Channel Tunnel Rail Link

London and Continental Railways

Oxford Wessex Archaeology Joint Venture

Small Finds from White Horse Stone, Aylesford, Kent

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CTRL Specialist Report Series

2006

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by Vanessa Fell

1.1 Introduction

The seven artefacts considered in this report come from deposit 6131, the fill of Iron Age pit 6132. The illustrations can be found on Figure 1. The following table summarises the artefacts and analysis conducted for this report.

Table 1: Summary table of metalwork from cremation

SF	ID	X-ray (ox)	Scientific analysis
106	Iron knife	954, 1405	Metallography X-ray diffraction analysis
107	Iron implement, awl	957, 1406	X-ray diffraction analysis
108	Iron implement, awl	957, 1406	X-ray diffraction analysis
109	Iron implement, awl	957, 1406	
110	Iron implement, awl	957, 1406	
111	Small iron curved blade	954, 1405	
112	Ring-headed pin, copper	954, 1405	X-ray fluorescence analysis X-ray diffraction analysis

1.2 Discussion

The grave finds comprise a group of iron craftsman's implements comprising two knives and four awls, together with a copper ring-headed pin. The pin is the only item which provides some indication of dating.

The small pin, with a notched terminal, has a bent shoulder placed well down the stem. This is like one from Woodeaton, Oxfordshire, which also has a notched terminal to the ring (Dunning 1934, 276, fig. 4.11). Another similar but plain example is one from Meare Village East (Coles 1987, 70-1, E67). The dating of these examples, which is later than the larger pins with bent shoulders at the top of the stems, is middle to late Iron Age (see discussion, Dunning 1934, 272–280).

Considering now the craftsman's implements, the size of the awls suggests that they may have been used for working untanned hide rather than leather. They are at the large end of the range of awls used today for leatherworking and saddlery (cf. Salaman 1986; E. Cameron pers comm). By comparison, they may have been for making heavy-duty goods, such as harnesses and straps, or they may have been used for working some type of thick textile.

There are other large iron awls known from early Iron Age contexts in Britain, for example at All Cannings Cross, Wiltshire (Cunnington 1923). Awls of possible middle Iron Age date were found at Barbury Castle, Wiltshire (MacGregor and Simpson 1963). However, in most instances these delicate implements are not in sufficiently good condition to enable detailed description unless they are from waterlogged conditions, or burnt as these ones are from White Horse Stone. The waterlogged site at La Tène, Switzerland has several long awls (Vouga 1923, 115-6, pl xlvi). Other examples from the continent, but from dry contexts, include several from the Tumulus de Celles, Cantal, France, where implements presumed to be for leatherworking were found with leather cutting tools and woodworking tools (Pagès-Allary et al. 1903). There is a range of awls from Manching, Bavaria (Jacobi 1974, pl 11), although none with the lozenge-shaped tips which occur in the group from White Horse Stone. The whetstone, from context 6137, complements the awls.

The small knife would be very suitable for cutting skin, leather or fibres, whereas the larger knife could have been used for numerous crafts. Metallography showed that the larger knife had not been hardened through carburisation, work hardening or heat treatment, suggesting that the knife was not used for working hard or tough materials. Modern knife blades for leatherworking have cutting edges which are flat, hollow or convex (Salaman 1986).

Several of the metal finds were analysed to determine the nature of the surface layers, with two aims. Firstly, iron artefacts do not commonly survive in such good condition and this has enabled detailed study and description of the items. Secondly, knowledge of the corrosion layers has helped to understand the relationship of the artefacts and the cremation.

At least four of the iron implements from this pit (knife 106 and awls 107, 108 and 110) have bright red deposits on their surfaces and these provided samples for X-ray diffraction analysis. In all samples, the red iron oxide haematite was detected. When iron is heated in air it forms multi-layer oxide scales comprising wüstite, magnetite and haematite in proportions dependant on temperature and oxygen pressure (Birks and Meier 1983). The presence of haematite on four of the six iron objects from this grave suggests that they were fired with the cremation, and the absence of any handles gives added support to this.

Pin 112 was analysed to determine the metal species and was shown to be copper with a trace of tin, with the black powdery surface layer comprising the cupric oxide tenorite. Copper alloys heated in oxidising atmospheres will invariably yield a surface layer of the black cupric oxide, tenorite, which suggests that this too was fired with the cremation.

The analytical results indicate that the metal finds were also placed on the cremation. This may have been at a late stage in the firing because none shows extensive damage, such as melting of the copper pin. Alternatively, the temperature of the pyre was not sufficiently high to cause extensive damage of the finds, which could suggest temperatures achievable in a bonfire.

1.3 Catalogue (Fig. 1)

Knife 106

Knife blade and tang, length 178 mm, maximum width 24 mm. The cutting edge was sharpened on both sides to a depth of 1 mm and the blade appears to have been little used**.** The rear of the blade and the tang in particular are in near pristine condition, with excellently preserved surface detail. There are traces of the red iron oxide, haematite, which suggests that this knife was burnt. The handle does not survive.
Metallographic analysis has shown that the knife was made of plain iron (ferrite) containing almost no carbon at the area examined. The hardness range was 115–134 HV (0.1). There had been no attempt to harden the knife through carburisation, work hardening or heat treatment. This suggests that the knife was not used for working hard or tough materials.

Awl 107

An awl, length 106 mm, with a blunt spatulate end. The stem is round in section, maximum 6 mm diameter, oval in section near the tip. The tang is c. 18 mm long, tapering and square in section, with traces of haematite. The handle does not survive.

Awl 108

An awl, length 103 mm, incomplete at the tip. The stem is round in section, 4 mm maximum diameter and slightly tapering. It was fractured across in antiquity. Tapering, square-sectioned tang. Haematite on the tang and upper stem suggests that the awl was burnt.

Awl 109

An awl, length 124 mm. The round-sectioned stem tapers evenly to a sharp point. The tang is 32 mm long, square sectioned and tapering from maximum 4 mm. The handle does not survive.

Awl 110

An awl, length 130 mm, with a lozenge shaped tip. The stem is round in section, 5 mm diameter, expanding to 6 mm and biconvex section at *c* 25 mm from the pointed tip. The tang and upper stem are square in section, maximum dimension, 5 mm. No evidence of the handle survives. Traces of haematite suggest that this awl was burnt.

Knife 111
Small iron knife, length 61 mm. The double-edged blade is curved and tapers to a blunt tip. The cross-section is biconvex. The iron handle is 27 mm long, rectangular in section and stepped. There is a suspension hole near the tip of the handle.

Copper pin 112
A small copper ring-headed pin, length 39 mm, complete. The stem is shouldered well down the stem. The ring head has two grooved notches on the outside of the stem close to the terminal. Analysis showed the pin to comprise copper with a trace of tin, and the black powdery to be the copper oxide, tenorite, suggesting that this pin was burnt.

1.4 Scientific analysis

1.4.1 Metallographic analysis of knife 106

A sample of metal was removed from the blade at 112 mm from the blade tip yielding a transverse sample through the blade, 10.3 mm long by 1.8 mm wide. This was mounted and prepared for metallographic examination according to standard techniques. Etching in 1% nital revealed a uniform structure of ferrite in which was a very slight amount of cementite. Hardness of the ferrite was 115 HV (0.1) on the side of the blade 10 mm away from the edge, and 134 HV(0.1) in the metal at the centre of the specimen. Non-metallic inclusions, principally slag from the smelting process and oxides from smithing, are visible as lines of elongated glassy and multi-phase inclusions. Across the sample were long acicular precipitates, probably iron carbonitride needles.

The structure of the blade is uniform and soft, containing almost no carbon. There had been no attempt to harden it through carburisation, work hardening or heat treatment.

1.4.2 Analysis of pin 112

The pin was analysed to determine the metal species. Analysis by X-ray fluorescence determined the presence of copper with a trace amount of tin. The black powdery surface layer was determined by X-ray diffraction analysis to be the cupric oxide, tenorite (CuO), the more highly oxidised compound than the common red oxide, cuprite. This is consistent with the pin having been burnt in the cremation.

1.4.3 Analysis of ironwork

Most of the iron finds had discrete patches of bright red deposits on their blades and tangs, which was thought to be haematite. Samples from knife 106 and awls 107, 108 and 110 were analysed by X-ray diffraction to identify these deposits. The red deposits were shown to be the iron oxide haematite (Fe_2O_3) along with common iron corrosion products such as goethite and magnetite.

2 THE WORKED STONE

by Ruth Shaffrey

2.1 Introduction

The majority of the worked and utilised stone was recovered from the early to middle Iron Age settlement, and includes saddle quern and rubber fragments, stone balls, a whetstone and a sling shot. One stone ball and one possible quern fragment were found in Neolithic contexts and one rotary quern and a number of small fragments (all of lava) were found at Boarley farm and are likely to be Saxon in date. In addition to the worked stone there were many fragments of burnt stone, mostly Sarsen, with some Greensand and chalk; these were not confined to specific contexts and were widely occurring across the site.

A total of 17 worked stone artefacts were recovered.

2.2 Methodology

All the stone was examined with the aid of a x10 magnification hand lens. The worked stone was then recorded according to the categories of dimensions, weight, lithology and description and entered into the Project Small Finds database.

2.3 Context and date

Almost all the worked and utilised stone was associated with the early to middle Iron Age settlement. Some lava quern fragments of probable Saxon date were found in a number of pit fills including one example from an isolated pit (14, fill 15; watching brief), some from mid to late Saxon pit fill 1058 (fill of pit 1057) and another undated pit (1061), both at the West of Boarley Farm site. Two pieces of worked stone were recovered from Neolithic contexts, one a small fragment with a worked surface which may be from a quern or rubber, although it is too small to be sure and the other a single ironstone ball. The possible quern fragment was from the secondary fill of late Neolithic (Grooved Ware) pit 4965 (4967) in the middle of the earlier early Neolithic sructure, while the ironstone ball was found in the fill of another Grooved Ware pit, 911 (fill 924). A further, similar, sphere was found in pit 2260 (fill 2261) associated with the early to middle Iron Age settlement, the phase of the site which produced the bulk of the worked stone.

Most of the Iron Age worked stone was found in pits and postholes. Twelse items were recovered from pits including five possible quern or rubber fragments, one sling shot, two pieces of building stone, one whetstone, one shale disc, a fragment of a shale bracelet and a piece of perforated chalk. Three probable quern fragments were recovered from postholes and many fragments of burnt stone were recovered from both pits and postholes.

Only three of the quern and rubber fragments recovered are large enough for their function to be reasonably clear. A further five fragments are likely to have been used as querns or rubbers but are too small for more than part of a worked surface to be identified. Of the most likely fragments, two were found in postholes (SF 963 from 19027 fill of 19028 and one from 19048 fill of 19046), while a third was in a pit (SF8; 2169 fill of 2171). Of the possible fragments, one was found in posthole 7019 (7020) and four were from pits (7139 fill of 7009; 6106 and 6103 both fills of 6101; and 6122 fill of 6110 (the latter is a post-medieval pit which, however, contains very large quantities of redeposited early-middle Iron Age finds).

Other items of stone include a probable sling shot that was found in the fill of pit 8012 (SF117, fill 8014) and is slightly pointed at the ends like its clay counterparts. A Sarsen whetstone was found in the fill of pit 6132 (6137). This appears to have been a deliberately placed deposit consisting of a kit of iron tools with their sharpening stone alongside deposits of rich, fully processed grain and some cremated remains. The whetstone could have been used to sharpen a number of different tools as it demonstrates use wear on the edges and one of the larger faces. Other large worked chunks of Sarsen and Greensand found in pits 4561 (4562), 4511 (4512) and 2130 (2120), in Area 9 have certainly been utilised, their square edges suggesting they may have been used in construction. A single shale disc was apparently discarded with other general rubbish in the primary fill of pit 4067 in Area 18 (4051). A fragment of a shale bracelet seems also to have been deposited The perforated chalk is natural but appears to have some evidence for working around the hole.

2.4 Discussion

With the exception of the Saxon lava quern fragments, (which can be provenanced to the Rhineland) most of the worked stone utilised locally available materials and is therefore not remarkable. The most popular stone, Sarsen, could be found nearby in the clay with flints (Worssam 1963, 103), a point demonstrated by large boulders found on the site (eg 708). The Greensand and chalk which were used for a few worked fragments, were both available just to the south of the site (Worssam 1963, 33; 65). The local availability also explains the prevalence of all three stone types in the large assemblage of burnt stone. Two balls of ironstone would also have had a nearby provenance (Worssam, 1963, 85) as could the shale, which is present in the local Wealden Clay (Worssam 1963, 13).

Despite the prevalence of Sarsen at Whitehorse Stone, and its accessibility, its use does not seem to have been particularly common during the Bronze Age and Early Iron Age in Kent; it was not found at sites such as Hayes Common, Gravesend and Beechbrook Wood (Philp 1973, 51 and Roe, 1994, 399-400; Shaffrey 2006a). The use of Greensand on the other hand, is more easy to identify with querns being found at sites including Beechbrook Wood and Monkton Court Farm (Shaffrey 20005a; Perkins et al, 1995, 304).

The lithologies exploited on the site suggest that during the Iron Age access was limited to locally available resources. There is also only limited evidence for domestic activities other than grinding, but these are represented by items such as spindle whorls and loom weights only infrequently made of stone. Despite this, it is clear that wide ranging use was made of the resources, as a number of unusual stone items were found. These include the sling shot (normally made of clay) and the stone balls found only occasionally on sites of varying dates including Thurnham Villa (Shaffrey 2006b). Both balls found here utilised naturally occurring spheres but have undergone some finishing. The function of neither is clear but they could have served a recreational purpose and been used as marbles, or given the polish on the Iron Age example, it is more likely that they were used as leather smoothers or pot burnishers.

It is also apparent that certain stone items were very highly regarded, for example the single whetstone found on the site. Whetstones would have been very important tools during the Iron Age, and, although examples have been deposited with cremated remains, for example at Stansted Airport in Essex (Shaffrey in prep) and a barrow cremation at Knighton Down, Broadchalke (Devizes Museum ref, 56), their inclusion in placed deposits are rare. This find is of particular interest because it was deposited with a range of tools it is likely to have been used to sharpen and also with some cremated remains. Whether the remains were of the craftsman who sharpened the tools is highly speculative, but the deposit nevertheless increases our awareness of the significance of whetstones.

2.5 Conclusions

Although the stone assemblage includes some more unusual artefacts such as the stone balls, the sling shot and the whetstone, it is, as a whole, fairly representative of Early to Middle Iron Age sites with a dominance of burnt stone alongside a few querns and rubbers.

2.6 Catalogue

The catalogue entries are classified by context (Cxt). Each entry includes the small fin number (SF), the object description, the event code (ARC WHS98, ARC 420 58+200-59+500 99 or ARC PIL98). The number (Y-) visible at the end of each catalogue entry refers to the unique record ID which can be found in the database. No worked stone artefacts were illustrated.

Cxt 15. Rotary quern fragment, medieval or Saxon. Lava. ARC 420 58+200-59+500 99. Y-76.

Cxt 924. Marble. Spherical ball. ARC PIL98. Y-58.

Cxt 2120. SF 7. Building Stone. Large angular chunk, slightly burnt. Probably building stone. Has two squared edges and flat parallel faces but otherwise no recordable features. Cherty Greensand. ARC WHS98. Y-59.

Cxt 2169. SF 8. Quern. Possible quern fragment. One flattish worked surface. Slightly burnt. Not enough detail survives to attribute function for certain. Sarsen. ARC WHS98. Y-60.

Cxt 4512. Building stone. Possible building stone. Slightly burnt chunk with 2 square surfaces. Sarsen. ARC WHS98. Y-61.

Cxt 4562. Possible building stone. Sarsen. ARC WHS98. Y-62.

Cxt 4563. Bead. Perforated chalk fragment. Appears to be deliberately perforated and could have been a small bead but is very soft and wouldn't have been much use. ARC WHS98. Y-63.

Cxt 4967. Processor. Burnt and with one worked surface. Also has scratches or grooves along one side although it is too soft to have been used as a whetstone. Tufa. ARC WHS98. Y-64.

Cxt 6103. Possible rubber with one smooth flat worked surface. ARC WHS98. Y-65.

Cxt 6106. Possible rubber. Burnt and very smoothed and worn on one face. ARC WHS98. Y-66.

Cxt 6122. Indeterminate. Burnt with possible worked surface. Small fragment with one possible worked surface but too small to determine function. Sarsen. ARC WHS98. Y-67.

Cxt 6137. Whetstone. Burnt. Very smooth with one flat edge, clearly shaped and one curved edge. One of the flat faces has also been used as it is well worn and slightly polished. Lots of iron deposits on the edges. Fine grained grey slightly micaceous quartz sandstone. ARC WHS98. Y-68.

Cxt 7020. Rubber. Probably from a rubber with one smoothed worked face but it is a small fragment and not clear. Sarsen. ARC WHS98. Y-69.

Cxt 7139. Indeterminate. One worked surface but too small for anything to be determined. Fine grained sandstone. ARC WHS98. Y-70.

Cxt 7225. Indeterminate. One worked surface but of indeterminate function. Greensand. ARC WHS98. Y-73.

Cxt 8014. SF 117. Possible sling shot. Not perfectly round – pointed slightly like clay ones. Fine grained pale cream sandstone. ARC WHS98. Y-71.

Cxt 9048. Probable quern fragment. One smooth flat surface. Probable quern fragment, though not enough remains to be sure. Greensand. ARC WHS98. Y-72.

3 IRON SLAG AND RELATED DEBRIS

by Lynne Keys

On the White Horse Stone site in Area 19 iron smelting and smithing took place during the early-middle Iron Age. Large amounts of slag were found in pits and shallow cuts, most of it produced by smelting, the manufacture of iron from ore and fuel in a furnace. No definite traces of a furnace were found but two shallow pits with very burnt bases and sides (7007 and 7005) have been interpreted as the bases of furnaces, although they could equally have been smithing hearths. One would expect the smithing debris to represent hot hammering of the iron bloom produced by the smelting process, but the evidence reveals ordinary smithing of iron also taking place. The slag from the two processes (smelting and smithing) was generally mixed together in the Area 19 features so no focus for either activity could be pinpointed.

3.1 Area 19: slag types and activity by feature

7009 – 81.6 kg

This pit contains mostly smelting slag with some smithing slag. The latter types are two smithing hearth bottoms (the three others are likely to be furnace bottoms) and a small amount of flake hammerscale.

The smelting evidence includes furnace slag (some fragments from slag blocks), some run slag, and raked slag. The furnace slag has large voids from burnt-out charcoal.

7201 – 15.5 kg

This pit contains both smelting and smithing slags. Smelting is represented by a furnace bottom, some slag with burnt-out charcoal voids, raked slag, and slag runs. There is a possible smithing hearth bottom in context (7204) and some hammerscale flake and spheres.

7007 – 10.7 kg

This feature had burnt base and sides which led to its being interpreted as a smelting furnace: the slag, however, represents smelting and smithing. The furnace slag has large charcoal inclusions and voids from burnt-out charcoal fragments. Run slag was also present.

The quantity of hammerscale (flake and occasional spheres) from smithing is well over 10g total weight. Also present are small iron shavings or iron slivers, probably products of iron working. Other slags are tiny runs (dribbles) and general undiagnostic fragments.

7217 – 10.5 kg

The slag in this Roman lynchet is probably residual Iron Age material, given its quantity and proximity to the other features with iron slag. The hammerscale (over 2 g) consists of both flake and spheres while the rest of the group consists of iron rich slag, slag runs, undiagnostic fragments, and vitrified hearth lining.

7205 – 1.7 kg

The slag from this is highly indicative of smithing: significant quantities of flake and spherical hammerscale and iron rich slag.

7072 – 214 g

The quantity and type of slag from this feature is not significant.

7005 – 73 g

Although this feature had a burnt base and sides and was interpreted as a smelting furnace, it contained very little slag, that being a tiny quantity of flake hammerscale and some slag runs.

7011 – 49g

No hammerscale was present although there were some small fragments of iron-rich and undiagnostic slag, a little cinder and vitrified hearth lining.

3.2 Methodology

A total of almost 111.3 kg of slag and related debris were recovered by hand and from soil samples taken during excavation. Pits containing iron slag and related debris were sampled but no sampling of possible occupation deposits or soil around and between pits appears to have taken place.

The material was visually examined and categorised on the basis of morphology; a magnet was run through the soil in bags to detect micro-slags such as hammerscale. Each slag type in each context was weighed, with each smithing hearth bottom being weighed individually and measured to obtain dimensions for statistical purposes. Details are given in the quantification table. No laboratory analysis of the slag had taken place at the time of publication.

3.3 Explanation of processes and terminology

Activities involving iron can take two forms:

1) the manufacture of iron from ore and fuel in a *smelting* furnace. The resulting products are a spongy mass called an unconsolidated bloom (iron with a considerable amount of slag still trapped inside) and slag (waste).

2a) *primary smithing* (hot working by a smith using a hammer) of the bloom on a stringhearth, usually near the smelting furnace, to remove excess slag. The bloom becomes a rough lump of iron ready for use and the slags from this process include smithing hearth bottoms and micro-slags, in particular tiny smithing spheres.

2b) *secondary smithing* (hot working by a smith using a hammer) to turn a piece of iron into a utilitarian object or to repair an iron object. As well as bulk slags including the smithing hearth bottom, this will also generate micro-slags: hammerscale flakes from ordinary hot working of a piece of iron, or tiny spheres from high temperature welding to join two pieces of iron.

Some types of iron slag are diagnostic of smelting or smithing, while others are not. Slag described as undiagnostic (of which 52.5 kg were recovered) could have been produced by either process or could be diagnostic slag broken up during deposition, re-deposition or excavation. Other types of debris sometimes encountered amongst the slag assemblage may be the result of a variety of high temperature activities - including domestic fires - and cannot be taken on their own to indicate iron-working was taking place. They include materials such as fired clay, vitrified hearth lining, cinder, and fuel ash slags. However if found in association with iron slag they may be possible products of the process.

3.3.1 Smelting

The smelting slags from White Horse Stone could be divided into two groups: those which had been formed and cooled within a furnace, and those which had run or been tapped out.. Different terms are used for the varieties of slag which resulted from the two technologies.

Run slag (22.4 kg) could take a variety of forms as it flowed to the bottom or out of the furnace. It occasionally resembled Roman tap slag, a low porosity, iron silicate slag with a ropy flowed structure like lava formed when slag was allowed to run out through a hole at the base of the furnace. Analysis by Sarah Paynter (Ancient Monuments Laboratory, English Heritage) of Iron Age slag from several sites (including Leda Cottages, a CTRL site) indicates the slag pit below the smelting furnace may have been deliberately slanted to allow slag to run or flow out. Dense slag (344 g) is similar to tap slag in its low porosity but lacks the flowed surface. Raked slag (912 g) is also a product of smelting.

Other smelting slags (usually referred to in the text and table as furnace slag, 16.74 kg) are furnace bottoms - resembling large smithing hearth bottoms but produced in a covered bowl furnace - and slag blocks. Both types recovered, though fragmentary, usually had large voids where the charcoal used as fuel had been burnt out during the smelt.

The slag blocks were represented by large fragments but were generally recognisable. They were produced in a furnace with a pit below, allowing the slag to collect, rather than being tapped or run out of the furnace. This slag is commonly encountered on Iron Age smelting sites in southern Scandinavia, north Germany and Poland but the few examples recognised in England were thought, until recently, to be early Anglo-Saxon. Recent excavations at several sites – including Leda Cottages and Beechbrook Wood (both CTRL projects) – have recovered fragments of slag blocks from definite Iron Age contexts.

3.3.2 Smithing

The smithing hearth bottom (two, weighing a total of 1062 g) is the most characteristic bulk slag of the smithing process. It formed as a result of high temperature reactions between the iron, iron-scale and silica from either a clay furnace lining or the silica flux used by the smith. The predominantly fayalitic (iron silicate) material produced by this reaction dripped down into the hearth base during smithing forming a slag which, if not cleared out, developed into the smithing hearth bottom. When removed from the hearth they were usually deposited in the pit or ditch nearest the activity. The proximity of cut features or dumps with amounts of smithing hearth bottoms to a building is often a good indication the structure may have been a smithy.

Hammerscale is a term used to describe two diagnostic microslags produced by smithing. The ordinary hot working of a piece of iron, either to make an object or repair, it produces flake hammerscale. When an iron bloom is worked at high temperature to remove excess slag after smelting or by high temperature welding as a smith joins two pieces of iron the other type, spherical, is produced. Since both types are not visible to the naked eye when in the soil but they usually remain in the immediate area of smithing activity (around the anvil and between it and the hearth) when larger (bulk) slags are cleared out.

Iron rich slag (915 g) contains a high percentage of iron so responds very strongly to a magnet.

The slag runs and dribbles (6006 g) could have been produced by either smelting or smithing.

Fuel ash slag (35 g) is a very lightweight, highly porous, grey-brown residue produced by a high temperature reaction between alkaline fuel ash and siliceous material such as a clay lining or surface. It can be produced by any high temperature activity where these two constituents are present including domestic hearths, accidental fires, and even cremations.

Vitrified hearth lining (6255 g) is produced in the area nearest the tuyère region (the region of highest temperature) of a hearth or furnace. By itself it is not diagnostic of smelting or smithing activity and can be produced by a number of other high temperature activities but its association with other diagnostic material provides support for the process. Cinder (740 g) is a very porous, highly vitrified material formed at the interface between the alkali fuel ashes and siliceous material of a hearth lining.

4 ASSESSMENT DATA

The following finds were examined during the post-excavation assessment and were not subjected to detailed analysis. Please refer to the post-excavation assessment report for further details (URS, 2001).

Material	Author
Metalwork	Ian Scott
Coin	Leigh Allen
Clay pipe	Alistair Barclay
Post-medieval glass	Cecily Cropper

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