

ARCHAEOLOGICAL  
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DURHAM UNIVERSITY

on behalf of  
Integra 61 (Durham) Limited

Integra 61  
Bowburn  
County Durham

post-excavation analysis

report 5757  
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## 1. Summary

### The project

- 1.1 This report presents an analysis of the results of excavations at the site of a 19th-century tilery, conducted in advance of development at Integra 61, Bowburn, County Durham. The project comprised evaluation trenching and an open-area excavation. Following post-excavation assessment, comparative research and further analysis has been undertaken.
- 1.2 The works were commissioned by Integra 61 (Durham) Ltd and conducted by Archaeological Services Durham University.

### Results

- 1.3 The evaluation and excavation work has uncovered the remains of the buildings of the former Crow Trees Tile Works. The earliest features were a clamp and a Scotch kiln, which might well have been in use at the same time, and which show that bricks were being made. Clay dug from pits near the tilery buildings must have been processed by weathering, tempering, crushing and mixing, but these activities have left no discernible traces in the excavation area. Attached to the Scotch kiln were two workshops where the products were moulded before being dried in long open sheds, one of which had a heated floor.
- 1.4 The site produced large numbers of pantiles for roofing, as well as bricks, floor tiles and field drains. Many broken tiles and wasters were dumped into the clay pits that lay to the east and west of the tilery. At a later stage in the development of the works, an updraught bottle kiln was built on the backfill of the western pit; this was subsequently replaced with a small Newcastle kiln.
- 1.5 Documentary evidence shows that the Crow Trees tilery was operated by members of the Birkett family between 1820 and 1866, and it is very likely that they were in charge of the works until it closed. The tilery was set up at a time of high demand for roofing pantiles, and its life coincided with a huge increase in the use of clay tiles and pipes for draining farmland. These factors are likely to have been the stimulus for its establishment and growth. While the earliest production is likely to have used clamps, old maps show that the Scotch kiln and adjoining buildings were present throughout the documented life of the tilery. The other kilns had fairly short lives. The bottle kiln was built before 1839 and replaced by the Newcastle kiln sometime after 1857; by 1898 the site was disused. The tilery structures were not demolished immediately, and the large eastern clay pit remained open and was used for dumping ashes and other household waste. Some of the buildings may have continued in use for other purposes. During the demolition work some re-useable materials were removed. The site was entirely levelled before 1939.
- 1.6 The Crow Trees tilery was a typical small-scale works set up to serve its local area, using local clay, sand and coal. It was not on a railway, and some distance from the nearest road, and its products would have been distributed by cart. The 1839 tithe map shows a building marked 'Tile sheds' on the side of the road between Bowburn and Tursdale, about 220m north-east of the kilns, on the site of a later house called Crow Trees. This may have been where customers collected the tilery's products.
- 1.7 Like many other examples in the region, the working life of the Crow Trees tilery mirrored the demand for its products. With the completion of underdraining in a

large proportion of the wet farmland of the area, and the increasing availability of building materials brought by rail, this demand fell and the kilns were shut down.

- 1.8 Apart from products of the tilery, many tonnes of which survive in the old clay pits, few artefacts were recovered. These were all either small elements of the working structures or items of domestic waste.

## 2. Project background

### Location (Figure 1)

- 2.1 The excavation site is east of the A688 at Bowburn, County Durham. The village of Bowburn lies about 900m to the north; the central Ordnance Survey grid reference is NZ 30475 36960. The site covered an area of approximately 0.4 ha.

### Development

- 2.2 Outline permission has been granted for a mixed-use development, now under way. The planning application reference is DM/15/03912/OUT.

### Objective

- 2.3 The objective of the scheme of works was to analyse data obtained from the excavation, to produce a coherent narrative setting out development and use of the site, and to set the findings in a regional context.

### Research objectives

- 2.4 The regional research framework (Petts & Gerrard 2006) contains an agenda for archaeological research in the region, which is incorporated into regional planning policy implementation with respect to archaeology. In this instance, the scheme of works was designed to address agenda items PMii: post-medieval industrialisation, and PMviii: post-medieval industrial intensification 1790-1830.

### Specification

- 2.5 The works have been undertaken in accordance with an updated project design produced by Archaeological Services.

### Dates

- 2.6 Trial trench evaluation of the Integra 61 site was carried out in August and September 2017, April 2018 and February 2022. Archaeological monitoring of road construction took place in August and September 2018. Excavation of the Crow Trees tilerly was carried out between 7th February and 8th March 2019. This report was prepared for June 2022.

### Personnel

- 2.7 The 2017 evaluation work was carried out by Matthew Claydon, Daniel Adamson and Alan Rae, and the 2018 extension of that scheme by Natalie Swann, who also undertook monitoring work in 2022. The 2022 evaluation trenching was carried out by Kayleigh Raine, Jenny Richards and Mark Randerson.
- 2.8 The excavators of the former tileworks in 2019 were Daniel Adamson, Hilly Andrews, Johnathan Goldberg-Booth, Jeff Lowrey, Meghan McCarthy, Ben Matus, Adam Mead, Geno Naughton, Alice Naylor, Alan Rae, Jenny Richards, Rebecca Watson and Laura Watson, and the supervisor was Mark Randerson. Specialist post-excavation reports were prepared by Dr Louisa Gidney and Jennifer Jones. This report was researched and written by Richard Annis and the illustrations were prepared by Dr Helen Drinkall. The Project Manager was Peter Carne.

### Archive/OASIS

- 2.9 The site code is BIA19, for Bowburn INTEGRA 2019. The archive has been prepared for deposition by Archaeological Services Durham University and will be transferred to the County Durham Archaeological Archives when it is open. Archaeological

Services Durham University is registered with the Online Access to the Index of archaeological investigations project (OASIS). The OASIS ID number for this project is archaeol3-506959.

### 3. Landuse, topography and geology

- 3.1 At the start of archaeological work, the site was part of a large area of farmland, chiefly pasture, divided by hedges into small fields. To the west is a sewage treatment plant and the disused Leamside railway line, and to the east is the A688 road between Bowburn and Tursdale (Figure 2).
- 3.2 The excavation site occupied a very slight slope, facing south and flatter at its north end. The mean elevation was about 87m above sea level.
- 3.3 The bedrock is sandstone of the Pennine Middle Coal Measures formation, overlain by deposits of glacial till. These provided easily accessible clay and sand, the raw material for making tiles and bricks, and provided supplies of coal for firing kilns.

### 4. Historical and archaeological background

#### 19th-century tile and brick making

- 4.1 Although the Romans made bricks and tiles in Britain before AD 400, the industry disappeared until late medieval times and remained a small-scale business until the 18th century. County Durham has a good deal of clay suitable for brick and tile making, and in the 19th century many working sites were set up. Much of the demand was for bricks and pantiles for house building (Guy & Atkinson 2008, 242). Equally important was the production of clay tiles for land drainage; Peter Davison's definitive description of the industry in our region says that

the first big increase in connection with brick making occurred in the early 1850s with the setting up of tileworks in the more fertile agricultural areas due to the big drive in helping to improve farmland by deep draining. Over 100 tileworks were established during the following two decades (Davison 1986, 4).

Drainage tiles could be horseshoe-shaped, round or egg-shaped in cross-section and varied in size. The industry developed quickly; a machine for extruding clay drainage tiles was invented in 1842 (Williamson 2002, 143) and other mechanisation followed. A recent history of land drainage says that "by the late 1840s underdraining had emerged as the outstanding agricultural improvement of the day" and estimates that up to 60% of wet land in County Durham had been underdrained in the second half of the 19th century (Philips 1999, 66-69). Peter Davison plotted the number of tileworks in Northumberland and Durham between 1845 and 1945. His graph shows a dramatic increase in the late 1840s and 50s, reaching a peak in the early 1860s. By the 1870s about 60 tileworks in the more remote rural areas had served their purpose in satisfying demand for drainage of the surrounding land and closed. From the 1890s, there was a steady decline in the number of working tileries and by the 1940s only a handful remained (Davison 1986, 202).

- 4.2 The methods and materials required for tile and brick production at that time were essentially those used by potters for centuries before. A tile manufacturer needed supplies of clay, sand and water, fuel for firing, as well as space for working and a suitable labour force. The basic method was simple (Brunskill 1990). Clay was dug

from the ground and broken up, ground or trampled underfoot to allow stones to be removed. The raw material was left in the open for a period of months before being mixed with water, and sometimes other materials, to produce a suitable consistency for shaping. This was done by hand using wooden moulds, with dry sand as a release agent. The process required a covered working area with tables and sometimes a small kiln for drying the sand. The tiles were then laid out to dry; this took several weeks, during which time they needed to be protected from the weather, either by being set on raised banks and covered with straw matting or other materials, or by being stacked in open-sided drying sheds.

- 4.3 Different products required different processing. The curved shape of pantiles was created in two stages. First the basic shape was made by pressing clay into moulds with a depression that formed a nib on the underside of the tile; then the clay was pressed into a curved mould to form the tile's characteristic S-profile. Some tiles needed to be beaten back into shape between drying and firing (Betts 1985, 535–7).
- 4.4 Once tiles had reached a stage known as white or leather hard, and bricks had reached the green state, they were fired. This might be done in a clamp or a kiln. The simplest and cheapest method was clamp firing. Unburned bricks or tiles were stacked in layers interleaved with coke or other fuels to create a large heap with battered sides for stability. The raw products were encased with an outer shell of burned bricks or wasters and, sometimes, a coating of clay. The clamp was then set on fire and left to burn itself out. Depending on the size of the clamp, this process might take a long time; Historic England's Practical Building Conservation guide to brick and tile says that "a large clamp containing around 150,000 to 200,000 bricks might take two or three months to burn through, and a further month would be needed for cooling before it could be dismantled" (Henry *et al.* 2015, 399). The unavoidable temperature variations within the clamp led to uneven firing, distortion and variable surfaces in the finished products, with a fairly high proportion of wasters.
- 4.5 The use of a kiln gave more controlled firing conditions and a more consistent product. At the beginning of the 19th century the commonest kiln design was one that had been used for pottery making since medieval times. This was an updraught kiln, where hot gases rose from fires in a pair of tunnels under a perforated floor, on which the charge of green tiles or bricks had been set, before escaping through a capping of ash, soil and waste bricks laid over the open top of the structure. To prevent steam from distorting or bursting the green products, the initial firing was at a low heat, the temperature gradually increasing over two or three days. Once this "water smoking" phase was finished, the heat was built up and the charge was burned for several more days before the fires were allowed to burn out and the products left to cool. Thick walls were required to retain heat and to limit the damage created by the intense heating of the kiln. The structure was usually partly sunk into the ground to provide the stoke holes with some protection from the wind and to give level access to the firing chamber. A report on a post-medieval tile kiln at Bexley, Kent, points out that many of these "rough rural structures" were short-lived because of heat damage and suggests a lifespan of about 40 years before a new kiln was built, often on waste accumulated from earlier firings (Dale 1974, 32).
- 4.6 The Scotch kiln was a larger and more sophisticated type of updraught kiln with several rows of fire holes, often using coal as fuel. The walls were typically about 12

feet (3.66m) high and the open top of the kiln was covered with a layer of ashes and soil interspersed with removable vent pipes. At the base of the side walls, the fire holes could be fitted with iron doors to control the flow of air and to retain heat. Once the contents were adequately fired, these holes would be closed up to extinguish the flames. A typical charge would take about a week to fire and as long again to cool sufficiently for the bricked-up loading door to be opened and the contents to be removed (Henry *et al.* 2015, 401). Typically, a Scotch kiln could only be fired once every three weeks (Watt 1996, 37), but they produced more consistent results than clamps. Before the middle of the century, Scotch kilns were being replaced by more efficient downdraught kilns. These technological changes did not cause older methods to be abandoned, particularly at small brickworks; the Historic England volume notes that “clamps and kilns, both updraught and downdraught, were all used during the same era, though for many hundreds of years clamp firing was the more common method in England” (Henry *et al.* 2015, 403). Both up- and downdraught kilns were in turn superseded after the introduction in 1862 of the more complex and expensive Hoffman kiln, which allowed continuous production.

#### Previous archaeological works at the Integra 61 site

- 4.7 Geophysical surveys were carried out in 2008 and 2015 and a desk-based assessment was prepared (Archaeological Services WYAS 2008, GSB Prospection Ltd 2015, Meager 2015). Trial trench evaluation of the site was carried out by Archaeological Services Durham University between August 2017 and January 2022, and monitoring work was undertaken in 2018 (Archaeological Services 2017, 2018a & b, 2022).

#### Site history: the prehistoric and Roman periods (up to 5th century AD)

- 4.8 No evidence of any early occupation of the site has been found. A late Bronze Age to late Iron Age settlement was discovered about 0.9km north-east of the study area, on the course of the A688 Bowburn-Byers Garth link road (Graham 2009). This fits a pattern of isolated enclosures known to have existed in this region during the later prehistoric period. The route of the Roman road between Great Stainton and Chester-le-Street, latterly known as Cade’s Road, is believed to lie to the west of Bowburn.

#### The medieval period (5th century to 1540)

- 4.9 The late prehistoric site mentioned above was re-occupied in the medieval period. There is a moated medieval manor south of the study area, outside the village of Tursdale. A second moated manor stood at Coxhoe, further to the east. It is almost certain that the Integra 61 site was used as agricultural land throughout the medieval period. Some evidence of medieval or post-medieval plough furrows was found during archaeological evaluation, and a few areas of similar earthworks can be seen in satellite photographs available on Google Earth.

#### The post-medieval and modern periods (after 1541)

- 4.10 The name Crow Trees / Crowtrees is much older than the tileworks; it appears on Armstrong’s 1791 map of the county and on 19th-century maps. These show the study site and its surroundings as agricultural land. The name is associated with a large farm at the south end of the present Bowburn village, a turnpike house between Bowburn and Coxhoe, and a house on the side of the Bowburn-Turisdale road just east of the study area (Syers 2014, 1). Confusingly, there was an entirely separate Crow Trees, a colliery, some way to the east at Quarrington; and some



documents refer to the study site as “Cornforth Tilery” because it is part of Cornforth township, in the parish of Bishop Middleham.

- 4.11 The earliest plan so far found that marks the tileworks is Christopher Greenwood’s 1820 Map of the County Palatine of Durham. This shows a T-plan building in an enclosure clearly labelled “Tile Yard”. Reed’s 1828 Plan of Cornforth Township shows the tilery as a T-shaped building, the long cross-stroke running north-west - south-east and the shorter down-stroke extending north-eastwards (Durham University Library Archives and Special Collections (DULASC) reference DHC11/V/101 (19)). Large clay pits are shown to the south, east and west of the buildings on this plan. The tilery is also shown and labelled on the 1839 Cornforth tithe map, in plot 20, which the apportionment names as Tile Shed Field (Figure 3). This and the surrounding land is listed as an estate in the hands of the executors of one Thomas Birkett; the occupier was David Birkett. The tileworks is once again shown as a T-plan building, and the plan also marks a large pond to the east and a small circular structure to the west. The names of the arable and grass plots around the site are typical of the rural landscape of the area at the time; they include Long, Meadow, Gibbon, Middle, and South Fields. To the east, the label “Tile sheds” appears beside buildings on the site of the later house called Crow Trees. This stood on the side of the road between Bowburn and Tursdale, now the A688.
- 4.12 Documentary evidence links the tileworks with at least three generations of the Birkett family. The Thomas Birkett whose executors were mentioned in 1839 was, presumably, the father of the David Birkett who was then occupying the site. In 1828, Parson & White’s trade directory entry for Cornforth included David Birkett, “brick and tile maker, Tile Shades”. David is also listed as a tile-maker in the Durham Probate Records: he moved from the tilery to Hett and died in February 1851, leaving an estate valued at £2000 (DULASC ref DPRI/2/61, pp246-254). The 1851 and 1861 censuses record the presence of a second Thomas Birkett, “farmer and tile maker, Cornforth Tilery”. He was also listed in an 1856 directory as “Thomas Birkett, Crow Trees Tile Works” (Whellan 1856, 226); in the 1860s he appeared as “Thomas Birkett, farmer & tile maker, Cornforth Tilery”, and a local historian records that he died in 1866 (Syers 2014, 3). In 1890, a second David Birkett was living at Crow Tree Tile Sheds, but the tilery and his occupation are not mentioned.
- 4.13 The first edition Ordnance Survey map of 1857 (Figure 4) shows ‘Crow Trees Tile Works’, with the T-shaped building between an angular structure to the west and a pond or clay pit to the east. A broad path runs around the main building and there is a small shed to the north. The 1898 second edition map (Figure 5) labels the site ‘Crow Trees Tile Works (Disused)’. By the time of that survey, some small extensions had been added to the large building and the smaller western structure had been rebuilt. The pit or pond to the east had been greatly enlarged. A 1901 directory of brick and tile makers lists more than 20 companies in County Durham, but the Crow Trees works and the Birkett family do not appear (British Clayworker, 1901).
- 4.14 By the time of the 1919 map (Figure 6), a large part of the T-plan building had been demolished but the pond remained the same. The 1939 map (Figure 7) shows the site entirely cleared and the pond or clay pit gone. A large angular pit, unconnected with the tilery’s operations, is shown at the south side of the tilery field, together with a small excavation near the south-west boundary. All later maps show the study area as an empty field. It is likely that there were more clay pits at the site

than are shown on the maps. Short-lived excavations, quickly backfilled with wasters and spoil from the next clay pit, would not necessarily be recorded.

- 4.15 In combination, the maps and documents show that the Crow Trees tilery was a family business that operated between 1820 and the 1890s, and probably over a longer period.

## 5. Archaeological evaluation

- 5.1 In three phases of site evaluation between August 2017 and January 2022, 124 trial trenches were opened. The great majority of these found no evidence of any early activity, apart from furrows and recent field boundaries (Archaeological Services 2017, 2018a, 2022). In the 2017 campaign, brick and stone walls, tiled floors and a brick drain were uncovered, just below the existing ground surface, in Trench 57 (Photograph 1). These were identified as parts of two tilery buildings shown on historic maps. A short way to the east of these buildings, trenches 52-54 and 58 exposed deposits of ash, clinker and early 20th-century rubbish that had been dumped in a large pit. In 2018, archaeological monitoring of work on an access road south of Peat Edge Farm found nothing of any significance (Archaeological Services 2018b).

## 6. The excavation

### Introduction

- 6.1 In 2019, a 'strip, map and record' programme of excavation was undertaken to examine the remains of the former tile works. The fieldwork was carried out between 7th February and 8th March.
- 6.2 The long axis of the tilery building was aligned roughly north-north-west – south-south-east. For clarity, the account below describes the structures as if this alignment was north-south. Context numbers are given in square brackets in the text below; numbers in bold face represent individual tilery structures.
- 6.3 A variation to the extent of work proposed by the written scheme of investigation was agreed by the Durham County Archaeology Officer in order to accommodate a path, an access road and an active sewer. The sub-rectangular excavation covered roughly 63m by 46m. A vertical aerial view of the site is given in Figure 8.

### Non-structural features

- 6.4 The whole excavation area was covered with a thin layer of clayey silt topsoil [1], over a variable deposit of glacial subsoil [2]. This was a stiff grey-brown silty boulder clay with lenses of fine sand and greyer clay. The tilery buildings, most of which had been cut into this subsoil, had been thoroughly levelled after the site ceased to work. The depth of soil cover above the structures was thin and there was evidence of the deliberate removal of brickwork in parts of the largest building.
- 6.5 Sizeable backfilled clay pits were identified immediately east and west of the larger tilery structure, as can be seen in the overall plan of the excavation (Figure 9). At the west, pit [F233=F250] was filled with laminated layers of broken and waster tiles, dumps of mixed clay and sand, and layers of crushed tile waste (Photographs 2, 3). Two smaller pits [F265; 270] had been dug through some of the later fills here. Clay

pits were also found on the east side of the excavation site; some appeared to have been excavated and backfilled in stages. They contained tile, drain, and brick wasters. Two [F239, F247] were very close to the east side of the buildings. Further to the south-east, a very large irregular pit [F167] had been backfilled with ash, coal waste, clinker, and gravel.

6.6 Separated from the buildings by the baulk left for the road, a section of stone culvert [F183, F185] ran parallel with the northern wing of the tiler. This is shown in Figure 9 and discussed with the main building in paragraph 6.15 below.

6.7 North-east of the main building there was a patch of burned material F9 on the surface of the subsoil (Photograph 4). This rectangular area consisted of blackened burnt clay and ash [6] with lines of lighter, reddish-brown colour [5] running east-west across it (Photograph 5). These show where hot gases passed between the bricks at the base of a clamp. A line of stone rubble [F8] was found on the south side of this square patch. The north faces of the stones showed marks of burning, indicating that it was the remains of the outer casing left behind after the clamp was dismantled.

#### The buildings

6.8 The remains of six buildings were identified; these are shown in Figure 10 and Photo 6. The downstroke of the T-plan building was roughly square. A tile kiln occupied its eastern half, which was divided into three roughly equal sections, aligned east-west. The middle of these chambers was a Scotch kiln 164 with five fire holes in each of its long walls. To the north and south of the kiln were furnace rooms 57 and 130, each entered by steps that descended from the moulding shop in the western half of the square. Each furnace room had a paved area in front of the fire mouths, and a brick structure against its outer wall. The western half of the square downstroke was a group of rooms making up a moulding shop 168, where tiles, drains and bricks were prepared before being set out to dry. The moulding shop was subdivided into several smaller rooms 140, some with tiled floors. Between the moulding shop and the two drying sheds was a square structure or outer workshop 139, with a small brick building 138 at its south-west side. Two open-sided drying sheds ran from the north and south sides of the workshop, together forming the long cross-stroke of the T. The north shed 30 was heated by flues running under its floor. The southern shed 220 was a light, unheated structure, its shape visible only as the remains of pier bases and the tile-filled French drains that ran below its eaves. A short distance away were the western kilns 198, superimposed structures of different designs that had been built on the backfilled west clay pit [F250].

#### The Scotch kiln 164 and furnace rooms 57, 130 (Figures 11, 12)

6.9 At the east end of the downstroke of the T, the kiln and its adjoining furnace rooms had stone walls and were sunk into the ground to a depth of 1.25m (Photograph 7). The very north-eastern corner had been disturbed by modern services, which had also truncated much of the northern side of the building (Photograph 8). Although construction differed slightly from place to place, these walls were made of roughly dressed sandstone blocks, randomly laid in or in uneven courses. The walls were between 0.4m and 0.5m thick, without any rubble core, the stones bonded with dense greyish-white mortar (Photograph 9). Where the foundation cut [F276] was visible, it was close-set and had steep sides. Some later brick repairs or alterations, mainly in the north and east walls [F66] and [F119], were seen.

- 6.10 The surviving external walls of the kiln 164 were [F60] on the north, [F119] on the east, [F120] on the south and [F122] on the west. Wall [F119=F65] continued as the east sides of furnace rooms 57 to the north and 130 to the south. The east-west walls of the kiln were over 6m long and up to 1.2m high. They were built of a mixture of brick and stone, sometimes with complete brick linings and with clear evidence of frequent damage and repair. The external faces were sloped (Photograph 10). Both walls contained five arched brick fire mouths, each opening into a furnace under the kiln (Figure 13). Distortion and erosion of the brickwork meant that the tall narrow arches varied in shape and size; the effects of heat damage were very obvious (Photograph 11). The arches were generally about 0.6-0.7m high and 0.2m wide. No fittings remained in place, but several iron plates used to blank off the upper parts of the fire mouths were recovered from demolition deposits around the kiln (Photograph 12). One of these plates would have been set into the top of each furnace arch to reduce airflow during firing; they were punched with holes to allow them to be lifted out when the metal was hot (Photograph 13). Two plates and a smaller fragment were found in [272], a dump of material on the floor of the southern furnace room, and another came from [10], a general layer of demolition spoil spread across the structure. One fragment, with a section of the outer curved edge and part of a hole, was found in [241], one of numerous layers of backfill in a large clay pit to the west of the kiln.
- 6.11 The arches and furnaces showed no trace of iron grates, which would have been needed for firing with coal; the ironwork may have been salvaged after demolition. The furnace chambers measured 0.54m-0.6m wide by 1.3m long and were separated by a central wall, two bricks (0.46m) thick (Photograph 14). This wall, present in all Scotch kilns and sometimes known as 'the old man', was required to stop cross-draughts passing through the furnaces (Hammond 2001, 21). The walls between adjacent furnaces were 0.55m to 0.6m wide. The whole of the inner structure was reddened and the furnaces walls had been vitrified by the intense heat (Photograph 15). The brick floors sloped downwards toward the fire mouths. Most of the arches that had formed the kiln floor were missing but one survived intact in each of the easternmost furnaces (Photographs 16-19). The springing of fallen arches could be seen in many other places (Figure 14). In the original design, each furnace chamber was spanned by three arches, each one brick wide and separated from one another and from the outer and central walls by half-brick gaps. In total there were 40 slots, each measuring about 0.6m by 0.12m, in the kiln floor where the green tiles or bricks were stacked. The marks of the hot gases that rose from the outermost slots could be seen along the inner face of the firing chamber (Photograph 20). When the kiln was demolished some of the floor was removed and other parts collapsed. At the west end of the kiln, some of the brickwork between the westernmost furnaces had been cut away.
- 6.12 Almost nothing of the upper walls of the kiln survived. The west wall [F122] was 0.4m thick and built of brick-lined stone. Near the middle, some flat, weathered and heat-damaged tiles and flags showed the position of the wicket, the door through which the kiln was filled and emptied (Photograph 21).
- 6.13 The furnace rooms 57 and 130, to the north and south of the kiln respectively, were similar in general form (Photograph 22). Room 57 was defined by walls [F62] to the north, [F65 = F119] to the east, [F60] to the south, and wall [F61] and steps [F121] to the west. The south room's walls were [F120] at the north, [F119] to the east, [F119]

to the south, and [F100] and steps [F58] to the west. In front of the fire mouths, narrow paved strips [F59, F133], about 0.8m wide, ran along the walls of the kiln (Photograph 23, 24). Both were made of broken heat-damaged sandstone slabs, and both sloped downwards from the furnace openings. In the remainder of each room the floor [64]/[131] was a dense, compacted surface of coarse gritty ash, clinker and coal fragments. At the west end of each of the paved strips, four stone steps rose from the furnace room floor to ground level. In the south room, the steps [F121] abutted a brick pier built onto the south-west corner of the kiln. The walls and floor of room 57 had been damaged by the sewer trench, which ran diagonally across it (Photograph 8). Room 130 was intact up to the former ground level, and here some traces of vanished features were seen. At the east end of the south wall, a break in the masonry indicated the position of an opening (Photograph 25) and a second was suggested by the presence of a wide weathered slab near the north-east corner. These would have been used both for ventilation and for loading fuel.

- 6.14 Inside each room, a small brick structure had been built against the middle of the outer wall. In the northern room, this addition [F63] measured 1.73m x 1.08m and was 0.79m high (Figure 15). It was formed of two short, parallel brick walls, the space between them filled with stone (Photograph 26). In the southern room, structure [F123] was 1.3m x 1.37m x 1.1m high and made of solid mortared brickwork without any internal divisions (Photograph 24). Both of these were late additions, their masonry not keyed into the outer walls of the rooms. Opposite them, the upper parts of the surviving side walls of the kiln showed a slight curve towards the interior of the firing chamber. This suggests that the brick and stone blocks [F63] and [F123] in the furnace rooms were the bases of supports for the long walls of the kiln, intended to resist movement caused by expansion and contraction during repeated cycles of firing and cooling. Because the furnace mouths needed to remain accessible, a simple buttress could not be used; the structural evidence suggests that there was a kind of flying buttress at the middle of each side of the kiln, spanning a passage for access to the stokeholes. The support that these provided kept the middle of each wall plumb, while the outer ends subsided to produce the curved lines visible in the vertical photograph (Figure 8).
- 6.15 A small rectangular hole was found at the north-east corner of the northern furnace room F57 (Photograph 27). This was the opening for a large sandstone drainage culvert [F185] that ran north-south in a 1m-wide construction cut [F183] (Photograph 28). It was built to lead water away from the furnace room; kilns needed to be kept dry, and drainage of the sunken rooms was an important consideration in their planning. At the south-west corner of the other furnace room F130 there was a quadrant-shaped brick structure [F132] (Photograph 29). This measured 2.2m by 1.4m in plan and extended to the top of the external wall. End-set bricks on its top were arranged in a fan shape, which might suggest that this structure was a chute for delivering fuel from ground level, but the quadrant seems unnecessarily large for such a function. Fuel seems to have been delivered from an external floor butted against the south side of the room. This floor [F124] was 2.52m wide and extended the full length of furnace room F130. It was a rectangular area of irregular sandstone flags, edged on the south-east side by a kerb of smaller edge-set stones (Photographs 22, 30). The surface was stained with coal dust, suggesting that this floor was used for fuel storage or handling. Two small patches of edge-set bricks were probably repairs to the very well-worn floor. The eastern edge of the floor overlay part of a large backfilled clay pit [F239] just east of the kiln building.



- 6.16 At the east end of the kiln, a stone buttress [F165] had been built against wall [F119] (Photograph 31). This measured 1.92m by 1.57m by 0.59m high and was made, like the rest of the building, of roughly squared rubblestone. As with the internal buttresses [F63] and [F123], this was not bonded with the main structure, but was a later addition. The courses were laid on a slope to maximise pressure on the wall of the kiln. The construction trench for the buttress cut into the natural subsoil and the backfill of the large clay pit [F239]. It may be that the proximity of the pit threatened to make the east end of the kiln unstable, and this buttress was the remedy.
- 6.17 At the south-west corner of this group, the south wall [F119] of the furnace room abutted the adjoining wall [F100] of the moulding shop. Modern truncation had destroyed the corresponding section at the north-west corner of the wall, so any similar relationship that may have existed there had been lost.

#### The moulding shop 168

- 6.18 The west half of the downstroke of the T-plan building was the moulding shop, which was equal in size to the kiln and furnace rooms to its east. This was assigned the overall structure number 168 but it contained five separate rooms, described here as A-E, and some smaller surfaces. The outer walls [F66], [F100] and [F119] were made of stone with a short stretch of brick and tile near the middle of the west side (Photograph 32). This block [F93] was 1.57m wide and formed a threshold and a step at the entrance to the building. Beside this was a square brick plinth [F95] for a roof support.
- 6.19 Much of the centre and north of the building had a bare floor of firm mottled clay [186] with frequent inclusions of small gravel and coal fragments; this can be seen in the vertical photograph, Figure 8. This might have been bedding for a tiled or flagged floor. Occasional lenses of yellow-brown sand [126] found lying on the clay might also represent a bedding layer or, if this part of the building had an earth floor while in use, they might be spillages of moulding sand. In the middle of the room there was a stone plinth for a post that supported the roof (Photograph 33). This sub-circular structure [F91], 0.82m in diameter and 0.32m high and partly overlain by internal walls, consisted of four courses of roughly-shaped flat sandstone slabs. On the west side of the earth floor [186] a drain [F56] had been cut alongside the outer wall [F66]. It was 0.6m wide and filled with broken and unbroken roof and ridge tiles [55], some laid at angles to form a rough channel.
- 6.20 A group of four main rooms A-D, [F140], filled the south end of the building (Photograph 34). Room E, a smaller paved area at the north-east, is probably a later alteration that can be seen on the 1919 OS map (Figure 4). Rooms A-D were defined by brick walls and brick and tile floors. A wall [F89] ran between the north side of the building's west entrance and the central plinth [F91]. This wall, 3m long and 230mm (nine inches, or one brick) thick, formed the north side of room A, which had a floor [F92] of brick and tile. The east side of the room was a similar brick wall [F127] that ran for 4.75m from the central pier base [F91] to the middle of the south wall of the building. The south side of room A was another 230mm brick wall [F125] that included a square tile with a socket for the jamb of a door into the larger south-west room B (Photograph 35). Square and rectangular tiles, all 250mm wide, covered the western two-thirds of the floor, and the rest was brick. These had been laid on a bedding layer of yellow-brown sandy mortar [129] which contained lenses of sand, small stones and broken tile. The floor was well worn between the west and south

doors, and in the centre of the room the tiles and bricks were badly damaged (Photograph 36). Although the floor was generally roughly level, the surface fell sharply at its west end beside the door threshold [F93]. This drop in level was in line with the drain [F56], which ran parallel with the west wall of the moulding shop and may have extended under the floor; the slope might reflect subsidence caused by the collapse of the drain (Photograph 37).

- 6.21 Room B, the largest of the group, was 3.4m wide and 4.1m long (Photograph 38). Its east wall [F127] was heavily truncated at its south end, where there was a doorway; the line was continued as wall [F128] south of this opening. As in room A, the floor [F117] was a mixture of tiles and brick laid on sandy mortar [129] (Photograph 39). Its western side sloped down to the west, probably because of subsidence into the underlying drain. At the middle of the west wall was a small brick structure [F118] (Photograph 40). This was 0.72m wide and projected 0.62m into the room, and appears to have been the site of a fireplace or stove. Two short sections of wall defined an area of darkened, heat-affected floor tiles. A square raised area beside this might have been a related feature, or a plinth for another roof support. The floor tiles between the fireplace and the door to room C were well-worn, indicating frequent traffic. The structure may have been used for drying the sand used as a release agent in tile and brick moulds.
- 6.22 The floor in B was continuous with that in room C, which occupied the south-east corner of the building. This room measured 3.1m east-west and 2.5m north-south. Its floor was an irregular mixture of tiles, with a lot of brick at the north-east corner. The tiles at the centre of the room were badly cracked, showing that some heavy work had been carried on there. The north wall [F111] was brick, apart from a stone section at the north-west corner of the room; this probably served a door into the smaller room D that lay in the angle between rooms B and C (Photograph 41). The tiled floor [F115] of room D was 1.7m long and 1.3m wide and was set a little lower than the floor of room C (Photograph 42). A half-brick wall [F113] surviving up to four courses high ran around its north and east sides. Immediately to its north, a small square patch of brick paving [F116] lay in the angle between rooms A and D. It measured less than 0.8m square and had no walls; the east side seems to have been retained by a plank set into the ground (Photograph 43). Both the floor [115] and surface [116] were set on the possible upper bedding deposit [126] seen in the unpaved parts of the building.
- 6.23 Room E, at the north-east corner of the moulding shop, was a small rectangular stone structure truncated by the modern sewer trench. The 1919 OS map, made after the tilery had closed down, suggests that this structure and rooms A-D were left standing after the rest of the moulding shop had disappeared; alternatively, the floors in rooms A-E may have been all that what visible when the site was surveyed. The west wall of room E [F143] was 1.48m long and 0.5m thick and its south end formed one side of a door in the south wall [F96]; a stout dome-headed iron pin at the west side of the opening may have served as a crude hinge (Photograph 44). Running from the doorway into the south-west part of the room was what remained of a floor [F97] of edge-set bricks set in a sandy bedding deposit [126]. In the south-east corner of the room was the base of a small circular oven with a floor of bed-set bricks that showed signs of intense heating near the former oven mouth. Outside the west wall of room E lay a small, irregular area of tile, a little over a metre square. This heavily-truncated surface [F98] had been laid on the sandy deposit [126] that

underlay the rest of room E. In contrast with all of the floors described above, this surface was made of two separate layers of perforated tiles made for use in drying kilns (Photograph 45, 46). The tiles in the lower layer were rectangular, 150mm wide and 260mm long, with scalloped ends that allowed them to interlock in rows. Each tile had three 22mm diameter holes near its centre. They were designed to lie on sleeper walls over flues, the tile junctions being supported by masonry and the holes being open to heat rising from below. The size of the holes shows that these were intended for drying or curing sizeable materials; by contrast, the tiles in the upper layer had very small holes and were designed for drying or malting grain. These tiles were about 200mm square and 32mm thick (8" by 1¼") and their undersides were pierced with nine rows of nine 20mm holes. Each of these ended in a pattern of six tiny holes on the upper surface of the tile. Only ten fragmentary examples were found during the excavation, and none in the extensive dumps of wasters found around the buildings, so it seems unlikely that they were a product of the tiliary. Maltkiln tiles like these were a specialist product. Nationally, most of the tiles that survive from the 19th century are machine-pressed examples made by a small number of firms. The nearest documented supplier was John Cooper of Canney Hill Pottery, Bishop Auckland (Crew 2021, 8). The source and use of the larger tiles is unknown, but, as with the kiln tiles, the small number of tiles found during the excavation suggest that it is unlikely that they were produced by the Crow Trees tiliary.

- 6.24 Against the outside of the south wall of the moulding shop, another small floor [F110] was found. This was a patch of square flat tiles edged with brick, about 1m square (Photograph 47). The use of this is unknown: it might simply have been a base for a water butt or some similar feature.

The drying shed range 30, 139, 220 (Figures 13, 14)

- 6.25 The cross-stroke of the T-plan building consisted of a square outer workshop 139 attached to the moulding shop, flanked by a heated drying shed 30 to the north and an unheated one 220 to the south. Almost all of this long range, over 60m long and 9m wide, was uncovered during the excavation. Walls were only found in the central block; the evidence showed that the drying sheds consisted of roofs carried on wooden or masonry piers set on brick and stone plinths. In the north shed, most of these were reasonably well preserved, but to the south modern disturbance meant that only occasional stonework survived, and two bases were absent altogether. The plinths or bases were roughly square, between 0.64m and 0.8m across, and made of rough, close-set sandstone blocks. The stones were supported, filled, or surrounded by sections of mortared brickwork. Beyond the rows of plinths, the outline of the roofs could be seen from French drains that had been laid to carry away the water that ran off the eaves.

The outer workshop 138, 139

- 6.26 The outer workshop 139 measured in total about 8m square and lay at the centre of the range. The structure was based on brick and stone pier bases of varying forms, all generally square and measuring about 0.45m on a side. Five of these bases were set around the walls and the sixth was in the centre of the room. On the east side, bases [F279] and [F145] abutted the west wall of the moulding shop and a third block [F95] was built into that wall beside the door sill [F93] (Photograph 48). On the west side there were two L-shaped pier bases made of mortared stone [F156, F277]. These had square bases for their uprights and short stub walls that extended for



over a metre along the line of the walls. Between these, the central pier base [F108] was set slightly out of line to accommodate a small brick structure 138. The pier base in the middle of the room was a stone slab [F136] over 0.5m square and 0.2m thick set in a construction cut [F137] packed with broken tile [135]. Its flat top carried the remains of a square brick pier. A cross cut into the smoothed surface was doubtless a setting-out mark from the building's construction (Photograph 49). On the north and south sides of the structure, two pairs of short stub walls flanked central doorways. The doors, about 1.3m wide, were designed to accommodate the barrows used to move freshly moulded bricks and tiles between the shop, the drying sheds and the kilns or clamps. The stub walls on the south [F149, F153] were made of mortared stone and measured 0.84m long. On the north side, walls [F155] and [F158] were similar in materials and position, but only their damaged bases survived. Between these and the corner pier bases, sections of brick wall [F68, F69, F103, F147] completed the north and south walls (Photograph 50). On the structure's west face was a separate rectangular surface or room 138. There was very little evidence for any above-ground structure, so it is quite likely that this was simply a paved area outside the workshop. It consisted of a brick floor [F107] that measured 5m by 2.7m. It was badly damaged and disturbed at its centre, though the outer edges were more or less complete. The north, west and south edges of the surface were single courses of half-brick dwarf wall [F105]. On the east side, two sections of more substantial brick wall [F158 and F161] formed the west side of the moulding shop. These sections were separated by a timber sill [F160] for a door into the outer workshop. Building 138 was partly built over the backfill of the large clay pit [F233/F250] (Photograph 51).

- 6.27 Inside the outer workshop [139], the floor was a firm surface of ash, clinker and coal fragments, mixed with large irregular patches of pale mortar [187]. Near the middle of the floor was an irregular patch of bricks [F134], perhaps a repair; running north-south across the centre of the room was a brick drain [F76], covered by flagstones [F151, F152] in the north and south doorways of the building. Outside the south door, the line of this drain was continued by a run of cast iron pipes. A second drain [F282] ran along the east wall of the room, continuing the line of drain [F56] in the moulding shop. This was a trench packed with broken tiles.

#### The heated (north) drying shed 30 (Figures 16 & 17)

- 6.28 In this open-sided structure, more than 24m long, artificial heat was used to dry products before firing. This was a method that had been in use for some time; an historian of the brick and tile industry says that

early in the 19th century, particularly in the Midlands and the North of England, hot-floor dryers were introduced, heated by underfloor flues piping hot air from a furnace ... bricks were set on end in a single layer on these floors' (Hammond 2001, 19).

Heat from these flues would probably have been distributed through iron plates laid out to form a floor. Accounts of brickmaking refer to workers wearing clogs to protect their feet from the hot metal in 'drying flats'. The centre of the drying shed had been damaged by the modern sewer trench, and part of it was covered by the baulk carrying the path and the access road (Photograph 52). The excavated area consisted of eight plinths or pier bases [F22-F25, F28, F82, F285 & F287] (Photograph 53), two long north-south French drains [F26, F46] (Photograph 54), and a series of parallel brick flues fed by furnaces at the north end of the shed. These were served

by a rectangular brick-lined stoking pit [F29] which was 6.9m long, 1.25m wide and 0.5m deep (Photograph 55). Its north side had been damaged by the construction of the modern access road that formed the edge of the excavation here. The remains of two very heavily truncated pier bases [F285, F287] were found at either end of this pit; only occasional bricks and a layer of eroded mortar survived at each location. A third pier base [F28], on the south side of the pit, was roughly 0.6m square and better preserved, with a brick pad set on a stone slab. Though this might be interpreted as the end of the building, the French drains continue north beyond the firing pit, which must have been under cover of the roof. Very little trace of the original floor was found in this shed, as the iron would have been taken away for re-use; its bedding may be represented by a possible soil surface [32].

- 6.29 The brick-lined pit had four stokeholes in its south side. These opened into identical rectangular brick furnace chambers, running north-south [F20, F21, F283, F284]. They had raised tile floors and brick barrel vaults; only the easternmost survived intact (Photograph 56, 57). Hot gases from the furnaces were drawn along six brick flues that ran under the floor of the shed. On the eastern and western sides of the shed, single flues [F11/F53, F19/F80] were connected directly to furnaces [F284] and [F283]. Wide openings from the central furnaces [F20] and [F21] split in two to create four flues [F15/F51, F16/F74, F17/F78, F18/F87] (Photograph 58). All of these dry-laid brick flues had been laid out in close, steep-sided construction trenches. The channels, all a half-brick wide, were single in some flues and double in others (Photographs 59, 60). Some truncated remains of flues [F11/F52], [F15/F51] and [F19/F80] were found in the narrow area between the two modern service cuts which crossed the area. The features were better preserved in the southern quarter of the shed (Photographs 61, 62). Here, the flues combined to connect with two large brick chambers attached to the end walls [F155] and [F158] (Photograph 63). These chambers were the bases for the chimneys that drew hot gases through the flues from the furnaces at the other end of the shed. Each was four courses deep and set in a construction pit cut into the subsoil.
- 6.30 The western chamber [F86] was 0.8m square and was met by flue [F17/F78] which entered from the north, and flues [F19/F80] and [F18/F87] which combined before running into the west side of the chamber to the west. Flue [F80] had a sharp eastward turn to allow this connection to be made. This flue was built with a slight curve, avoiding plinth [F82] to the north, which shows that the flues were laid out after the drying shed was put up (Photograph 64). The base of the eastern chimney chamber [F67] was generally similar in form but more irregular in plan. Flues [F15/F51] and [F11/F53] combined a little to the north and entered this chimney at the north-east, while flues [F16/F74] had entered at the west, in an area that had been damaged by later activity (Photograph 65).
- 6.31 The flues were either abandoned or altered during the life of the building. The majority of the channels contained quantities of ash, cinder and coal fragments, suggesting that they had been allowed to clog up with fuel waste. However, one of the central flues [F16/F74] had been demolished; most of its brick walls had been removed and the construction trench had been backfilled with a dense deposit of crushed brick and tile. The south wall of the stoking pit [F29] had also been altered. A base layer of ash and clinker [230], similar to the fuel waste in the flues, was sealed by 0.25m of brownish-yellow clay [229], presumably a deliberate backfill (Photograph 66). In front of the west furnace [F283], part of this backfill had later

been cut away to allow a low wall of brick [F240] to be built, closing the head of flue [F19/F80].

- 6.32 The French drains [F46, F26] that collected the eaves-drip at either of the shed consisted of U-shaped trenches loosely filled with broken pantiles (Photographs 54, 62, 64). This fill was far denser north of the small room [138], where frequent foot traffic in and out of the open side of the outer workshop had compacted the ground and the tiles. On the east side, drain [F26] ran south towards the north end of the moulding shop; it appears to have been continued as the internal tile drain [F56], which in turn passed under the west wall of the shop to meet drain [F282] in the outer workshop. In the southern drying shed, the line of drain [F282] continued south as a brick channel [F260]. This met the trench carrying the iron pipe drain [F76], before running south-east to drain into the large clay pit [F167]. Water from the western drains soaked away into another large clay pit [F250] to the west of the building.

#### The cold (south) drying shed 220

- 6.33 The only feature found inside this long, open-sided structure was a rough surface of re-worked subsoil, the continuation of deposit [186] seen further north. The outline of the drying shed was visible as two rows of plinths inside French drains. In contrast with the truncated north shed, the entire footprint of the unheated structure was seen. It originally consisted of seven bays and was about 25m long and 7m wide. Elements of seven plinths on the east side [F170-175, F300] survived, in varying states of preservation (Photograph 67). There was a central plinth [F176] in the south end of the shed; on the west side, preservation was poor and only five of the pier bases survived [F177-181]. At the north-east corner of the shed, the drain emerging from the south wall of the moulding shop ran into the eaves-drip channel of the drying shed; it contained sections of land drain as well as pieces of broken pantile (Photograph 68).

#### The western kilns 198 (Figures 18, 19)

- 6.34 Two kilns of different designs were found, one on top of the other, to the west of the T-shaped group of buildings (Photograph 69). These western kilns had been built on a backfilled clay pit, their foundations being set on a thick dump of waste roofing tile. The remains formed a sub-rectangular structure with its longest side aligned roughly north-east - south-west, at an angle to the larger tilery buildings.
- 6.35 The first structure was a circular bottle kiln with an internal diameter of about 3m (Photograph 70). Part of the south-western side of its curved brick wall [F192] was revealed to be bedded directly onto a deposit of crushed tile [243], part of the fill of the clay pit [F233 / F250]. Another truncated wall fragment [F266] survived at the north-east side.
- 6.36 Almost a metre outside the curved wall, an apron of stone flags [F196] ran around the circular structure. Although this was badly truncated, its overall form was clear (Photograph 71). The flags had been bedded on firm reddish-grey silty clay [226], inside a single row of edge-set bricks that appeared to have defined an angular platform. The large broken sandstone slabs were laid in a pattern that radiated from the centre of the circular kiln. The largest areas of this surface were seen at the south and south-west sides but a small patch was exposed at the north, below the later kiln. The area between the brick wall and the stone pavement was occupied by

fan-shaped areas of brickwork. Two were seen on the south side [F189, F190] and one at the north [F268] (Photographs 72, 73). They were just over 1.1m wide at their outer edges and had walls of brick around cores of random brick and sandstone. Between these features were deposits of dense, coarse crushed brick and mortar [191, 267]. The fan-shaped blocks appear to have been sections of kiln wall, separating stokeholes that were fed from the surrounding flagged area. Inside the circular wall of the kiln were the remains of a brick floor [F195]. The surviving area was 2.47m on its longest north-east - south-west axis and 1.5m wide. The floor was made of eroded edge-set brick and bedded on a dense laminated deposit of crushed brick and tile [194]. All were strongly coloured as a result of intense heating.

- 6.37 Extrapolation from the surviving elements of the bottle kiln gives dimensions that fit with the evidence on the 1857 Ordnance Survey map. The kiln floor was about 3m across and the external diameter of the structure at the level of the stokeholes was about 5.3m. Including the stone paving outside the fire mouths, the total width of the kiln would have been about 9m, and the map suggests a structure measuring roughly 9m east-west and 10.5m north-south. The excavated evidence suggests a simple updraught kiln with up to six stokeholes in a brick structure that formed the firing chamber and its chimney. This is a simpler form than the bottle kilns seen in the Potteries and elsewhere, which were built with an outer shell or 'hovel' that provided shelter for fires, fuel and stokers, and generated the draught that was essential for firing. There is no evidence of a hovel wall at the Crow Trees site. It seems likely, both from the map evidence and practical considerations, that the paved area would have had some sort of roof, but no archaeological evidence of this was found.
- 6.38 At some point in the later 1800s the bottle kiln was demolished, and a larger Newcastle kiln was built on the same spot. This design has been described as "the north-east's main contribution to the industrial archaeology of the brick industry" and one that "emerged as a viable alternative to Scotch-type kilns in the mid-19th century and was especially popular by 1900" (Johnson 2021). Newcastle kilns had rectangular, vaulted firing chambers that were loaded and fired from one end and had flues and a chimney at the other; they also had small openings in the top of their vaults, through which small coal fuel was dropped during firing. Their horizontal draught arrangement was an improvement on updraught bottle and Scotch kilns, especially at larger works, where several kilns could be linked in banks and the waste heat from firing in one chamber could preheat the bricks in another. A good local example of a three-chamber Newcastle kiln can still be seen at the former Belsay Tillery, 1.1km east of Belsay village, just off the A696. With a firing chamber a little over 5m long, the Crow Trees kiln was a fairly short example of the design; some Newcastle kilns were double that length or more.
- 6.39 The remains of the vaulted firing chamber were found. This was aligned north-east – south-west with a detached chimney at its south side. The surviving elements were the bases of the thick side walls of the vault (Photograph 74), some internal walls and part of the firing floor, and a flue and chimney base. Parts of the structure were built directly onto the levelled remains of the bottle kiln. Of the two very substantial brick walls of the vault, the north-western was set partly on the old kiln wall and partly on a stone foundation laid onto the lower-lying dump of waste tile [243] to its north. This footing [F212] was 5.46m long and 1.42m wide, and consisted of large, roughly-squared blocks of stone with some brick (Photograph 75). It supported the

mortared brick kiln wall [F211], which measured 5.32m by 1.39m. The brick courses in this block had been laid at an angle of about 23° from the horizontal, with the slope running down towards the interior of the kiln (Figure 17). The matching block on the opposite side [F213] was slightly larger, at 6.3m by 1.35m in plan (Photograph 76). This was partly set directly on the tile bed [194] that underlay the bottle kiln.

- 6.40 Inside each section of sloping masonry was a brick wall, the lining of the firing chamber, abutting but separate from the larger blocks (Photograph 77). As in all of the kilns seen at this site, the lining walls were made of common bricks rather than firebrick. On the north-west side, this inner wall [F201] was 3.9m long; at its south-west end a separate section of brickwork [F200], 0.9m long, was laid at a slight angle following the foundations of the earlier kiln. At the south-east side, the 4.8m-long inner wall [F209] did not run the full length of the sloping block. It ended at a cross-wall [F208], one of four that ran between the side walls of the structure. The north-eastern of these was the outer wall of the kiln [F205], 3.7m long and 0.46m thick. An area of weathered and burnt bricks at its centre marked the position of the former door, or wicket. There would have been firing holes at either side of this (Searle 1920, 255), but these had been removed by the general truncation of the site. About 0.8m inside this, and a little higher up, was a thinner wall [F203], one brick thick and one course high (Photograph 78). This was the remains of a flash wall, a temporary structure, roughly 1m high, installed between the firing holes and the charge of green tiles or bricks inside, to protect them from direct contact with the flames and to deflect heat up to the vaulted roof of the kiln so that it spread evenly through the chamber. Between these walls was a sloping grey and red layer of crushed brick and ash [204], up to 0.4m thick, evidence of the last firing. The vertical photograph shows this grey-white deposit in two lobes corresponding with the vanished stokeholes that flanked the kiln's loading door. The burned material [204] lay on a decayed brick floor [F249]. At the west end of [F203], a short stub of wall extended from the north wall [F201]. This was probably a remnant of one of the firing holes.
- 6.41 Demolition and clearance had badly damaged the other end of the kiln and, although the base of the chimney survived, the arrangement of the back wall and flues was difficult to interpret. A damaged wall [F199] attached to the south end of the vault base [213] marked the back of the chamber. Inside this, a narrower truncated wall [F208] ran across the width of the kiln from the south end of [F209]. The function of this is unknown. The remains of the heavily burnt floor of the Newcastle kiln [F207] was badly truncated on its west side (Photograph 79). It was made of flat tile and edge-set brick laid on a bedding deposit of compact, friable crushed brick [202]; this lay on the bottle kiln's floor [F195]. Another section of brick floor [F210] lay between the end wall [F199] and the internal structure [F208]. Clearance of the site had removed any traces of the flues that would have run through the rear wall of the chamber in this area. The usual pattern was to have three flues running from holes set low in the back wall of the firing chamber and leading to the chimney that provided the draught that drew hot air through the kiln.
- 6.42 The brick base of the chimney [F223] was at the south-west end of a long structure on the south-east side of the kiln. This consisted of two substantial parallel walls. The outer of these [F219/F220] was 9.5m long, 0.65m thick, and survived to a height of 0.6m. Its lower part, set on an offset foundation, contained some edge-set header courses with gaps between the bricks (Photograph 80). The inner wall was in three brick sections [F222, F214, F217] with a smaller and slightly later block of stonework



[F215] near the middle of the kiln wall. The two long walls were connected by short brick cross-wall [F216], 1.3m long. This divided the space between the walls into two unequal sections. That at the south [F219, F220] was over 6.5m long and had no floor; it ended at the chimney base [F223], which had a small area of brickwork [F221] beside it. The northern section [F217] was 2.2m long and had a splay at its eastern corner that matched a similar splay on the opposite wall [F219]. Together, these formed a mouth that opened onto the tiled floor [F218] of a small hearth running south-westwards to the internal wall [F216] (Photograph 81). The hearth's floor had some marks of burning and its wide mouth was blackened. A small iron door was found on this surface (Photograph 82: paragraph 7.3, below). This was certainly some distance away from its original position and had probably been left behind during the demolition of the tilery buildings. At the eastern corner of this structure, a small anomalous block of heavily disturbed wall [F197] was found. This was 1.3m long and 0.52m thick, made of four courses of brick and capped by a stone slab. It was set at an angle to the east side of the small hearth.

- 6.43 To the north-west of the long parallel walls, the site of the flues was badly truncated and nothing remained of the link between the Newcastle kiln and its chimney. A small area of brick floor [F224] was found here. This was 2.9m long and 1.5m wide and lay between the long walls and the edge of the older stone paving [F196]. To the west of this, a drain [F222] ran north-westwards away from the brick floor. Another tile drain [F245] ran along the north-eastern face of the Newcastle kiln, cutting through the fills of the old clay pit [F223 / F250].
- 6.44 The function of the elongated structure on the south-east side of the vaulted kiln is unknown. It was strongly built but there is no evidence that it supported anything other than the chimney at its south-west end. The hearth in its smaller northern section showed no connections with the larger space or the main part of the kiln. The function of the small angled block at the north-east corner is equally obscure.

#### Clearance deposits and later activity

- 6.45 The tilery buildings were demolished sometime between the two World Wars. In the process, almost all of any surviving metal was removed. Some areas, such as the interior of the Scotch kiln, seem to have been deliberately targeted for the recovery of useable materials (see paragraph 6.11 above). Demolition deposits covered the remains of all major structures on the site. The western kilns 198 were overlain by a loose deposit of silty clay [228] with many fragments of brick, tile and stone mixed with ash, coal and cinders. The furnace rooms F57 and F130 were filled with very dark clayey silt [12] and [273] containing numerous stones, tiles, bricks, cobbles, and much burnt material. The Scotch kiln F164 was overlain by a very dense, compact deposit of crushed brick and brick dust [299] which appeared to be the result of collapse or demolition rather than deliberate backfilling. A deposit of dark grey-brown silt and building rubble [140] was found over the long cross-stroke 30 / 139 / 220 of the tilery. The same material was found in large, irregular lenses across the eastern part of the excavation site. In some places it was overlain by a thin layer of heavily compacted silty clay [10], which also sealed the backfill deposits in the furnace rooms. Later than all of these layers was the modern service trench [F14], over 1.3m wide, which cut through them and the Scotch kiln building, the upper fills of old clay pits and waste dumps on either side of the tilery, and the glacial subsoil.

## 7. The artefacts

- 7.1 The assessment reports on the finds from the excavation are provided in Appendix 3. The material recovered from the site can be divided into three categories: objects associated with the working of the Crow Trees tile works, products produced at the site, and domestic waste dumped during and after its life.

### Working materials

- 7.2 Five sections of furnace mouth blanking plates were recovered (Photographs 13, 83). All but one of these came from demolition deposits around the Scotch kiln. One fragment was found in [241], one of numerous layers of backfill in a large clay pit to the west of the buildings. The plates are roughly semi-circular with a burned, or perhaps deliberately formed, curve at the middle of the straight side and a 20mm hole near the top of the curve. There is some variation in size between the pieces, which are generally 460-480mm wide, 180-240mm high and at least 20mm thick. They were used to control airflow through the furnace arches of the Scotch kiln.
- 7.3 A dump of material on floor [F218] in the Newcastle kiln, assumed to be demolition waste, contained part of a small iron door. This highly corroded object is 320mm wide and up to 300mm high; it is made from an iron plate, 12mm thick, with a rounded flange on the closing edge (Photograph 84). This shows that this door was one of a pair; the flange would have covered the join between their edges when they were closed. On the opposite side are two hinges to fit plain pintles; these are made from 25mm (one-inch) bar and project 38mm beyond the edge of the door. A narrow half-round moulding forms a frame, 240mm high and 225mm wide, on what was presumably the outer face of the door (Photograph 85). Within this frame are four bosses that may be the heads of rivets. On the inner face is a separate iron plate. It is 215mm high, 212mm wide and about 8mm thick, and there is no sign of rivets or other fixings under the rust on its face (Photograph 86, 87). This door and its lost partner would together have covered a wide, low opening up to about 0.48m wide and 0.24m high. This might have been part of one of the firing holes in the Newcastle kiln.
- 7.4 The only other finds of this sort were some chunks of glassy grey-black, vesicular waste found in the demolition deposit [273]. Their outer surfaces incorporated grit and small stones, suggesting deposition while the material was still plastic. This is probably vitrified silica-rich material from the lining of one of the tilery's kilns. A small piece of burnt coke was recovered from one of the clay pits; this might be domestic or industrial in origin.

### Tilery products

- 7.5 A total of 77 substantial pieces of ceramic material were recovered from 11 backfill and demolition deposits. The assemblage includes earthenware pantiles, near-square floor tiles known as quarrels, bricks, sections of field drain and perforated ventilation or heating tiles. Many of these are likely to be examples of the output of the Crow Trees tile works.
- 7.6 The commonest products seen during the work were pantiles, which were used for roofing houses and other buildings (Photographs 88, 89). Those found at this site are nearly all in similar, fully oxidised, hard-fired fabrics, either orange-red or purplish-red in colour, and sparsely tempered with very fine sand. One face of the tiles is sanded, the other smoothed. The three almost intact examples are variable in size

(325mm long x 255mm wide x 12mm thick; 372mm long x 260mm wide x 12mm thick; 346mm long x 276mm wide x 16mm thick), suggesting that a variety of sizes was available or that tiles were made to order. One small fragment from a black glazed pantile was recovered; many thousands of broken tiles and overfired waster fragments were seen in the backfilled clay pits around the tillery.

- 7.7 Five floor tiles, two almost complete, were collected from the clay pit fill [270] and a demolition deposit [273]. These are near-square tiles in a homogenous, oxidised orange-red fabric, again very sparsely tempered with fine sand, and with the top surface and edges lightly sanded. One of the more complete examples from [270] measures 230 x 225mm x 50mm thick; its underside is smoothed and lightly criss-crossed (Photograph 90). Another example, from [273], with only the thickness (43mm) measurable, also has a sanded top and edges, but the underside here has an incomplete embossed stamp showing a square or rectangle with a smaller diamond shape inside (Photograph 91). This could be an identifying mark of the tillery, but it was not seen on any other products.
- 7.8 Eighteen complete or partial bricks were retained. Some may have been from the kiln structures, as they had partly blackened, burnt or vitrified surfaces (Photographs 92, 93). Another complete brick from demolition backfill deposit [12] is more recent. It is a hard-fired frogged brick with the stamp LUMLEY and is a product of Lumley Brickworks, originally part of the colliery of the same name. The colliery closed in 1966 and the brickworks were demolished in the 1990s. Lumley bricks were manufactured throughout the 19th and 20th centuries.
- 7.9 Several examples of fragmentary and complete overfired waster bricks were seen in clay pit fill [264]. These included distorted complete bricks and two pairs of two bricks, distorted and melted together (Photograph 94-96). These are likely to have been clamp-fired.
- 7.10 Finds suggest that both tubular and U-shaped field drains were made by the tillery. Seventeen pieces were recovered (Photographs 97, 98). Tubular drains were found in three diameters, 50, 66 and 110mm, the smaller two sizes having a built-in base plate. The flanged, U-shaped drains are about 115mm (6 inches) deep and 20mm wide. One complete section from clay pit fill [3] is 327mm (13 inches) long. Pieces of distorted, overfired U-shaped drain were also found in this deposit.
- 7.11 Ten fragmentary perforated tiles were found. Some of these are maltkiln tiles, described in paragraph 6.23, above, and are unlikely to have been a product of the tillery (Photographs 99, 100). Tiles of this kind were sometimes set in garden buildings, but their principal use was in the floors of malting and grain drying kilns, where they were supported on inverted T-section iron bars (Archaeological Services 2008, 2014). A small number of tiles with larger perforations, found beneath the malting tiles, might have been a local product, but the absence of any broken or waster examples in the excavated material argues against this.

Domestic waste

- 7.12 All of the household pottery found during the site investigations can be dated to the 19th or early 20th century. While some types, such as the sponge printed wares of around 1840, could be from the lifetime of the tillery itself, others post-date it. The



mixed dating of the contexts in which the material was found makes the later date for the use and deposition of the pottery the more likely.

- 7.13 The small collection of animal bones that was recovered derived from domestic food waste, burials of pet dogs, and natural mortality of rabbits. Most of the food waste is beef bones, and the presence of butchers' saw marks and the robust size of the cattle bones shows that they are of 19th-century date.
- 7.14 Other materials clearly represent household rubbish. The assemblage includes a single bone button, several damaged and fragmentary pieces of footwear and two pieces of softwood. A total of 17 unmarked clay tobacco pipe fragments came from six backfill, demolition and bedding contexts. A pipe bowl from one of the rooms in the moulding shop 140 has ribbed decoration and another has floral decoration along the seam, both suggesting a date of about 1800-1830, as does the heel shape of the third bowl fragment, found in the small outer workshop room 138. Most of the glass bottles found on the site date from the early 1900s, with a few later examples from the 1920s and one outlier, possibly from during or after the Second World War. All of the bottles post-date the abandonment of the tilery itself. The small quantity of iron objects includes bucket handles, parts of a cooking vessel and a knife blade. The five copper alloy objects included a spoon, a pair of sugar tongs, and a small turned rod that might once have been part of an oil lamp. All of this material dates from the 19th or early 20th century.

## 8. Conclusions

- 8.1 The remains of the buildings of the former Crow Trees Tile Works have been uncovered. Bricks were originally made in a clamp and a Scotch kiln, possibly at the same time. The works were surrounded by clay pits, from which the raw material for the bricks was obtained, but no discernible traces of the processing of the clay, by weathering, tempering, crushing and mixing, has been identified. Attached to the Scotch kiln were two workshops where the products were moulded before being dried in long open sheds, one of which had a heated floor.
- 8.2 Broken tiles and wasters were dumped into the clay pits that lay to the east and west of the tilery. The site produced large numbers of pantiles for roofing, as well as bricks, floor tiles and field drains. At a later stage in the development of the works, an updraught bottle kiln was built on the backfill of the western pit, subsequently replaced with a small Newcastle kiln.
- 8.3 The tilery was operated by members of the Birkett family between 1820 and 1866, and probably until it closed. The tilery was set up at a time of high demand for roofing pantiles, and its life coincided with a huge increase in the use of clay tiles and pipes for draining farmland. These factors are likely to have been the stimulus for its establishment and growth. While the earliest production is likely to have used clamps, old maps show that the Scotch kiln and adjoining buildings were present throughout the tilery's documented life. The bottle kiln was built before 1839 and replaced by the Newcastle kiln sometime after 1857; by 1898 the site was disused. The large eastern clay pit remained open and was used for dumping ashes and other household waste, and the tilery structures were not demolished immediately. Some of the buildings may have continued in use for other purposes. During the

demolition work some re-useable materials were removed. The site was entirely levelled before 1939.

- 8.4 The Crow Trees tilery was not on a railway, and some distance from the nearest road, and its products would have been distributed by cart. It was a typical small-scale works set up to serve its local area, using local clay, sand and coal. The 1839 tithe map shows a building marked 'Tile sheds' on the side of the road between Bowburn and Tursdale, about 220m north-east of the kilns, on the site of a later house called Crow Trees. This may have been where customers collected the tilery's products.
- 8.5 With the completion of underdraining in a large proportion of the wet farmland of the area, and the increasing availability of building materials brought by rail, the demand for the products of the Crow Trees tilery fell and the kilns were shut down.

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## Appendix 1: Data tables

Table 1.1: Context data

The Ÿ symbols in the columns at the right indicate the presence of artefacts of the following types: P pottery, B bone, M metals, F flint, I industrial residues, G glass, C ceramic building material, O other materials.

No	Description	P	B	M	I	G	C	O
1	Topsoil							
2	Natural glacial subsoil							
3	Fill of clay pit/waster pit [F4]	Ÿ			Ÿ		Ÿ	Ÿ
F4	Cut of clay pit/waster pit							
5	Heat-affected natural subsoil in [F9]							
6	Heat-affected natural subsoil in [F9]							
F7	Possible rubble wall foundation S of brick clamp							
F8	Cut for [F7]							
F9	Structure number for probable clamp							
10	Sealing dump deposit	Ÿ	Ÿ	Ÿ		Ÿ	Ÿ	Ÿ
F11	Brick flue structure							
12	Demolition backfill within furnace rooms	Ÿ	Ÿ	Ÿ		Ÿ	Ÿ	Ÿ
13	Fill of modern sewer [F14]							
F14	Cut of modern sewer							
F15	Brick flue structure							
F16	Brick flue structure							
F17	Brick flue structure							
F18	Brick flue structure							
F19	Brick flue structure							
F20	Furnace in drying shed 30							
F21	Furnace in drying shed 30							
F22	Plinth base							
F23	Plinth base							
F24	Plinth base							
F25	Plinth base							
F26	French drain							
F27	French drain							
F28	Plinth base							
F29	Pit serving flues							
F30	Group number for flue structures							
31	Clinker and ash filling [F29]							
32	Probable surface surrounding flues [F30]							
F33	Cut for flue [F11]							
F34	Cut for flue [F15]							
F35	Cut for flue [F16]							
F36	Cut for flue [F17]							
F37	Cut for flue [F18]							
F38	Cut for flue [F19]							
F39	Cut for furnace [F20]							
F40	Cut for furnace [F21]							
F41	Cut for plinth base [F22]							
F42	Cut for plinth base [F23]							
F43	Cut for plinth base [F24]							
F44	Cut for plinth base [F25]							
F45	Cut for French drain [F26]							
F46	Cut for French drain [F27]							
F47	Cut for plinth base [F28]							
F48	Cut for [F29]							
49	Tile fill of French drain [F50] in centre of hot drying shed							
F50	Cut for French drain in centre of hot drying shed							
F51	Truncated brick flue structure							
F52	Cut for flue [F51]							
F53	Truncated brick flue structure							

No	Description	P	B	M	I	G	C	O
F54	Cut for flue [F53]							
55	Tile fill of heavily-truncated flue							
F56	Cut containing [55]							
F57	Structure number for northern furnace room							
F58	Steps in room [F57]							
F59	Floor surface in room [F57]							
F60	Furnace wall in room [F57]							
F61	West wall of room [F57]							
F62	North wall of room [F57]							
F63	Brick structure added to wall [F57]							
64	Ash floor surface in [F57]							
F65	East wall of room [F57]							
F66	North/south (main) stone wall							
F67	Chimney south of brick flues [F52] & [F53]							
F68	East/west wall at southern end of flues							
F69	East/west wall at southern end of flues							
F70	Construction cut for [F66]							
F71	Construction cut for [F67]							
F72	Construction cut for [F68]							
F73	Construction cut for [F69]							
F74	Brick flue structure							
F75	Cut for flue [F74]							
F76	Brick drain							
F77	Cut for drain [F76]							
F78	Brick flue structure							
F79	Cut for flue [F78]							
F80	Brick flue structure							
F81	Cut for flue [F80]							
F82	Plinth base							
F83	Cut for plinth base [F82]							
84	Fill of French drain							
F85	Cut of French drain							
F86	Chimney south of flues [F78], [F80], & [F87]							
F87	Brick flue structure							
F88	Cut for flue [F87]							
F89	Internal brick wall							
F90	Construction cut for wall [F89]							
F91	Sub-circular plinth base							
F92	Tile floor							
F93	Wood and brick threshold/step							
F94	Construction cut for [F93]							
F95	Plinth base							
F96	Truncated stone wall							
F97	Brick floor							
F98	Tile floor							
F99	Construction cut for wall [F96]							
F100	Main stone wall							
F101	Construction cut for [F100]							
F102	Construction cut for [F91]							
F103	Brick wall							
F104	Cut for wall [F103]							
F105	Brick wall of outbuilding							
F106	Cut for wall [F105]							
F107	Broken brick/tile floor within wall [F105]							
F108	Plinth base at south-east end of wall [F103]							
F109	Cut for plinth base [F108]							
F110	Small external tile floor							
F111	East/west brick wall							

No	Description	P	B	M	I	G	C	O
F112	Construction cut for [F111]							
F113	Internal brick wall							
F114	Construction cut for [F113]							
F115	Tile floor							
F116	Tile floor/step							
F117	Tile floor							
F118	Brick hearth on floor [F117]							
F119	Eastern stone wall							
F120	Furnace wall in room [F130]							
F121	Steps in room [F130]							
F122	Western wall of kiln room [F164]							
F123	Brick 'buttress' in room [F130]							
F124	External flagstone floor							
F125	Internal brick wall							
F126	Possible bedding layer or working surface							
F127	Internal brick wall							
F128	Internal brick wall: southern continuation of [F127]							
F129	Bedding below floor [F92]							
F130	Structure number for southern furnace room							
131	Ash floor surface in [F130]							
F132	Sub-circular brick structure/buttress in room [F130]							
F133	Stone floor in room [F130]							
F134	Brick repair to drain [F76]							
135	Tile backfill for cut [F137]							
F136	Stone pier base							
F137	Cut for pier base [F136]							
138	Structure number for room	Y	Y	Y		Y	Y	Y
139	Structure number for room							
F140	Structure number for room	Y	Y	Y		Y	Y	Y
141	Bedding/surface underneath [F124]							
F142	Cut for plinth base [F95]							
F143	Stone wall footing							
F144	Cut for [F143]							
F145	Plinth base							
F146	Cut for plinth base [F145]							
F147	Brick blocking wall							
F148	Cut for [F148]							
F149	Stone wall stub							
F150	Cut for [F149]							
F151	Flagstone sealing drain [F76]							
F152	Flagstone sealing drain [F76]							
F153	Stube wall in S side of room 139							
F154	Cut for [F152]							
F155	Brick blocking wall							
F156	L-shaped pier base							
F157	Cut for [F156]							
F158	Short wall stub	Y						
F159	Cut for [F158]							
F160	Sill between [F158] and [F161]							
F161	Short wall stub							
F162	Cut for [F161]							
F163	Cut for [F155]							
F164	Structure number for main kiln room	Y		Y				Y
F165	External buttress to east of [F130]/[F164]							
166	Ash fill of [F167]	Y				Y		
F167	Cut of main pond/clay pit (backfilled as ash pit)							
F168	Group number for moulding shop							
169	Reworked natural subsoil surface							
F170	Plinth base							

No	Description	P	B	M	I	G	C	O
F171	Plinth base							
F172	Plinth base							
F173	Plinth base							
F174	Plinth base							
F175	Plinth base							
F176	Plinth base							
F177	Plinth base							
F178	Plinth base							
F179	Plinth base							
F180	Plinth base							
F181	Plinth base							
182	Primary fill of [F35]							
F183	Cut for stone culvert							
184	Backfill of [F183]							
F185	Stone drainage culvert							
186	Probable surface in room [F139]							
187	Remains of working floor in room [F139]							
188	Upper fill of [F183]							
F189	Buttress/paving surrounding [F192]							
F190	Buttress/paving surrounding [F192]							
191	Surface between [F189] & [F190]							
F192	Curving brick wall for primary kiln structure							
F193	Surface abutting [F189]							
F194	Bedding deposit for [F195]							
F195	Brick floor contemporary with [F192]							
F196	Flagstone surface							
F197	Fragmentary steps							
F198	Structure number for secondary kiln building							
F199	Wall fragment at end of [F213]							
F200	Wall fragments at end of [F210]							
F201	Wall of secondary kiln structure							
F202	Bedding layer/surface	Y						Y
F203	End wall of secondary kiln structure							
F204	Burnt deposit between [F203] & [F205]							
F205	External wall of secondary kiln structure							
F206	Probable truncated wall underlying [F203]							
F207	Brick floor between [F201] & [F209]							
F208	Internal wall of secondary kiln structure							
F209	Wall of secondary kiln structure							
F210	Brick surface							
F211	Angled brick base abutting [F201]							
F212	Stone base to [F211]							
F213	Angled brick base							
F214	Brick wall							
F215	Stone repair/addition							
F216	Brick blocking							
F217	Curving brick wall – probable extension of [F214]							
F218	Tile floor inside [F217] & [F219]							
F219	Brick wall							
F220	Structure number for unheated drying shed							
F221	Layer between [F214] & [F220]							
F222	Linear drain cut							
F223	Probable chimney base							
F224	Brick surface							
F225	Brick retaining wall							
226	Fill of [F222]							
227	Levelling/consolidation deposit							
228	Dump deposit overlying [F218]			Y				
229	Clay backfill of [F29]							



No	Description	P	B	M	I	G	C	O
230	Ash and clinker layer below [229]							
F231	Cut of wall [F29]							
232	Fill of [F233]							
F233	Backfilled clay pit							
234	Laminated deposit below [F194]							
235	Broken tile layer beneath [234]							
236	Backfill of [F239]							
F237	Construction cut for buttress [F165]							
238	Fill of [F237]							
F239	Cut of clay pit							
F240	Wall inserted into stoking pit [F29]							
241	Backfill layer in pit [F250]			Y				
242	Backfill layer in pit [F250]							
243	Backfill layer in pit [F250]						Y	
244	Backfill layer in pit [F250]							
F245	Cut of drain							
246	Fill of [F245]							
F247	Cut of clay pit							
248	Fill of [F247]							
249	Burnt brick surface underlying [F204]							
F250	Cut of clay pit							
251	Fill of [F250]							
F252	Cut of clay pit							
253	Fill of [F252]							
254	Later fill layer of [F250]							
F255	Cut for plinth base [F170]							
F256	Cut for plinth base [F171]							
F257	Cut for plinth base [F172]							
258	Fill of brick drain [F76]							
259	Backfill of cut [F77]							
F260	Brick drain joining [F76]							
F261	Tile drain along SE side of main building							
262	Fill of French drain [F263]							
F263	Extension of French drain [F85]							
264	Fill of [F265]						Y	
F265	Cut of clay/waster pit							
F266	Curving brick wall of primary kiln structure							
267	Surface abutting [F268]							
F268	Buttress/paving surrounding [F266]							
F269	Flagstone surface							
270	Fill of [F271]						Y	
F271	Cut of clay/waster pit							
272	Dump deposit in room [F130]			Y			Y	
273	Demolition deposit between [F214] & [F220]	Y		Y	Y		Y	
274	Fill of [F275]						Y	
F275	Cut for soakaway							
F276	Construction cut for eastern side of main kiln building							
F277	L-shaped pier base							
F278	Cut for [F277]							
F279	Pier base next to [F66]							
F280	Cut for [F279]							
281	Drain fill							
F282	Drain cut – continuation of [F56]							
F283	Furnace in drying shed 30							
F284	Furnace in drying shed 30							
F285	Heavily truncated pier base							
F286	Construction cut for [F285]							
F287	Heavily truncated pier base							
F288	Construction cut for [F287]							
299	Backfill deposit in room [F164]							
300	Plinth base in south drying shed = [170-181]							

No	Description	P	B	M	I	G	C	O
301	Tile floor of oven in 168 room E							

Table 1.2: Pottery sherd numbers by context and types

Context	No	Includes
3	24	BGEW; CH; GEW; GSTW; SPEW; TPEW; YGCW
10	21	GEW; GSTW; TPEW; YGCW
12	37	GEW; BLW;SGSTW; TPEW; YGCW
138	73	BLW; CGW; GEW; SGSTW; SPEW; TPEW
140	4	TPEW
158	7	SGSTW
F164	33	BLW; GEW; HEW; SPEW; SGSTW; TPEW
166	1	GSTW
202	13	GEW; SGSTW; SPEW; TPEW; YGCW
273	7	CH; GEW; SGSTW
Total	220	

Key:

BGEW	Brown glazed earthenware	HEW	Horticultural earthenware
BLW	Brown lustre ware	SGSTW	Salt-glazed stoneware
CGW	Colour-glazed ware	SPEW	Sponge printed earthenware
CH	China	TPEW	Transfer printed earthenware
GEW	Glazed earthenware	YGCW	Yellow-glazed coarseware
GSTW	Glazed stoneware		

Table 1.3: Clay pipe stem and bowl numbers by context

Context	Stems	Bowls
3	2	
10	2	
12	2	
138	2	1
140	4	2
F164	1	
202	1	
Total	14	3

Table 1.4: Glass bottle and sherd numbers by context

Context	Complete Bottles	Sherds
10		2 bottle sherds, 1 window sherd
12	2	12 bottle sherds
138	2	9 bottle sherds, 1 window sherd
140	1	3 bottle sherds
166	15	
Totals	20	26

Table 1.5: Ceramic building material fragment numbers by context and type

Context	Pantiles	Quarrels	Bricks	Field drain	Perforated	Notes
3	4					one pantile in reduced fabric
3	1					almost complete ®
3			1			vitrified deposit on one end ®
3			1			complete
3				10		three pieces 'U' shaped
3				4		two larger diameter, two smaller
3				3		'U' shaped, overfired
10					3	®
12	1		1			brick complete ?modern ®
138	2				3	
140					1	
243	8					one nibbed
264	2		1			all overfired ®
264			1			
264			2			overfired – stuck together ®
264			4			overfired – two pairs stuck together
264			1			complete
264			5			four overfired
270		3				one almost complete ®
270	3					almost complete, one nibbed ®
270		1				almost complete
272					3	
273		1				®
274			1			complete ®
274	6					two sooted, 1 nibbed
Totals	27	5	18	17	10	

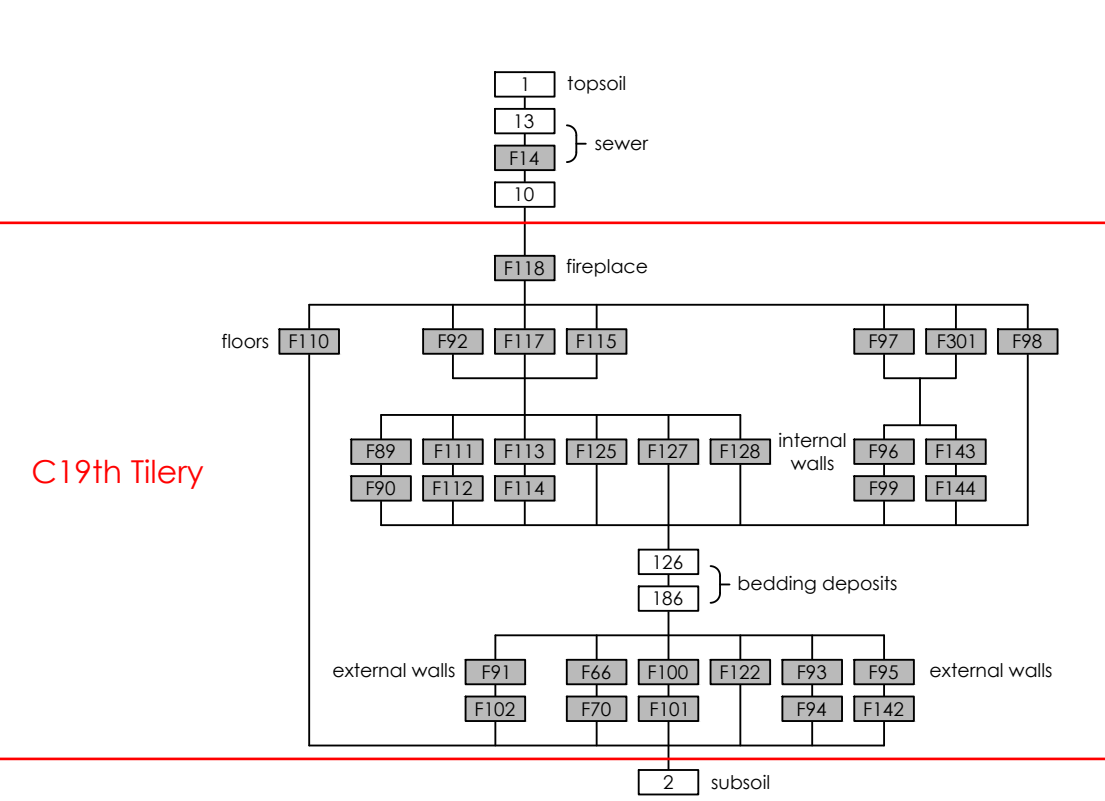
Key: ® = photographed for inclusion in the archive

Table 1.6: Iron object number by context

Context	No	Includes
10	6	semi-circular lid/cover, 3 pieces bar, 2 near joining knife blade fragments
12	23	7 nail/bolt fragments, heel cleat, rectangular buckle, strap hinge, bar fragments cooking vessel, hook, part bucket handle
138	13	hooked bar, brackets, door lock plate, nails/bolts
140	5	hooked bucket handle, 2 large nail/bolts, ring/washer, painted bike fork (modern)
F164	2	galvanised ?bucket base, complete hooked bucket handle
228	1	hinged door
241	1	lid/cover frag
272	3	2 semi-circular covers/lids, quarter of circular cover/lid
273	2	nail, tapering bar frag
Total	56	

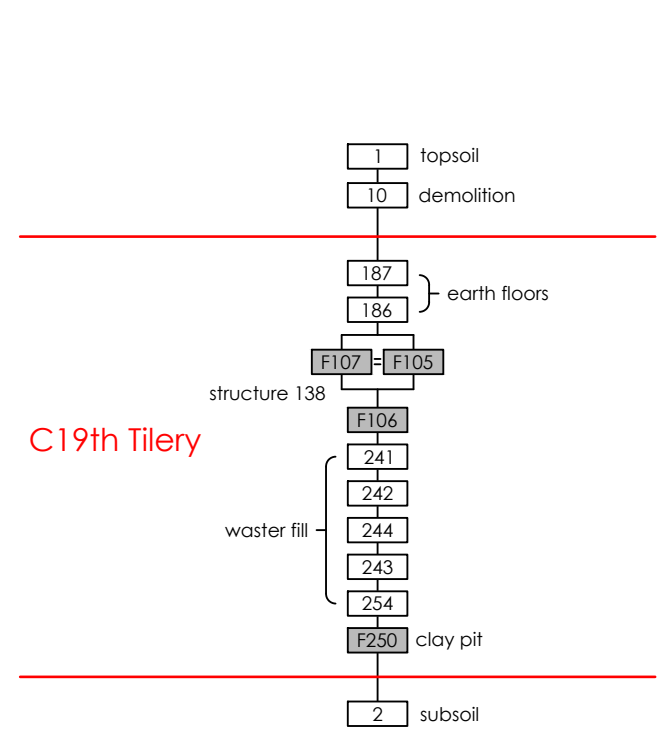
## Appendix 2: Stratigraphic matrices

moulding shop 168



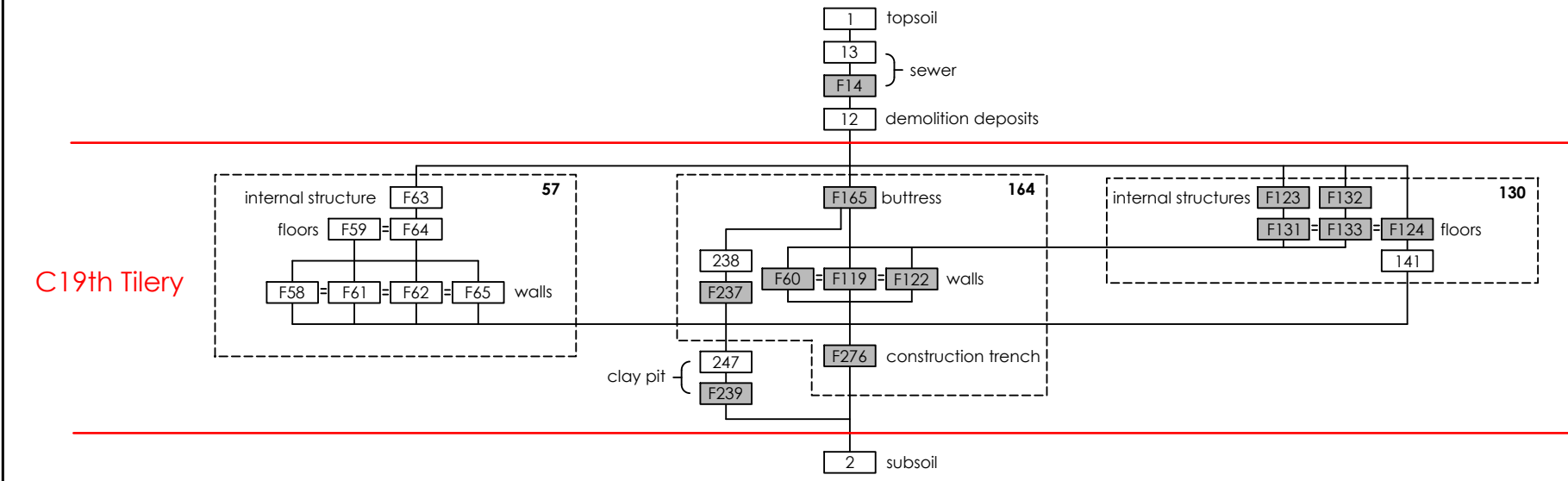
C19th Tilers

structure 138



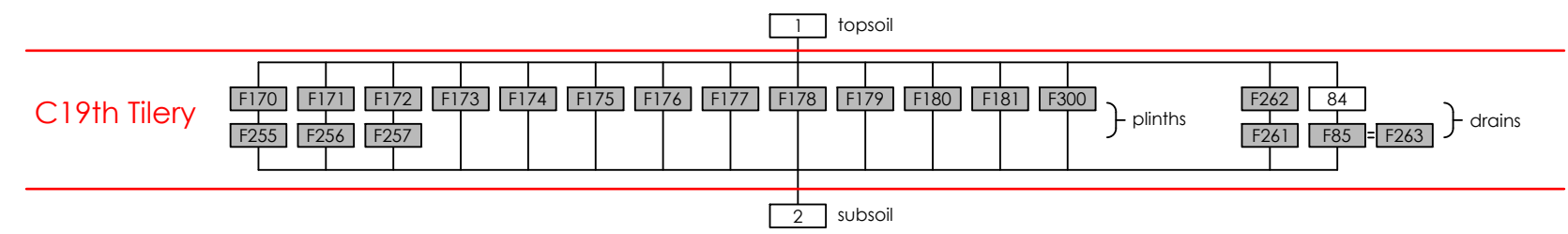
C19th Tilers

Furnace rooms and Scotch kiln 57, 130, 164



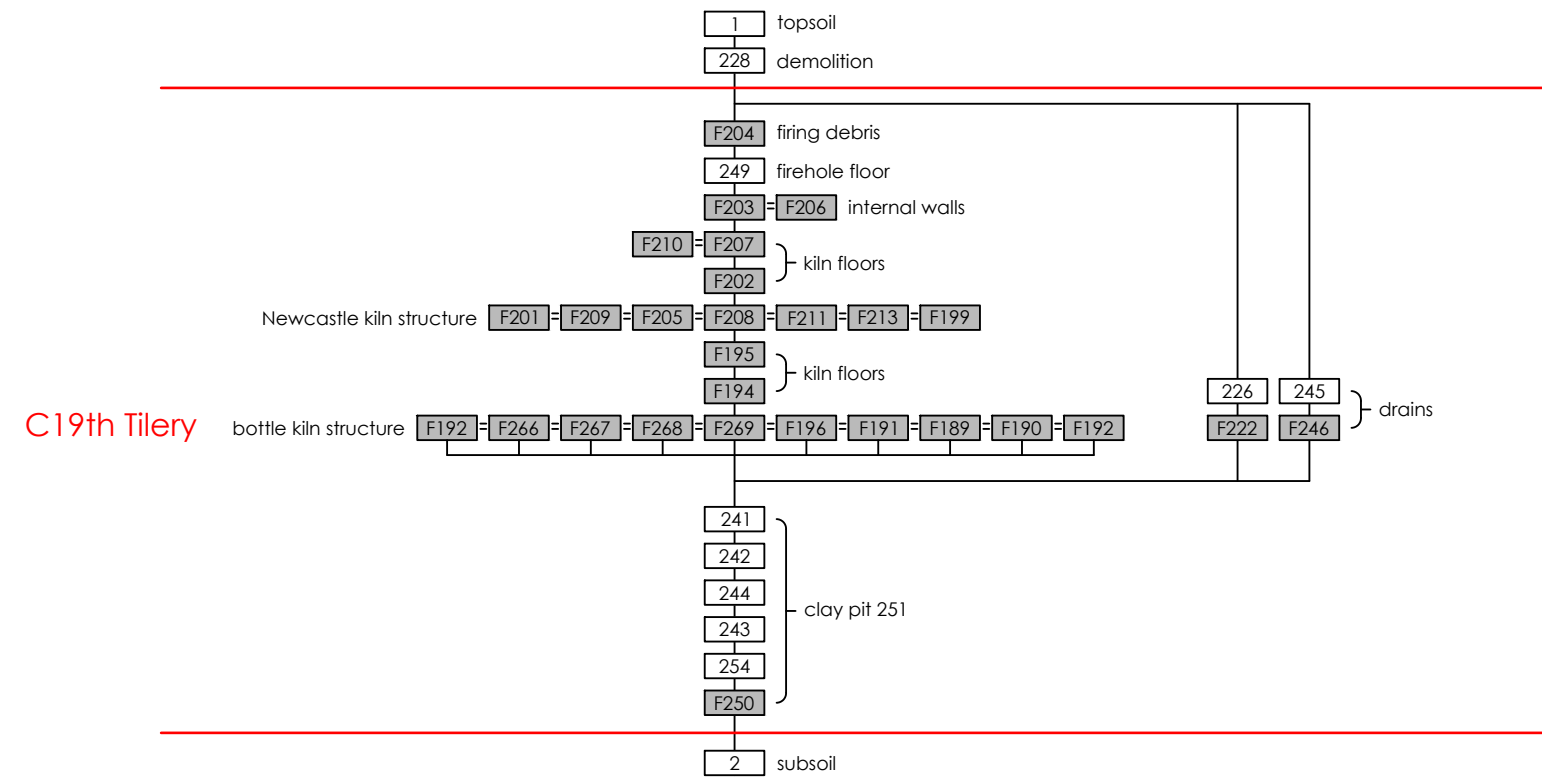
C19th Tilers

cold drying shed [220]



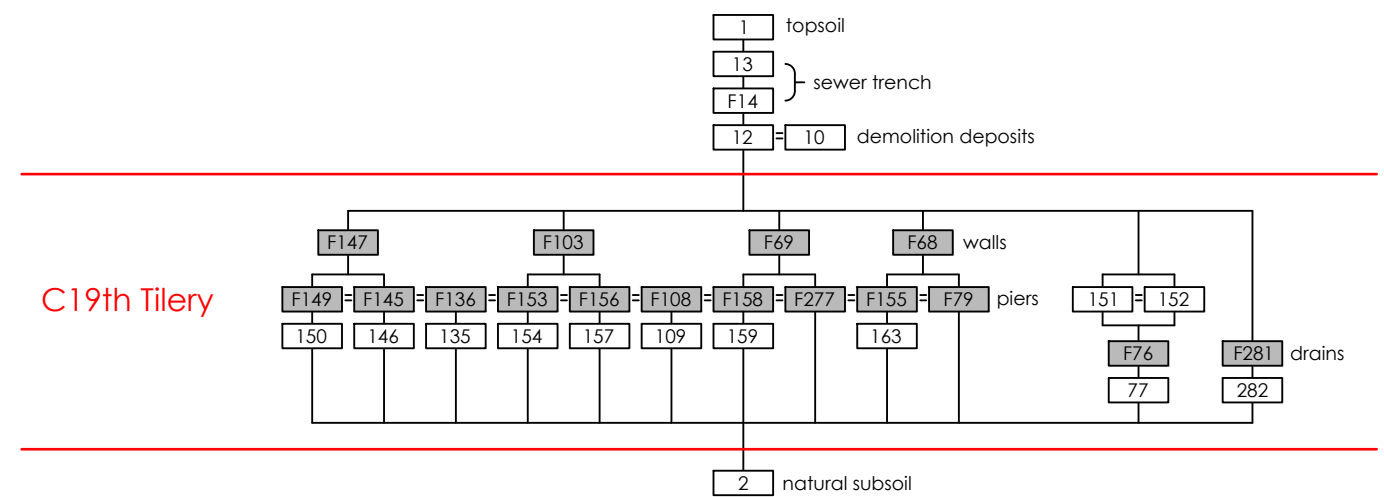
C19th Tilers

western kilns 198



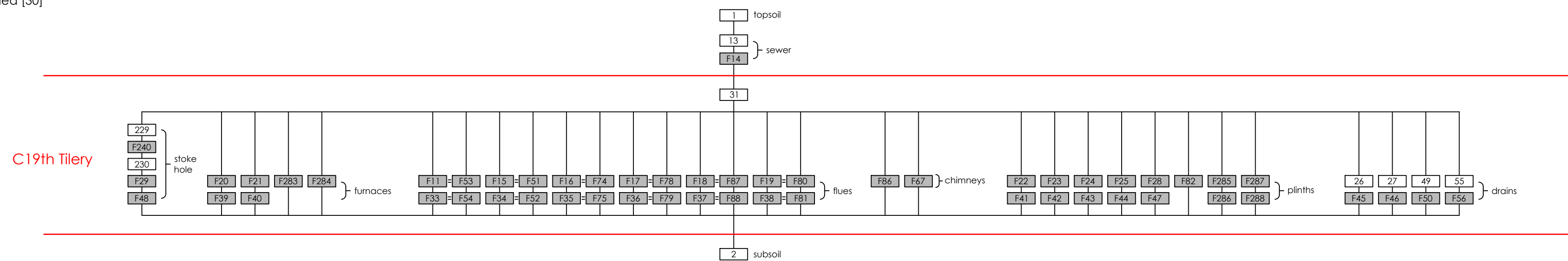
C19th Tilers

outer workshop 139



C19th Tilers

heated drying shed [30]



C19th Tilers

## Appendix 3: Finds assessment reports

### Pottery assessment

#### Results

- A3.1 The site produced 220 19th/early 20th century domestic and utilitarian sherds, many large, with a total weight of 12704g. They came from ten demolition, backfill and bedding deposits as well as waster pit fills. Table 1.2 shows sherd numbers from each context together with the range of wares represented.
- A3.2 Notable and dateable fragments included one complete and one partial, small, round glazed white earthenware 'Nature's Herbal Ointment' jars from [12], each 46mm high x 32mm diam, with seated lids. A further small seated lid, probably for the same product, came from [F164]. The jars are black printed below the glaze with the manufacturer's name, Frederick W Hale of Covent Garden, London, along with extensive recommendations for the ointment's efficacy in a wide variety of ailments and for its use. FW Hale was an American, born 1848, who developed his herbal ointment business post 1883 in both the US and England. The style of these jars suggests a date of around 1905.
- A3.3 Ash pit fill [166] produced a brown-glazed stoneware rim, neck and part shoulder from a flagon with internal screw thread, printed with the words 'PICKUP BROS BOTANICAL BREW LOW GRANGE RD, \*PENNYM\*\*\*, likely referring to Spennymoor. The Pickup Brothers were related by marriage to the Fentiman family, notable botanical brewers. They first worked with the Fentimans, then separated to form their own botanical brewing company in 1903.
- A3.4 Various contexts [10, 12, 138, 140, 158] had fragments from two sponge-printed earthenware chamber pots, one with a floral design in purple, the other with green sponge-printed leaves and blue lines, neither scheme very well executed. Sponge-printed earthenware dates to post 1840.
- A3.5 Other vessels had joining sherds found in different contexts, e.g. a rectangular 'Willow Pattern' dish with sherds found in contexts [10] and [12]. This suggests either that several backfills were made at the same time or that there was mixing of the fills before deposition.

#### Discussion

- A3.6 All the pottery can be dated to the 19th or early 20th century. Some more closely dateable pieces could be from the lifetime of the tiler itself (e.g. the sponge printed wares of 1840+), though of course they could be later. But others (Pickup Bros flagon and Herbal Ointment jars, 1900s) post-date the existence of the tiler. The mixed dating of the contexts makes the later date for the use and deposition of the pottery more likely.

#### Recommendation

- A3.7 No further work is recommended.

### Animal bone assessment

#### Results

- A3.8 Identifiable animal bone fragments were hand-recovered from three contexts, [12, 138 and 140], relating to the demolition of the tile works and subsequent backfill

with domestic rubbish in the later mid-19th/20th century. Bones were also found in context [10], a later sealing and consolidation deposit.

Context [10]

- A3.9 This produced only rabbit bones, mostly from one adult individual with fused epiphyses. However, there are two right femora, indicating that two animals are represented. These may be relatively recent natural mortalities on site.

Context [12]

- A3.10 Cattle and domestic fowl are represented. The cattle elements comprise one second phalanx, two incisor teeth and two sections of cattle-size rib shafts with saw mark butchery. The domestic fowl bones may all derive from one bird. There is a distal humerus, a pair of radii and a tarso-metatarsus with no spur.

Context [138]

- A3.11 The majority of the animal bones found were deposited in this context, which are a mixture of food refuse and pet burials.
- A3.12 An adult dog had been buried here. Parts of both forelegs, the rib cage and one hind leg have been recovered. A juvenile is represented by one femur with unfused epiphyses.
- A3.13 Horse is represented by a metatarsal with the distal end chopped off. A largely complete cattle mandible has fragmented on lifting. The teeth indicate this was a young animal, less than two years old, with no wear on molar 2. There are also single fragments of ulna shaft and ischium and also two cattle-size rib shafts with saw mark butchery.
- A3.14 The sheep finds are a sawn humerus, a broken mandibular molar and three sheep size rib shaft fragments.
- A3.15 The only evidence for pig is a single deciduous incisor tooth.

Context [140]

- A3.16 Only cattle remains were found: part of a male acetabulum and pubis with saw mark butchery and two proximal ribs, one fused and one unfused, both also with saw mark butchery.

Discussion

- A3.17 This small collection encompasses both food waste from cattle, sheep, pig and chicken; pet burials of dogs and possible recent natural mortality of rabbits. The food waste is predominantly from beef consumption. The prevalence of saw mark butchery and robust size of the cattle bones reflect the 19th century origin of the deposits. Sheep consumption appears to be limited to a half shoulder joint in context [138]. The single pig tooth from [138], like the single sheep tooth, may be incidental inclusions in the soil used for backfill. Despite the presence of two dogs in context [138], no gnawing marks were seen in the assemblage.

Recommendation

- A3.18 No further work is recommended.

### Worked bone object assessment

#### Results

- A3.19 Context [12] had a small (15mm diameter) complete, 4-hole bone button, slightly dished, with an incised line set 3.5mm from its front edge. 19th/20th century.

#### Recommendation

- A3.20 No further work is recommended.

### Leather assessment

#### Results

- A3.21 Twelve pieces of leather (10 waterlogged) came from four demolition/dump contexts. Where identifiable, all are parts of 19th or early 20th century boots and shoes. The leather is catalogued below:
- [10] : Mid-part of boot/shoe sole, 87mm long x 53mm across the waist. It is made up of 3/4 layers, held together by tiny (2mm) copper alloy tacks, placed at 3 per 10mm.
- [12] : A very damaged left foot insole layer, 252mm long, heel and toe edges lost. Remains of three nails on the forepart underside and two on the heel seat.
- [12] : Damaged and ragged mid-part sole layer, 75mm long x 45mm wide. Impressions of other sole components visible on one side.
- [12] : Two pieces of strap, 122 and 126mm long. The shorter piece, 21mm wide max, has an intact tapered end and a 6mm diameter perforation at its mid-point. The other non-joining fragment has both ends torn. It tapers from 26-16mm wide with two large 12mm perforations.
- [12] : Three heels from different pieces of footwear, 80, 73 and 59mm wide. The largest and smallest are made up of 5 or 6 layers of leather, the other has just two or three. All have a row of hobnails around the edge on the underside.
- [138] : Dry. Mid-part and heel seat from a left foot sole layer, 170mm long x 36mm across the waist and 52mm wide across the heel seat. Strips of leather packing survive along the waist on one side, held in place by tiny (2mm) copper alloy tacks placed at 3 per 20mm. Iron corrosion suggests the missing heel had hobnails.
- [138] : Dry. Heel from a different shoe or boot, 57mm wide max, made up of three surviving layers of leather held together by 2mm copper alloy tacks placed at 2 per 10mm.
- [138] : Fragment of sole edge, heel and toe missing, 185mm long. Two/three layers held together by 2mm copper alloy tacks placed at four per 20mm.
- [F164] : Fore and mid part of sole layer, 214mm long, 44mm across the waist, heel lost. Toe shape is squarish. Packing strips survive at forepart and waist, held by 2mm copper alloy tacks placed at four per 20mm.

#### Discussion

- A3.22 The small assemblage is wholly made up of very damaged and fragmentary pieces of footwear, suggesting deliberate disposal of unwanted, worn-out items, possibly alongside other discarded household rubbish.

#### Recommendation

- A3.23 The material has been photographed for inclusion in the site archive. No further work is recommended. The leather will be discarded.



## Wood assessment

### Results

- A3.24 Context [10] had two pieces of probably associated, but non-joining, waterlogged softwood, 285 and 118mm long. The larger piece is rectangular in section, c.40 x 31mm, both ends broken, with the remains of an iron nail shank visible in a hole/split mid-length. The other piece is more damaged and of irregular shape, c.30 x 40mm max. This piece has one pointed end, but this is likely the result of water action. Both pieces have an abraded appearance. Though obviously pieces of converted timber with a particular use, this cannot now be determined.

### Recommendation

- A3.25 The wood has been photographed for inclusion in the site archive. No further work is recommended. It will be discarded.

## Clay pipe assessment

### Results

- A3.26 A small assemblage of 17 clay tobacco pipe fragments came from 6 backfill, demolition and bedding contexts (Table 1.3). None has a maker's stamp or initials.
- A3.27 One bowl from [140] has ribbed decoration and the other has floral decoration along the seam, both suggesting a date of c.1800-1830, as does the heel shape of the third bowl fragment, from [138]. Two of the pipe stem fragments from [138 & 140] have shaped mouthpieces.

### Discussion

- A3.28 This is a very small assemblage, but the dateable pieces suggest disposal during or shortly following the life of the tillery.

### Recommendation

- A3.29 No further work is recommended.

## Glass assessment

### Results

- A3.30 Twenty complete drinks, foodstuffs, and medicine bottles, along with 26 bottle and window sherds were hand-recovered from 5 backfill contexts, with most (15) coming from ash pit fill context [166]. Table 1.4 shows numbers and contexts.
- A3.31 None has a surviving label, but several are embossed with the maker's name or the bottle's contents. Complete bottles which could be identified and/or dated are catalogued below:

[12] : blue/green, weathered bottle, 238mm high x 68mm diameter, ?mouth-blown, with wide (45mm diameter) added closure for a cork. 'KILNER BROTHERS DEWSBURY' embossed on underside. The Kilner company, later (and still) most famous for preserving vessels, made a wide variety of glass bottles and jars at their extensive Dewsbury factory in the late 19th/early 20th century. ?Carbonated soft drinks bottle.

[138] : blue/green, slightly weathered bottle, 205mm high x 66mm diameter, mould-made with applied lip for a cork. 'ROBERT THOMPSON BISHOP AUCKLAND' embossed on the bottle, along with an image of a cockerel. c.1900. Soft drinks bottle.

[138] : blue/green, weathered bottle, 162mm high, hexagonal in shape, 65 x 38mm, , mould-made with applied closure for a cork. 'JC ENO'S EFFERVESCING FRUIT SALTS' embossed on one side. 1900s. Medicinal.

[166] : clear, unweathered bottle 173mm high, square section 40 x 40mm, mould-made with external screw thread and the remains of a metal cap. 'SCWS' (Shieldhall Co-operative Wholesale Society) and 'SHIELDHALL' embossed along the sides. 1900s. ?Relish. Foodstuff.

[166] : green unweathered, necked bottle, 262mm high x 72mm diameter, 'VAUX & Co' embossed around the base. Internal screw thread and Vulcanite and cork stopper, stamped 'VAUX' *in situ*. 1900s. Beer.

[166] : clear, unweathered bottle 305mm high x 77mm diameter, mould-made, necked bottle with applied closure for a cork. 'GLENSEL PATTERSON'S' embossed around shoulder, 'J PATTERSON & CO LTD' and 'GLASGOW' embossed down bottle length. c.1900. Whisky bottle.

[166] : clear, unweathered bottle 256mm high x 74mm diameter, mould-made with internal screw thread. 'WOOD & WATSON DURHAM' embossed on the front, around an image of Durham Cathedral. This company, started in Bedlington, moved to Gilesgate, Durham in the 1890s. It continued in existence until the 1990s. Early 1900s. Soft drinks bottle.

[166] : clear, unweathered, mould-made bottle 212mm high, square-section 45 x 45mm with round neck and external screw thread with remains of a metal cap. 'GARTONS HP SAUCE' embossed down length. HP sauce was invented by Frederick Garton in 1896 in Nottingham. This bottle dates to the early 1900s. Foodstuff.

[166] : clear, unweathered, mould-made bottle 207mm high, square-section 45 x 45mm with round neck and closure for a cork. 'HOE'S SAUCE' embossed down its length. The Hoe's sauce company started in Manchester in the early 1900s. Foodstuff.

[166] : three clear, unweathered mould-made bottles 185mm high, square-section 42 x 42mm with round neck and closure for a cork. 'BOB'S SAUCE' embossed down the length. This product seems to have been a relish, produced in the early 20th century, but little further information was found. 1900s. Foodstuff.

[166] : clear, unweathered mould-made bottle 162mm high, rectangular section 65 x 35mm, with a short round neck and closure for a cork. 'FENNING'S FEVER CURE' embossed on one side. 1940s/50s. Medicinal.

[166] : blue/green unweathered bottle, 191mm high x 57mm diameter, mould-made with added lipped closure. Upper body is faceted. 'E N JONES BISHOP AUCKLAND' embossed along its length. 'PATENT REG No 731697' embossed on its underside. Soft drinks bottle 1900s.

[166] : clear, unweathered mould-made bottle 165mm high, rectangular section 57 x 35mm. 'MANDALL & Co LTD' and 'NEWCASTLE ON TYNE' embossed along the sides and 'Licoricine acts like magic for coughs and colds' embossed on one side. 1920s Medicinal.

[166] : clear, unweathered, mould-made bottle 145mm high, rectangular section 45 x 27mm, with closure for a cork. 'SCOTTS EMULSION' embossed on one side. This was a patented mixture of cod liver oil, lime and soda, emulsified to improve palatability. c.1900. Medicinal.

[166] : brown, unweathered circular jar 97mm high x 50mm diameter, mould-made with external screw thread and the remains of a metal lid. 'KRUSCHEN SALTS' embossed on the base. Distributed in Britain and America from the 1920s, this was a

product claiming a cure for a variety of ailments from rheumatism to constipation. 1920s +. Medicinal.

[166] : small, clear, unweathered, mould-made bottle 70mm high, oval in section 65 x 52mm, with lipped closure for a cork. 'BRITISH ISINGLASS Co LTD GRIMSBY' embossed on the underside. Isinglass is product made from the swim bladders of fish. It was and is widely used in food and other products. This is likely to be a glue bottle, 1920s. Domestic.

#### Discussion

- A3.32 The assemblage is dominated by bottles dating to the early 1900s, with a few later examples from the 1920s and one outlier, possibly dating to the 1940s or 50s. They probably represent the disposal of household rubbish in the tilery backfill. All the bottles post-date the abandonment of the tilery itself.

#### Recommendation

- A3.33 All the complete bottles have been photographed for inclusion in the site archive. No further work is recommended.

#### Ceramic building materials assessment

##### Results

- A3.34 A total of 77 substantial pieces of ceramic building material were hand-recovered and retained from the excavation, from 11 backfill and demolition deposits. They are listed in Table 1.5.
- A3.35 The assemblage includes earthenware pantiles, quarrels (near square floor tiles), bricks, field drain pipes and ventilation/heating tiles. Most of the recovered material appears to comprise examples of the output of the tilery on site.

##### Pantiles

- A3.36 Twenty-seven fragmentary or nearly complete pantiles were retained. Pantiles came into use in Britain as a roofing material in the 17th century, their 'S' shaped profile giving them good waterproofing qualities. Examples here are nearly all in similar, fully oxidised, hard-fired fabrics, either orange/red or purplish/red in colour, sparsely tempered with very fine sand. Just one fragment from [3] is in a reduced fabric. Where more complete, the top edge of the tile is seen to be curved, three examples retaining the small, rectangular nib which protrudes from the middle of the top edge and was used to hang the tiles onto the roof battens. One face of the tiles is sanded, the other smoothed. The three almost intact examples are variable in size (325mm long x 255mm wide x 12mm thick; 372mm long x 260mm wide x 12mm thick; 346mm long x 276mm wide x 16mm thick), suggesting that a variety of sizes was available or that tiles were made to order. Some fragments from [264] are completely overfired and are likely to be wasters.
- A3.37 One small fragment from context [3], 15mm thick, has a black glaze on its outer face. A similar example came from recent excavations in Durham City (Archaeological Services 2019b). These tiles date to the late 18th or (more probable here) early 19th century.

##### Floor tiles/quarrels

- A3.38 Five examples were found in contexts [270 & 273], two almost complete and a third with an embossed stamp on its reverse. These are nearly square floor tiles in an

homogenous, oxidised orange/red fabric, again very sparsely tempered with fine sand, the top surface and edges lightly sanded. One of the more complete examples from [270] measures 230 x 225mm x 50mm thick, its underside smoothed and lightly criss-crossed. Another example, from [273], with only the thickness (43mm) measurable, also has a sanded top and edges, but the underside here has an (incomplete) embossed stamp showing a square or rectangle with a smaller diamond shape inside. This is possibly an identifying mark of the tiler, though it was not observed on other products.

#### Bricks

A3.39 Eighteen complete or partial examples were retained. A complete example from [3], 190 x 115 x 65mm thick, in a coarse, buff/orange fabric tempered with sand, grit and crushed tile, has a thick vitrified deposit on one end. This is possibly a kiln firebrick.

A3.40 A large, complete brick, 260 x 110 x 58mm with one sanded face, from [274], may have been from the 19th century tiler buildings. It has obviously been in use, as one end is blackened, and it also has mortar traces. Its surfaces are cracked and the width and thickness are uneven. Another complete brick from [12] is likely to be of more recent date. It is an even, very hard-fired example, 215 x 100 x 70mm, with a frog on both faces, one of which is stamped 'LUMLEY'. This is a product of Lumley Brickworks, originally part of the colliery of the same name. The colliery closed in 1966 and the brickworks were demolished in the 1990s. Lumley bricks were manufactured throughout the 19th and 20th centuries.

A3.41 Several examples of fragmentary and complete overfired bricks were seen in context [264], including a distorted single, complete brick and two pairs of two complete bricks, also distorted and melted together. These finds suggest that bricks as well as tiles were part of the tiler's output.

#### Field drains

A3.42 Finds suggest that both tubular and 'U' shaped (horseshoe) field drains were made by the tiler. Seventeen pieces were found altogether. Tubular drains were found in three diameters – 50, 66 and 110mm, the smaller two sizes having a built-in base plate. Flanged, 'U' shaped drains are c.115mm deep with a 20mm wide 'U' shape. One section from [3] has both short ends intact and is 327mm (c.13") long. Pieces of distorted, overfired 'U' shaped drain also came from this context.

#### Ventilation/heating tiles

A3.43 Ten fragmentary examples of these were found. They were likely a product of the tiler, but some from context [10] have been in use, as the top surface shows discolouration and mortar survives along the edges. The most complete example, from [10] is 192 x 209 x c.32mm thick, in an orange/red fabric. The top surface has circles of five x3mm diameter perforations, with a sixth in the centre, set c.25mm apart, with corresponding 20mm diameter x 27mm deep single perforation on the underside of the tile. Such tiles were used in floors and walls to allow the distribution and circulation of heated air. Similar pierced tiles have been found in excavations on the site of a 19th century hothouse (Archaeological Services 2014) and but their principal use was in the floors of malting and grain drying kilns, where they were supported on inverted T-section iron bars (Archaeological Services 2019a).

#### Discussion

- A3.44 This assemblage reflects some of the output of the 19th century tiliary, though undoubtedly only those pieces which failed to make it onto the market, for whatever reason.
- A3.45 If earthenware roofing tiles formed a large part of the tiliary's output, perhaps the upsurge in house building, occasioned by colliery expansion from the mid-19th century, may have contributed to its demise, as pit village houses are more usually roofed in slate.

#### Recommendation

- A3.46 Selected representative, more complete and interesting examples have been photographed for inclusion in the site archive – as indicated in Appendix 1.5 below. No further work is recommended. The assemblage may be discarded.

#### Iron objects assessment

##### Results

- A3.47 The assemblage of 56 hand-recovered fragmentary and mainly highly corroded iron artefacts came from 9 demolition/backfill and dump contexts. Selected pieces have been photographed for inclusion in the site archive and some are described below. Table 1.6 shows the range of material recovered.

##### Nails/bolts

- A3.48 Some 13 nails or bolts were found, both fragmentary and complete, including a large complete bolt 140mm long, from context [12], with a 20mm diameter shank and a flat, square nut 20 x 20mm, and a large nail 282mm long, from context [140], with a square-sectioned, tapering shank, 22 x 22mm and a slightly domed circular head 37mm diam.

##### Containers

- A3.49 Three curved (probable) bucket handles were found, two complete examples from [140] and [F164] and one part handle from [12]. All have hooked ends for attachment to the bucket. Along with the handle found in [F164] was a galvanised or tinned sheet metal bucket/container base 234mm diameter x 3.5mm thick.
- A3.50 Remains of a highly corroded cooking pot/cauldron came from context [12], found in 5 pieces plus the intact circular base. The three largest fragments of the vessel can be placed to provide the diameter (180mm) and a near profile (c150mm high) for the vessel. The metal is c.4mm thick. The bellied pot had a flat base and a beaded rim. The remains of a solid tubular handle, 21mm diameter, can be seen on one side, just below the rim. 19th century.

##### Buckle

- A3.51 Context [12] had a complete rectangular buckle 65 x 44mm, the sub-rectangular metal of the frame measuring 9 x 10mm. The buckle pin is still *in situ*, with traces of desiccated leather adhering. Probably a strap fastener rather than clothing.

##### Knife blade

- A3.52 The two fragments of knife blade from [10] barely join and are 155mm long together. The 20mm wide blade had a flat back and a curved cutting edge.

#### Hinged door

- A3.53 Context [228] produced part of a highly corroded, hinged ?door or inspection hatch, 415mm long x 315mm wide x c5mm thick. All edges are broken. The top has one intact looped lug, 25mm wide, probably intended to take a bar, thus forming a hinge. On one face is a rectangular area, outlined by a slightly raised border, within which are the remains of four large ?bolts. The other face has what appears to be an added rectangular plate, of unknown purpose, c.220 x 250 x 5mm, held in place by these bolts - possibly a repair? The object is very highly corroded and detail is obscured by adhering debris, particularly along the lower edge.

#### Covers/lids [Later recognised as blanking plates from furnace stoke holes]

- A3.54 Three ?complete lids/covers, along with two further fragments, were recovered. Two very similar ?complete lids came from [272]. These are semi-circular in shape, each 470mm long, one c.185mm wide and the other c.200mm wide. Each is 20mm thick and very heavy. The differing widths of the two suggest they were probably not used as two halves of the same lid. The outside edge of each is curved, but the inside straight edge of the semi-circle has a further curve cut from its centre. Each has a 20mm diameter hole near its outer edge. A further possible fragment, 190mm long x 210mm diameter x 11mm thick, around half the length of the pieces above, also came from this context.

- A3.55 Another, similar example came from [10], this one 457mm long x 220mm max width x 25mm thick. The shape of the object is the same as those from [272], again with a 20mm hole near the outside edge.

- A3.56 Context [241] produced another possible similar fragment, with only the outer curved edge intact. Its dimensions are 330mm long x 230mm wide x 30mm thick, with part of a hole visible on a broken edge.

#### Discussion

- A3.57 Where identifiable, the artefacts seem to be industrial in origin, though some (bucket handles, cooking vessel, knife) could also be interpreted as domestic debris. It is perhaps more likely that they represent discarded or broken pieces of tools, fittings and machinery which were not removed from the tilery before demolition took place.

- A3.58 The 5 lids or covers seem all to be of slightly different dimensions, suggesting that they were custom made for particular locations on the site. All the material - apart from a painted bicycle fork from context [140] - fits well into a 19th/early 20th century date range.

#### Recommendation

- A3.59 Selected objects have been photographed for inclusion in the site archive. No further work is recommended.

#### Copper alloy objects assessment

##### Results

- A3.60 5 copper alloy objects / fragments came from four backfill contexts, and are catalogued below:

[10] : an irregularly shaped fragment (c.87 x 58mm max) of thin (1mm) sheet from a can or container. The surfaces are covered with bitumen.



[12] : a section of baluster-decorated copper alloy stem, perhaps from an oil lamp stand, 180mm long x 52mm diameter max. Both ends are incomplete, one showing traces of iron corrosion. 19th/20th century.

[138] : small and highly corroded oval spoon bowl, 44 x 29mm max, broken at the handle end. Surfaces are rough and pitted. 19th/20th century.

[138] : a pair sugar tongs, apparently complete though distorted, 138mm long, made of rectangular-sectioned metal 12mm wide max x 1mm, tapering and terminating in small, pointed and slightly dished spoons 11mm wide. Undecorated. 19th/20th century.

[140] : a bent strip 78mm long, rectangular in section, 10 x 3mm, long ends and one short end intact. There is a 3.5mm perforation at each end (one broken) and a series of dimples of the same diameter along its length, set at c.3 per 20mm. Unknown industrial or mechanical use. 19th/20th century.

#### Discussion

- A3.61 This very small assemblage contains a mix of discarded household objects/waste and parts of objects probably in use in the tilery.

#### Recommendation

- A3.62 Selected objects have been photographed for inclusion in the site archive. No further work is recommended.

#### Industrial and fuel residues assessment

##### Results

- A3.63 Chunks of glassy grey/black, vesicular waste (1979g weight), deliberately broken up, came from demolition deposit context [273]. The outer surfaces have incorporated grit and small stones, suggesting deposition while the material was still plastic. This (probably) silica-rich waste may come from the inside of the tilery's firing kilns.

- A3.64 A small piece (17g weight) of burnt coke was recovered from [3]. May be domestic or industrial in origin.

#### Recommendation

- A3.65 No further work is recommended.



Photograph 1: Tiled buildings exposed in trench 57 during the 2017 evaluation. Note the very thin layer of soil over the masonry



Photograph 2: Part of a large dump of broken tiles in one of the former clay pits. A view looking west in the early stages of excavation





Photograph 3: Pantiles and floor tiles among the wasters dumped in a clay pit at the tilery site



Photograph 4: The burnt soil shows the shape of the brick clamp [9]. The stone in the foreground is the remains of the outer skin of the clamp. A view looking north-east





Photograph 5: The stripes of burnt and blackened soil show the arrangement of the base layer of bricks in the clamp



Photograph 6: The tiliary buildings. The reddened brick of the Scotch kiln 164 is flanked by the sunken furnace rooms 130 (left) and 57 (right), with the tiled floors in the moulding shop 168 beyond. The western kilns are in the distance, top left. A view looking west





Photograph 7: The Scotch kiln 164 and its furnace rooms are sunk into the ground. A view looking north-west



Photograph 8: The grey backfill of a modern sewer trench runs obliquely across the black floor of furnace room 57. A view looking west





Photograph 9: The east wall of furnace room 57 is stone with a brick lining. A view looking south



Photograph 10: The outer faces of the long side walls of the kiln lean inwards, and each has a slight curve towards the interior near its centre. A view looking north-west





Photograph 11 (left): The central fire mouth in the northern furnace room shows several rings of brick in the arch. The shape is distorted by heat and movement of the structure. The scale divisions are 100mm long

Photograph 12 (below): An iron blanking plate that would have covered the upper part of a fire mouth, found lying beside one of the stokeholes







Photograph 13: All of the blanking plates have lifting holes near their top edges. Their straight lower edges appear to be damaged. 100mm scale



Photograph 14: The southern furnace chambers. The 'old man' wall runs left-right. A gap in the brickwork at the right marks the position of the kiln chamber's door. 1m scale





Photograph 15 (left):  
Vitrified brick around the  
inner end of the  
stokehole and on the wall  
of one of the furnace  
chambers

Photograph 16 (below):  
Furnaces at the east end  
of the kiln during  
excavation, with two of  
the floor arches still in  
place







Photograph 17: The spacing of the furnace arches and the slots in the kiln floor are represented by the sloping brick faces in this view looking east along the kiln



Photograph 18: An oblique view of the east end showing the relationship between furnace arches, the external walls and the 'old man'. The kiln floor was just below the bottom of the white labels on the far wall





Photograph 19: One of the two surviving furnace arches. The 300mm scale is lying on the old kiln floor. A view looking north



Photograph 20: The north face of the Scotch kiln. Fan-shaped areas of purplish heat-affected brick can be seen above the stokeholes in the far wall





Photograph 21: The southern chambers seen from the west. This view shows the sloping floors and the discolouration of the furnaces, and the floor of the wicket



Photograph 22: The south furnace room 130, with an external paved area on its south side. A view looking west





Photograph 23 (left): The stone-flagged area [F59] in front of the fire mouths in the north furnace room 57. A view looking east

Photograph 24 (below): A similar paved strip [F133] leads to steps [F121] in the west wall of furnace room 130. The two brick structures are not keyed into the stone walls. Note the shallow indentation in the kiln wall, at the extreme right in this view







Photograph 25: The base of a probable window or loading door in the west wall of the south furnace room 130. 1m scale



Photograph 26: The damaged support block or buttress [F63] against the north wall of furnace room 57





Photograph 27: The drain opening at the north-east corner of furnace room 57. A view looking north



Photograph 28: The drain leads to this stone culvert [F185], which runs north from the kiln building





Photograph 29: The quadrant structure [F132] at the south-west corner of room 130, with a fan of end-set brick at its top



Photograph 30: The stones of the paved area [F124] south of furnace room 130 are stained with coal dust, suggesting that it was probably a fuel store





Photograph 31: The foundations of the buttress [F165] at the east end of the kiln have cut through the waste tile fill of the clay pit in the foreground. A view looking north-west



Photograph 32: The threshold [F93] on the west side of the moulding shop 168. A view looking east





Photograph 33: Plinth [F91], the central support for the roof of the moulding shop. A view looking south



Photograph 34: The tile-floored rooms A-D at the south end of the moulding shop. Note the slope at the right, caused by subsidence into the drain shown in Photo 68. Room A is in the foreground of this view, which is looking south-east





Photograph 35: A socket for a jamb or a hinge beside the door between rooms A and B. A view looking north: 300mm scale



Photograph 36: The damaged floor of room A seen from the east, with the door at the top left





Photograph 37: The floor in rooms A (foreground), B (centre) and C (far left) are on the same level, while that in room D (centre left) is lower. A view looking south



Photograph 38: Rooms B and C seen from the west. Blackened and broken paving marks a route between the fireplace in the foreground to Room C in the distance





Photograph 39: Brick and tile in the floor of Room B. 1m scale



Photograph 40: The fireplace or stove structure [F118] at the west side of room B, with stained tiles in front of it





Photograph 41: The stone step between rooms C and D. A view looking south



Photograph 42: The small tiled room D, seen from the north





Photograph 43: A patch of bricks [F116] in the angle between rooms A (top) and D (left). At the bottom right corner, the edge of a retaining board can be seen



Photograph 44: Brick paving [F97] and a possible hinge pin at the door into room E. A view looking north





Photograph 45: Two layers of different perforated tiles [F98] on the west side of room E. A view looking south-east. 300mm scale



Photograph 46: Tile floor [F98]. The maltkiln tiles in the upper layer are bedded on sand laid over the larger interlocking tiles, each of which has three holes





Photograph 47: The small brick and tile area [F110], outside the south wall of the moulding shop. A view looking north



Photograph 48: The brick and stone plinth [F95] for a roof support at the middle of the moulding shop's west wall. A view looking east





Photograph 49: The stone base of the plinth [F136] at the centre of the outer workshop 138 has a surveyor's cross cut into its upper surface



Photograph 50: The brick and stone blocking wall [F103], at the south side of the outer workshop. A view looking south-west





Photograph 51: The brick floor or small room 138 (upper left) lies over the layers of tile and brick waste that fills clay pit [F250]. A view looking south-east



Photograph 52: The heated drying shed 30 seen from the outer workshop. The flues extend beyond the grassy baulk to the far edge of the excavation. A view looking north





Photograph 53: [F23], one of the brick and stone plinths that carried the roof supports in the drying shed 30. A view looking west



Photograph 54: Looking east across the shed. In the middle of the view is the French drain [F46] and the plinth [F24], with brick flues beyond





Photograph 55: The stoking pit [F29] before excavation. A view looking west



Photograph 56: The brick vault of the eastern furnace [F284] and the level capping of flue [F11], seen from the south





Photograph 57: Furnace [F284] seen from the east



Photograph 58: Brick flues between the baulk and the northern edge of the excavation, with the dark fill of the stoking pit [F29] visible at the far end





Photograph 59: Section through one of the single flues [F36]. 300mm scale



Photograph 60: Section through one of the double flues [F11]. The side of the right-hand channel has partly collapsed into the void





Photograph 61: Flues and chimney bases south of the baulk, seen over the door to the outer workshop. The near line of bricks, left of centre, is the capping of drain [F76]. A view looking north.



Photograph 62: Looking west across the south end of the heated drying shed. The modern sewer trench is at the right and the French drain [F26] is in the foreground





Photograph 63: Double flues [F80] and [F87] and the single flue [F78] converging on the chimney base [F86], at the upper left



Photograph 64: The double flue [F80] curves around the east side of plinth [F82]. The tile-filled drain [F46] can be seen at the left





Photograph 65: The western chimney base [F86] with a single opening serving flues [F80/F87] at the left and another for flue [F78] at the right



Photograph 66: Section through the backfill layers, left of centre, in the stoking pit [F29], and the later brick wall [F240] that cut off the western furnace. A view looking east





Photograph 67: One of the damaged plinths that were almost all that remained of the unheated drying shed 220



Photograph 68: Land drains and broken roof tiles in the eastern eaves-drip trench [F261]. This continues the line of the drain that caused subsidence in the moulding shop. At the left is plinth [F301]





Photograph 69: The western kilns 198. A view looking south-west



Photograph 70: The circular wall [F192] and edge-set brick floor [F195] of the bottle kiln, overlain by later features. A view looking north





Photograph 71: A damaged stone floor [F196], foreground and left, was separated from the south-west side of the curved wall by fan-shaped brick areas [F189, F190]



Photograph 72: Another fan-shaped structure on the north-west side of the kiln. The flagged surface [F196] is visible in the background. A view looking south-west





Photograph 73: Detail of the northern fan structure, overlain by the later kiln's flash wall



Photograph 74: The sloping brickwork [F213] and [F211] that supported the vault of the Newcastle kiln. The door and the fire holes were at the lower right in this view, which is looking south-west. An iron door can be seen on the floor of the structure at the bottom left





Photograph 75: The stone footing [F212] under the north side of the vaulted kiln was laid on broken tiles dumped into the clay pit [F50]. A view looking south-east



Photograph 76: The upper surface of the south-eastern vault block [F213]





Photograph 77: The north-west kiln lining wall [F201] is not bonded with the sloping brickwork of the chamber. 300mm scale



Photograph 78: The base of the outer wall of the Newcastle kiln [F205] and the thinner flash wall [F203]. Part of the grey firing waste deposit [204] has been excavated. The kiln door was around the far end of the scale. A view looking west





Photograph 79: The remains of the floor of the Newcastle kiln [F207] over the bottle kiln floor [F195]. A view looking south



Photograph 80: The outer [F219/F220] of the two large walls at the south-east side of the kiln. Note the edge-set courses and the absence of any floor. A view looking east





Photograph 81: The smaller hearth between the long walls has evidence of burning on its brick floor [F218]. In the foreground is an unexplained section of wall [F197], set at an angle to the rest of the Newcastle kiln



Photograph 82: The iron door that was found lying on the brick floor [F218]





Photograph 83: Another of the blanking plates from the Scotch kiln; compare with the example shown in Photo 13. The wear or erosion of the lower edge is more pronounced here. 100mm scale



Photograph 84: The iron door from the small hearth at the Newcastle kiln, with the hinges at the left and a flange to cover the junction with a matching door at the right. A block of rust has fallen off to reveal the moulded frame, lower right





Photograph 85: Detail of the moulded frame and the flange that covered the gap between this door and a second one to its right



Photograph 86: The plate attached to the inside face of the door



Photograph 87  
(above): This edge-on view shows the bold projection of the moulded frame, the presumed rivet heads, and the half-round flange on the door's edge

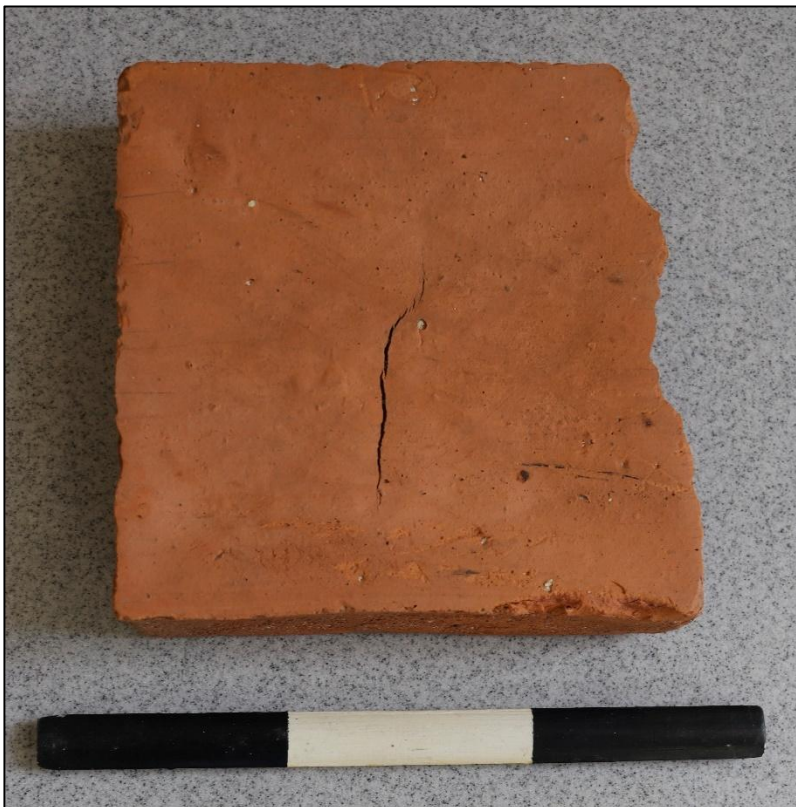


Photograph 88  
(left): A damaged floor tile and a complete pantile, both products of the Crow Trees site. The scale is 300mm long





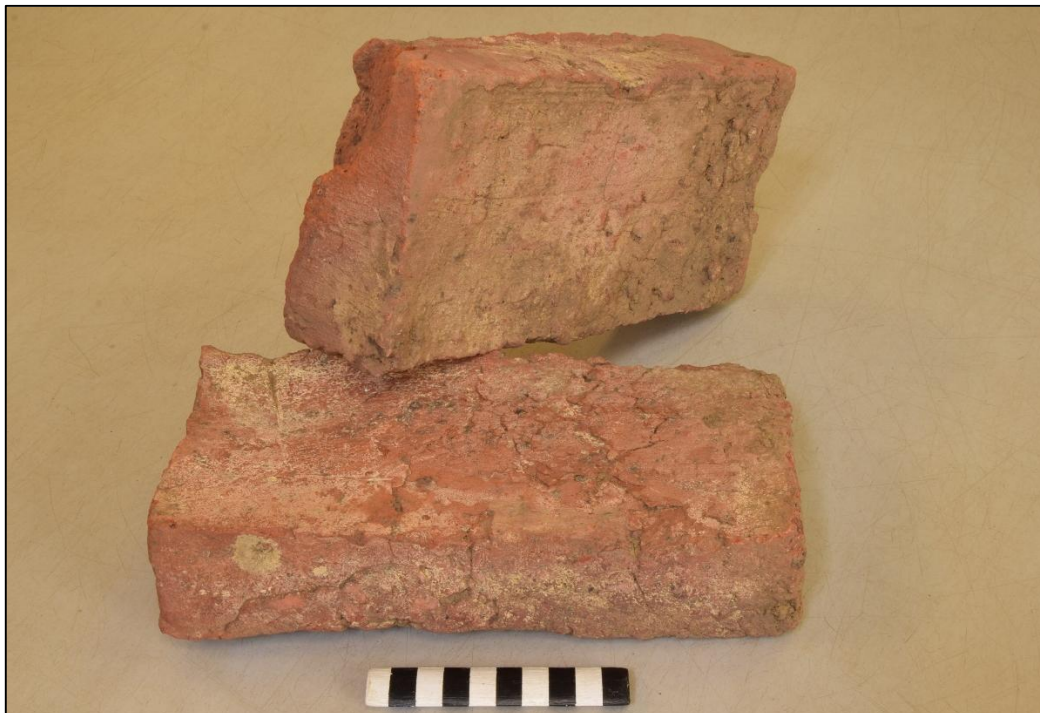
Photograph 89:  
Some examples  
from the many  
tonnes of broken  
tile fragments seen  
around the kilns



Photograph 90: A  
near-complete  
floor tile or quarrel.  
Note the faint  
criss-cross pattern  
on the face



Photograph 91: A quarrel with an embossed pattern. This was the only example of a stamped or decorated tile seen at the site



Photograph 92: Two of the complete bricks recovered from the site. 100mm scale





Photograph 93: A kiln brick with a heavily burnt end. 300mm scale



Photograph 94: A 'blown' waster brick, perhaps from clamp firing



Photograph 95: Another example of failed firing; the brick is distorted and broken



Photograph 96: Two bricks that have stuck together during burning in a clamp





Photograph 97: Sections of cylindrical and U-shaped land drains. 300mm scale



Photograph 98: Extrusion marks are visible on the surfaces of these land drain sections



Photograph 99 (above): The underside of one of the maltkiln tiles. The holes stop short of the upper surface

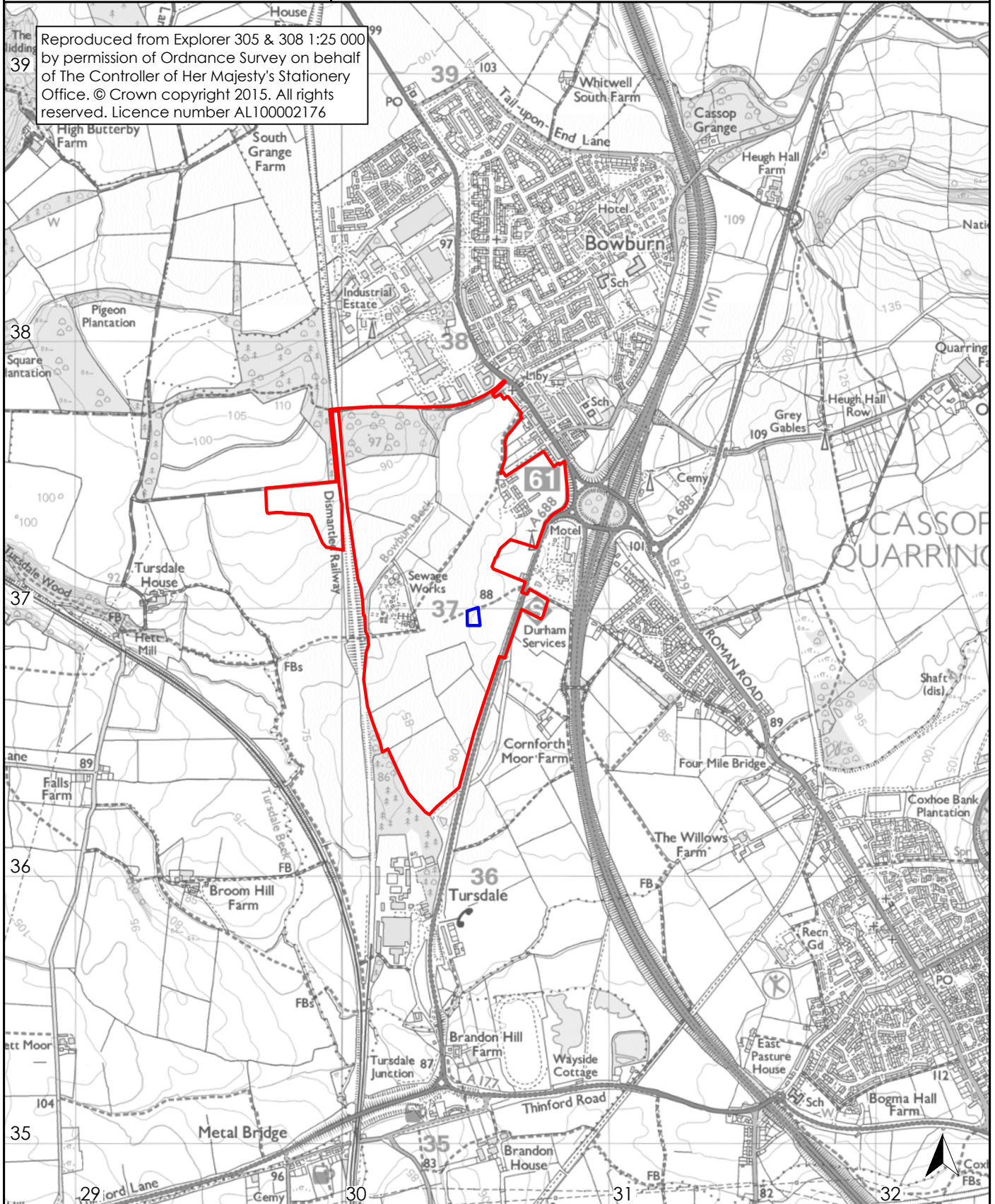


Photograph 100 (left): The top of a similar tile, showing the small holes at the end of each of the larger openings shown above. The scale division is 100mm long



Figure 1: Site location

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site boundary

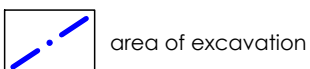
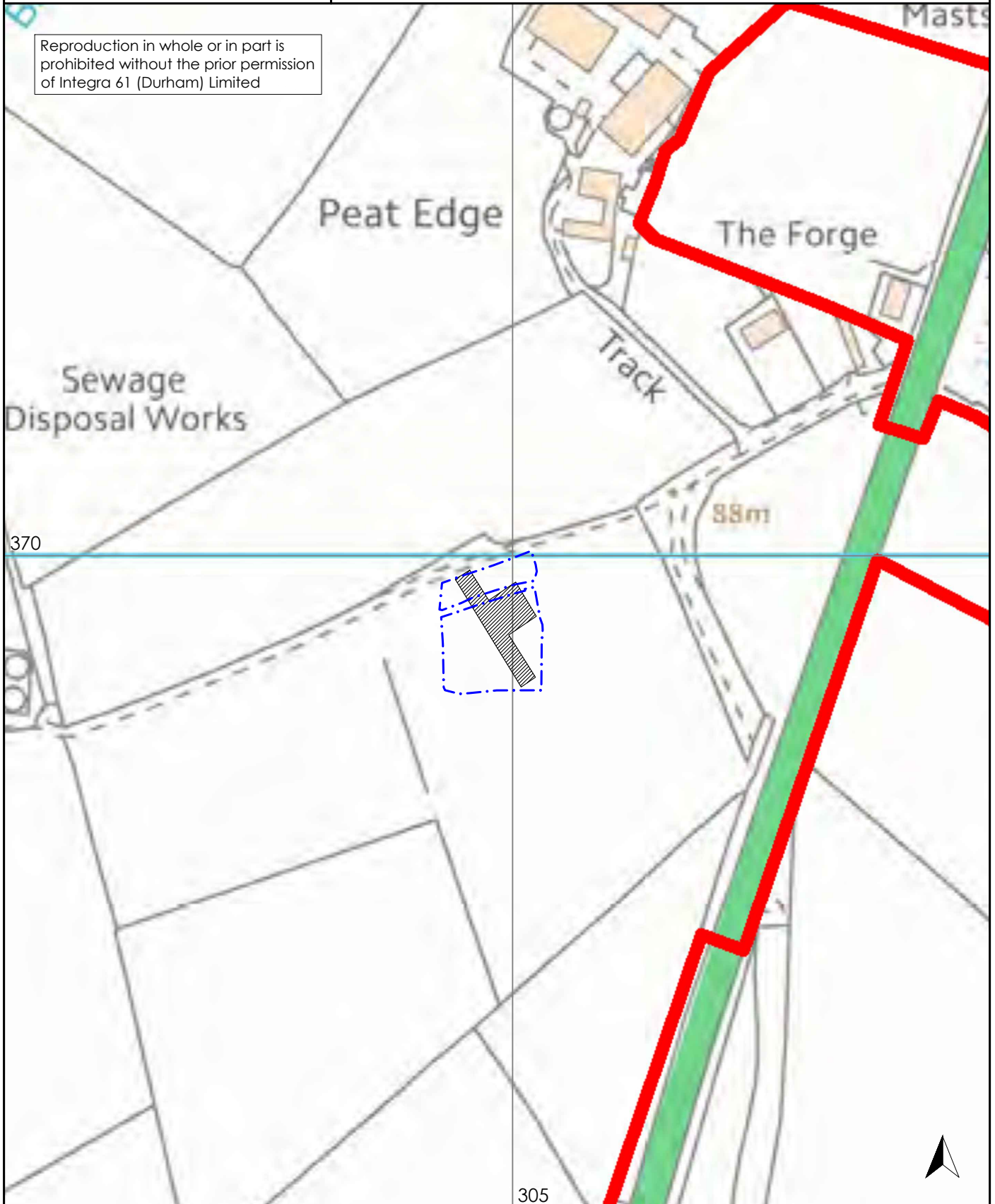


excavation area

0 1km  
scale 1:20 000 for A4 plot

Figure 2: Trench location

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Integra 61  
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post-excavation analysis  
report 5757

Figure 3: Extract from the 1839 tithe  
map

0 100m  
scale 1:2000 for A4 plot

 site boundary



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Figure 4: Extract from the 1st edition  
Ordnance Survey map, 1857

0 100m  
scale 1:2000 for A4 plot

 site boundary





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Figure 5: Extract from the 2nd  
edition Ordnance Survey map, 1897

0 100m  
scale 1:2000 for A4 plot

 site boundary



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Figure 6: Extract from the 3rd edition  
Ordnance Survey map, 1919

0 100m  
scale 1:2000 for A4 plot

 site boundary





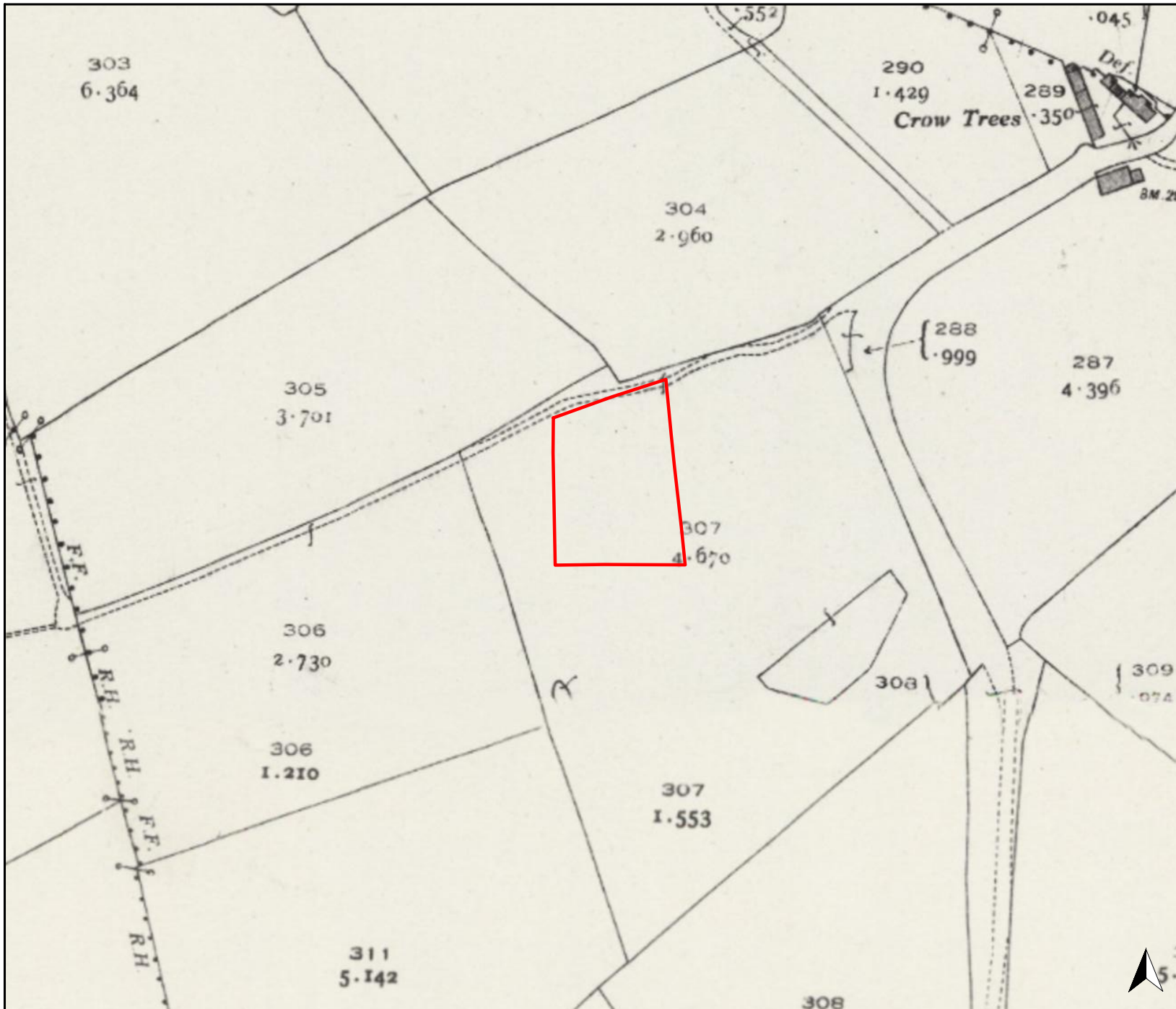
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Figure 7: Extract from the 1939  
Ordnance Survey map

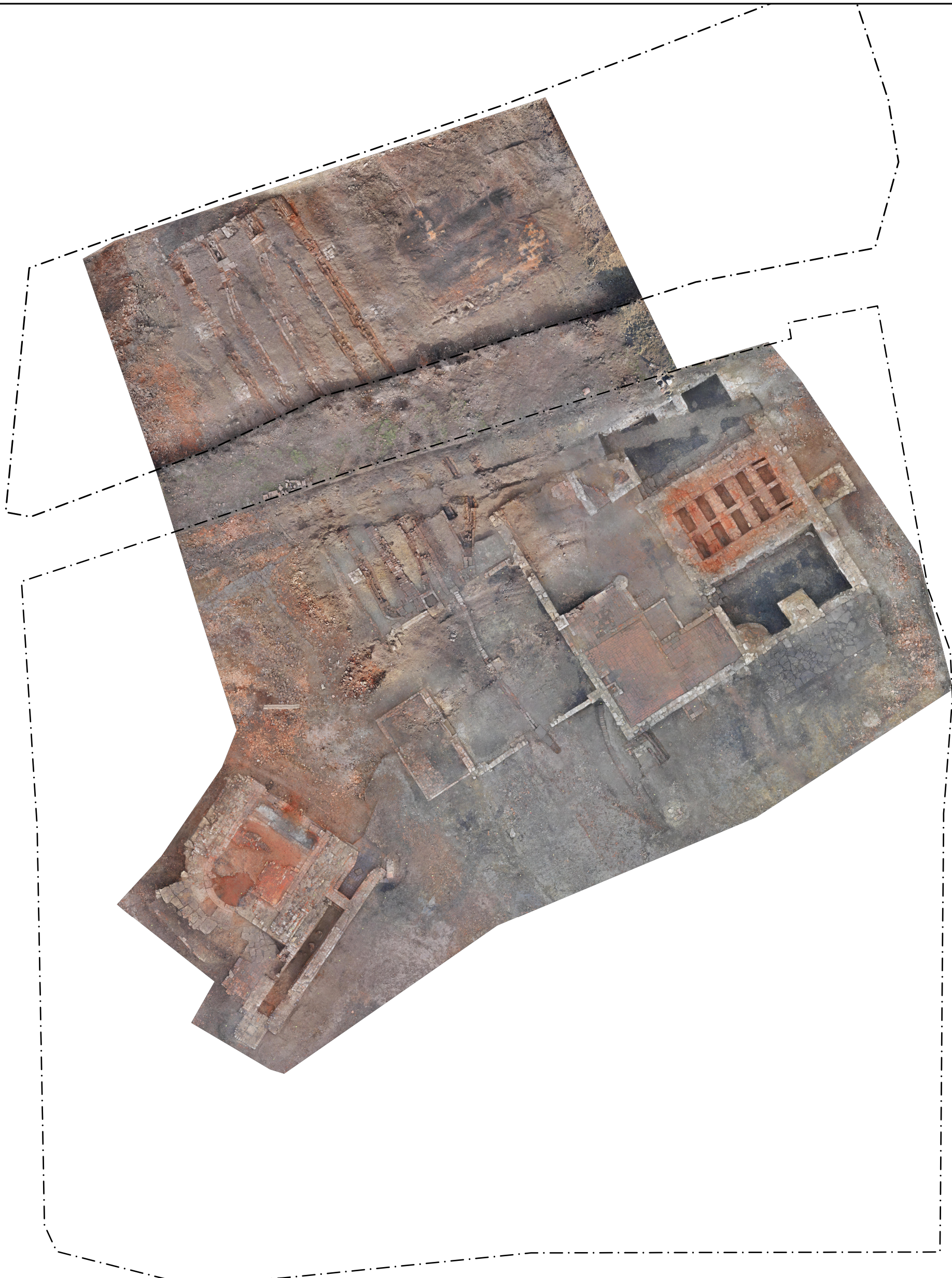
0 100m  
scale 1:2000 for A4 plot

 site boundary





 edge of excavation

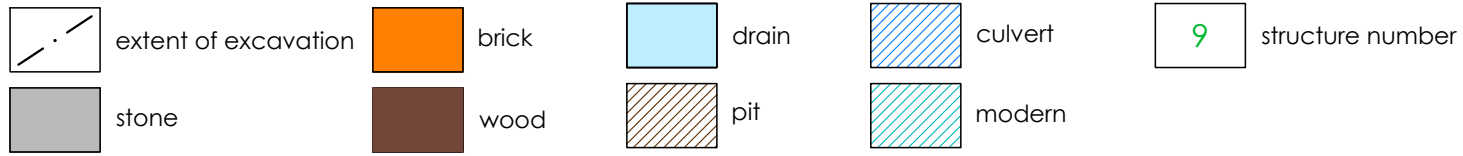


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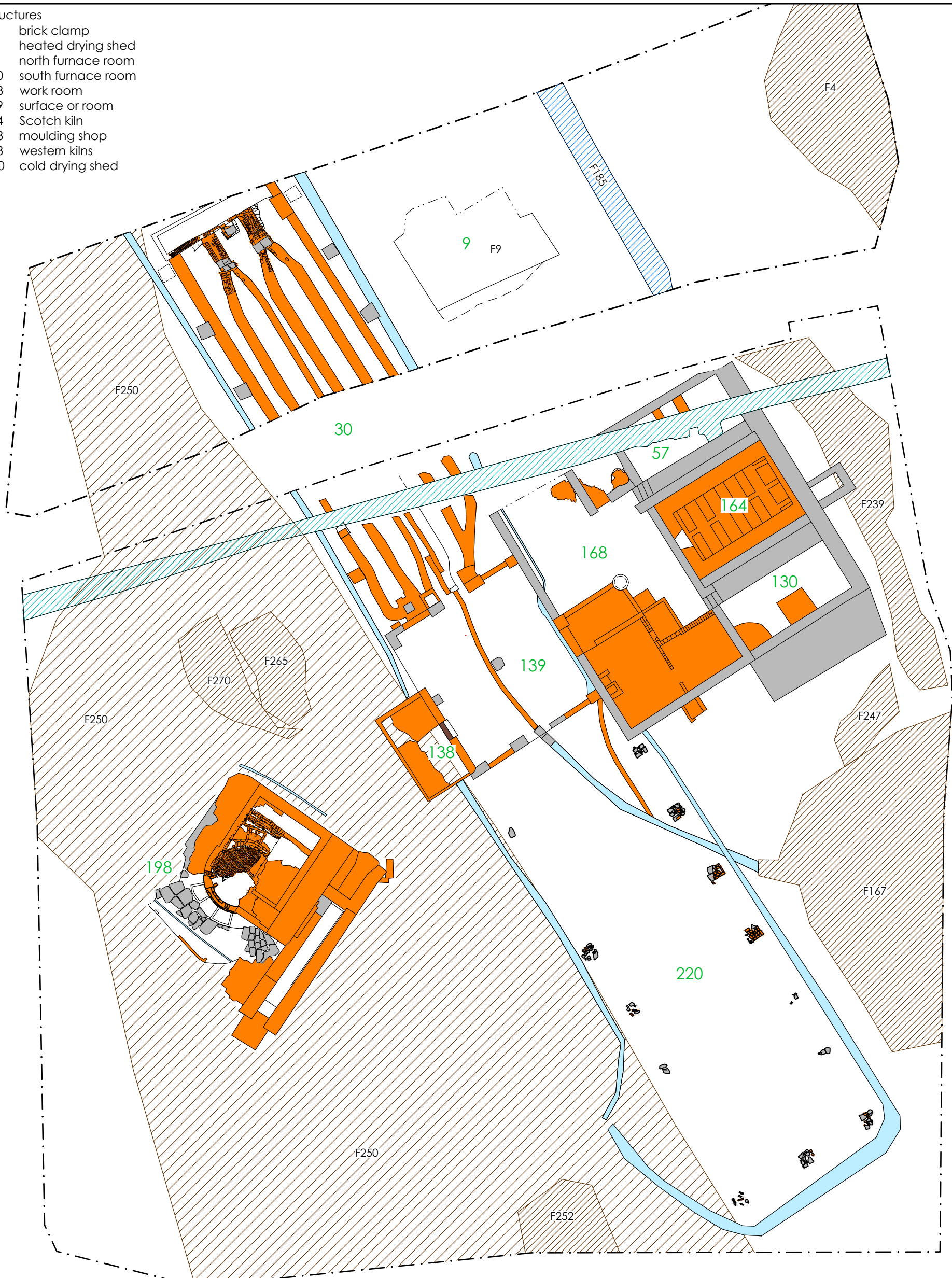
0  10m  
scale 1:200 for A3 plot

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Figure 8: Aerial view of the site





- Structures
- 9 brick clamp
  - 30 heated drying shed
  - 57 north furnace room
  - 130 south furnace room
  - 138 work room
  - 139 surface or room
  - 164 Scotch kiln
  - 168 moulding shop
  - 198 western kilns
  - 220 cold drying shed



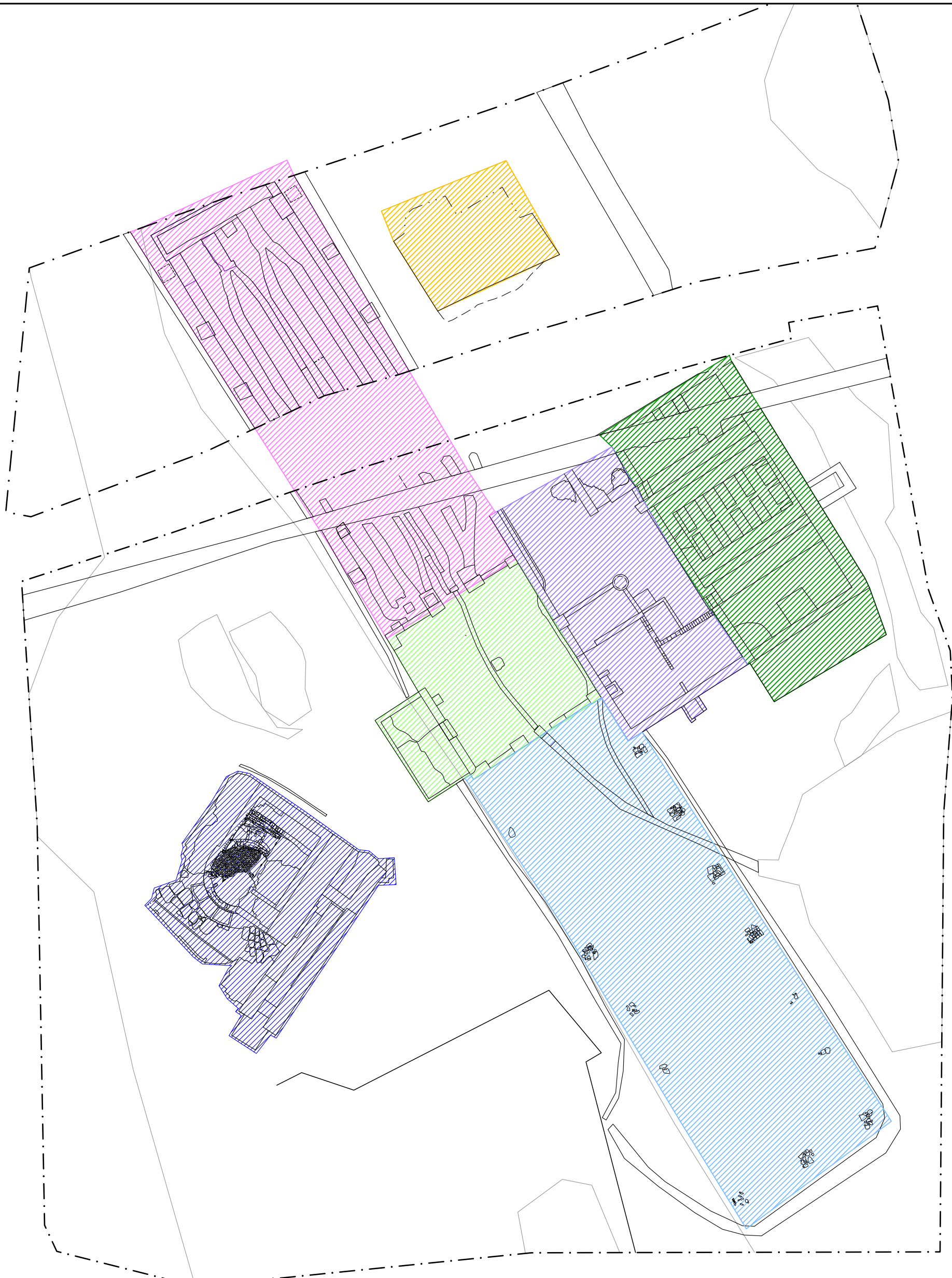
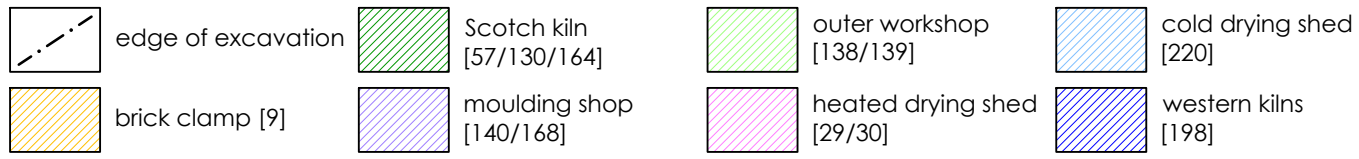




Figure 11: The Scotch kiln and workshops









Elevation 1 - Wall F120 (kiln)

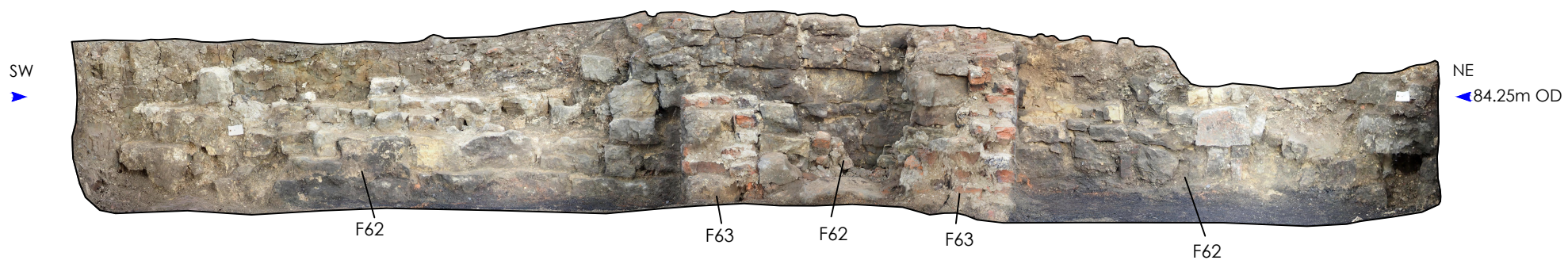


Elevation 2 - Wall F164 (furnace arches)

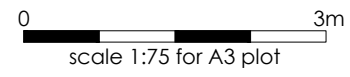




Elevation 3 - Walls F62 & F63 (furnace room)







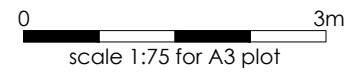
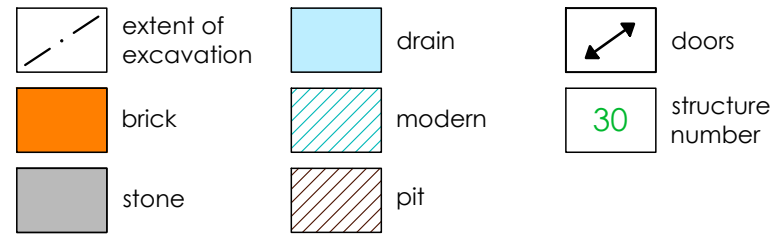
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Figure 16: The heated drying shed [30]





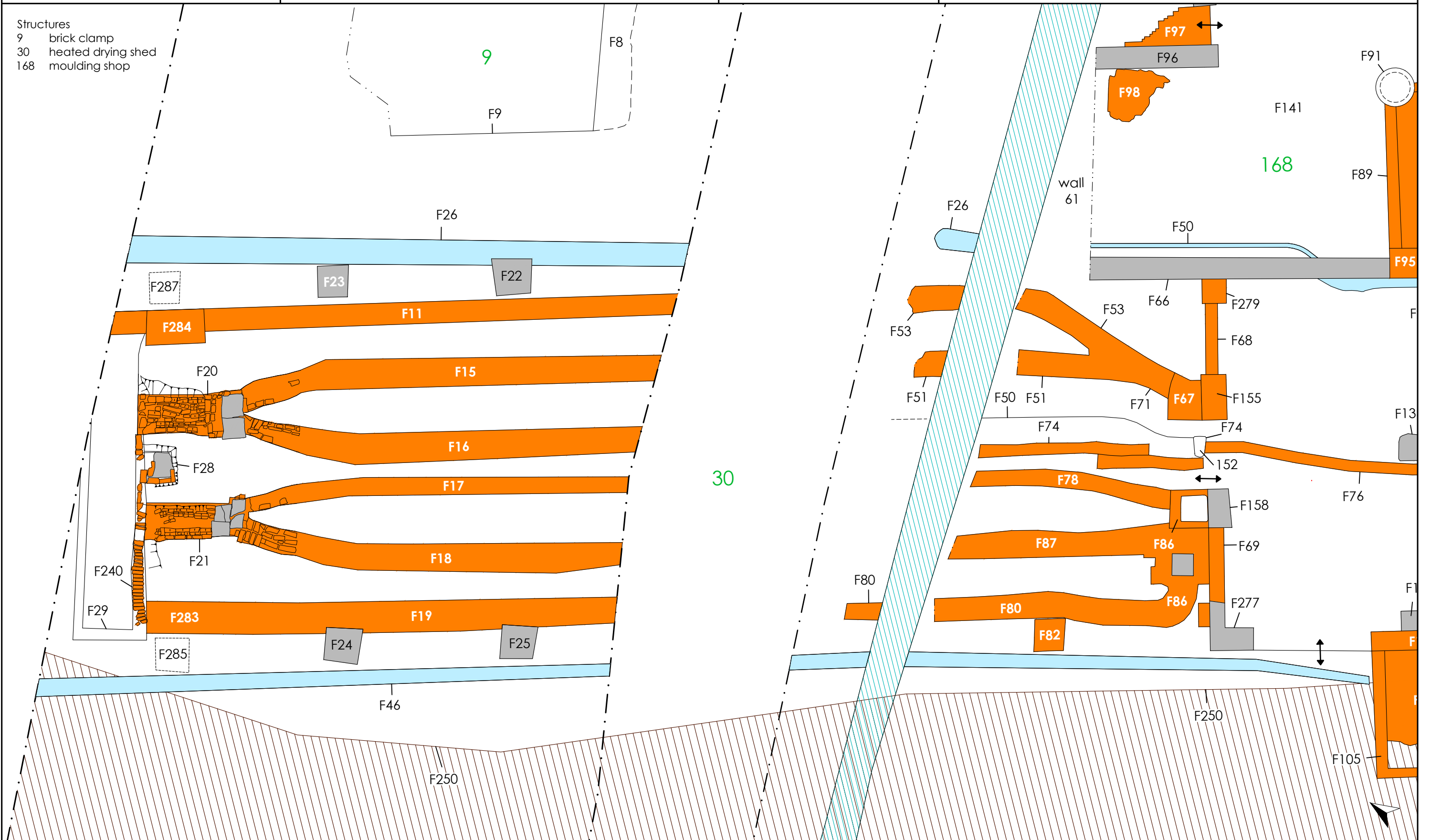


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Figure 17: Plan of the heated drying shed

- Structures  
9 brick clamp  
30 heated drying shed  
168 moulding shop





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Figure 18: The western kilns [198]

0 4m  
scale 1:80 for A4 plot












Structure  
198 western kilns

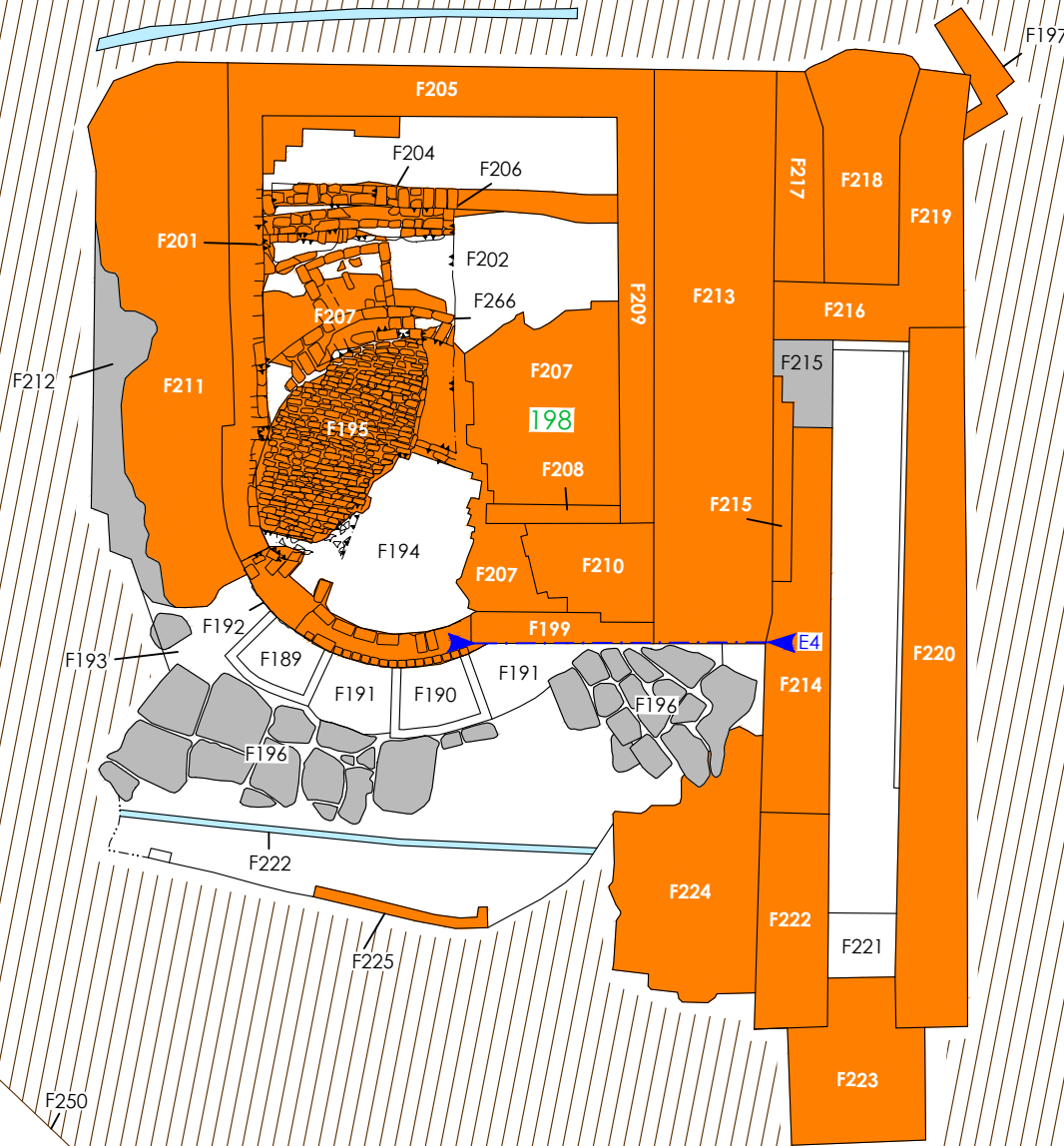
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Figure 19: Plan of the western kilns

0 4m  
scale 1:80 for A4 plot

-  extent of excavation
-  brick
-  stone
-  drain
-  pit
-  structure number
-  elevation



Elevation 4 - Walls F199 & F213

NW



SE

84.20m OD

F199

F213