GeoArch

Report 2012/09

Evaluation of archaeometallurgical residues from Mildenhall, Suffolk (MNL 622)

Dr Tim Young
20th April 2012

Evaluation of archaeometallurgical residues from Mildenhall, Suffolk (MNL 622)

Dr T.P. Young

Abstract

The assemblage from Recreation Way, Mildenhall (MNL 622) comprises archaeometallurgical residues occurring at a low density from a large number of contexts (107) across the site and across a broad stratigraphic age range.

Activity from the Iron Age (Phase 2) includes evidence for the casting of copper alloy objects, with a small number of crucible and mould fragments. The restricted occurrence of these materials might indicate an occasional activity rather than a persistent one. There is also a low level of occurrence of microresidues from iron-working (although these might be intrusive from the better documented later iron-working activity).

Romano-British (Phase 3) metalworking evidence indicates iron-working (smithing), with at least some undertaken with coal as fuel.

The early medieval evidence (Phase 4) also indicates iron-working. The evidence was somewhat more substantial than for the Roman period. The presence of some materials suggesting the use of coal as fuel, may indicate that at least some of this material may be residual material of Roman age.

The medieval period (Phase 5) produced a large number of contexts containing iron-working residues. Coal-fuelled smithing is represented among some of the possibly later material.

Post-medieval residues (Phases 6 and 7) are likely to include some residual material, together with contemporary use of coal, not necessarily for metallurgical purposes.

The assemblage as a whole is therefore suggestive of a persistent low level of blacksmithing activity in the area from the Iron Age to late Medieval period. A small amount of copper ally casting was undertaken in the Iron Age.

Contents

Abstract 1

Methods 1

Results 2

Interpretation 2

Evaluation of potential..... 3

References 3

Table 1: Summary catalogue of materials 4
Table 2: Interpretation of assemblages 21
Table 3: Identifiable SHC fragments 24

Methods

All materials were examined visually with a low-powered binocular microscope where required. As an evaluation, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional. The summary catalogue of examined material is given in Table 1.

This project was undertaken for Cotswold Archaeology.

Results

Description of residue classes

Iron-working (smithing)

Identifiable macroscopic iron-working residues were mainly complete or broken examples of smithing hearth cakes (SHCs). These items are listed in Table 3.

The weights of the cakes, where determinable, are all within the typical range of cakes produced during the end-user working of iron (blacksmithing) during their respective periods.

Most of the small fragments of indeterminate iron slag are probably also fragments of SHCs (although too small to be identifiable as such)

The micro-residues from iron working are widely distributed (geographically and temporally) in the magnetic residues, but are never present in sufficient quantities to provide compelling evidence for proximity of loci of working. Micro-residues include flake hammerscale (FHS), spheroidal hammerscale (SHS) and slag flats (typically representing materials lost outside the forge hearth), together with various slag and clinker droplets (probably mostly particles formed within the hearth).

Most of the residues seen here probably represent activities undertaken with a charcoal fuel; the presence of clinker particles indicates the use of coal as fuel at times as well. This seems particularly to be in material of Roman age and also of 13th century age or younger.

Casting of copper-alloys

Evidence for the handling and casting of copper alloy was present in the fills of MIA pits 15129 and, to a lesser extent, 21786.

The principal artefacts from pit 15129 were a failed crucible from [15132], further crucible fragments from [15132] and mould fragments from each of [15131] and [15132].

The mould fragment from [15131was from the flared pouring gate of a mould in hard sandy fabric. The example from [15132] shows the partial impression of the curved components, the central one forming part of a disc .c 16mm in diameter and 4mm thick. Whether the three impressions are part of a single complex object, or three small ones, is not known, although complex object seems more likely.

The crucible fragments derive from examples of moderately large (>60mm tall) examples of 'triangular' or 'pyramidal' crucibles. The fabric is mostly fine grained, with scattered quartz grains and an abundant organic temper. Such a fabric is typical of prehistoric crucibles, where the emphasis is on the insulating, rather than the refractory, properties of the ceramic. Much of the crucible material seems lightly used, if at all. Three pieces together form much of one side and one angle of an example that shows intense heating, and failure, on one side – possibly having been placed immediately in front of the air blast. This example showed copper oxide droplets (representing corroded metal droplets) on both inner and outer surfaces.

At Danebury the 'triangular' crucibles replaced the handled forms in cp 4/5 and survived until at least cp 7 (Cunliffe 1984, p441) – so are essentially MIA. Similar forms of crucible in the latest Iron Age and later tend to be in much more refractory fabric.

A planar sheet of ceramic from [21794] resembles the crucible material in many ways. This sheet may have functioned as a 'heating tray' or just possibly a crucible lid – but is too incomplete to interpret fully.

A curiously lilac-pink fragment of hearth lining from medieval context [21590] might just possibly indicate an episode of much later non-ferrous metalworking, but this is not certain on the basis of the colour alone.

Other materials

The assemblage includes a variety of less diagnostic materials, mainly lining slags (slags derived from the melting of the hearth/furnace wall) and fuel ash slags (FAS).

The lining slags will be from metallurgical hearths or furnaces, but are not in this instance, diagnostic of process or material.

The fuel ash slags are not necessarily metallurgical in origin, and may originate in suitable conditions, in structures such as corn-driers.

A few concretions formed around corroding iron are present, but none is probably significant enough for X-radiography.

Distribution of the residues

The stratigraphic distribution of the activities suggested by the residues is presented in Table 2.

Interpretation

The general impression of this site is one in metalworking was undertaken persistently, if not necessarily on a large-scale, over a long period of time. Most of that activity was iron-working – the repair and fabrication of tools and implements being an occupation within most significant settlements from the Iron Age until the 20th century. The local casting of copper alloy fitments and horse-gear is also a common feature of Iron Age settlements – perhaps facilitated by travelling craftsmen. In neither case is the level of activity likely to indicate processes undertaken on an industrial scale.

The low volumes of residue recovered suggest that the activities, or at least the main locations for waste disposal, were outside the excavated areas.

Evaluation of potential

The iron-working residues on the site are so sparse that they do not merit further investigation, or even detailed description in a final report, though their occurrence should be noted. Their significance for further investigation is greatly reduced by the lack of evidence for metallurgical activity actually within the excavated area and there are no certain metallurgical features.

The Iron Age copper-alloy casting is worthy of description in the final report, although there is little useful additional analysis that could be contemplated. The crucible fragments are worth illustrating and a review f the fabrics by the Iron Age pottery specialist would be worthwhile to establish any links with other ceramic materials.

Further investigation should be pursued to attempt to identify the artefact represented by the Iron Age mould fragment.

References

Cunliffe, B. 1984. *Danebury: an Iron Age hillfort in Hampshire. Volume 2 The excavations, 1969–1978: the finds* . CBA research report 52.

Table 1: Summary catalogue of materials. Assm – assemblage of sieved residues, FAS – fuel ash slag, FHS – flake hammerscale, SHS – spheroidal hammerscale, BOM – burnt organic matter

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
2009	2033			stone, moderate amount of slag including black glass (including spheroids), maroon spheres and other lining slags	Layer	alluvium		12th-14th c.	5
2009	2033 slag	44	assm	highly weathered slags - mainly blebs of FAS-like material, but some appear more texturally like iron slag, although most show at least a partial white colour, one small 'prill' may actually be iron.	Layer	alluvium		12th-14th c.	5
2010	slag	76	bag		Layer	alluvium			5
		40	1	spherical concretion on iron					
		32	3	concretions containing FAS/lining slag - not clear if that is what they are cored on, or simply a clast					
2010	2034 slag	88	assm	collection of fragments of vitrified lining, FAS-like blebs, droplets of black vesicular glass - possibly a smithing hearth assemblage? Contains at least two concretions (6 and 10g) on iron	Layer	alluvium			5
2011	slag	130	1	highly concreted piece - but resembles half of a biconvex small SHC	Layer	slumping			5
2020	2000		assm	stone, fired clay	Fill	fill of pit	2028		3
2020	2007		assm	fired clay (some reduced)	Fill	fill of pit	2028		3
2020	2002		assm	fired clay, stone	Fill	fill of pit	2028		3
2025	2003		assm	stone, dark blistery slags, vesicular lining slag	Fill	fill of pit	2024	8th-9th c.	4
2025	slag	362	bag wt		Fill	fill of pit	2024	8th-9th c.	4
		80	8	ashy and charcoal-rich sandy concretions - some certainly contain slag - some may be cored on slag; only slag well seen is lining slag, which may just be the concretion material vitrified					
		56	1	dense pale grey curved weathered slag - possibly burr from a SHC (small)					
		68	1	dense rounded concretion, slightly exploding so probably with iron core					
		16	1	gravelly concretion on slag fragment					
		112	3	variably concreted - three pieces of SHC crust					

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
2025	2003 slag	18	many	disintegrated piece of bleached vitrified hearth lining?	Fill	fill of pit	2024	8th-9th c.	4
		<1	1	lining slag prill? Really rust-cemented sand - might be natural					
		12	1	rounded slag lump in concretion					
2026	2001		assm	stone, variably reduced-fired clay fragments	Layer	redeposited natural			3
2026	2004 slag	6	4	highly decomposed slag blebs	Layer	redeposited natural			3
2027	2005		assm	fired clay	Fill	fill of pit	2028		3
2034	2008		assm	large amount of fired clay	Fill	fill of pit	2028		3
2039	2022		assm	FAS?	Layer	alluvium		9th-11th c.	4
2039	slag	6	3	broken piece of vitrified lining - lining itself is bright red but vitrified material is dominated by white crystals	Layer	alluvium		9th-11th c.	4
2043	2018		assm	fired clay, stone, BOM, probable slag	Fill	fill of pit	2046	12th-13th c.	5
2043		5	1	pale grey vesicular material similar to that from 20406/20906	Fill	fill of pit	2046	12th-13th c.	5
2044	2019		assm	stone, 1 slag fragment	Fill	fill of pit	2046	12th-13th c.	5
2049	2038		assm	stone	Layer	peat			5
2050	slag	360	bg wt		Layer	peat			5
		192	1	large complex accreted block - probably relates to failed hearth wall around the burr region of an SHC, but could simply be a deformed SHC					
		42	4	bloated, and vitrified hearth wall - clear glaze on sand-rich lining. Bleached white					
		24	2	concretions probably cored on slag					
		72	3	concretions cored on iron					
		22	1	rounded lump of vitrified ceramic and FAS					
2050	2053	16	9	lining or fuel ash slag blebs	Layer	peat			5
		256	1	large concretion containing iron (not clear if it bears slag containing iron or simply iron)					

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
2057	clinker	12.3	7	coke	Layer	dumping			7
2070	2010		assm	stone, slag fragment, lining slag fragment	Fill	fill of pit	2074		5
2083	2012		assm	stone	Fill	fill of pit	2085		5
2084	2013		assm	stone	Fill	fill of pit	2085		5
2086	2028		assm	stone, fired clay	Layer	alluvium		C3-C4+	3
2086	2031		assm	stone	Layer	alluvium		C3-C4+	3
2086	slag	392	bag wt		Layer	alluvium		C3-C4+	3
		378	2	broken highly weathered SHC 115mm x 80mm x 40mm (20mm bowl) still slight colour difference between bowl and top but very degraded, slightly biconvex, appears conventional. Small fragment missing, but >95% present.					
2089	2015		assm	large amount of fired clay with rare slag	Cut	pit			U
2096	2023		assm	stone, 1 irregular FHS/blister	Layer	alluvium		8th-9th c.	4
2100	2029		assm	stone	Fill	fill of gully	2098		
2122	2046		assm	stone	Layer	dumping			6
3002	slag	122	1	small dense SHC, folded, base has pendent prills, top probably smoothish but obscure, 50mm x 70mm x 30mm - no clear evidence for nature of fuel	Layer	Made ground		L.18th-19th c.	6
3008	3000		assm	stone, BOM	Layer	Dumped deposit		12th-14th c.	5
3053	vitrified clay	10.95	1	rotted, charcoal-bearing, slag	Layer	Peat			4
3080	3029		assm	probable BOM	Layer	Clay dump		13th c.	5
3081	3030		assm	stone	Layer	Peat	3082	12th-13th c.	5
3083	3028		assm	stone	Layer	Silting		LC3-C4	3

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
3111	clinker	3.7	2	irregular fragments of blackened fired clay - might just be coal shale as has organics on one side of one piece - but not conclusive	Fill	Single fill of pit/treethrow	3112	C3-C4	3
3158	slag	5	2	rotted fragments of iron slag	Layer	Levelling			4
3608	3033		assm	stone	Layer	Dumped deposit			3
3613	3037		assm	stone	Fill	Fill of Paleochannel	3617		0
3946	3045		assm	stone, slag droplet	Fill	Single fill of ditch	3945	RB	5
3949	3052		assm	stone	Fill	Fill of pit	3948		3
3949	slag	94	2	broken highly rotted dimpled iron slag sheet c 15mm thick	Fill	Fill of pit	3948		3
4056	3038		assm	stone	Fill	Fill of ditch	4047		3
4112	slag	122	1	part of a small thin SHC - fairly conventional , base slightly prilly, very dense, top rusted, 70x50x20mm fragment	Fill	Fill of pit	4111	12th-13th c.	5
5128	slag	4	2	dimples of highly altered vesicular slag, probably a lining slag, turned white in areas	Layer	Silty clay deposit			4
5118	3058		assm	fired clay, stone ,BOM	Layer	Clay deposit			5
5131	3061		assm	stone rust	Layer	Silty clay deposit		LC3-C4	4
5131	slag	166	bag wt		Layer	Silty clay deposit		LC3-C4	4
		160	4	broken fragments of perhaps half of a small SHC, appears to have been slightly glassy, is vesicular and contains charcoal clasts					
5135	slag	8	1	angular fragment of grey iron slag, vesicular, with clasts of charcoal	Fill	Fill of ditch	5136		3

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
5203	3059		assm	stone	Layer	Dumped deposit			4
5204	3049		assm	stone	Layer	Silting			0
5205	3048		assm	stone	Layer	Same as 3867			0
5206	3050		assm	stone	Layer	Same as 3867			3
5213	3054		assm	burnt bone, stone	Fill	Fill of pit	5211		4
5224	slag	712	bag wt		Fill	Fill of pit	5223	8th-9th c.	4
		702	1	110mm x 100mm x 45mm SHC, top dominated by 90mm diameter horizontal smooth surface with only minor dimpling, base obscured by gravelly concretion					
5233	3062		assm	stone	Layer	Re-deposited natural			3
5235	3064		assm	stone	Layer	Silting			0
5236	3065		assm	stone BOM	Layer	Silting			0
12060	glass production waste	32	1	strongly marginally devitrified clear green glass, glass appears folded - could be collapsed artefact	Fill	fill of pit	12061	13th-14th c.	5
15032	3066		assm	stone	Fill	fill of pit	15031		2
15131	3067		assm	stone, some FHS, fired clay	Fill	fill of pit	15129	MIA	2
15131	mould fragment	12.32	1	lip of mould, very hard sandy fabric, void is elongate and probably narrow, blackened in thin layer on red fabric	Fill	fill of pit	15129	MIA	2
15132	slag cu	18	1	45mm high sherd from side of crucible; wall 15mm thick at base and 10mm at rounded rim; outside with dark dimpled slag locally; inside similar but smaller dimples and with abundant corroded Cu alloy droplets (only one on outside), raised areas just show clear reddish glaze. Clear glaze extends onto one lateral surface to 40mm below rim. Rim line appear as deformed and possibly twisted. Probably conjoins (across failure) 41.1g piece below	Fill	fill of pit	15129	MIA	2

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
15132	crucible	72	bag		Fill	fill of pit	15129	MIA	2
		13.1	1	mould fragment in hard sandy fabric, shows 3 impressions, outer two are curved, central one more like the edge of a disc; 9mm separates one pair, 13mm the other; central object is 4mm thick and has an arc of radius c6-8mm					
		41.1	2	two conjoining sherds of crucible with prominent spout, probably c60mm tall, one side has failed and fallen outwards accompanied by much Cu oxide staining of glass					
		15.1	2	two non-conjoining sherds of spouts of similar crucibles, the fabric is similar to the organic-tempered material from other contexts- these sherds may not have had much/any use. Like the planar pieces these shows wiped surfaces, slightly buff fired on surface, dark grey within.					
15145	industrial related clay	86	bag wt	(note lime coating on many pieces)	Fill	fill of pit	15129		2
		26	10	reduced fired ceramic , 6-10mm thick, many freshly broken with debris, much organic temper as well as small gritty ?chert and sand (well rounded, medium to coarse grade)					
		30	1	irregular piece of mainly oxidised fired (gradational through piece) gritty clay 50x25x25mm, with organic temper too					
		26	1	oxidised fired material, not too dissimilar to reduced material above, in hand-made vessel, slightly angular, c35mm average radius, wall c12mm, but finely smoothed exterior largely spalled-off, outside probably more angular than inside, 35x40mm.					
15186	vitrified clay	2.02	1	same vesicular grey material as from 20406/20906/2043	Fill	fill of pit	15185	12th c.?	5
15203	15005		assm	stone, rust, piece of FHS	Fill	fill of posthole	15204		U
15214	15019		assm	stone, slag, rare FHS	Fill	fill of pit	15215	11th c.	5
15240	15009		assm	stone, small amount of BOM (bone?)	Fill	fill of posthole	15241		U
15244	15004		assm	stone, fired clay ,slag droplets	Fill	fill of posthole	15245		5
15258	15008		assm	burnt, coked, organic matter	Fill	fill of posthole	15259		U
15258	15008		assm	stone, rust, bone, fired clay, BOM	Fill	fill of posthole	15259		U
15260	15006		assm	fired clay ,stone, BOM, possible slag	Fill	fill of posthole	15261		U
15260	15006	11.9	assm	burnt bone and BOM, 2-3 pieces of sandstone, 1 green-glazed slag droplet	Fill	fill of posthole	15261		U

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
15264	15003		assm	fired clay, slag fragments, slag blebs, FHS, rare SHS	Fill	fill of posthole	15265	11th-12th c.	5
15270	15000		assm	stone	Fill	fill of pit	15271	MIA	2
15281	15001		assm	stone	Fill	fill of pit	15234	MIA	5
15305	15002		assm	stone, some minor slag and FHS	Fill	fill of posthole	15295		U
15416	15020		assm	stone ,possible fired clay, possible slag, bone	Fill	fill of ditch	15415	12th c.	5
15419		22	1	same vesicular grey material as from 20406/20906/2043	Fill	fill of ditch	15415	13th-14th c.	5
15429	15013		assm	stone, slag fragments, droplets and single FHS	Fill	fill of posthole	15430		U
15429	15013	0.67	c40	six pieces coal, 1 piece bone, rest mainly BOM	Fill	fill of posthole	15430		U
15434	15012		assm	stone, sparse slag and FHS	Fill	fill of posthole	15433		U
15440	15011		assm	stone, moderate FHS, some slag	Fill	fill of posthole	15439		U
15476	15009		assm	stone, slag droplets and blebs	Fill	fill of posthole	15477	10th-11th c.	4
15486	15010		assm	slag fragments, dense droplets, stone	Fill	fill of posthole	15487	11th c.	5
15489	15016		assm	stone, moderate slag fragments and droplets	Fill	fill of posthole	15488	10th-11th c.	4
15490	15015		assm	stone	Fill	fill of posthole	15488		4
15492	15018		assm	stone, BOM, rare slag	Fill	fill of posthole	15491		U
15492	15018	bag 2	assm	fossils, burnt material and some grains of probable coal	Fill	fill of posthole	15491		U
15493	15017		assm	stone, fired clay, BOM ,sparse slag	Fill	fill of posthole	15491		U
15579	15024		assm	stone	Fill	fill of ditch	15568		2
15692	15023		assm	stone	Fill	fill of ditch	15625		2
16004=16098	16004		assm	stone, abundant slag including angular black glass and maroon droplets	Fill	fill of pit	16003	12th-13th c.	5

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
16004=16095	16004 hs	<	3	2 blebs of possible clinker	Fill	fill of pit	16003	12th-13th c.	5
16004=16098	16004	0.67	17	burnt bone. 1 piece coal?	Fill	fill of pit	16003	12th-13th c.	5
16006	16002		assm	stone, 1 grain of FAS?	Fill	fill of pit	16005	MIA	2
16064	16003		assm	stone, probable slag fragments, rare FHS, burnt bone	Fill	fill of pit	16063	MIA	2
16070	16000		assm	stone ,slag sheets, FHS, slag droplets	Fill	fill of pit	16069	10th-11th c.	4
16100	16001		assm	stone	Fill	fill of pit	16101	MIA	2
16100	16001	0.11	16	BOM	Fill	fill of pit	16101	MIA	2
17017	17289		assm	stone , slag droplet, some poor FHS, single good SHS	Cut	gully			U
17020	17034		assm	stone, BOM, rare slag, rare FHS	Fill	fill of pit	17022	MC1-C2	3
17026	17033		assm	stone ,reduced fired clay?, probable slag, rust	Fill	fill of corn drier	17028		3
17026	17033	0.05	8	BOM	Fill	fill of corn drier	17028		3
17034	17000		assm	stone	Fill	fill of posthole	17019	LC3-C4;EMSAX?	3
17043	17002		assm	stone	Fill	fill of posthole	17041	C10-C11	3
17048	17243		assm	stone, rare probable FHS and SHS	Cut	corn drier			3
17050	17024		assm	fired clay	Fill	fill of corn drier	17048		3
17056	17001		assm	stone	Fill	fill of pit	17051		3
17069	17003		assm	stone ,slag flat, pottery	Fill	fill of corn drier	17048	Rom	3

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
17070	17022		assm	stone, fired clay, blistery slags	Fill	fill corn drier	17048	Rom	3
17071	17031	0.44	3	black material, some sandy so possibly Mn-pan, others may be burnt clay	Structure	ceramic lining in corn drier	17048		3
17075	17005		assm	fired clay, stone	Fill	fill of corn drier	17048	RB	3
17075	17023		assm	fired clay, stone, some slag	Fill	fill of corn drier	17048	RB	3
17075	17023	<1	2	red-surfaced black glass - probably clinker	Fill	fill of corn drier	17048	RB	3
17075	17023 vitrfied clay	0.55	8	BOM - posibly bone	Fill	fill of corn drier	17048	RB	3
17076	17032		assm	stone, minor slag, single FHS and single blister	Fill	fill of corn drier	17048		3
17077	17029		assm	stone	Fill	fill of corn drier	17048	C2+	3
17077	17006		assm	fired clay, stone	Fill	fill of corn drier	17048	C2+	3
17085	17007		assm	stone	Fill	fill of corn drier	17048	RB	3
17085	17026		assm	stone, fired clay, BOM, rust	Fill	fill of corn drier	17048	RB	3
17089	17008		assm	fired clay	Fill	fill of corn drier	17048	RB; C2-C4	3
17100	17009		assm	stone	Fill	fill of corn drier	17048		3
17110	17014		assm	stone, fired clay?	Fill	fill of ditch	17111	RB	2

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
17129	17010		assm	stone	Fill	fill of pit	17133	RB	3
17138	vitrified mat	0.61	1	coke	Fill	fill of pit	17137	13th-14th c.	5
17144	17012		assm	stone	Fill	fill of ditch	17145	11th-12th c.	5
17157	17011		assm	stone, possible slag flats	Fill	fill of well	17156	12th c.	5
17200	17030		assm	stone	Deposit	burnt natural chalk beneath corn drier 17048			0
17221	17040		assm	stone, rare slag fragment, one FHS, one lining slag droplet (double)	Fill	fill of corn drier	17182	11th-12th c.?	5
17242	17047		assm	stone and a few very varied slag fragments (maroon sheet, black glass, dark grey finely crystalline)	Fill	fill of posthole	17244	Rom	3
17270	17020		assm	stone, rust, BOM rare slag	Fill	fill of ditch	17145	10th-11th c.	5
17270	vitrified stone	7.74	3	2 pieces are a broken fragment of crystalline probable iron slag, one is a bleb of sandy, partially-melted material with a black glass - probably a lining slag	Fill	fill of ditch	17145	10th-11th c.	5
17272	17013		assm	stone	Fill	fill of ditch	17164		2
17283	17016		assm	stone, fired clay, slag films (FHS?)	Fill	fill of ditch	17295	11th c.	5
17291	17015		assm	fired clay, stone, BOM	Fill	fill of ditch	17295	11th-12th c.	5
17308	17019		assm	stone, 1 piece FHS	Layer	sand			0
17343	17025		assm	stone, fired clay, maroon glassy slag droplet	Fill	fill of corndrier	17048		3
17344	17027		assm	stone	Fill	fill of corndrier	17067		3
17349	17028		assm	stone, probable dark slag fragments	Fill	fill of corndrier	17067	RB?	3

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
17356	17044		assm	stone	Fill	fill of pit	17359	15th-16th c. (modern intrusive?)	5
17381	17039		assm	stone	Fill	fill of ditch	17384		2
17383	17038		assm	stone	Fill	fill of ditch	17384		2
17412	17041		assm	stone, slag blebs	Fill	fill of posthole	17411		U
17436	17046		assm	stone, fired clay, abundant slag droplets (possibly SHS?) but no FHS	Fill	fill of posthole	17434	C3-C4	3
17520	industrial waste	12.9	1	slab of slag with central cavity, laminated inclusions suggest this is clinker, but it might be an odd lining slag, 12mm thick, 35x35mm	Fill	fill of gully	17521		7
17635	burnt stone	5.58	1	natural stone	Fill	fill of posthole	17636	11th-12th c.	5
17637	slag	0.66	1	chip of rusty concretion (similar to the coatings on some slag pieces)	Fill	fill of pit	17638	LC3-C4+	3
17699	17043		assm	stone	Cut	posthole			7
18041	18001		assm	stone, sparse slag fragments and FHS	Fill	fill of tree throw	18040		U
18073	18002		assm	stones, moderate amount of fragments of black vesicular slag and some slag films	Fill	fill of posthole	18074	12th-13th c.	5
18073	18002	0.05	6	BOM	Fill	fill of posthole	18074	12th-13th c.	5
18078	18003		assm	stone, fired clay, slag, BOM, some FHS	Fill	fill of posthole	18080	12th-13th c.	5
18104	18000		assm	stone, rare FHS, clinker-like droplet	Fill	fill of posthole	18103		U
18104	18000 vit mat	0.36	15	BOM	Fill	fill of posthole	18103		U
18104	18000	<	1	slag droplet	Fill	fill of posthole	18103		U

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
19000	vitrified clay	4.28	1	maroon-surfaced black glassy slag - clinker	Fill	fill of tree throw	19060	RB	5
19028	slag	8	2	gravelly vesicular very dark slag, verging on a purple tint to the black slag. Contains various gravelly clasts and a sandy material that could be decomposed sandstone or sandy hearth wall	Fill	fill of pit	19027	12th c.?	5
19028	slag	14	2	broken lump of clinkery material, contains both sandstone and shale clasts, purplish smooth surfaces and purple tint to dark crystalline parts, some accreted sand on outside, probably true clinker	Fill	fill of pit	19027	12th c.?	5
19042	charoal	16.12	assm	coal shale - broken single lump probably - has been burnt and has clinker coating	Fill	Fill of posthole	19040		7
19092	19000		assm	stone	Fill	Fill of pit	19093	MIA	2
19102	19004A		assm	stone	Fill	Fill of pit	19088		2
19116	industrial residue	4.59	assm	fragmented rounded used coke particles up to 20mm	Fill	Fill of posthole	19115		7
19120	19002		assm	stone	fill	Fill of pit	19119		U
19211	19003		assm	stone	Fill	Fill of Pit	19215	MIA	2
19214	19004		assm	stone	Fill	Fill of pit	19215	MIA	2
19232	19005		assm	stone	Fill	fill of pit	19088		2
20014	slag	66	3	broken section from centre of a small SHC , slightly green top passing through dense slag into prilly base surrounding charcoal clasts	Fill	fill of ditch	20013	C1	2
20045	20004		assm	stone, vesicular clinkery slag fragments	Fill	fill of kiln	20044	RB; MC1-C2	5
20045	slag	52	2	gravelly clinkery slag, larger piece is cored on large slab of shale with hints of fossils	Fill	fill of kiln	20044	RB; MC1-C2	5
20047	20000		assm	stone, bone, rare slag, one slag droplet	Fill	Fill of kiln	20044	10th-11th c.	5
20124	20002		assm	stone	Fill	fill of pit	20119	MIA	2
20125	20001		assm	stone, rust	Fill	fill of pit	20119	MIA	2

20185	20051		assm	stone	Fill	fill of pit	20184		U
20198	slag	288	6	6 major pieces plus bits, apparently from a single well-preserved SHC. Pale grey colour, lower crust dense with tubular vesicles connecting to tabular ones above, uppermost part seen is granular but not well seen. Proportion of original cake uncertain, slag mainly with fine equant grains	Fill	fill of pit	20153 + 20794	13th c.	5
20219	20028		assm	stone, rare slag fragments	Fill	Fill of kiln	20044		5
20220	20021		assm	stone, single SHS	Fill	Fill of Kiln	20044	12th c.	5
20220	20025		assm	stone, possible fired clay	Fill	Fill of Kiln	20044	12th c.	5
20294		31	1	small fragment from 25mm thick SHC with very smooth top and charcoal rich base, with very slightly prilly margin	Fill	fill of ditch	20293	MIA	4
20325	20048		assm	stone	Cut	Gully		LBA	U
20326	20049		assm	stone	Fill	fill of gulley	20235		U
20336	20052		assm	stone	Fill	Fill of pit	20238	LBA	1
20368	20027		assm	<1 stone	Fill	Fill of Pit	20370	12th-14th c.	2
20391	vitrfied clay	9.71	1	maroon-surfaced black glassy slag - clinker	Fill	fill of posthole	20390	RB	3
		0.29	1	coke					
20406		1	1	pale grey vesicular slag - possibly a highly bloated ceramic - identical to piece from 20906 but do not appear to join	Fill	Fill of pit	20405	8th-9th c.	4
20906	slag	2	1	pale grey vesicular slag - possibly a highly bloated ceramic (should this be 20406?)	Fill	fill of post hole	20907		U
20430		18	1	protrusion of lining slag and glazed material from surface of highly vitrified sandy lining	Fill	fill of pit	20392		3
20435	20003		assm	stone, fired clay, blebby slags, FHS	Fill	Fill of pit	2153		5
20485	20005		assm	stone	Void				VOID
20515	industrial waste	2.65	1	coke	Fill	fill of pit	20513	17th c.	2

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
20561	20006		assm	stone, possible burnt clay, glassy slag fragments	Fill	fill of kiln	20044		5
20585	20007		assm	stone, BOM	Fill	fill of Kiln	20044		5
20586	20008		assm	stone	Fill	fill of Kiln	20044		5
20588	20010		assm	stone	Fill	fill of pit	20153	MIA	2
20589	20011		assm	stone	Fill	fill of pit	20153		2
20590	20012		assm	fired clay (probably some reduced)	Fill	fill of pit	20153	MIA	2
20609	slag	162	1	heavily encrusted slag piece - probably around 75% of small SHC. Starting to explode, so contained metallic iron	Fill	fill of pit	20569	12th-13th c.	5
20618	20017		assm	stone, rust?, single FHS	Fill	fill of kiln	20044		5
20619	20018		assm	stone, some slag and FHS	Fill	fill of kiln	20044		5
20620	20019		assm	stone	Fill	fill of kiln	20044		5
20624	vitrfied clay	1.69	1	clinkery slag on high vitrified siltstone chip	Fill	fill of ditch	20554		4
20756	20020		assm	stone, fired clay, one SHS, one slag droplet	Fill	Fill of hearth	20755	12th-14th c.	5
20792	slag	42	1	natural Mn pan	Layer	Silting Deposit		C1	4
20805	20023		assm	stone	Fill	Fill for kiln	20044		5
20807	20024		assm	stone - rich in natural Fe-oxide granules, but also some SHC and FHS in minor amounts	Fill	Fill of grave cut	20809	12th-13th c.	5
20807	20024 slag	1	1	small fragment of greenish, highly porous glassy FAS / lining slag	Fill	Fill of grave cut	20809	12th-13th c.	5
		<1	1	4mm bleb of brown clinkery appearing FAS					
20811	20026		assm	stone	Fill	Fill of grave cut	20813	Rom	3

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
21015	20031		assm	stone	Fill	fill of kiln	20044		5
21016	20029		assm	stone	Fill	fill of kiln	20044		5
21035	20031		assm	stone	Cut	Gully			4
21041	vitrified materials	104	13	small SHC fragment - dense, large olivine crystals, fresh,	Fill	fill of pit	21039	10th-11th c.	4
		2	1	large slag flat					
		6	1	gravelly lining slag					
21062	20030		assm	stone	Fill	Fill of pit	21060		6
21062	20030		assm	abundant grey porous material (same vesicular grey material as from 20406/20906/2043 in macro), some droplets, at least one thin shelled and hollow	Fill	Fill of pit	21060		6
21080	20037 slag	4	1	burnt bone	Skeleton	Skeleton		MIA	4
sk 20080	20036		assm	stone, possible slag, single FHS [*sk 21080 assumed correct number*]	Skeleton	Skeleton		MIA	4
sk 21080	20039		assm	stone, two small slag or clinker blebby pieces	Skeleton	Skeleton		MIA	4
sk 21080	20035		assm	stone, single FHS	Skeleton	Skeleton		MIA	4
sk 21080	20038		assm	stone, poor slag piece	Skeleton	Skeleton		MIA	4
sk 21080	20037		assm	stone, 1 vesicular glassy slag chip	Skeleton	Skeleton		MIA	4
sk 20080	20036	0.25	8	2 pieces bone, 6 pieces of stone	Skeleton	Skeleton		MIA	4
21124	20033		assm	fired clay (half of which is reduced)	Fill	Fill of pit	21123		4
21303	20042		assm	stone	Fill	Fill of Pit	21193	MIA	2
21304	20041		assm	stone	cut	Grave cut			2
21306	20043		assm	stone	Fill	fill of grave	21305	MIA	2
21306	20044		assm	stone	Fill	fill of grave	21305	MIA	2

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
21320	20053		assm	stone, 1 possible FHS	Fill	Fill of pit	20238	LBA	1
21332	pottery	2.98	1	apparently complicated fired clay strips surrounded by black residue, 17x28x6mm, 2 overlapping strips, very odd - could it be some sort of packing from ,for instance inside a cauldron rim, shows slightly out-turned rim, raised line 6mm below on inside, and outer strip finishes 12mm below rim, leaving step of c2mm	Layer	natural silting layer			2
21681	slag	20	1	maroon surfaced black glassy slag in complex shape - clinker	Fill	fill of pit	21672	5th-7th c.	4
21384	20055		assm	<1mm large bag of fired clay,	Fill	fill of pit	21377		2
21390	20047		assm	large collection of stone dominated by highly polished Fe-oxides	Fill	fill of pit	21398	MIA	2
21620	20054		assm	stone	Fill	fill of ditch	21197+21116		2
21794	pottery crucible	15.64	1	sheet of ceramic c5mm thick, curved edge, one face shows increased vitrfication and reddening to the outside, the other face is less vitrified, has a smoothed, lightly striated surface, but has a layer of black glass and sand adhering to the surface	Fill	Fill of pit	21786		2
21920	20056		assm	stone	Fill	Fill of Grave cut	21922		6
21933	20057		assm	stone, a few slag fragments, one SHS/droplet	Fill	fill of ditch	21915		2
21950	slag	108	assm	bag of sandy material, mixed with lens of charcoal and with partially fused patches, some bands have taken on pink-violet colour that might hint at Pb-Zn contamination possibly	Fill	fill of ditch	21944	13th-14th c.	5
22017	20058		assm	stone fired clay, blebby slags, slag droplets, FHS	Deposit	Remains of superstructure			2
22017	20058	0.19	9	1 stone, 8 BOM	Deposit	Remains of superstructure			2
22019	20060		assm	large quantity of fired clay, a few slag fragments including flats	Deposit	possible base of hearth			2

Context	Sample	Wt.	No.	Description	Type	Description	Fill of	Pottery spot	Phase
22019	20060	<	1	slag droplet	Deposit	possible base of hearth			2
22021	20063		assm	fired clay, a few FHS, some probable SHS, slag droplets - one rather clinkery-looking, some slag fragments - all sparse	Deposit	Remains of hearth			2
22021	20074	0.47	c22	mainly BOM, 2 stones	Deposit	Remains of hearth			2
22021	20053	<	1	slag droplet	Deposit	Remains of hearth			2
20021	20074	<	1	slag droplet	Deposit	Remains of hearth			2
22030	20059		assm	stone	Fill	fill of defensive ditch	21979		2
22038	20061		assm	abundant fired clay, some stone, a few slag fragments and a droplet	Deposit	layer			2
22039	20062		assm	fired clay, maroon glassy slag droplet	Deposit	hearth layer			2
22059	20073		assm	fired clay?	Fill	fill for hearth	22058		2

Table 2: Summary interpretation of assemblage by context

Context	*Type*	*Description*	*Fill of*	*Pottery spot*	*Phase*	*Summary interpretation*
17308	Layer	sand			0	trace evidence for iron-working
21320	Fill	Fill of pit	20238	LBA	1	possible trace evidence for iron-working
15131	Fill	fill of pit	15129	MIA	2	evidence for copper alloy casting, trace evidence for iron-working
15132	Fill	fill of pit	15129	MIA	2	evidence for copper alloy casting
15145	Fill	fill of pit	15129		2	possible evidence for copper alloy casting
16064	Fill	fill of pit	16063	MIA	2	trace evidence for iron-working
20014	Fill	fill of ditch	20013	C1	2	evidence for iron-working
20515	Fill	fill of pit	20513	17th c.	2	evidence for coal use - supports late date
21332	Layer	natural silting layer			2	possible metalworking residue
21794	Fill	Fill of pit	21786		2	evidence for copper alloy casting
21933	Fill	fill of ditch	21915		2	possible trace evidence for iron-working
22017	Deposit	Remains of superstructure			2	trace evidence for iron-working
22019	Deposit	possible base of hearth			2	trace evidence for iron-working
20021	Deposit	Remains of hearth			2	trace evidence for iron-working
22038	Deposit	layer			2	trace evidence for iron-working
22039	Deposit	hearth layer			2	evidence for metalworking
2026	Layer	redeposited natural			3	evidence for metalworking
2086	Layer	alluvium		C3-C4+	3	evidence for iron-working
3111	Fill	Single fill of pit/tree-throw	3112	C3-C4	3	possible evidence for coal use
3949	Fill	Fill of pit	3948		3	evidence for iron-working
5135	Fill	Fill of ditch	5136		3	evidence for iron-working using charcoal
17020	Fill	fill of pit	17022	MC1-C2	3	trace evidence for iron-working
17026	Fill	fill of corn drier	17028		3	possible trace evidence for metalworking
17048	Cut	corn drier			3	trace evidence for iron-working
17069	Fill	fill of corn drier	17048	Rom	3	trace evidence for iron-working
17070	Fill	fill corn drier	17048	Rom	3	trace evidence for iron-working
17075	Fill	fill of corn drier	17048	RB	3	possible trace evidence for iron-working using coal
17076	Fill	fill of corn drier	17048		3	trace evidence for iron-working
17242	Fill	fill of posthole	17244	Rom	3	possible trace evidence for iron-working using coal
17343	Fill	fill of corndrier	17048		3	possible trace evidence for iron-working using coal
17349	Fill	fill of corndrier	17067	RB?	3	trace evidence for iron-working
17436	Fill	fill of posthole	17434	C3-C4	3	evidence for iron-working
20391	Fill	fill of posthole	20390	RB	3	evidence for using coal
20430	Fill	fill of pit	20392		3	evidence for metalworking
2025	Fill	fill of pit	2024	8th-9th c.	4	evidence for iron-working

Context	*Type*	*Description*	*Fill of*	*Pottery spot*	*Phase*	*Summary interpretation*
2039	Layer	alluvium		9th-11th c.	4	evidence for metalworking
2096	Layer	alluvium		8th-9th c.	4	trace evidence for iron-working
3053	Layer	Peat			4	evidence for metalworking
3158	Layer	Levelling			4	evidence for iron-working
5128	Layer	Silty clay deposit			4	evidence for metalworking
5131	Layer	Silty clay deposit		LC3-C4	4	evidence for iron-working
5224	Fill	Fill of pit	5223	8th-9th c.	4	evidence for iron-working
15476	Fill	fill of posthole	15477	10th-11th c.	4	trace evidence for iron-working
15489	Fill	fill of posthole	15488	10th-11th c.	4	trace evidence for iron-working
16070	Fill	fill of pit	16069	10th-11th c.	4	trace evidence for iron-working
20294	Fill	fill of ditch	20293	MIA	4	evidence for iron-working
20406	Fill	Fill of pit	20405	8th-9th c.	4	evidence for metalworking
20624	Fill	fill of ditch	20554		4	evidence for metalworking
21041	Fill	fill of pit	21039	10th-11th c.	4	evidence for iron-working
sk 21080	Skeleton	Skeleton		MIA	4	trace evidence for iron-working and possibly coal use
21681	Fill	fill of pit	21672	5th-7th c.	4	evidence for using coal
2009	Layer	alluvium		12th-14th c.	5	trace evidence for iron-working (possibly with coal)
2010	Layer	alluvium			5	trace evidence for iron-working
2011	Layer	slumping			5	evidence for iron-working
2043	Fill	fill of pit	2046	12th-13th c.	5	trace evidence for metalworking
2044	Fill	fill of pit	2046	12th-13th c.	5	trace evidence for metalworking
2050	Layer	peat			5	evidence for iron-working
2070	Fill	fill of pit	2074		5	trace evidence for metalworking
3946	Fill	Single fill of ditch	3945	RB	5	trace evidence for metalworking
4112	Fill	Fill of pit	4111	12th-13th c.	5	evidence for metalworking
12060	Fill	fill of pit	12061	13th-14th c.	5	uncertain significance
15186	Fill	fill of pit	15185	12th c.?	5	possible trace evidence for metalworking
15214	Fill	fill of pit	15215	11th c.	5	trace evidence for iron-working
15264	Fill	fill of posthole	15265	11th-12th c.	5	trace evidence for iron-working
15416	Fill	fill of ditch	15415	12th c.	5	possible trace evidence for metalworking
15419	Fill	fill of ditch	15415	13th-14th c.	5	possible trace evidence for metalworking
15486	Fill	fill of posthole	15487	11th c.	5	trace evidence for iron-working
16004=16098	Fill	fill of pit	16003	12th-13th c.	5	trace evidence for metalworking (probably using coal)
17157	Fill	fill of well	17156	12th c.	5	trace evidence for iron-working
17221	Fill	fill of corn drier	17182	11th-12th c.?	5	trace evidence for iron-working
17270	Fill	fill of ditch	17145	10th-11th c.	5	evidence for iron-working
17283	Fill	fill of ditch	17295	11th c.	5	trace evidence for iron-working
18073	Fill	fill of posthole	18074	12th-13th c.	5	trace evidence for metalworking
18078	Fill	fill of posthole	18080	12th-13th c.	5	trace evidence for iron-working

Context	*Type*	*Description*	*Fill of*	*Pottery spot*	*Phase*	*Summary interpretation*
19000	Fill	fill of tree throw	19060	RB	5	evidence for coal use
19028	Fill	fill of pit	19027	12th c.?	5	evidence for metalworking (possibly using coal)
20045	Fill	fill of kiln	20044	RB; MC1-C2	5	evidence for metalworking (possibly using coal)
20047	Fill	Fill of kiln	20044	10th-11th c.	5	trace evidence for metalworking
20198	Fill	fill of pit	20153 + 20794	13th c.	5	evidence for iron-working
20219	Fill	Fill of kiln	20044		5	trace evidence for metalworking
20220	Fill	Fill of Kiln	20044	12th c.	5	trace evidence for iron-working
20435	Fill	Fill of pit	2153		5	trace evidence for iron-working
20561	Fill	fill of kiln	20044		5	trace evidence for metalworking
20609	Fill	fill of pit	20569	12th-13th c.	5	evidence for iron-working
20618	Fill	fill of kiln	20044		5	trace evidence for iron-working
20619	Fill	fill of kiln	20044		5	trace evidence for iron-working
20756	Fill	Fill of hearth	20755	12th-14th c.	5	trace evidence for iron-working
20807	Fill	Fill of grave cut	20809	12th-13th c.	5	trace evidence for iron-working
21950	Fill	fill of ditch	21944	13th-14th c.	5	evidence for metalworking (possibly non-ferrous)
3002	Layer	Made ground		L.18th-19th c.	6	evidence for iron-working
21062	Fill	Fill of pit	21060		6	possible trace evidence for metalworking
2057	Layer	dumping			7	evidence for coal use
17520	Fill	fill of gully	17521		7	probable evidence for coal use
19042	Fill	Fill of posthole	19040		7	evidence for coal use
19116	Fill	Fill of posthole	19115		7	evidence for coal use
2089	Cut	pit			U	possible trace evidence for metalworking
15203	Fill	fill of posthole	15204		U	trace evidence for iron-working
15260	Fill	fill of posthole	15261		U	possible trace evidence for metalworking
15305	Fill	fill of posthole	15295		U	trace evidence for iron-working
15429	Fill	fill of posthole	15430		U	trace evidence for iron-working and coal use
15434	Fill	fill of posthole	15433		U	trace evidence for iron-working
15440	Fill	fill of posthole	15439		U	trace evidence for iron-working
15492	Fill	fill of posthole	15491		U	evidence for coal use and possible trace evidence for metalworking
15493	Fill	fill of posthole	15491		U	trace evidence for iron-working
17017	Cut	gully			U	trace evidence for iron-working
17412	Fill	fill of posthole	17411		U	trace evidence for iron-working
18041	Fill	fill of tree throw	18040		U	trace evidence for iron-working
18104	Fill	fill of posthole	18103		U	trace evidence for iron-working
20906	Fill	fill of post hole	20907		U	possible trace evidence for metalworking

Table 3: list of identifiable SHC fragments, ordered by phase and context

Piece weight	Piece note	Slag note	Original weight	Context	Phase
66g	fragment			20014	2
378g	>95%		400g	2086	3
112g	3 pieces crust			2025	4
160g	c. 50%	charcoal	320g	5131	4
702g	100%		702g	5224	4 (8-9)
31g	fragment	charcoal, smooth top		20294	4
104g	broken fragment	coarse dense		21041	4 (10-11)
130g	c. 50%?		260g	2011	5
192g	block (burr?)			2050	5
122g	fragment			4112	5
288g	6 pieces			20198	5 (13)
162g	c. 75%	exploding	220g	20609	5 (12-13)
122g	100%		122g	3002	6

GeoArch

geoarchaeological, archaeometallurgical & geophysical investigations

Unit 6,
Western Industrial Estate,
Caerphilly,
CF83 1BQ

Office:	029 20881431
Mobile:	07802 413704
Fax:	08700 547366
E-Mail:	Tim.Young@GeoArch.co.uk
Web:	www.GeoArch.co.uk