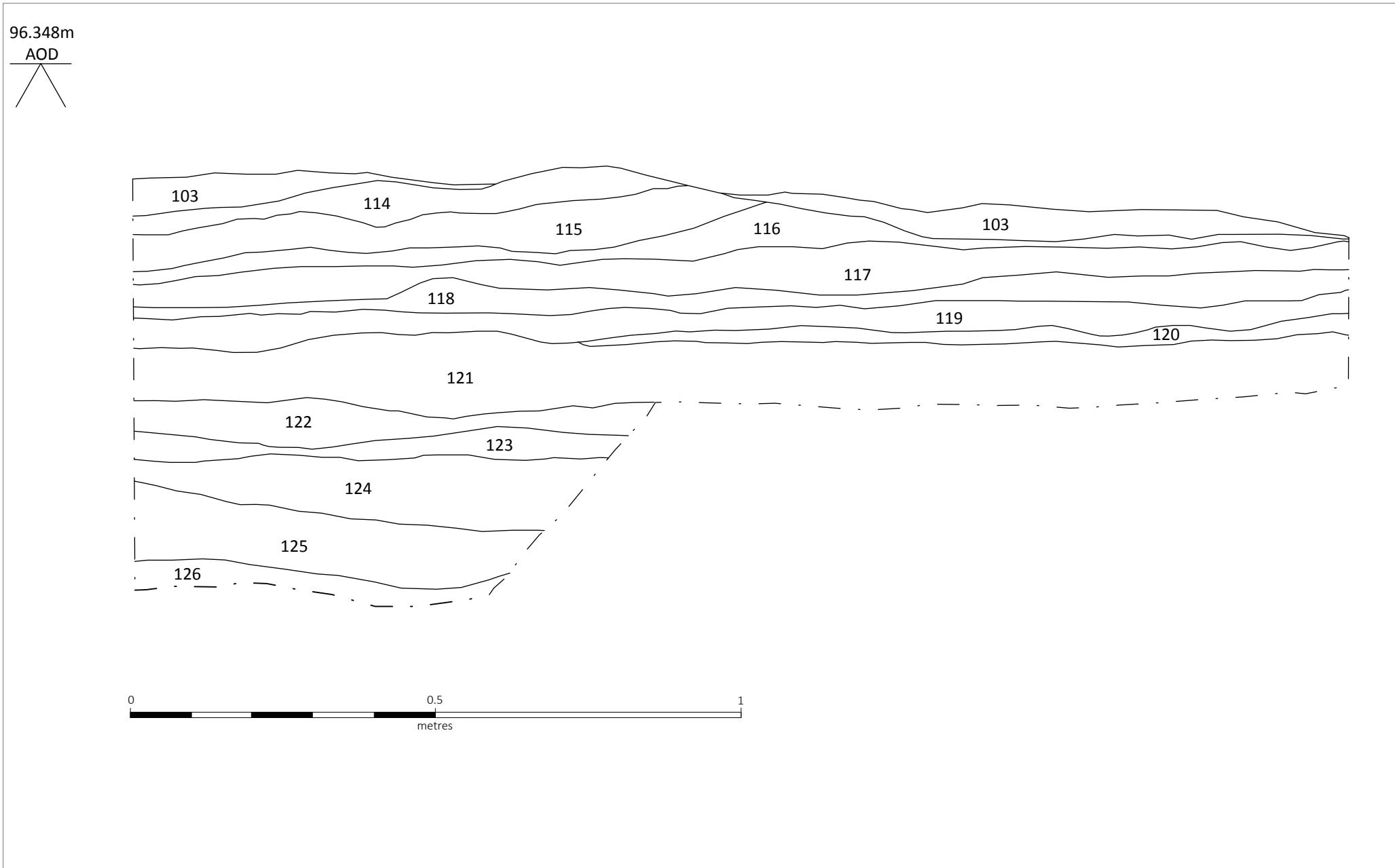
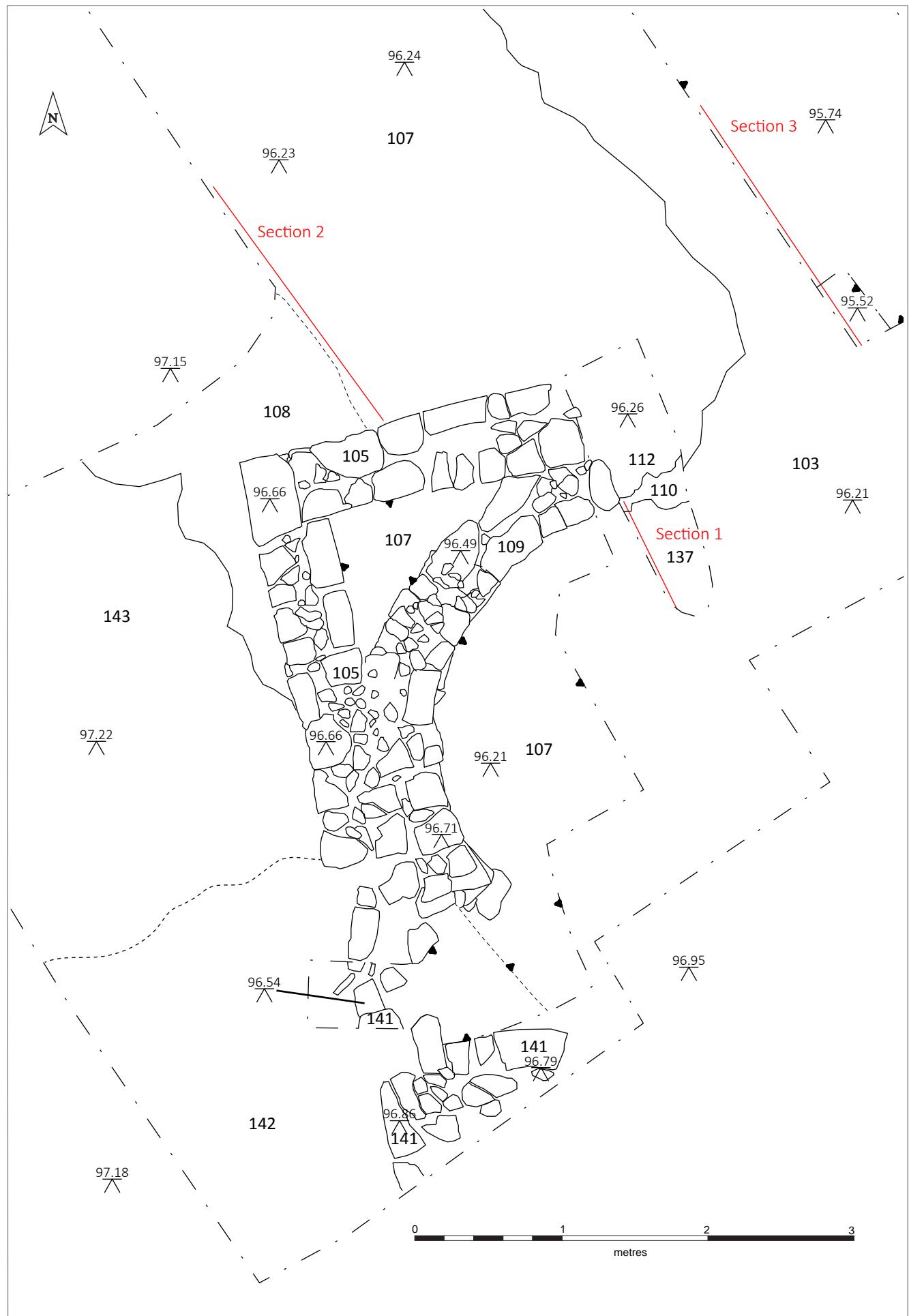
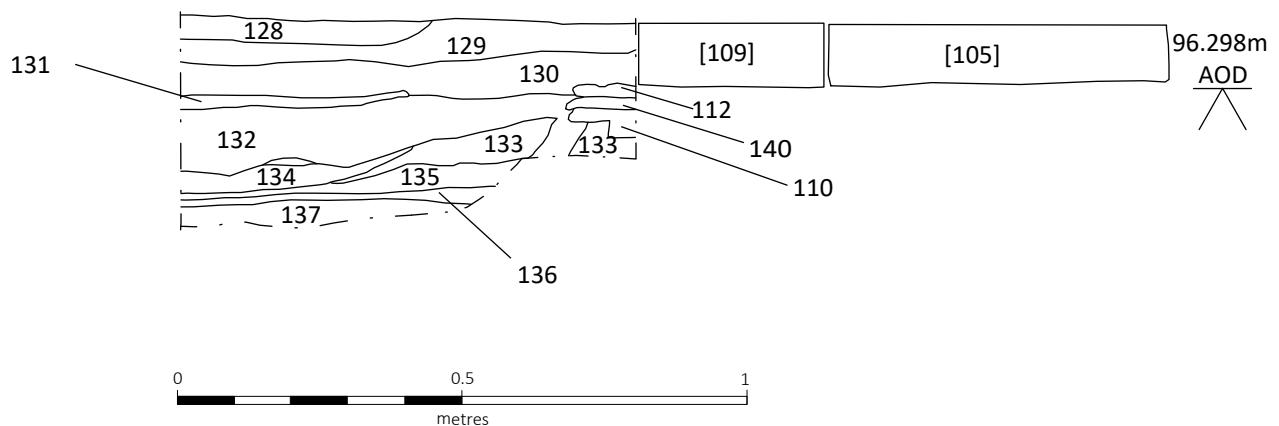


Figure 5: Trench 1 Section 3, Northeast facing

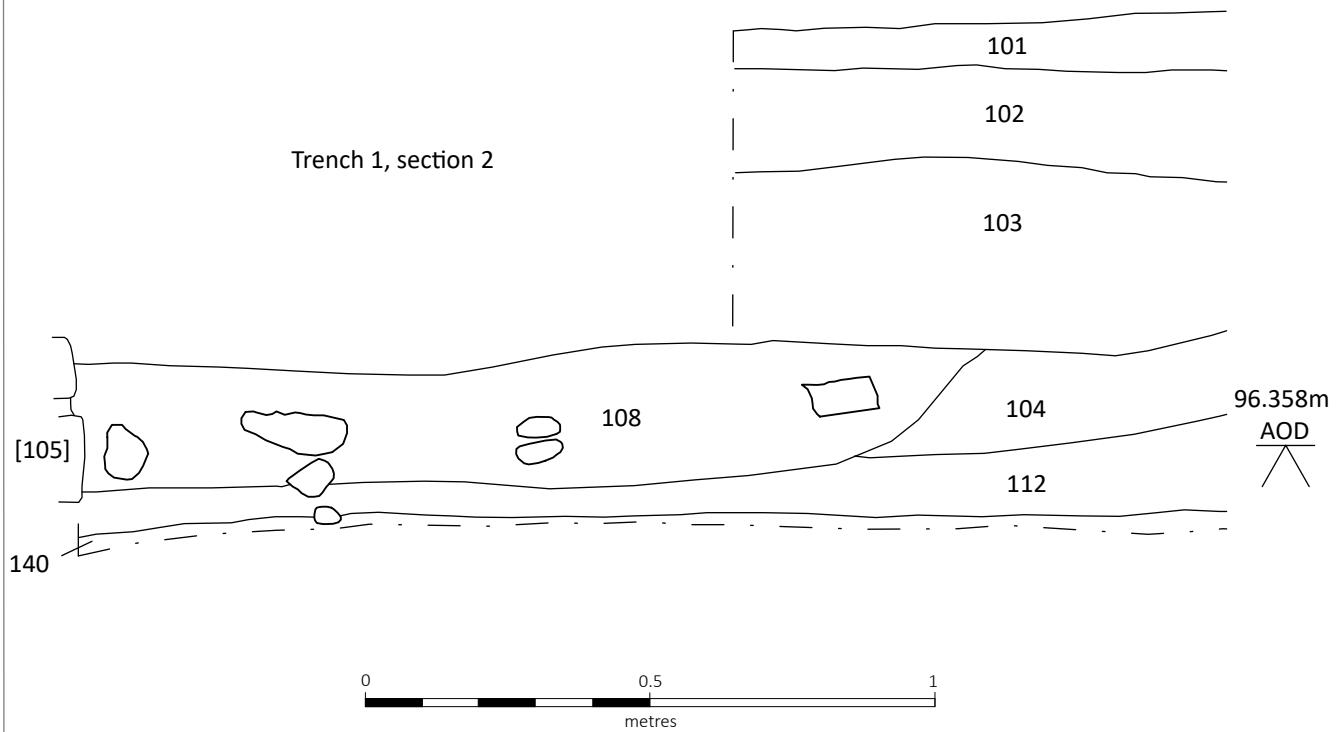


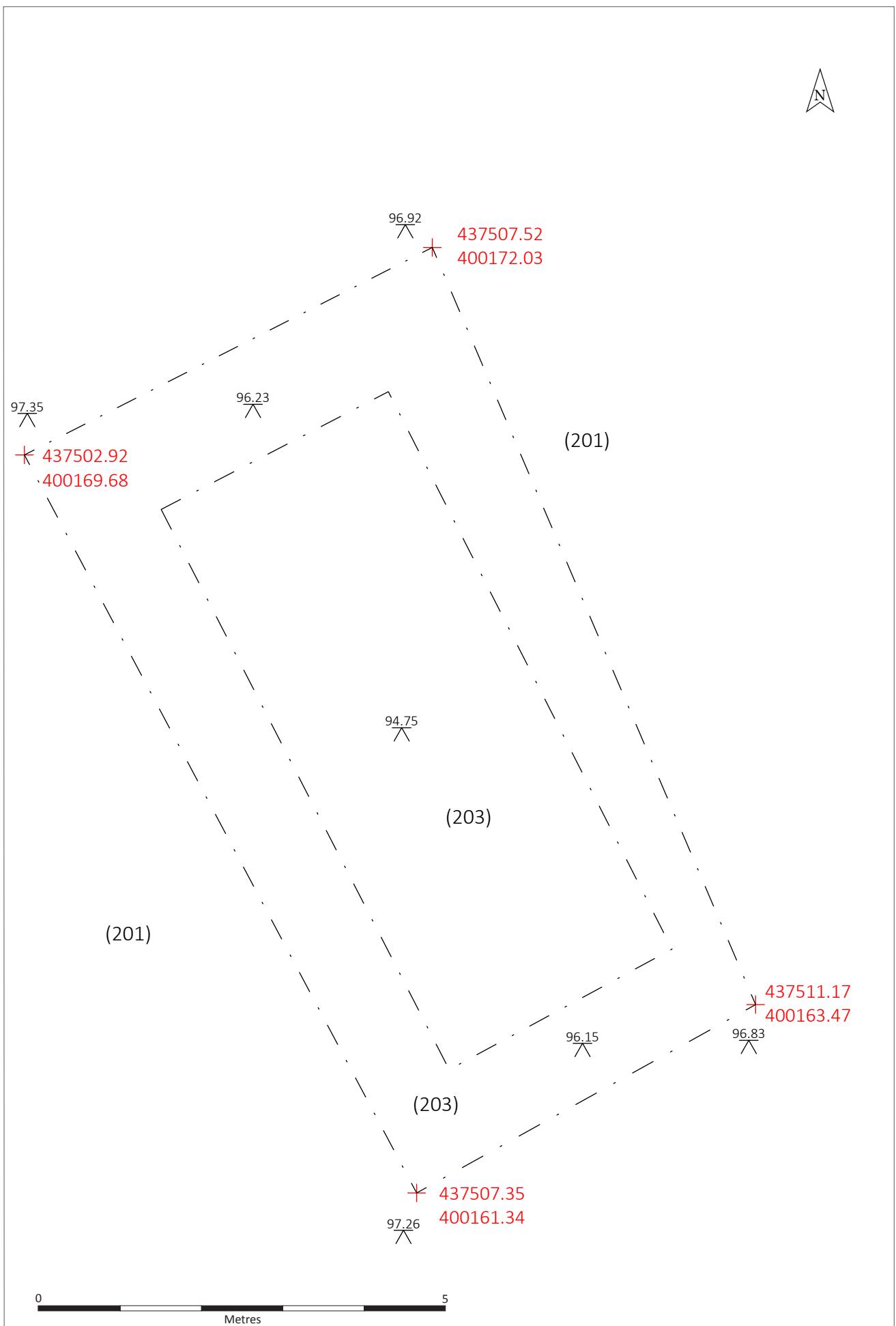


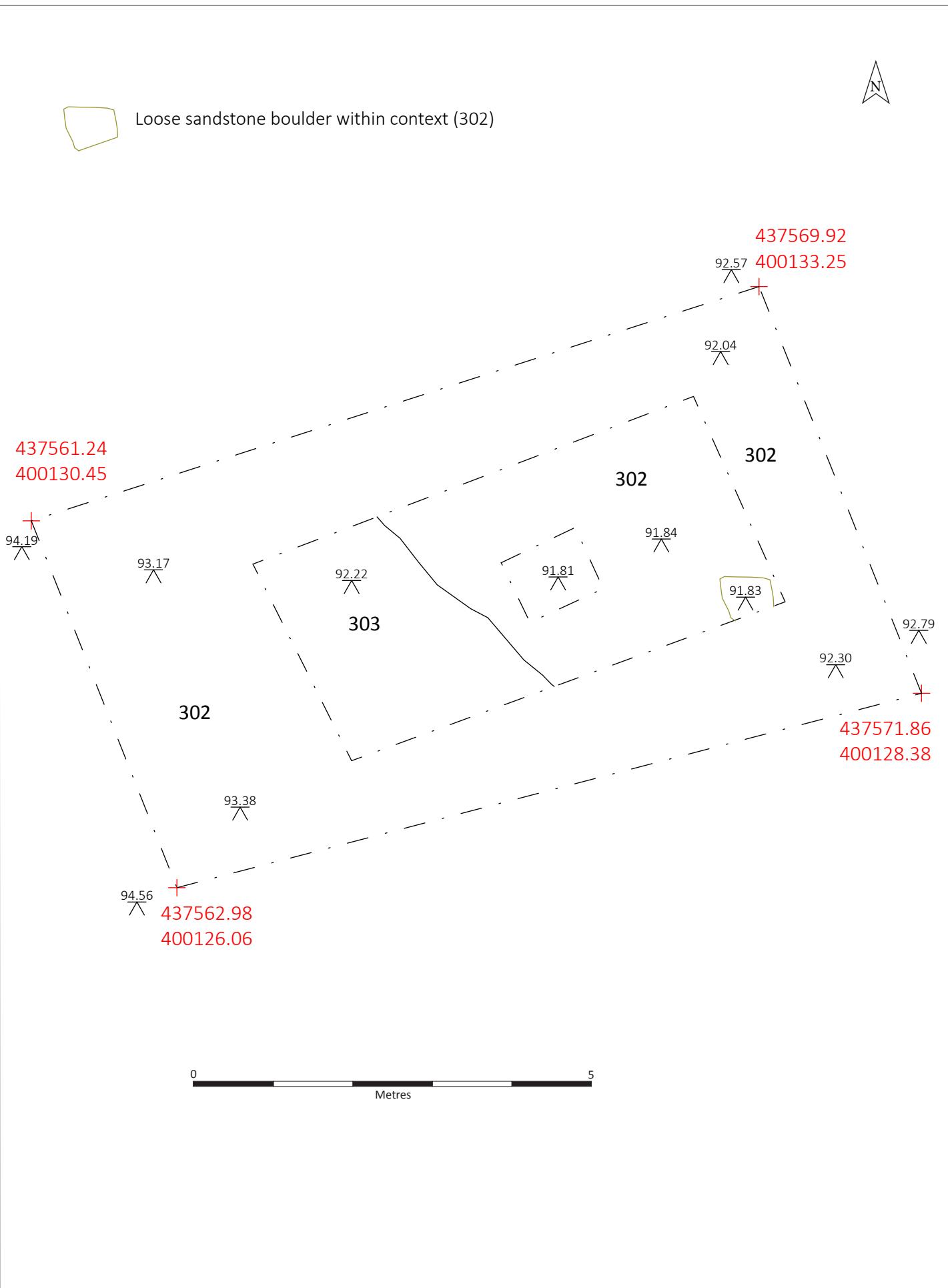
Trench 1, section 1



Trench 1, section 2







APPENDIX 1: INDEX TO ARCHIVE

Item	Quantity
Context Sheets	49
Context Registers	3
Original Drawings	4
Black & White Photographs	56
Digital Photographs	170
Project Design	1
Report	2
Pottery sherds	716 sherds

Table 1: Archive contents

APPENDIX 2: CONTEXT LIST

Trench	Context	Description
Trench 1	101	Upper made ground/topsoil
Trench 1	102	Lower silty clay below 101
Trench 1	103	Made ground clay silt
Trench 1	104	Orange-pink clay
Trench 1	105	Linear stone structure
Trench 1	106	Rubble & clay directly NW of 105, same as 112 in fig 7 section 1 & 2
Trench 1	107	Impacted pale orange granular deposit/surface
Trench 1	108	Slag & rubble deposit stratigraphically above 104, overlying 107
Trench 1	109	Curvilinear sandstone wall, butts 105
Trench 1	110	Slaggy deposit adjacent to 105
Trench 1	111	Gritty silt deposit, adjacent to & below 110
Trench 1	112	Red-brown clay with sandstone inclusions below 108 and above 107
Trench 1	113	Fill between structures 105 and 109, overlying 112
Trench 1	114	White/grey 'shale-like' material. Roasted ferrous oxide residue
Trench 1	115	Orange/red compact deposit below 114
Trench 1	116	Mixed brown-grey burnt deposit below 115
Trench 1	117	Yellow-brown compact deposit (similar to 107)
Trench 1	118	Grey/white burnt deposit Loose, gritty. Below 117
Trench 1	119	Orange/brown soft gritty deposit below 118
Trench 1	120	Mixed carbonised deposit, dark brown/black, below 119
Trench 1	121	Dark gritty deposit with inclusions of clinker below 120
Trench 1	122	Coarse orange sandy deposit below 121
Trench 1	123	Dark grey burnt deposit below 122
Trench 1	124	Dark brown/black burnt deposit below 123
Trench 1	125	Dark brown compact material below 124
Trench 1	126	Dark brown sandstone and clay deposit
Trench 1	127	Bulk number ascribed for the backfill contexts within 109
Trench 1	128	Red-orange compact deposit (drawing 4)
Trench 1	129	Dark brown mixed deposit of burnt material
Trench 1	130	Mixed burnt material
Trench 1	131	Mixed deposit of yellow-grey clay.
Trench 1	132	Dark brown/black material

Trench	Context	Description
Trench 1	133	Orange material
Trench 1	134	Dark grey compact material
Trench 1	135	Orange-yellow material
Trench 1	136	Soft brown-grey material
Trench 1	137	Loose white-grey material
Trench 1	138	Internal rubble packing between structures 105 and 109
Trench 1	139	Lower fill against northeast face of 109, overlies 107
Trench 1	140	Thin dark grey clay directly overlying 107/110
Trench 1	141	Heat-affected sandstone structure southeast of 109
Trench 1	142	Red clay deposit west of 142
Trench 1	143	"Natural" clays below 142
Trench 2	201	Topsoil
Trench 2	202	Clay capping
Trench 2	203	20 th century landfill tipping
Trench 3	301	Topsoil
Trench 3	302	Made ground
Trench 3	303	Made ground mixed with demolition rubble

Table 2: List of contexts

APPENDIX 3: POST-EXCAVATION ASSESSMENT OF SLAG AND INDUSTRIAL PROCESS RESIDUES

by Dr R. Mackenzie

The following report is an archaeometallurgical assessment of slag and industrial process residues recovered during excavations at the site of Milton Ironworks in Elsecar, South Yorkshire. The aim of the assessment has been to identify the slag and residues, and determine whether further analysis could provide additional information about the site, or specific processes carried out there. The slag and residues have been visually examined and the results of the assessment are described below.

Results

Context Number	Number of pieces/volume	Weight(g)	Description of material
101	7	380	Blast furnace slag, mixture of glassy and classic tap slag
102	1	25	Fragment of vitrified firebrick.
102	3	65	Glassy blast furnace slag
102	1	35	Clinker
102	1	25	Tap slag
114	Bulk c.1 litre	-	Fine iron rich sand and small fragments of stone (possible iron ore fines), and lumps of compacted cinders (possibly from floor/yard surface)
115	Bulk c.1 litre	-	Predominantly fine iron rich sand with small fragments of stone (possible ore fines)
116	Bulk c.1 litre	-	Mixture of fine cinders, coal and earth; very low abundance of possible ore fines
121	Bulk c.1 litre	-	Predominantly fine sand, dark brown to black in colour, with occasional small (<5mm) spheroidal slag inclusions (possibly sand floor from casting area of foundry)
127	63	1860	Slag with flat upper surface and highly vesicular texture (possible foundry slag)
127	3	355	Tap slag
127	1	20	Glassy blast furnace slag
127	37	1000	Drossy slag with occasional coke fuel inclusions
138	1	550	Possible lump of partially reduced iron ore
138	3	1690	Fragments of refractory brick (possible furnace lining)
138	2	815	Fragments of red brick (non refractory)
138	3	1360	Drossy slag with refractory brick inclusions (probable raked out blast furnace slag)

Context Number	Number of pieces/volume	Weight(g)	Description of material
138	1	9150	Dense iron rich slag, probably from base of blast furnace
139	9	635	Tap slag
139	20	2100	Drossy furnace slag with coke inclusions (probable blast furnace slag)
139	5	37	Coke fuel
139	1	1000	Tap slag
139	2	35	Glassy blast furnace slag
139	6	280	Drossy furnace slag
138	Bulk c.10 litres	9200	Fragments of drossy slag, tap slag and vitrified refractory brick
138	Bulk c.5 litres	1650	Fragments of drossy slag and vitrified refractory brick
138	Bulk c.10 litres	9050	Fragments of slagged and vitrified refractory brick (possible blast furnace lining material)
138	1	-	Ferrous metal bar approximately 40mm x 30mm x 400mm (undiagnostic)
138	1	-	Ferrous metal bar approximately 40mm x 40mm x 500mm (undiagnostic)
138	1	-	Rectangular ferrous metal plate with a 20mm hole at either end; measures circa 360mm x 100mm x 10mm (possible structural or machine part, but otherwise undiagnostic)

Table 3: Results of assessment of slag, metals and industrial process residues

Discussion and interpretation of results

The assemblage is almost entirely composed of residues that appear to relate to iron production, and a significant proportion are by-products of coke fired blast furnaces. The slag in the assemblage contains examples of 'glassy' blast furnace slag, as well as iron rich dense tap slag. Many of the fragments of 'drossy' furnace slag have pieces of coke fuel fused within them.

Some of the slag was recovered from the rubble fill (138, 139) between structures (105) and (109). Although one cannot discount the possibility that the slag was brought in from another furnace site as construction material, it is possible that the slag was produced by the furnaces on site, and simply used as convenient backfill rubble during a remodelling phase.

Most of the fragments of pale green glassy slag have pale blue banding running through them, and this colouring is typical of coke fired blast furnaces that used cold blast. The apparent use of cold blast furnaces fits with the age of the former ironworks.

Two of the bulk samples (114, 115) contain a high proportion of iron rich sand/dust, along with small fragments of iron rich stone; it is possible that this material is the fine fragments and dust (known as 'ore fines') from an area of the ironworks that had been used to handle or store the

iron ore for the blast furnace(s). One of the other bulk samples from (121) consists almost entirely of very dark brown-black sand, with occasional inclusions of spheroidal foundry slag; this material is what one might expect to find in an iron foundry where the metal is cast into sand moulds.

In summary, the assemblage contains a relatively high proportion of residues that are characteristic of an early to mid-19th-century blast furnace site.

Recommendations

Given the type and archaeological contexts of the material in the assemblage, and what is already known about the site, further analysis of the material is not recommended at this stage. However, it is recommended that a small representative selection of fragments of the vesicular tap slag from context 127 is retained as part of the site archive.

APPENDIX 4: POTTERY ASSESSMENT

By Richard Jackson

The pottery assemblage from Milton Ironworks Community Excavation consisted of 716 sherds of pottery from five contexts, with further unstratified artefacts from Trench 1 and Trench 2. The results of the assessment are summarised in the following table.

Context	Type	Qty	Part; Form	Comments
101	Whiteware	1	Body; u/id	
102	Coarse Earthenware	4	1 rim, 2 body, 1 base; pancheons	White slipcoat under clear glaze
102	Coarse Earthenware	1	Rim; possible pancheon	Unusual perforated item. White slipcoat internal, clear glaze int & ext
102	Porcelain	2	1 body, 1 base; hollowware	Undecorated
102	Slip-banded ware	2	Body; bowl	
102	Stoneware	2	1 rim, 1 body; bowls	Brown salt glaze
102	Stoneware	2	Rim, body; jars	Grey stoneware 'marmalade' jars
102	Whiteware	6	2 base, 4 body; tablewares	1 sherd dec w. Handpainted gold lustre overglaze. 1 dec in green. Abraded
103	Coarse Earthenware	2	1 Base, 1 body; pancheons	Black glaze
103	Late Blackware	1	Body sherd; u/id	Irregular profile
103	Porcelain	2	1 rim, 1 base; hollowware	Rim is 20 th century w. gold lustre banded decoration. Base; teacup. Body:
103	Porcelain	1	Body; Mug or similar	Polychrome transfer print
103	Whiteware (plain)	14	3 rim, 3 base, 8 body; 1 flatware, hollowware	Mostly thick-walled sanitary ware
103	Whiteware (decorated)	2	Tile	Decorated with faint irregular 'bubble' pattern in blue
103	Whiteware (decorated)	3	Rims; hollowware	1 spongeware dec, 2 Transfer print
103	Whiteware (decorated)	4	Body; flatware	3 sherds decorated with faint TP. Abraded
103	Whiteware (decorated)			
108	Whiteware	1	Handle	Overfired
Trench 1 u/s	Coarse Earthenware	2	1 rim, 1 body; pancheon	Black glaze
Trench 1 u/s	Porcelain	2	1 rim; saucer. 1 handle	

Context	Type	Qty	Part; Form	Comments
Trench 1 u/s	Stoneware	3	2 rim, 1 body; jars	Grey stoneware 'marmalade' type jar
Trench 1 u/s	Stoneware	1	Body; jug or similar	
Trench 1 u/s	Whiteware	1	Sphere	Sphere fragment;? knurr & spell
Trench 1 u/s	Whiteware	1	Base; hollowware	Undecorated
Trench 1 u/s	Whiteware	2	Tile	Decorated with faint irregular 'bubble' pattern in blue
Trench 1 u/s	Whiteware (decorated)	4	1 rim, 3 body; flatware	Brosley-type transfer print in blue
302	Coarse Earthenware	19	Rims; 18 pantheon, 1 lidded jar	White slipcoat underglaze, broad brown band around rim.
302	Coarse Earthenware	17	Body; pantheon	White slipcoat underglaze.
302	Coarse Earthenware	2	Base; pancheons	White slipcoat underglaze.
302	Coarse Earthenware	7	Body; 6 pantheon, 1 jug or similar	Jug glazed int. & ext. Pancheons black glaze internal.
302	Coarse Earthenware	6	3 body, 2 base, 1 rim	Clear glaze
302	Porcelain	1	Eggcup, 2/3 intact	Pink wash dec with TP image of Manchester town hall, bordered in gold lustre.
302	Porcelain	15	Base; Teacups, saucers, mugs	Plain
302	Porcelain	21	Body; 16 hollowware, 5 flatware	3 dec in TP; blue, pink, polychrome. 1 gold lustre dec.
302	Porcelain	22	Rim; 18 saucers, 1 cup, 1 jug, 1 jar	3 TP dec. Saucers decorated with gold lustre banding . 1 sherd dec. onglaze plant pattern
302	Porcelain	2	Handles; 1 teacup, 1 jug or similar.	Moulded.
302	Coarse Earthenware	4	Body; flower pot	
302	Refined earthenware	2	Teapot spouts	1 glazed in buff-yellow, 1 glazed in brown
302	Refined earthenware	1	Body; hollowware	Unusual black-glazed ware with fine yellow/ochre TP floral pattern overglaze with hand-painted green & pearlescent embellishments

Context	Type	Qty	Part; Form	Comments
302	Stoneware	22	Bases; jars	Grey stoneware 'marmalade' type jars. 1 intact base stamped '7'. 2 joining sherds. Variety of sizes from 9.4cm to 5.7cm.
302	Stoneware	49	22 rims, 27 body.	Grey stoneware 'marmalade' type jar
302	Stoneware	1	Intact jar	Grey stoneware 'marmalade' type jar. 8 cm high, 6.7cm diameter
302	Stoneware	1	Rim; bottle	Screw-threaded stopped intact. Oxide wash
302	Stoneware	2	Body; hollowware	
302	Stoneware (salt-glazed)	9	6 body, 2 base, 1 rim; bowls	Typical rouletted decoration on 1 sherd. 2 with slightly more unusual rouletted pattern
302	Stoneware (salt-glazed)	3	Rim-base fragments; drinking vessel	
302	Stoneware (salt glazed)	1	Match striker	
302	Stoneware (salt glazed)	1	Base; bottle	
302	Whiteware (plain)	1	Doorknob	
302	Whiteware (plain)	41	Rims; 20 teawares, 21 thicker hollowwares	Considerably cracked and stained
302	Whiteware (plain)	69	Body; includes 1 mug	Mostly small undiagnostic sherds; thickness suggests larger vessels such as bowls or jars. Considerably cracked and stained
302	Whiteware (plain)	40	Base; Hollowares, 1 large flatware	Crown stamp on base of flatware
302	Whiteware (plain)	6	Handles	1 moulded, 5 strap
302	Whiteware (plain)	1	Misc	Extruded item, intended as a rest or similar
302	Whiteware (decorated)	40	Rims; flaware & hollowware	TP in blue; Brosley, Willow pattern, Flow Blue; 2 sponged ware; 2 'sprig & berry' on a thinly-potted bowl or vase; 1 TP of a steam locomotive; Large jar or similar with rolled rim & handle attached, linear banding on side, teardrop repeating pattern around rim, possibly locally made.
302	Whiteware (decorated)	13	Rims; 12 flatware, 1 jug or similar	TP in green, variety of styles and quality. Floral design on jug
302	Whiteware (decorated)	2	Rims; flatware	TP in grey. Finely executed leaf motif; repeating geometric pattern

Context	Type	Qty	Part; Form	Comments
302	Whiteware (decorated)	1	Rim; flatware	Shell edge
302	Whiteware (decorated)	4	Rims; misc u/id	Various hand decorated in dark blue
302	Whiteware (decorated)	1	Rim; lid	Gold lustre band
302	Whiteware (decorated)	8	Rims; 2 flatware, 6 bowls	Blue slip banded decoration
302	Whiteware (decorated)	5	Rims; flatware	4 TP in brown, 1 TP in mauve
302	Whiteware (decorated)	2	Rims; holloware	Dec in pink wash
302	Whiteware (decorated)	1	Rim; jug or large mug	Handpainted freestyle design
302	Whiteware (decorated)	16	Body; bowls	Blue slip-banded dec
302	Whiteware (decorated)	12	Body; u/id hollowware	TP in green, mostly u/id, 1 italiante scene.
302	Whiteware (decorated)	30	Body; Small u/id sherds, probably flatware	Blue TP, floral border patterns
302	Whiteware (decorated)	1	Body; hollowware	Pink TP, depicts a flag, presumably part of a crossed flag motif
302	Whiteware (decorated)	4	Body; hollowware	Spongeware dec in brown && green; pink; blue
302	Whiteware (decorated)	10	Body; hollowware	Polychrome transfer dec. Generally floral patterns; 1 equestrian scene, 1 depicts a child in a green smock eating bread & jam
302	Whiteware (decorated)	2	Body; mug or jug	Freehand green scrawl in a bordered frieze
302	Whiteware (decorated)	1	Body; hollowware	Relief-moulded flower pattern dec in green, brown & yellow
302	Whiteware (decorated)	1	Body; flatware	Flow blue
302	Whiteware (decorated)	2	Body; flatware	TP in grey
302	Whiteware (decorated)	1	Body; flatware	Gold lustre band overglaze
302	Whiteware (decorated)	23	Bases; Plates and platters	Various TP in blue; floral patterns. 3 recognisable as willow pattern
302	Whiteware (decorated)	3	Bases; 1 mug, 1 plate, 1 large tureen	'Flow blue'

Context	Type	Qty	Part; Form	Comments
302	Whiteware (decorated)	3	Bases; 1 jug, 1 plate, 1 mug or similar	TP in green. Indented edge on mug. Partial backstamp on mug of a winged globe '-VE' in centre
302	Whiteware (decorated)	1	Base; Jug or similar	Blue banded decoration, partial base stamp 'ADAMS/ -OLAND'
302	Whiteware (decorated)	1	Rim; plate	Faint traces of TP in brown at sherd margin, green sponge pattern around edge, appears to have moulded decoration, randomly overlain with streaks of gold lustre dec.
302	Whiteware (decorated)	1	Base; hollowware	Black TP, pattern u/id
302	Whiteware (decorated)	1	Base; flatware	Handpainted onglaze, blue & green leaf & flower pattern
302	Whiteware (decorated)	1	Base, flatware	Possibly pearlware
302	Whiteware (decorated)	1	Base, flatware	Floral pattern with gold lustre detail. Backstamped 'seville/ stoke/ N° 96049
302	Whiteware (decorated)	1	Base; flatware	u/id TP, brown
302	Whiteware (decorated)	1	Base; flatware	Brown TP
302	Whiteware (decorated)	1	Base; flatware	TP in grey/blue, cracked & stained
302	Whiteware (decorated)	5	Handles	Traces of green TP; 1 green wash with gold lustre speckles, 2 ornately moulded & crudely decorated
302	Whiteware (decorated)	1	Body; Mug or cup	TP in brown "-AND TOWN/ -ELMONT/ -MEN'S/ CLUB", depicts handshake
302	Whiteware (decorated)	1	Body; hollowware	TP in black, agrarian scene depicts man with shire horse
302	Whiteware (decorated)	1	Body; Mug or jar	TP in pink, rural scene of 3 figures in a cornfield, buildings and trees in background
302	Whiteware (decorated)	1	Body; hollowware	TP in green, possibly a religious/didactic text "-/ OF/ GRACIOUS"
302	Whiteware (decorated)	1	Body; Hollowware	TP in blue; union flag
302	Whiteware (decorated)	1	Statuary	Handpainted, horse and tree.
Trench 3 u/s	Coarse Earthenware	8	2 rim, 2 base, 4 body; pantheon	Cream, slipcoat underglaze
Trench 3 u/s	Coarse Earthenware	1	Body; jar	Unglazed

Context	Type	Qty	Part; Form	Comments
Trench 3 u/s	Coarse Earthenware	2	1 rim, 1 body; Lidded jar, pancheon	Brown glaze
Trench 3 u/s	Stoneware	5	3 rims, 2 body; Jars & dishes	Brown salt-glazed stoneware
Trench 3 u/s	Stoneware	17	6 rims, 6 body, 5 bases; jars	Grey stoneware 'marmalade' type jars. One base sherd stamped "W. P. HARTLEY LIV-". Partial trademark, lighthouse.
Trench 3 u/s	Stoneware	2	1 base, 1 body; cistern/large jar	Grey stoneware
Trench 3 u/s	Whiteware (decorated)	11	6 rim, 3 body, 2 base; flatware	TP in blue, green, pink.
Trench 3 u/s	Slip-banded ware	4	1 rim, 3 body; bowls	Blue banded decoration
Trench 3 u/s	Porcelain	17	8 rim, 5 body, 4 base; flatware	Polychrome TP on base
Trench 3 u/s	Porcelain	1	Statuary	Animal ear, probably dog.
Trench 3 u/s	Whiteware	10	Base; 1 jar, 1 mug, 2 bowls, 5 flatware	Large ringfoot base on jar
Trench 3 u/s	Whiteware	7	Rim; 4 flatware, 3 Hollowware	
Trench 3 u/s	Whiteware	13	Body; 1 hollowware, 12 flatware	Hollowware sherd decorated with relief moulding
Trench 3 u/s	Whiteware	4	Handle; jugs or tureens	

Table 4: Results of Pottery Assessment from Milton Ironworks

The pottery from Trench 1 did not relate directly to any primary stratified deposits, but was instead derived from secondary contexts which were created and deposited during final landscaping phases and bore no direct relationship to the industrial activity at Milton Forge. The one exception to this was a single sherd of whiteware recovered during the excavation of context 108, although the whiteware sherd was of little diagnostic value.

The pottery from Trench 3 was by far the bulk of the entire assemblage, most of which was derived from context 302. All of the pottery can be ascribed a mid- to late 19th-century date; this is supported by an absence of any Pearlwares or Creamwares, along with an abundance of mass-produced Porcelains and polychrome transfer-printed wares, and is indicative of the material being part of a series of refuse dumping episodes which took place at the site after the ironworks closed.

An abundance of domestic wares relate to food production (pancheons) and consumption; (tablewares, marmalade jars, stoneware lidded vessels) as well as the consumption of hot beverages (porcelain teaware).

Quite a variety of patterns were represented in the transfer-printed whitewares, although given the nature of the formation of this context not too much can be inferred from this; it may be considered a randomized sample of forms and fabric in common use in and around the area of Milton at the time of deposition of the waste material which slowly buried Milton Forge over a period of some years. However, the clearly local nature of some of the stamps (see below) implies a reasonably local origin for at least some of this material.



Whiteware from 302; the stamp of G. T. Mountford, 1888



Fragment of commemorative cup from Belmont WMC



Barkers & Kent "Olive" pattern from 303



Polychrome transfer print on porcelain depicting Manchester Town Hall

Stamps & Transfer Prints

A partial stamp on a crazed whiteware sherd from context 302 was identifiable as manufactured by G. T. Mountford, a manufacturer of earthenwares at the Alexander Pottery, Wolfe Street, Stoke on Trent. The registration number dates to 1888.

Although unstamped, a fragment of whiteware has a partial transfer print in brown relating to the nearby Belmont Working Men's Club, which continues to operate to this day.

The partial stamp in green on the base of a whiteware mug from 302 was identified as Barkers & Kent Limited, who were in production at Foley Pottery, Fenton, Stoke-on-Trent between 1889-1941

The porcelain egg cup from 302 has clearly originated from Manchester, although the place of manufacture may be different. It serves as an example of the potential for extra-local items to be included within an apparently local assemblage via means of human agency.

Recommendations

The pottery assemblage from Milton Ironworks is of no intrinsic interest and it is not required to be deposited with a museum for retention within the site archive, although it could be retained by Great Place Wentworth & Elsecar for educational purposes and use in handling collections.

References

<http://thepotteries.org/allpotters/762a.htm> (accessed 31/01/2019)

APPENDIX 5: CLAY PIPE ASSESSMENT

By Richard Jackson

The small selection for clay pipe fragments recovered during excavations at Milton are generally of limited diagnostic value (see table), with the notable exception of the whole clay pipe recovered from context 302. This was manufactured in Shropshire by the Southorn family of Broseley, who were manufacturing clay pipes up until the 1960s. This particular pipe has a much shorter stem than earlier pipes, and is referred to as a 'cutty' or 'nosewarmer'. This style of pipe was popular in the 1920s, when this type of pipe was deemed cheap enough to be given away free with a pint of beer.

Context	Item
103	Single stem fragment, flattened oval profile. Green glazed
T1 u/s	2 undiagnostic plain stem fragments
302	1 intact pipe. 75mm long, bowl 40mm high, 24mm diameter. Stem tapers to oval profile, smoking end glazed green, Stamped "W., SOUTHORN BROSELEY 27"
302	10 short segments of stem fragments, no joining pieces.
302	1 wider stem, 13mm at wider end. Small amount of bowl still present. Stamped "273" on side.

Table 5: Results of Clay Pipe Assessment from Milton Ironworks

Recommendations

It is recommended that the clay pipe assemblage is to be retained by Great Place Wentworth & Elsecar for educational and outreach purposes at the Elsecar Heritage Centre. The undiagnostic stems can be used for handling collections or contributing to art projects at the discretion of the appropriate Project Manager, but the intact Brosley pipe merits retention for display at the Elsecar Heritage centre.

References

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APPENDIX 6: GLASS ASSESSMENT

By Richard Jackson

The glass assemblage from Milton Forge Community excavation consisted of a total of 99 individual fragments, including 10 intact or virtually intact glass bottles. The total weight of the glass assemblage was 5275 grams. Whole bottles were weighed individually. The results are summarised in the following table.

Context	Qty	Item	Description
101	1	Base; bottle	Clear glass; milk bottle. 20 th century
101	1	Body; bottle	U/d
101	1	Intact phial	Brown glass, 60mm high, base diameter 27mm, neck diameter 20mm. Late 19 th century. Weight 35g
101	1	Bottle	Press-moulded flat profile bottle in pale green glass. Broken at neck. Indented panels on three sides. 19 th century
101	1	Bottle	Clear glass wide-necked bottle. Press moulded. Stamped at shoulder "furniture cream" on one side, "Stephenson Brothers" on reverse. 130mm high, base diameter 47mm. Neck d. 32mm. Weight 115g
101	1	Bottle	Plain pale green glass, broken at neck. Base diameter 47mm
101	1	Bottle, partial	Dark green glass, intact at base. 58mm diameter "-Co/ -Ltd/ -mark/ -eld". Probably table water bottle. 19 th century
T1 u/s	1	Bottle	Small brown bottle. 35mm base diameter 70mm high 27mm neck diameter. Later 19 th /early 20 th "B-H" on base. Weight 30g
T1 u/s	1	Bottle neck	Broken neck fragment, pale green glass.
T1 u/s	1	Base	Pale green glass
T1 u/s	1	Body	Thick green glass, bottle
T1 u/s	1	Body	Clear glass, square profile
T1 u/s	1	Bowl fragment	Clear glass decorated with ripples. Press-moulded, 19 th /20 th
T3 u/s	1	Bottle	Green glass. High pontil: 50mm. 73mm diameter at base. 255mm high, 30mm at top. 19 th century. Contains fluid. Weight 725g
T3 u/s	1	Jar	Intact. Screw-threaded. 88mm wide, 70mm high. 20 th century. Weight 300g
302	1	Bottle	Flattened profile octagonal bottle, pale green glass. 62 x 34mm at base. 200mm high. 20mm neck diameter. Chipped at neck, otherwise intact. Press moulded, air bubbles visible in base. Weight 240g
302	1	Bottle	Square profile, pale green glass. 37mm across at base. 145mm high. Broken at neck. Neck diameter c. 20mm. Indented panels on 3 sides stamped "FLETCHERS", "SAUCE", "SHIPLEY". Weight 125g
302	1	Bottle	Rectangular profile, pale green glass. Broken at neck seam. Base 35mm x 26mm. 75mm high, 20mm neck. Weight 70g

Context	Qty	Item	Description
302	1	Bottle	Pale green glass, square profile, ribbed on three sides. 43mm x 43mm, 53mm high. Neck snapped at seam. Probably ink bottle. Weight 75g
302	3	Bottle	Codd bottle fragments. 2 bases, 1 neck. Larger base fragment is 75% intact, stamped: "W-/ SON &-/ LIM-/ WA-/"
302	1	Bottle; body	Wide-diameter fragment. Diameter 82mm, Partial stamp "- CUTTA". Press-moulded
302	10	u/id	Small undiagnostic fragments. Discarded during assessment
302	1	Window	Fragment. Late 19 th century
302	1	Bottle	Neck fragment. 29mm diameter, pale green.
302	1	Bottle	Bottle neck, 27mm diameter. For beer or wine
302	1	Bottle	Body fragment, stamped but illegible. Green glass.
302	1	Bottle	Thick base of round-profile bottle. Laboratory related? 56mm diameter
302	2	Bottle	Dark green, 1 base, 1 body. 20 th century
302	2	Bottle	Partial clear glass necks. 23mm diameter, 20mm diameter.
302	1	Jar	Partial jar neck fragment. Clear glass.
302	1	Bottle	90% intact Codd bottle. 75mm diameter base. 255mm from base to break. Stamped "G. W. MALLINSON BARNSLEY" on front, trademarked, "REDFERN BROS BOTTLE MAKER BARNSLEY" on back. Weight 565g
302	1	Bottle	Long neck fragment. 25mm diameter, 75mm high, press moulded.
302	1	Bottle	Clear glass neck fragment. Screw threaded, 20 th century
302	1	Bottle	Dark green body fragment. 19 th century
302	1	Bowl	Rose glass decorative bowl rim fragment. Irregular profile, gold lustre embellishments
302	18	Bottle	Pale green glass bottle frags, at least 3 vessels represented. No further identification possible. 19 th century
302	3	Bottle	Dark green bottle fragments
302	2	Window	u/d fragments
302	2	Bottle	Conjoining table water frags stamped "FERGUSON"
302	2	Bottle	Clear glass, square profile . 1 base, 1 neck
302	1	Bottle	Pale blue, probably laboratory ware
302	3	u/id	Flint glass. 2 blue, 1 white.
302	1	Bottle	Pale green bottle, neck absent. 101mm high, 35mm diameter at base. Press-moulded.
302	1	Bottle	Pale green rectangular profile [flattened] bottle 38mm x 18mm at base. 112mm high. Press moulded. Remains of cork stopper inside. Weight 65g
302	1	Bottle	Pontil fragment from a bottle. 45mm high

Context	Qty	Item	Description
302	1	Glass	Base of a clear drinking glass vessel. 54mm diameter
302	1	Bottle	Pale green bottle neck, 27mm diameter at top. Stopper type.
302	1	Bottle	Very dark green bottle body fragment, medium pontil, 76mm diameter.
302	1	Bottle	Pale green bottle base, 49mm diameter, stamped '91' on base
302	1	u/id	Flint glass sherd of indeterminate function. Tapering open-ended cylinder. 20mm diameter at open end
302	4	U/id	Pale green glass fragments. 2 partial bases, 2 body frags
302	1	Bottle	Dark green bottle fragment.
302	1	u/id	White flint glass fragment
302	1	vase	Decorative small vase or pot. 43mm diameter at base, 91mm high, 47mm neck diameter. Clear glass, press moulded, decorated with pattern of intersecting curves. 20th century, Weight 145g
302	1	Bottle	Intact clear bottle. 33mm base diameter, 51mm high, 25mm neck diameter. Press-moulded. Weight 35g
302	1	Phial	Pale green phial. 18mm base diameter, 79mm high, 13mm neck
302	1	Stopper	Pale green, 27mm diameter at top, 11mm shank. Weight 15 g
302	2	Marbles	18mm diameter, probably originated from codd bottles

Table 6: Results of Glass Assessment from Milton Ironworks

The relatively small assemblage from Milton nonetheless represents a fair range of vessel types, none of which are earlier than the mid-19th century. Bottles which presumably were intended for the consumption of alcohol are equally represented alongside bottles expressly made for the sale of table water. It is slightly more problematic to ascribe specific functions to the smaller bottles and phials. These may have originally contained perfume or medicinal tinctures.

The pale green colouration of several vessels from this assemblage is likely due to impurities in the manufacturing process rather than a deliberate attempt to produce coloured glass, and as such is indicative of mid-19th-century glass production; the ink bottle from context 302 is a good example of that particular type of glass.

The vast majority of the glass assemblage was derived from context 302, and appears to represent a selection of a wide range of domestic items related to the consumption of wine, table sauces, mineral water and slightly more esoteric items such as perfume, medicines and furniture polish.

Embossed stamps and logos

The bottle marked "Stephenson Brothers Furniture Cream" was manufactured for Stephenson Brothers, a manufacturer of soap bases and furniture polishes based in Bradford from 1856 onwards. The bottle is likely to have originally contained their beeswax-based furniture cream.

"Fletchers Sauce Selby"

Fletchers were established by Joshua Percy Fletcher in the early 1900s for the manufacture of pickles and sauces. Their sauce and bottling works was transferred to Selby in 1915, where the popular 'Tiger Indian Sauce' was made. Fletcher's Sauce Co Ltd was acquired by HP sauce of Birmingham in 1947.

G. W. Mallinson Barnsley

George Washington Mallinson was a mineral water manufacturer and fine art dealer associated with the Barnsley area in the second half of the 19th century. The manufacturers of the glass bottle, Redfern, began production in 1862 but were not formally incorporated as "Redfern Bros" until 1910. It is unlikely that this bottle pre-dates the 1910 date.

Conclusion & Recommendations

The glass assemblage represents a range of items relating to the local production and consumption of alcohol and condiments, as well as non-edible consumables such as perfume, cleaning products and possibly even medicines. The material from tipping context 302 probably represents a mixed chronological range of material pertaining to the very end of the nineteenth century and the first few decades of the twentieth century.

It is recommended that this assemblage is retained by Great Place Wentworth & Elsecar for the purposes of education and outreach within the local community. Choice items should be retained for display purposes, and the remainder of the assemblage should be retained for use as educational handling collections or similar appropriate purposes at the discretion of the relevant Project Manager following a risk assessment.

References

- <https://www.stephensonpersonalcare.com/about/company-history> (accessed 19/10/2018)
- <http://letslookagain.com/2015/08/fletchers-sauce-co-of-selby/> (accessed 19/10/2018)
- <https://www.gracesguide.co.uk/Redfearn> (accessed 19/10/2018)

APPENDIX 7: ANIMAL BONE ASSESSMENT

By Dr. Glyn Davies

A total of 32 animal bones were recovered from the excavation at Milton. The bones were generally in good condition although a few had eroded surfaces.

The species represented were domesticates such as sheep and cattle of which sheep were slightly more common. There was one bird bone that was not identified to species so could be domestic or wild and one bone from a small mammal.

There were two cut marks from butchery and five of the cattle bones, mainly ribs, are sawn through. The marks are typical of butchery for food.

The small sample size does not enable any significant conclusions to be drawn regarding the assemblage or its context.

Context	Species	Bone	Description	L/R	Fused P	Fused D
101	bird	tibia	distal end and part shaft			Y
101	cattle size	rib	fragment			
101	sheep size	lbsf	shaft fragment			
102	sheep	radius	proximal end and shaft left	L	Y	
102	sheep size	lbsf	fragment			
3 unstrat	sheep size	lbsf	fragment			
3 unstrat	sheep size	pelvis	acetabulum fragment			
302	cattle	phalange 1	near complete cut mark on shaft		Y	Y
302	cattle	rib	fragment			
302	sheep	tibia	distal end and part shaft right	R		Y
302	sheep size	rib	fragment			
302	sheep	radius	proximal end and partial shaft left	L		
302	sheep size	rib	shaft fragment, cut mark			
302	cattle size	rib	shaft fragment, chopped through			
302	sheep	tibia	distal and shaft fragment	R		Y
302	sheep size	tibia	shaft fragment	L		
302	sheep	humerus	broken proximal partial shaft and distal	L	N	Y
302	cattle	phalange	distal end			Y

Context	Species	Bone	Description	L/R	Fused P	Fused D
302	cattle size	vertebrae	broken body missing			
302	cattle size	rib	shaft fragment, sawn through both ends			
302	cattle size	rib	shaft fragment sawn through one end			
302	cattle size	rib	small shaft fragment sawn through one end			
302	cattle size	rib	small shaft fragment sawn through one end			
302	cattle size	pelvis	fragment sawn through both ends			
302	sheep	humerus	shaft and distal end	R		Y
302	sheep size	lbsf	shaft fragment			
302	sheep size	lbsf	shaft fragment burnt			
302	small mammal	radius?	proximal and shaft		Y	
302	unident.	unident	fragment			
302	unident	unident	fragment			
302	unident	unident	fragment			
302	unident	unident	fragment			

Table 7: Results of Animal Bone Assessment for Milton Ironworks

Abbreviations: lbsf =Long Bone Shaft Fragment.

APPENDIX 8: PROJECT DESIGN

Milton Ironworks Excavation,

Elsecar

Project design prepared for a Community Archaeology Project

Funded by Great Place Wentworth and Elsecar and Elsecar Heritage Action Zone

Supported by Heritage Lottery Fund, Arts Council Fund, Barnsley Metropolitan
Brough Council, Rotherham Borough Council and Historic England.

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Purpose of this Document

This document has been prepared to as a project design for the community excavation at Milton Ironworks. The purpose of this document is to lay out the research questions and methodology which will be used to deliver the project. The work is being carried out as part of the Great Place Wentworth and Elsecar and Elsecar Heritage Action Zone. Please be aware that this project design is subject to change through written communication at any time if requirement of the archaeology change.

Partners

Great Place Wentworth and Elsecar

Great Place Wentworth and Elsecar is a 3-year funded project supported by the Heritage Lottery and Arts Council England. The project is hosted by Barnsley Metropolitan Borough Council (BMBC), with support from Rotherham Metropolitan Borough Council and Wentworth Woodhouse Preservation Trust. The project is based at Elsecar Heritage Centre, part of Barnsley Museums. The remit of the project is to work with deprived communities within Rotherham and Barnsley to help instil pride, raise aspirations and work with young people using heritage, arts and culture to achieve this.

Elsecar Heritage Action Zone

The Elsecar Heritage Action Zone (HAZ) is a 3 year partnership project between Barnsley Museums and Historic England. The key aims of the Heritage Action Zone (HAZ) are; improve understanding of Elsecar's industrial heritage, support the conservation and future protection of historic sites within the HAZ area, and encourage local people and community groups to get involved in shaping the future development of the village.

1. Introduction

1.1 This project design outlines how a community archaeological research project at Milton Ironworks will be delivered. This project design will put forward aims and objectives and an overall methodology to investigate the site. The work carried out should be done so in accordance with project design and the Chartered Institute for Archaeologists (CIIfA) Codes of Conduct (2014) and all relevant standards and guidance.

1.2 This fieldwork element will be the form of an excavation and most of the work will be done by members of the community, instructed by a commercial unit and managed by the Great Place Wentworth and Elsecar Project and the Elsecar Heritage Action Zone. The tender process will be used to commission a commercial unit to undertake the work.

2. Site Location and Description



Site location

2.1 The site is located off Milton Road (centred NGR SE 37616 00193), approximately 6 miles south of Barnsley town centre. The site lies on the eastern side of Milton Road. (Figure 1)

2.2 The site falls between Hoyland and Elsecar, in an area known locally as Milton. It is within the local authority boundary of Barnsley in South Yorkshire. The site is locally known as Milton Forge Recreation Ground and is owned by Barnsley Metropolitan Borough Council. It is managed by the Parks and Open Spaces Team as a public recreation ground. The site is an open grassed space with several football pitches to the east of the site and bordered by Milton Road to the West. On the western side of Milton Road are two large ponds, which relate to the past industrial use of the site.

2.3 The field is bordered on the western side by Milton Road and on the northern side by Millhouse Street. A footpath (part of the Trans Pennine Trail, and formerly an incline plane that linked the Milton ironworks to the canal basin at Elsecar) marks the southern boundary. The eastern boundary is marked by a fence which divides the recreation ground from an allotment.

3. Topography and underlying Geology

3.1 The site is laid to grass. The eastern end is flat and used as a football pitch. The western end is higher and there is a sloping bank on a north south alignment running the full length of the site. The western side has a number of mature and semi-mature trees, mostly following the line of the bank and the southern boundary of the field.

3.2 The geology of the local area is a mixture of middle coal measures and sandstone (British Geological Survey).

4. Archaeological and Historical Background

Milton Forge recreation ground was formerly the site of the Milton Ironworks, which operated from the late 1790s until the early 1880s. The site was owned by the Fitzwilliam family, from nearby Wentworth Woodhouse. The site appears to have been undeveloped until the late 18th century.

In 1795 a new ironworks was opened at Elsecar by Darwin and Co. on land owned by the Earl Fitzwilliam, of nearby Wentworth Woodhouse. Following the success of the Elsecar works, an agreement to create a second ironworks further up the hill was made between the Earl and Rotherham ironmasters Joshua Walker and Co. in 1797. The new works was named the Milton Ironworks after the Earl's heir, Viscount Milton.

During the first half of the 19th century the area around the ironworks started to be developed, with new workers housing creating a new settlement which also became known as Milton. This included a number of double fronted back-to-back houses, clustered in groups of four, which still survive.

Walker and Co. operated two blast furnaces at the Milton Ironworks until 1821. After this, the Earl Fitzwilliam leased the site out to a new partnership of Sheffield businessmen; Hartop, Littlewood and Sorby. This partnership was short-lived, and the Graham brothers of London took over the running of the site in 1829.

During this period the Milton Ironworks became known for creating large iron bridges, including Southwark bridge in London and two suspension chain bridges designed by Marc Brunel for the Isle of Bourbon. Contemporary newspaper reports suggest that the bridges were temporarily erected in the nearby fields at Milton, attracting many visitors. One report on the 5th April 1823, stated that “The Curiosity excited in the neighbourhood of Sheffield by two chain bridges erected at the ironworks of Messrs. Hartop, Sorby and Littlewood is nearly as great as when the arches of the Southwark Bridge were put up there.”

A waggonway was constructed in the 1830s to connect the Milton Ironworks to the canal basin at Elsecar (which had been established in the 1790s) to the east, and the ironstone mines at Tankersley, to the west. The waggonway infrastructure was manufactured by Grahams’ at the Milton Ironworks and featured two inclined planes, one of which borders the recreation ground. Much of the track bed appears to remain in situ, although it is mostly buried (with the exception of a number of sleeper stones that are visible in the section between Fitzwilliam Street and the railway crossing, and a visible earthwork where the track crosses gasworks field in the middle of Elsecar village).

The Stanley Ferry Aqueduct was cast at Milton in the 1830s. It was built in 1836-39 for the total of £50,000 and is thought to be the largest iron cast aqueduct in the world. The aqueduct is a Scheduled Ancient Monument and Grade I listed.

In 1848, the Graham brothers gave up their lease, and in 1849 the Earl leased both the Milton and Elsecar Ironworks to George and William Dawes, iron manufacturers from Staffordshire. The two works operated in tandem until a downturn in the market made them unprofitable.

A detailed site plan from the mid-1840s (exact date uncertain) was produced for the Earl Fitzwilliam as part of the lease negotiations with the Dawes brothers. It is thought to show the site as it was when it was handed to the Dawes at the start of their tenancy. The first edition Ordnance Survey map was produced a few years later, and shows a very similar plan to the site.



Stanley Ferry Aqueduct (taken by M Clement 2017)



1840s lease plan, showing the ironworks at the start of the Dawes' tenancy (exact date unknown)



First edition Ordnance Survey map (surveyed 1849-50, published 1855)

The furnaces at Milton were blown out in 1883, with Elsecar Ironworks following in 1884. Between 1883 and 1898, a smaller-scale iron and brass foundry was opened at the Milton Ironworks site, known as the Milton Iron Foundry. This firm produced sanitary and colliery iron and brassware, and closed in 1905. The foundry buildings were finally demolished in the mid-20th century.



Second edition Ordnance Survey (surveyed in 1901, published in 1905)

After the closure of the brass foundry the site appears to have remained a waste ground until the late 20th century, when it was landscaped to create a recreation ground.

There is very little above-ground evidence of the ironworks surviving, with the exception of the incline plane and two large furnace ponds at the West end of the site.

In 2017, Historic England undertook a geophysical survey of the site as part of the Elsecar Heritage Action Zone. See next section for more details.

5. Previous Work

A geophysical survey of the site was undertaken by Historic England in the summer of 2017, using Ground Penetrating Radar and Magnetometry. As expected on an industrial site, the geophysics encountered a large amount of 'noise' from ferrous deposits, however the survey did identify a number of interesting features, including possible building foundations, the infilled ponds and areas of hot working within the existing bank that runs north-south across the site.



Geophysics results from 2017 Survey

The full report can be downloaded from the Historic England website -

<http://research.historicengland.org.uk/Report.aspx?i=15655&ru=%2fResults.aspx%3fp%3d1%26n%3d1%26rn%3d62%26ry%3d2017%26ns%3d1>

The geophysics results do not map directly on to the first edition Ordnance Survey, or the 1840s lease plan, but it is possible that the maps are slightly inaccurate, or that some of the features may relate to earlier phases of the site. Local knowledge has also suggested that the features labelled as M5 and M6 (above) may relate to a furnace bank, similar to that still visible at Elsecar (at the back of the Heritage Railway at the Heritage Centre). Structures in this location were still visible in living memory and included brick-arched recesses similar to those surviving at Elsecar (Mrs Palmer, pers. comm).

Targeted excavation will allow us to test this assertion, and to assess how the geophysics results relate to the historic mapping, as well as increasing our understanding of the site and the level of preservation of any surviving archaeological remains.

6. Aims

6.1 The aims of the archaeological excavation are:

- To engage members of the local community and local school children with their local heritage and provide an enjoyable and engaging heritage-led experience
- To assess the likely extent, condition, character, importance and date of any below-ground archaeological remains present
- To compare the archaeological remains with the geophysical survey carried out in 2017
- To provide information that will enable the remains of the Milton ironworks to be placed within its local, regional, and national context and for an assessment of the significance of the archaeology of the proposal area to be made

7. Trench Rationale

7.1 Two trenches will be opened. These will target features of interest from the 2017 Geophysical survey results and historical map evidence, specifically the blast furnace shown on the first edition Ordnance Survey map and the M5/M6 features identified in the geophysics survey report (see attached trench location plan). Historic England will help to locate the trenches using GPS.

7.2 Both trenches will be approximately 10m x 5m. Trench one is an area of sloping ground (east-west). Trench 2 is relatively flat.

7.3 The trenches will not be places within 2m of the canopy of any upstanding trees in order to minimise any potential disruption to the roots; this has been agreed with BMBC Parks and Open Spaces Team.



Approximate trench locations shown on satellite image of the recreation field



Approximate trench locations overlaid on geophysics results



Approximate trench locations overlaid on 1840s site plan

8. Excavation Methodology

8.1 The commercial unit will lead on the excavation and must ensure that they have sufficient staff on site to manage the excavation and the community volunteers. It is expected that there will also be a lot of local interest and that the site will attract a number of casual/walk-up visitors. The contractor should allow time to accommodate this by talking to visitors and explaining what is happening on site. Great Place and HAZ staff will provide additional support, including leading group tours and talking to visitors where appropriate.

8.2 The excavation area should be returned to as close to its current state as possible after the trenches have been backfilled. The turf should be carefully removed by hand and stored on site for reinstatement after back-filling. Trenches should be opened carefully; if using a mechanical excavator this should have a toothless bucket and a careful watching brief at all times. Please note the archaeology may be close to the surface, so any mechanical excavation must be carefully monitored. Please identify this within your overall costs for tendering.

8.3 The contractor should carry out sufficient checks (CAT scan etc.) before work commences, to satisfy themselves and BMBC that no services, including but not limited to; electrical cables, gas

pipes and sewer/water pipes, will be disrupted during the excavation. If services are detected, the trench locations will be adapted accordingly.

8.4 The excavation will take place over two weeks, working Monday-Saturday each week. Local school groups and community volunteers will be asked to sign up for half-day sessions in advance. There will be a maximum of 20 volunteers/students per session.

8.5 All archaeological features will be hand dug. If any historical structures are uncovered, these should be exposed, recorded and left in situ wherever possible.

8.6 All archaeological features will be drawn, following standard conventions. Context numbers will be assigned to each identifiable soil layer and structure.

8.7 Each trench will be photographed. Any in situ archaeological features will be recorded and left undisturbed.

8.7 The most representative section of a trench will be hand-cleaned, photographed and drawn. If different archaeological features are exposed in different sections additional sections/profiles will be drawn to record all the features identified.

8.9 If any significant *in situ* historic deposits relating to previous industrial activity on the site – e.g. metal working residues - are encountered during the excavation, these should be recorded in situ and then assessed to determine whether sampling and testing would be appropriate and would add to overall understanding of the site. It is intended that, on the whole, significant historic deposits (such as furnace residue) will be left in situ wherever possible.

8.10 All artefacts will be bagged and recorded by context. Small finds will be recorded in detail, shown on the relevant plan/section and a level recorded.

9. Recording Methodology

9.1 The commercial unit must ensure that all excavation work is fully recorded to accepted archaeological standards; including producing plans, sections and context sheets, and a full photographic record. The contractor should provide sufficient training to volunteers to allow them to undertake elements of the recording; however the contractor will be responsible for ensuring this is completed to a high standard, and that a complete record is produced.

9.2 A standardised pro forma record sheet will be used to record all archaeological contexts and soil horizons and volunteers will be trained in how to competently fill these out. Each context will

be described in full on each sheet in accordance with accepted context record conventions. Each context will be given a unique number and a register of numbers will be kept. Each of these records will be checked after completion.

- 9.3 All archaeological features should have a plan and all trenches should be planned and have a section. These should be drawn using standardised conventions. Plans should be drawn at a minimum of 1:20 and sections at a minimum of 1:10.
- 9.4 Photographs will be combination of working shots and post-excavation shots of trenches. This includes general and more detailed views. The photographic record will comprise 35mm format back and white film. Digital photography may be used in addition, but will not form any part of the formal site archive. All site photography will adhere to accepted photographic record guidelines.

10. Specialist Assessment

10.1 Finds processing

There will be some on-site processing of finds, which will include washing and bagging of finds. All artefacts found on site will be bagged and recorded by context.

All artefact and find should be appropriately packaged and stored under optimum conditions, with recording systems compatible with the recipient museum, Barnsley Museums. All finds which fall within the Treasure Act (1996) will be reported to HM Coroner according to the procedures outlined in the Act, after discussion with client and local authority.

The costs for artefact processing must be included and identified within the overall costs as part of the tender application.

10.2 Specialist analysis

Stratigraphic information, artefacts, samples and residues should be assessed for their potential and significance for further analysis. Any with considerable potential will be sent off for further analysis from specialists.

All artefacts will be cleaned, marked and labelled prior to assessment.

The costs for any specialist analysis for the artefacts recovered must be included and identified within the overall costs as part of the tender application.

10.3 Sampling

If any significant *in situ* historic deposits, relating to previous industrial activity on the site, are encountered during the excavation, these should be assessed to determine whether sampling and testing would be appropriate and would add to the overall understanding of the site.

Indicative costs for processing any soil samples taken must be included and identified within the overall costs as part of the tender application.

10.4 Reporting

A full grey literature report on the findings of the excavation should be produced by the archaeological contractor commissioned for the work. The grey literature report should include and subsequent post-excavation reports made by specialists.

A copy of the report should be submitted to South Yorkshire Archaeology Service and uploaded to OASIS. A digital copy will be made available to Great Place and Barnsley Museums so it can be made freely accessible online via their web platforms.

The costs for a full report, including any specialist analysis and report written for artefacts and environmental samples, must be included in overall costing as part of the tender application.

10.5 Deposition of archive at Barnsley Museum

It is the responsibility of the archaeological contractor commission to deposits the archive with Barnsley Museums.

The costs for deposition of the primary archive and any artefacts recovered must be included in overall costing as part of the tender application.

11. Community Engagement

11.1 The excavation will run across a two week period. The volunteers in the first week will all be school groups from the local area. Three local primary schools and two secondary schools from Barnsley and Rotherham will be offered the opportunity to attend. The second week will be open to members of the local community. The days will be split into two sessions; morning and afternoon. Community volunteers will be asked to sign up to sessions in advance (this will be managed by BMBC staff). A maximum of 20 volunteers will be booked for any one session. The

contractor should ensure that there is a suitable staff to student/volunteer ratio on site at all times.

11.2 The contractor should allow for a short induction at the start of each half-day session for new or inexperienced volunteers. Attendees should be taught the following skills:

- The principles of stratigraphy
- Excavation technique
- Context recording
- Scale drawing (plans and sections)
- Archaeological photography
- Artefact retrieval and handling

11.3 In addition to participants engaging in the excavation there will be number of additional opportunities for more people to engage through different forms of media. The following activities should be costed for in the proposal;

- Two evening talks will be given to the local community on the Friday evening of each week, to give updates on what has been found during the week's excavation and why this is significant. One will be held in Barnsley and one in Rotherham (venues to be agreed).
- Production of a grey literature report to be deposited with SYAS, with a digital version to be made freely accessible on the Great Place website.

The contractor should also be aware that additional work will be taking place around the dig, including the commissioning of one or more artists who will be creating artistic responses to the excavation and the history of the site. The contractor should allow a time (up to half a day) to engage with the artist(s) and facilitate one or more site visits.

In addition, the following related activities will be undertaken by BMBC staff (Great Place/HAZ)

- Sunday 22nd is the annual Milton Gala, which is held on the recreation ground close to the excavation. Great Place (WE) /HAZ staff will have a stall at the gala, and will lead site tours during the day.
- Two blog posts will be written, once a week, to communicate what has been found and history of the site and Milton Ironworks.

12. Dissemination

12.1 It is expected that the commercial unit who undertake the work will provide a grey literature report, deposit the primary archive with the relevant archive and upload to OASIS. Any additional costs for this should be included in the tender.

13. Reinstatement

13.1 The trenches should be backfilled with the spoil excavated from the trenches. The spoil will be backfilled in reverse order to re-establish the soil profile. The turf should be carefully removed by hand, kept on site, and reinstated after backfilling.

14. Health and Safety

14.1 Health and safety issues will take priority over archaeological matters and all archaeologists will comply with relevant Health and Safety Legislation.

14.2 A risk assessment will be produced by the archaeological contract commissioned for the work and provided to Great Place and HAZ prior to work starting.

14.3 Appropriate Personal Protective Equipment and other archaeological equipment (e.g. gloves and trowels) should be provided to participants (allow for up to 20 people at a time). Members of staff on site will wear Hi-Viz jackets and there must be a first aider on site at all times.

14.4 The site should be appropriately secured out of hours to ensure that no damage to members of the public and the archaeology can occur when members of staff are not on site. This should be included in initial costing as part of the tender application.

14.5 There should be welfare provision for school children and members of the community for the duration of the excavation. This should include access to a toilet, hand washing facilities and shelter. This should be organised by the contactor and included in costings for the tender.

15. Timetabling and staffing

15.1 There will be 12 days of excavation, with an additional day for closing and backfilling the trenches (on Sunday 29th July). The dates on site will be Monday 16th July – Sunday 29th July, working Monday-Saturday both weeks. The trenches should be opened on Monday 16th July in the morning ready for a school group to attend site in the afternoon. The days will be split into two sessions; morning and afternoon.



15.2 As part of the tendering process the commercial unit must provide a list of the staff who will undertake the work, their roles and a copy of their current CV detailing previous experience of work with school and community groups. It is expected that the staff will be experienced and knowledgeable in archaeological investigation and community outreach and this will have to be demonstrated through the tender application.

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