

GeoArch

Report 2011/03

Archaeometallurgical residues from Llangors Crannog

Dr Tim Young
15th February 2011

Archaeometallurgical residues from Llangors Crannog

Dr T.P. Young

Abstract

The assemblage of possible metallurgical residues was large (538 pieces excluding various extraneous finds). There were 189 items of probable archaeometallurgical origin (slags, hearth lining, crucible), 65 items of low density fuel ash slag which may not be of metallurgical origin and 186 pieces of indeterminate fired clay. In addition there 98 items associated with the burning of coal (coal, coke, clinker), most, if not all, of which are likely to be later post-medieval in date.

Of the archaeometallurgical residues, most are probably associated with the working of iron. One complete and several substantial fragments of small smithing hearth cakes indicate end-use iron-working (blacksmithing). Most of the indeterminate dense slags are probably also derived from the fragmentation of similar cakes. Several small fragments of highly bloated pale grey ceramic with an external wood ash glaze may be fragments from the clay coatings applied to iron objects in order to braze them (coat or join them with a copper alloy). One sherd of crucible is also probably indicative of non ferrous metalworking, but has no visible adhering residues.

The large body of fired clay fragments is not particularly indicative of originating process. Some may be derived from metallurgical hearths (but lack the distinctive internal vitrified surface), others may be from domestic hearths or be fired daub. Some fragments may possibly be from moulds, but there are no pieces with clear diagnostic features of being moulds.

The low density fuel ash slags are abundant, but again not indicative of a particular process.

Materials derived from the burning of coal may be residues from domestic hearths, but it likely that the high temperature residues (clinker) derive from steam boilers.

Contents

Abstract	1
Methods	1
Description	
Materials of probable metallurgical origin	
Smithing hearth cakes	1
Indeterminate dense slag	2
Crucible	2
Highly vitrified, bloated ceramic	2
Low density fuel ash/lining slags	2
Vitrified lining and lining slags	2
Indeterminate fired clay	2
Materials of probable non-metallurgical origin	
Material associated with the use of coal	2
Other materials	3
Interpretation	3
References	4
Catalogue	5

Methods

All investigated materials were examined visually, using a low-powered binocular microscope where necessary, and were summarily described and recorded to a database (table 1).

Description

Material of probable or possible metallurgical origin

Smithing hearth cakes

Some twenty three pieces of slag were identifiable as being derived from smithing hearth cakes (SHCs). Those pieces for which a size could be estimated for the original SHC all indicated very small cakes. One example [#3082] was complete and weighed 209g. Four incomplete examples suggested original weights of between 100 and 200g. One piece [#650] was from the burr (the region of interaction between the slag cake and the hearth wall) of an SHC and weighed 128g, possibly suggesting a slightly larger original SHC weight, probably of more than 200g. The other sixteen pieces were small fragments with textures that allowed

confident attribution to SHCs, but which were too small to allow estimate of original size.

The textures seen in the SHC material varied from slag rich in charcoal inclusions, through grey slags with abundant vesicles, to material with a dense texture and a somewhat lobed surface. The larger specimens suggest that the SHCs were overall fairly dense, compact and well-formed, despite their small size.

Four of the SHC fragments came from area A (contexts 3, 15, 16 and 23). One fragment was from D6. The other eighteen pieces were from the underwater surveys.

Indeterminate dense slag

Approximately 94 small fragments of indeterminate dense slag were retrieved. Most of these were small fragments of dark grey vesicular slag without clear identifying features. All of the pieces were compatible with an origin in iron working. It is likely that most of this material comprises fragments of smithing hearth cakes that have become too fragmented for that origin to be recognisable with any confidence.

Crucible

One single small fragment of crucible was identified from the assemblage ([#5357, from corridor 42, 1-3-1.5m). The piece was a rather stout rim, from a crucible of uncertain form, with no visible slagging or other residue.

Highly vitrified, bloated ceramic

Ten pieces of highly vitrified, bloated ceramic with a pale grey colour were identified as being distinct from most of the assemblage of fired ceramic, although similar to some of the fuel ash slags. Two of the fragments show a green glaze (typical of a wood ash glaze).

Although such material cannot be referred to any particular process with certainty, they show some characteristics in common with the clay coatings employed to cover iron during brazing (Young in press). Such material (referred to as shrouds or wraps) typically shows a bloated pale grey quartzose ceramic, with a dimpled green glazed exterior and a rather variable internal surface, sometimes with a fabric impression and sometimes with a vesicular glassy coating. One of the present sherds [#4213] shows a slightly striated internal surface which might be a poor fabric impression.

Bloated fabrics of this kind have been recorded in other contexts however, including in furnace linings (Young 2010), so the identification of these materials as brazing shroud must remain tentative.

Low density fuel ash/lining slags

Sixty five pieces of low-density glassy slags were retrieved. Such slags are typically formed through the fluxing action of the fuel ash on particles of fine-grained soil or clay from the substrate into which a hearth has been cut, from impurities within the fuel or from the hearth materials. Some coarser grained, gravel-grade particles, that have been partially vitrified

are also included here, and would have had a similar origin.

It is likely that this group embraces materials from a variety of different processes. Some may be pieces of clinker (residues from coal-burning) that happen to lack the diagnostic criteria of clinker (such as a black glassy matrix, a maroon surface and enclosed particles of burnt shale). Others may be genetically close to the lining slags mentioned below, but differing in having a more vesicular or a paler glass. Others again may be associated with the partial melting of small isolated derived particles within a hearth.

Fuel ash slags may be produced in metallurgical hearths, and may be particularly prominent in hearths from non-ferrous metalworking (such as the casting of copper alloys or the brazing of iron), in which, unlike the smithing of iron, the metal being worked does not (intentionally at least) directly enter the hearth.

On the other hand, fuel ash slags may also form in non-metallurgical hearths and kilns. Some described examples derive from cereal drying kilns (e.g. Young 2005, 2009), but they would also be expected to be produced in other forms of hearths and kilns.

Vitrified hearth lining and associated lining slag

There were sixty one fragments of fired ceramic with features (principally a vitrified surface with a dark glass) that are strongly suggestive of these being pieces of vitrified hearth lining. This material is almost all oxidised-fired, although some shows a superficial darker, possibly reduced-fired, layer. A minority of the material shows evidence for organic tempering. Most of the material bears fine sand grains but a few samples show some coarser grains that might possibly be a deliberate addition.

The dark colour of the glass (which is itself frequently rich in sand-grade quartz grains derived from the ceramic substrate) is compatible with an origin in an iron-working hearth. None of the material showed any diagnostic morphological features that would enable attribution to a tuyère or other particular hearth component.

Indeterminate fired clay

The assemblage includes approximately 150 fragments of oxidised fired clay, seventeen of which showed organic temper. Almost all of this material came from Area C grids A14, A15, A16, B15 and B16.

There were nine fragments of indeterminate reduced-fired clay, three of which showed fine organic temper (hair?). These pieces were in general more fired than the oxidised material, with some degree of vitrification observed in several.

There were twenty seven fragments of fired clay with variable oxidation. These mostly derived from the same area of excavation as the oxidised fired clay described above. Some of these pieces are compatible with being degraded fragments of moulds, but none is certainly so.

Material of probable non-metallurgical origin

Material associated with the use of coal

A large number of finds were identifiable as residues associated with the burning of coal. There was no confirmed association of any of this material with metallurgical activities (the fuel for which was charcoal wherever an identification could be made).

Coal is likely to have been used both as a domestic fuel from the later medieval period onwards and as a fuel for steam engines in agricultural machinery (and perhaps also in boats).

In this collection, 18 isolated pieces of coal were recorded, all but two from excavations on the crannog rather than from the underwater survey.

Some forty two pieces of coke were recovered (the precise number is uncertain because of breakage), approximately half from the excavations and half underwater. The most likely origin for this material is as an incidental residue from incompletely-burnt coal, rather than being deliberately-produced metallurgical or household coke, although the materials cannot be distinguished.

The partial melting of the inorganic component of coal generates clinker. Seven pieces of clinker were identified, and a further seven pieces were probable. Of the fourteen pieces five were recovered during excavations and nine underwater.

One particular distinctive class of material was an ashy concretionary material, containing small particles of fresh coal, but probably cemented by clinker. Twenty four particles of this class were recovered, all in a very small area. Corridor 31 yielded this material from intervals 5.3-5.7m (one piece), 6.8-7.3m (four pieces) and 7.3-7.5m (one piece). Corridor 32 had similar material from intervals 5.9-6.4m (one piece), 6.4-6.8m (five pieces), 6.8-7.3m (seven pieces) and 7.3-7.9 m (two pieces). Corridor 33 produced three pieces from interval 7.3-6.65m. This tight clustering suggests that this material may derive from a single depositional episode, probably the cleaning of a boiler on a boat.

Other materials

Various non-metallurgical materials were contained within the assemblage. Items identified as rock fragments have not been incorporated in the final catalogue. Other samples included building materials (brick, plaster), bitumen, a blob of plastic, fragments of nails and more significantly at least thirteen fragments of bone.

Interpretation

The assemblage shows considerable mixture with materials that are likely to be post-medieval, but there is a core of material indicative of light blacksmithing, of the use of non-ferrous metal (probably copper alloy casting) and possibly also of brazing.

The late 9th to early 10th centuries is not a period for which there are many well-described blacksmithing residue assemblages, so there are few good comparative examples. The only blacksmithing assemblages of this date from Wales are the unpublished collections from Llanbedrgoch (Anglesey) and Abernant (Newport). Smithing residues of this period have been described from South Hook (Pembrokeshire), but are associated (Young 2010a) with primary smithing (bloom smithing) rather than secondary smithing (blacksmithing). There is also an

almost complete lack of well-described smithing residue assemblages from Late Saxon England.

In general, however, small SHCs like those from Llangors, are typical of blacksmithing assemblages of earlier Romano-British age, as well as of slightly later medieval age. The blacksmithing slags of Roman age have had maximum sizes of about 820g at both Carmarthen (Crew 2003) and Marsh Leys Farm (Young 2005a), with mean weights of 230 and 330g respectively. The 12th century assemblages from Worcester in Mill Street (Young 2009b) and Willow Lane (Young 2007), are very similar, with maximum weights of 782g and 770g respectively and mean weights of 233g and 327g respectively.

In Ireland, 9th to 10th century smithing assemblages have been described from secular sites at Woodstown, Co. Waterford (Young 2006, 2008b, 2009a), Rochefort Demesne, Co. Westmeath (Young in press), Blackchurch, Co. Kildare (Young & Kearns 2010a) and Ballyellin, Co. Wexford (Young & Kearns 2010b). Assemblages of smithing residues probably of this age are also known from the monastic centres of Clonmacnoise, Co. Offaly (author's work in progress), Clonfad, Co. Westmeath (Young in press) and Armagh (Gaskell Brown & Harper 1984). For most of these sites, it would appear that there was at least some primary smithing being undertaken, so the SHC assemblages contain much larger examples, alongside the small ones from blacksmithing. It would appear likely that iron was traded or distributed in an incompletely refined form in early medieval Ireland (Young, in press).

The production of copper alloys artefacts has been recorded in 9th-10th century Ireland in the Viking centres of Woodstown (Young 2006, 2008b) and Dublin (Bayley, forthcoming), as well in Irish monastic "proto-urban" centres including Clonmacnoise (author's unpublished data and Armagh (Gaskell Brown & Harper 1984). In England similar occurrences are seen, for instance, in the urban centres of York (e.g. Bayley 1992) and Hamwic, but also on other high status sites (e.g. Cheddar, Rahtz 1979). In addition, copper alloy artefacts were cast at some of the small, but high status sites in Ireland, including both elite ringforts (e.g. Rochefort Demesne mentioned above) and, perhaps more significantly, on 'royal' crannog sites, such as Lagore Crannóg, Co. Meath (Comber 1997), which provides particularly abundant evidence for both ironworking (unfortunately not yet fully described) and the casting of copper alloys.

In contrast to these high status sites, rural smithies in Ireland, including Ballyellin and Blackchurch mentioned above, together with the slightly younger smithies at Coolamurry, Co. Wexford (12th century?; Young 2008a) and Garryleagh, Co. Cork (14th century; Young 2009b), appeared to have worked solely with iron.

Brazing has not been widely recognised in early medieval Ireland. Dublin (Bayley forthcoming) is the only site in Ireland where the brazing is of certainly of 9th – 10th century date. In Scandinavia, brazing has been more widely recognised at this period (e.g. Gustafsson 2005; Soderberg & Holmquist Olausson 1997), mostly on high status and proto-urban sites.

In summary, although the assemblage is small, there are parallels with metalworking evidence from other high status sites of the period. The tentative identification of residues from brazing adds to the very small number of early medieval sites in Britain and Ireland on which this activity has been recognised.

References

- BAYLEY, J. 1992. *Anglo-Scandinavian non-ferrous metalworking from 16-22 Coppergate*. The Archaeology of York, Volume 17, fasc. 7. Council for British Archaeology.
- BAYLEY, J. (forthcoming). *Non-Ferrous Metalworking in Viking Dublin*. Medieval Dublin Excavations 1962-81, National Museum of Ireland, Dublin.
- COMBER, M. 1997. Lagore Crannóg and non-ferrous metalworking in Early Historic Ireland. *The Journal of Irish Archaeology*, **8**, 101-114.
- CREW, P. 2003. Slags and other iron-working residues. pp. 333-340 in: H. James, *Roman Carmarthen: Excavations 1978-1993*. Britannia Monograph Series 20, Society for the Promotion of Roman Studies 2003.
- GASKELL BROWN, C. & HARPER, A.E.T. 1984. Excavations on Cathedral Hill, Armagh, 1968. *Ulster Journal of Archaeology*, **47**, 109-161.
- GUSTAFSSON, N.B. 2005. On Norse padlocks – production and use. Examples from the Birka Garrison, *Journal of Nordic Archaeological Science*, **15**, 19-24.
- RAHTZ, P., 1979, *The Saxon and Medieval Palaces at Cheddar*. British Archaeological Reports British Series 65.
- SÖDERBERG, A & HOLMQUIST OLAUSSON, L. 1997. On Bronzing Iron Objects - Archaeological Evidence of Weight-manufacture in Viking Age Scandinavia? Pp. 188-191 in Edgren, T (ed). *Iskos 11. Proceedings of the VII Nordic Conference on the Application of Scientific Methods in Archaeology - Savonlinna, Finland, 7 - 11 September 1996*. The Finnish Antiquarian Society. Vammala.
- YOUNG, T.P. 2005a. Evaluation of metallurgical residues from Marsh Leys Farm. *GeoArch Report 2005/07*. 10pp.
- YOUNG, T.P. 2005b. Site Activities: slag and related materials. pp. 174-176. In: Sharples, N (ed.), *A Norse Farmstead in the Outer Hebrides. Excavations at Mound 3, Bornais, South Uist*. Cardiff Studies in Archaeology, Oxbow Books, Oxford.
- YOUNG, T.P. 2006. Evaluation of archaeometallurgical residues from sites on the N25, Co. Waterford (Woodstown 6, Adamstown 1,2,3). *GeoArch Report 2006/15*. 38pp.
- YOUNG, T.P. 2007. Evaluation of archaeometallurgical residues from Willow Street and Mill Street, Worcester. *GeoArch Report 2007/12*. 10pp.
- YOUNG, T.P. 2008. Archaeometallurgical residues from Coolamurry 7, 04E0323. *GeoArch Report 2006/10*. 46pp.
- YOUNG, T.P. 2008. Evaluation of archaeometallurgical residues from Woodstown 6 SRP, E2964. *GeoArch Report 2008/11*. 15pp.
- YOUNG, T.P. 2009. Ferrous archaeometallurgical residues from Woodstown 6, *GeoArch Report 2009/22*, 66 pp.
- YOUNG, T.P. 2009. Evaluation of archaeometallurgical residues from 35 Mill Street, Worcester, *GeoArch Report 2009/33*, 9 pp.
- YOUNG, T.P. 2009. Evaluation of archaeometallurgical residues from the N8 Fermoy-Mitchelstown, Garryleagh, Co. Cork (E2433), *GeoArch Report 2009/47*, 10 pp.
- YOUNG, T.P. 2010. Archaeometallurgical residues from the South Hook LNG Terminal. *GeoArch Report 2010/03*, 54 pp.
- YOUNG, T.P. 2010. Fuel ash slags from corn-drying kilns, South Hook LNG Terminal. *GeoArch Report 2010/04*, 24 pp.
- YOUNG, T.P. 2010. Archaeometallurgical residues from Domgay Lane, Four Crosses, Powys. *GeoArch Report 2010/23*, 51 pp.
- YOUNG, T.P. in press. Chapter 10. Exploiting the bog: iron production and metalworking. In. *Behind the Ramparts: excavation of three early medieval enclosures on the N6 & N52*. NRA Scheme Monograph.
- YOUNG, T.P. & KEARNS, T. 2010. Evaluation of metallurgical residues from N7 Road-Widening and Interchanges Scheme: Site 48, Blackchurch, Co. Kildare (03E1607). *GeoArch Report 2010/18*, 7pp.
- YOUNG, T.P. & KEARNS, T. 2010. Evaluation of archaeometallurgical residues from Ballyellin 1, Co. Wexford (North Service Area Scheme, E4146). *GeoArch Report 2010/34*, 11 pp.

Table 1. Summary catalogue by residue class. Blue tone indicates material appearing in more than one category.

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
group 1 : materials derived from the burning of coal							
LC 89	6	Area A, context 6		1	2	clinker	fuel ash slag with white vesicular bloated clast coated in melt - probably clinker
LC 90	2172	Area C, Grid B8		2	1	clinker	black hard material - coke/Mn and small rounded slag fragment
LC 90	2305	Area P, Grid 11		1	26	clinker	large block of clinker with tiny fragment of pale green FAS
LC 90	2339	Area P, US		1	100	clinker	large ball of clinker with coal shale
LC 92	4046	corr. 32, 6.4-6.8m		2		clinker	1 piece clinker, 1 piece of iron slag (check the ceramic section too)
LC 92	4326	corr. 31, 4-6.6m		1	+	clinker	slightly clinkery-looking FAS
LC 92	4448	corr. 33, 7.3-7.8m		2	1	clinker	1 piece oxidised fired ceramic with irregular glass layer, small fragment of partially burnt coal shale
LC 92	4668	corr. 42, 2.0-2.3m		1	1	clinker	fuel ash slag bleb with chocolate-brown surface - possibly clinker?
LC 92	4763	corr. 32, 0.0-0.3m		1	+	clinker	1 piece stone, 1 piece clinker (vitrified shale with maroon surface)
LC 92	4829	corr. 34, 5.4-6.0m				clinker	fuel ash slag with slight maroon surface
34	4839	corr. 34, deep search				clinker	3 pieces of stone, 1 piece of clinker
LC 92	5070	corr -2, 4.2-4.5m		1	10	clinker	large piece of vesicular iron slag, small piece of FAS with small area of maroon on surface
LC 92	?	corr. 37, 2.8-3.7m		1	2	clinker	highly vesicular orange bloated glassy material, probably vitrified pebble
LC 92	?	corr. 31, 7.3-7.5m		3	5	clinker & coal concretion	smallest piece is low density FAS. Medium piece is clinker, large piece is cemented clinker and coal dust.
2004.56h	8618	b1	7062			clinker & coke	one piece of coke, one piece of FAS with slightly maroon surface, variegated pale/grey
LC 92	4305	corr. 34, 7.5-8.0m				coal	coal
LC 92	5613	corr. 37, 2.6-2.8m				coal	coal
2004.56h	8047	m6				coal	coal
2004.56h	8576	a10, sw	7005			coal	4 pieces of coal
2004.56h	8602	e1, se	7240			coal	coal
2004.56h	8722	a3	7011/7013			coal	2 pieces of coal
2004.56h	8734	m6		6		coal	6 pieces of coal
2004.56h	8763	a3, nw	7010	2		coal	2 pieces of coal
LC 92	4023	corr. 31, 5.3-5.7m		2	2	coal concretion	1 piece vesicular iron slag, 2nd piece is concreted ash and coal fragments
LC 92	4043	corr. 32, 5.9-6.4m		1	+	coal concretion	indurated coal dust and clinker
LC 92	4047	corr. 32, 6.4-6.8m		5	21	coal concretion	5 pieces from a slightly clinker-bound conglomerate of coal particles, 1 bleb of fuel ash slag
LC 92	4052	corr. 32, 6.8-7.3m		7	5	coal concretion	coal, coal shale and some grit bound by pale fuel ash slag, some shale fragments coated with more typical maroon clinker, clinker also occurs as spheroids
LC 92	4055	corr. 32, 7.3-7.9m		3	3	coal concretion	2 pieces of clinker binding coal residue, 1 stone

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	4441	corr. 31, 6.8-7.3		5	2	coal concretion	1 piece of bone, plus 4 pieces (broken?) of cemented clinker and coal dust
LC 92	4449	corr. 33, 7.3-6.65m		3	4	coal concretion	pale fuel ash slag binding coal fragments
LC 90	1447	Area C, Area A5, upper deposit		1	+	coke	1 stone, plus 1 lump oxidised fired clay plus one coke fragment
LC 90	2041	Area C, Grid A7		1	4	coke	coke
LC 90	2099	Area C, Grid A8		1	2	coke	coke
LC 90	2163	Area C, Grid D1		3	44	coke	broken large block of very low density black FAS or more likely coked remains of coal
LC 90	2212	Area C, Grid B7		1	+	coke	2 pieces of ?fired clay and 1 piece of coke
LC 90	2284	Area C, Grid B4, upper layer		1	3	coke	coke
LC 90	2324	Area C, Grid B10		1	4	coke	coke?
LC 90	2379	Area C, grid B10				coke	coke
LC 90	2400	Area C, Grid B (?)		1	1	coke	coke
LC 91	2909	Area C, Grid A14, contexts 4/2		2	4	coke	1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface
LC 90	3272	Area C, Grid B5		1	+	coke	Very glassy, black, slag or coke
LC 92	4011	corr. 30, 5.0-5.5m		1	-	coke	coke
LC 92	4016	corr. 30, 6.15-6.5m		1	+	coke	1 piece of coke 1 piece of charcoal or coke
LC 92	4477	corr. 31, 0.1-1.0m		3	+	coke	1 piece of coke, 1 piece of dense iron slag
LC 92	4499	corr. 33, 7.3-6.65m		2	1	coke	2 pieces of FAS plus 1 piece coke
LC 92	4518	corr. 32. 1.8-2.0m		1	60	coke	part of shc, plus block of coke (9g)
LC 92	4582	corr. 33, 3.7-4.1m		2	+	coke	coke
LC 92	4599	corr. 34, 1.3-1.9m		2	+	coke	coke
LC 92	4606	corr. 34, 1.9-2.3m		2	1	coke	1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth
LC 92	4706	corr. 34, 3.0-3.6m		1	+	coke	coke
LC 92	4726	corr. 38, 2.3-2.6m				coke	coke
LC 92	4902	corr. 39, 6.0-6.5m		1	+	coke	coke
LC 92	5157	corr. 45, 1.4-1.7m		1	+	coke	coke
LC 92	5241	corr. 39, 4.8-5.2m		3	2	coke	1 piece of coke, 1 piece of fuel ash slag, 1 piece of eroded iron slag
LC 92	5359	corr. 38, 4.9-5.1m		1	7	coke	coke
LC 92	5374	corr. 46, 4.0-4.3m				coke	coke
LC 92	5455	corr. 38, 2.6-2.9m		2	+	coke	1 piece of coke , 1 piece possibly weathered slag
LC 92	5462	corr. 36, 5.1-7.8m		2	+	coke	coke (now 5)
LC 92	5467	corr. 35, 5.8-6.3m		1	+	coke	(? Not seen)
2004.56h	7029	a7				coke	coke
2004.56h	8015	f7				coke	coke
2004.56h	8139	a4	7014/7016			coke	coked material
2004.56h	8171	b1	7065			coke	large piece of coke and smaller fragment of pale/grey FAS with local grey smooth surface
2004.56h	8538	b3	7073			coke	coke
2004.56h	8735	M6, trench 8		1		coke	coke
LC 92	?	corr. 34, 3.0-3.6m		1	1	coke	coke

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	?	corr. 35, 3.0-3.9m		1	+	coke	coke
LC 92	?	corr. 36, 2.3-3.0m		1	2	coke	coked organic residue
LC 92	?	corr. 36, 4.1-4.6m		2	+	coke	coke with granular texture (or possibly coal?)
group 2 : other fuel ash slags							
LC 90	1436	Area C, Grid A4, Upper deposit		1	1	FAS	FAS in complex bleb
LC 90	2079	Area C, Grid A3 upper layer		2	1	FAS	sandy fuel ash slag with green glass, soft clay lump and several stone fragments
LC 90	2159	Area C, Grid A2, upper deposit		3	4	FAS	3 FAS and 1 stone, 2 of the 3 FAS pieces have blue glass
LC 90	2244	Area C, Grid A6		1	3	FAS	sandy ceramic rather irregularly transformed into FAS
LC 90	2305	Area P, Grid 11		1	26	FAS	large block of clinker with tiny fragment of pale green FAS
LC 90	2366	Area C, Grid B5		2	16	FAS	1 piece of fired clay passing into lightly vitrified front, 1 large crude prill of fuel ash slag
LC 91	2533	corr. -1, 4.0m		1	24	FAS	dense sandy fuel ash in crude prill
LC 92	4008	corr. 30, 4.5-5.0m		1	+	FAS	low density FAS
LC 92	4030	corr. 31, 6.0-6.3m		1	1	FAS	fuel ash plus clay piece (v small)
LC 92	4033	corr. 31, 6.3-6.8m				FAS	stone with one tiny fuel ash slag fragment
LC 92	4037	corr. 32, 5.0-5.7m		1	+	FAS	irregular pale low density FAS
LC 92	4068	corr. 32, 9-9.3m		1	+	FAS	sandy fuel ash slag
LC 92	4151	corr. 31, 5.3-5.7m		1	+	FAS	FAS
LC 92	4364	corr. 32, 8.3-9.5m		2	2	FAS	one small fragment of fuel ash slag, one small piece of reduced fired ceramic with possible hair temper
LC 92	4497	corr. 33, 6.3-6.65		3	3	FAS	2 pieces of oxidised fired sandy ceramic with glassy vitrified layer, third piece is reduced fired poorly vitrified FAS, grey sandy
LC 92	4499	corr. 33, 7.3-6.65m		2	1	FAS	2 pieces of FAS plus 1 piece coke
LC 92	4606	corr. 34, 1.9-2.3m		2	1	FAS	1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth
LC 92	4634	corr. 40, 3.5-3.7m		1	+	FAS	low density FAS probably attached to fired clay
LC 92	4650	corr. 41, 3.6m		2	2	FAS	1 fuel ash, very sandy bound by blue glass, 1 small dense slag scrap
LC 92	4674	corr. 42, 2.3-3.0m		4	2	FAS	1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb
LC 92	4683	corr 29/30, 3.0-3.5m (inside palisade)		1	2	FAS	vesicular fuel ash slag with large crystals (?olivine)
LC 92	4721	corr. 36, 7.6-7.9m		+	42	FAS	?one piece (broken into many), highly vesicular low density FAS shattered, also burnt pig tooth
LC 92	4791	corr 29/30, 3.0-3.5m (inside palisade)		3	3	FAS	1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS
LC 92	4845	corr. 35, 3.4-4.1m		1	6	FAS	pale, sandy FA or lining slag
LC 92	4851	corr. 35, deep search		1	15	FAS	dark FAS with charcoal clast
LC 92	4872	corr. 34 deep search		1	47	FAS	large block of FAS with hollows presumably from fuel
LC 92	4877	corr. 38, 5.8-6.3		1	1	FAS	grey fuel ash slag (2nd bag with same number has 2 greenish slag blebs with charcoal inclusions)

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	4883	corr. 38, 6.3-6.8m		2	11	FAS	one large piece of fuel ash slag
LC 92	4911	corr. 43, 2.3-2.7m		2	7	FAS	large piece 6g possibly weathered slag, small piece 1g is highly vesicular fuel ash
LC 92	4922	corr. 36, 3.6-4.2m		1	1	FAS	slightly gravelly FAS
LC 92	4993	corr. 43, 0.0-1.0m		1	1	FAS	sandy fuel ash slag
LC 92	5002	corr. 43, 1.6-2.0m		2	3	FAS	1 piece vesicular iron slag, 1 piece of low density FAS
LC 92	5141	corr. 44, 4.1-4.7m		1	5	FAS	Blue tinge, pale, FAS, vesicular low density
LC 92	5190	corr -2, 2.3 - 3.5m		2	3	FAS	2 pieces of lining slag or FAS
LC 92	5227	corr. 39, 4.0-4.2m		1	+	FAS	low density FAS
LC 92	5232	corr. 39, 4.2-4.5m		1	1	FAS	pale FAS
LC 92	5257	corr. 40, 5.0-5.6m		1	+	FAS	dark FAS with small patches of blue glass
LC 92	5269	corr. 40. 6.1-6.3m		5	14	FAS	large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag
LC 92	5429	corr. 35, 5.1-5.3m				FAS	dark fuel ash or lining slag
LC 93	5921	corr. 49, 2.3-2.6m		1	1	FAS	Fuel ash with one coarsely crystalline end - ? vitrified pebble
LC 93	5986	corr. 49, 2.0-2.3m		1	1	FAS	highly vesicular pale FAS bleb
2004.56h	8001	d4				FAS	fuel ash slag with pale green glass
2004.56h	8171	b1	7065			FAS	large piece of coke and smaller fragment of pale/grey FAS with local grey smooth surface
LC 2004	8178	Grid F8		1	0.6	FAS	1 small fragment lining, 1 small piece FAS
LC 2004	8185	Grid B7 (SW) context 7089		1		FAS	Very dark; curved, convex outer surface, internally pale FAS - probably just a FAS piece not crucible
LC 2004	8191	Grid A12		1		FAS	weathered FAS?
2004.56h	8271	b8, ne	7091	1		FAS	moderately dense FAS with pale body colour and pale green glass
LC 2004 context 7240	8603	Grid E2 (SE)		1	0.2	FAS	dark slag fragment, vesicular - not a dense Fe-slag
2004.56H	8675	C12		1		FAS	moderately dense FAS with pale body colour
?	?	Area C, Grid A15, Context 5		1	+	FAS	curious material - possibly blue fuel ash slag, very fine grained (possibly lake marl?)
LC 90	?	Area C, Grid B8		3	5	FAS	one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining
LC 92	?	corr. 30, 6.5-6.9		1	+	FAS	1 piece FAS, 1 piece stone
LC 92	?	corr. 31, 7.3-7.5m		2	6	FAS	low density slag fragments - one with large platy olivine plus large piece of material with iron oxide crust
LC 92	?	corr. 36, 3.8-5.1		1	1	FAS	sandy FAS
LC 92	?	corr. 35, 7.3-7.6m		1	+	FAS	sandy FAS with blue glass
LC 92	?	corr. 37, 4.0-6.6m		2	2	FAS	1 piece FAS, 1 dark prill of glassy slag with green colour (lining or FAS?)
LC 92	?	corr. 31, 7.3-7.5m		3	5	FAS	smallest piece is low density FAS. Medium piece is clinker, large piece is cemented clinker and coal dust.

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
group 3a: ceramic materials with variable reduction - possibly mould fragments							
LC 90	2142	Area C, Grid A4		1		mould	reduced fired clay with neatly rounded surface - could be mould...
LC 91	3119	Area C, Grid B15, context 2?		3		mould	3 pieces mainly oxidised fired clay, one piece with mottled reduction - and could therefore be mould
LC 91	3277	Area C, Grid B14, Lower 2/6		1		mould	pale fired clay with darkened surface - could be mould fragment but not diagnostic
LC 91	3277			20		mould	c20 variably fired clay, 4 pieces show mottled reduction so could be mould debris
LC 92	4819	corr. 33, 8.9-9.3m		1		mould	quite likely to be mould, reduced fired
LC 93	5968	corr. 52, 2.6-3.0		1	+	mould	very fine grained fired clay, half oxidised half reduced, end has coarse organic inclusion ?straw (possibly mould?)
group 3b: ceramic materials - crucible							
LC 92	5357	corr. 42, 1.3-1.5m		1		crucible	stout rim with no visible residues
group 3c: ceramic materials - indeterminate oxidised-fired clay							
LC 90	1447	Area C, Area A5, upper deposit		1	+	ox	1 stone, plus 1 lump oxidised fired clay plus one coke fragment
LC 90	2212	Area C, Grid B7		1	+	ox	2 pieces of ?fired clay and 1 piece of coke
LC 90	2271	Area A, Grid C9, context 8		1		ox	highly fired clay
LC 91	2909	Area C, Grid A14, contexts 4/2		2	4	ox	1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface
LC 91	3232	Area C, Grid A16, context 9		8		ox	8 rounded lumps of oxidised fired clay
LC 90	3253	Area C, Grid B2, upper deposit		1	+	ox	probably fired clay
LC 92	4015	corr. 30, 6-6.15m		3	6.1	ox	2 pieces of fired lining with buff interior, 1 piece of grey fired clay
LC 92	4030	corr. 31, 6.0-6.3m		1	1	ox	fuel ash plus clay piece (v small)
LC 91	6057	Area C, Grid A15, layer 8		6		ox	6 tiny scraps of mainly oxidised
LC 91	6098	Area G, grid A13, context 2		2		ox	2 tiny scraps of oxidised fired clay
LC 91	6105	Area C, grid B15, probably c7	4mm sieve	20		ox	c20 rounded pieces of oxidised-fired clay
LC 91	6108	Area C, grid B15, context 2		29		ox	1 large lump of reduced fired clay, c28 tiny rounded pieces of oxidised fired clay
LC 91	6113	Area C, grid A16, context 5		8		ox	6 rounded pieces of oxidised fired clay, 2 pieces half reduced

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 91	6123	Area C, grid B13, context 2		4		ox	4 pieces of buff fired clay, one small pebble of red sandstone
LC 91	6133	AreaC, grid B16, context 18		10		ox	10 pieces of fired clay, variably fired ranging from pale grey to pale orange
LC 91	6138	Area C, grid A16, context 8	4mm sieve	5		ox	5 pieces of probable oxidised fired clay
LC 91	6158	Area C, grid A16, context 2/7				ox	1. tiny concretion around iron fragment, 2. possible fired clay
LC 91	6174	Area C, grid A13, context 1		2		ox	2 tiny rounded pieces of oxidised fired clay
LC 91	?	Area C, Pit (11.9.91)		3		ox	3 oxidised fired clay fragments
LC 91	?	Area C, Grid A15, context 5		3	11	ox	10g fired clay, + fragment of stone
LC 90	2184	Area C, Grid B5, Upper layer		1		ox	buff coloured fired clay pellet
(with organic temper)							
LC 89	127	Area A, context 17		1		ox org	oxidised fired clay lump with organic temper
LC 90	2372	Area C, grid B5		3		ox org	3 tiny scraps of fired clay, oxidised, some organic temper
LC 91	3371	corr. 18, 6.1m		2		ox org	fine grained clay, variable oxidised reduced, larger piece has small hole through (ex organic temper). Could be lining or mould
LC 92	4857	corr. 36, 3.6-4.2m		1		ox org	oxidised fired pale clay with organic temper?
LC 91	?	Area C, grid A16, context 5	15/09/1991			ox org	11 pieces of fired clay with organic temper, 2 pieces of burnt bone, 1 piece of iron slag with charcoal
group 3d: ceramic materials - indeterminate reduced-fired clay							
LC 92	4026	corr. 31, 5.7-6.0m		1		red	broken rounded bleb of reduced fired clay
LC 92	4038	corr. 32, 5.0-5.7m		1	2	red	vesicular hard but fissured pale grey ceramic
LC 92	4066	corr. 32, 8.3-9.0m		2	3	red	fired grey clay with indurated almost pelletal texture
LC 92	4140	corr. 30, 6.5-6.9m		1	+	red	dark sandy lining or fuel ash slag
LC 92	4194	corr. 32, 7.9-8.3m		2	2	red	slightly vesicular hard fired pale grey clay, plus sandstone fragment?
LC 92	4252	corr. 29, 5.8-6.0m		1	3	red	Abraded, discoloured vitrified clay, highly vesicular grey-dark on outside, buff less vitrified inside
(with organic temper)							
LC 92	4014	corr. 30, 5.8-6.0m		2	+	red org	probably hard fired and fissured pale grey ceramic, apparently with organic temper
LC 92	4364	corr. 32, 8.3-9.5m		2	2	red org	one small fragment of fuel ash slag, one small piece of reduced fired ceramic with possible hair temper
LC 90	?	Area C, Grid B8		3	5	red org	one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
group 3e: ceramic materials - reduced-fired clay +/- bloating +/-green glaze (possible brazing shroud)							
LC 92	1447	Area C, Grid A5, Upper Deposit		1		braze	probably not crucible. Grey fired clay with green glaze - might be brazing?
LC 92	4054	corr. 32, 7.3-7.9		3		indet. clay	1 piece of brazing shroud, 1 piece of indeterminate fired clay, 1 other possible brazing shroud fragment
LC 92	4060	corr. 32, 8.3-9.0m		2		braze	1 piece of deeply vitrified clay (cf. brazing shroud). Larger arcuate piece similar, might just be crucible but inconclusive
LC 92	4213	corr. 28, 4-5.5m		1		braze	grey fired clay - just possibly brazing shroud with fabric impression?
LC 92	4020	corr. 31, 4.0-5.3m		1		red bloat	reduced fired clay starting to bloat, organic temper
LC 92	4054	corr. 32, 7.3-7.9m		1	+	red bloat	3 fragments of vesicular fired ceramic - possibly fuel ash slag or even possibly from brazing shroud - bloated.
LC 92	4888	corr. 39, 2.7-3.3m		1		red bloat	just possibly brazing shroud - pale grey, slightly buff in places, bloated - vesicular
LC 92	-	Corr. 29, 4.5-6.3m		1	+	red bloat	grey bloated reduced fired clay - cf. Brazing material
group 3f: ceramic materials - vitrified material, probably hearth lining							
LC 89	53	Area A, context 23		2	3	lining	oxidised fired fine clay with rather thin external vitrified and vesicular layer
LC 90	1414	Area C, Grid B4, upper deposit		1	+	lining	1 piece reduced fired clay with thin dark glassy surface, 1 piece of the fragmenting grey partly vitrified clay, third piece is probably stone , but might be FAS
LC 90	1421	Area C, Grid A6				lining	oxidised fired ceramic with very thick vesicular glass layer
LC 90	2239	Area C, Grid A10		1	2	lining	oxidised fired ceramic with thick highly vesicular external glass
LC 90	2253	Area C, Grid B3, upper deposit				lining	small fragment of hearth lining with larger piece of blebby pale material that might just be stone
LC 90	2297	Area C, Grid A5, upper deposit		1	+	lining	decomposed sandy lining slag with blue glass
LC 90	2366	Area C, Grid B5		2	16	lining	1 piece of fired clay passing into lightly vitrified front, 1 large crude prill of fuel ash slag
LC 91	2909	Area C, Grid A14, contexts 4/2		2	4	lining	1 piece of coke, 1 stone + c20 oxidised fired clay fragments, 1 reduced fired clay with glazed surface
LC 91	3078	corr. 17, 6.43m		1	2	lining	oxidised fired fine clay with very black glass externally
LC 92	4015	corr. 30, 6-6.15m		3	6.1	lining	2 pieces of fired lining with buff interior, 1 piece of grey fired clay
LC 92	4321	corr. 30, 4.0-6.6m		1	+	lining	tiny fragment of fine, hard oxidised fired ceramic with external dark vesicular glass
LC 92	4497	corr. 33, 6.3-6.65		3	3	lining	2 pieces of oxidised fired sandy ceramic with glassy vitrified layer, third piece is reduced fired poorly vitrified FAS, grey sandy
LC 92	4623	corr. 39, 7.1-7.4m		2	2	lining	large piece is of typical fired oxidised clay with dark glass surface, smaller piece has very fine clay with organic temper passing into dark vitrified layer
LC 92	4674	corr. 42, 2.3-3.0m		4	2	lining	1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb
LC 92	4791	corr 29/30, 3.0-3.5m (inside palisade)		3	3	lining	1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS
LC 92	4805	corr. 33, 0.6-1.0m		1	+	lining	small fragment of hearth lining with oxidised fired clay and external black glass

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	4859	corr. 36, 4.1-4.6m		1	8	lining	well oxidised, deeply vitrified and slagged lining
LC 92	4860	corr. 36, 4.5-5.0m		1	7	lining	coarse gravelly vitrified lining, 5mm thick black vitrified layer
LC 92	4866	corr. 36, 6.6-7.0m		1	1	lining	oxidised fired sandy clay passing outwards into rather bleached surface vitrified layer which bears a dark (pebble?) inclusion
LC 92	4867	corr. 37, 6.1-6.5m		1	+	lining	lining, not particularly diagnostic
LC 92	4868	corr. 37, 6.9-7.3m		1	4	lining	oxidised fired sandy clay passing out into thick pale vesicular layer
LC 92	4906	Corr. 42, 3.0-3.9m		1	4	lining	oxidised fire ceramic passing out into thick vesicular glassy layer (stone already discarded)
LC 92	4907	corr. 42, 3.0-3.9m		1	43	lining	small lining slag mass attached to wall
LC 92	4910	corr. 42, 8.0-10.4m		1	7	lining	reduced fired ceramic with small pebbles, broken into fragments and pellets roofed by dark glass surface layer - which has local patches of blue glass
LC 92	4912	corr. 43, 0-1.0m		1	+	lining	tiny chip of oxidised fired ceramic with glass vitrified layer
LC 92	4947	corr. 37, 6.9-7.3m		1	1	lining	1 dense brown weathered grain, 1 small fragment of q-rich lining slag
LC 92	4974	corr. 39, 6.0-6.5m		2	47	lining	2g small pale vesicular lining slag, 45g SHC fragment
LC 92	5079	corr. -3, 2-2.3m		1	28	lining	small amount of glass binding gravel and ceramic fragments - sloughed lining
LC 92	5081	corr. 3, 2.0-2.3		1	6	lining	hearth lining with thick vesicular sandy glass on remnant of oxidised fired ceramic
LC 92	5209	corr. 31, 8.3-9.5		2	39	lining	hearth lining, reduced to grey/buff with attached mass of low density FAS
LC 92	5292	corr. 42, 1.5-1.8m		1	2	lining	black vesicular glassy lining slag
LC 92	5310	corr. 42, 4.8-5.0m		1	6	lining	ball of sandy lining slag
LC 92	5348	corr. 45, 1.7-2.0		1	+	lining	weathered hearth lining oxidised with moderately coarse quartz, very thin dark vitrified layer
LC 92	5356	corr. 41, 4.2m		1	6	lining	well-fired hearth lining, oxidised rear face and thick black glassy slag
LC 92	5358	corr. 42, 1.3-1.5m				lining	oxidised sandy lining with black vitrified surface
LC 92	5360	corr. 44, 0.7-1.5m				lining	slagged and vitrified oxidised hearth lining with dark glass
LC 92	5378	corr. 46, 4.3-4.5m		1	4	lining	oxidised fired clay passing out into very thick irregular black glassy layer
LC 92	5384	corr. 46, 4.5-5.1m		1	+	lining	very coarse grained quartz in oxidised ceramic with black glass surface
LC 93	5810	corr. 52, 2.6-3.0m		1	+	lining	hearth lining oxidised with thin dark vitrified surface
LC 93	5899	corr. 51, 3.0-3.5m		2	4	lining	2 piece of vitrified hearth lining, one with slightly larger sand grains than typical
LC 93	5959	corr. 49, 2.6-3.0m		1	2	lining	reduced fired lining with vesicular black glass on very coarsely sandy ceramic
LC 93	5975	corr. 52, 3.5-3.7m		1	7	lining	oxidised fired sandy ceramic with very thick black vesicular sandy glass
LC 93	6000	corr. 49, 1.5-2.0m		1	2	lining	hearth lining oxidised with thin dark vitrified surface
LC 93	6027	corr. 51, 3.5-3.8m		1	2	lining	hearth lining oxidised with thin dark vitrified surface
LC 93	6030	corr. 49, 2.3-2.6m		1	7	lining	very deeply vitrified. Some organic temper. Green colour on surface seems to be ?chlorite vesicle fill
LC 2004	8178	Grid F8		1	0.6	lining	1 small fragment lining, 1 small piece FAS
LC 2004 context 7004	8663	Grid A1		1	8.3	lining	oxidised fired lining with deep dark vitrified vesicular surface
2004.56h	8721	b14, ne	7115			lining	oxidised fired sandy hearth lining with pale bleached glassy surface
LC 2004	8771	Grid F12		1	2.6	lining	oxidised fired lining with deep dark vitrified vesicular surface
?	?	? 0.6-1.3				lining	vitrified hearth lining, deep dark glassy surface. Oxidised
?	?	lc+				lining	small fragment of oxidised fired vitrified hearth lining

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 90	?	Area C, Grid B8		3	5	lining	one piece grey coarse fired clay with organic temper, one piece FAS, 1 piece of degraded vitrified lining
LC 92	?	corr. 31, 9.3-9.5m		1	+	lining	oxidised fired wall with deep vitrified layer to 8mm
LC 92	?	corr. 42, 1.1-1.3m				lining	small fragment of oxidised fired vitrified hearth lining
LC 92	30.8.92	corr. 44, 3.9-4.1m				lining	oxidised vitrified lining, 3-4mm glass. Possible hair temper.
group 4a: fragments of smithing hearth cakes (SHCs)							
LC 89	37	Area A, context 3	91.4m/s			SHC	slag, probably part of very small SHC
LC 89	50	Area A, context 15		1	34	SHC	lobed slag, dense, dark and coarse, flowed but viscous - probably top of an SHC
LC 89	131	Area A, context 23		1	7	SHC	Small SHC with little lining attached. Deeply etched broken surface. Charcoal inclusions in top. Some tubular vesicles.
LC 89	650	Area A, context 16		1	128	SHC	Well -formed burr with 10mm olivine in adjacent slag. Shows blue FAS inclusions in lining above burr
LC 91	3082	corr. 17, 7.47m		1	209	SHC	Complete small SHC with pale slab top and smaller, dark, prilly bowl with charcoal moulds - almost classifiable as a tongue
LC 92	4518	corr. 32, 1.8-2.0m		1	60	SHC	part of shc, plus block of coke (9g)
LC 92	4642	corr. 40, 4.2-4.6m		1	73	SHC	73g, roughly 50% of small SHC, 4g small dense prill fragment
LC 92	4657	corr. 41, 6.2m		3	15	SHC	1 burnt bone, 1 fragment probably SHC crust, 1 amorphous vesicular slag fragment
LC 92	4932	corr. 36, 6.6-7.0m		2		SHC	2 small pieces of dark slag. Large piece of vesicular fired pale grey clay - probably from top of burr of small SHC
LC 92	4945	corr. 37, 6.1-6.5m		1	48	SHC	open honeycomb-textured slag with large olivines. Not clear if simply weathered or a draw-down texture.
LC 92	4948	corr. 37, 7.3-7.7m		1	14	SHC	angular vesicular slag fragment, possibly from SHC crust
LC 92	4974	corr. 39, 6.0-6.5m		2	47	SHC	2g small pale vesicular lining slag, 45g SHC fragment
LC 92	4977	corr. 39, 6.5-6.9m		1	11	SHC	fragment broken from SHC crust - 15mm thick
LC 92	5027	corr. 42, 8.0-10.4m		1	96	SHC	most of small SHC, has coarse platy olivine near top
LC 92	5263	corr. 40, 5.6-6.1m		1	119	SHC	large part of small SHC, very dense, has lining slag encroaching on upper surface
LC 92	5367	corr. 45, 6.3-6.55m		5	56	SHC	grey fine vesicular iron slag, probably SHC fragments
LC 92	5569	corr. 37, 4.6-4.9m		1		SHC	just over 50% of small SHC, has up to 15mm lower dense section, upper has charcoal moulds but still dense, biconvex,
2004.56h	8448	d6		1		SHC	fragment from large boulder with various organic overgrowths, also small piece of small SHC
LC 92	?	corr. 38, 2.3-2.6m		1	126	SHC	part of small SHC. Has small speck of blue glass on base.

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
group 4b: fragments of indeterminate dense slag (probably iron slag)							
LC 90	2086	Area C, grid A9		1	3	slag	dense iron slag bleb
LC 90	2172	Area C, Grid B8		2	1	slag	black hard material - coke/Mn and small rounded slag fragment
LC 91	3105	Area C, Grid B15, context 5		2	1	slag	small slag fragment? attached to pebble, plus small stone fragment
LC 92	4023	corr. 31, 5.3-5.7m		2	2	slag	1 piece vesicular iron slag, 2nd piece is concreted ash and coal fragments
LC 92	4046	corr. 32, 6.4-6.8m		2		slag	1 piece clinker, 1 piece of iron slag (check the ceramic section too)
LC 92	4049	corr. 32, 6.4-6.8m		1	14	slag	small rounded bleb of vesicular grey slag
LC 92	4056	corr. 32, 7.9-8.3m		1	14	slag	fragment of grey vesicular slag - probably a smithing slag
LC 92	4135	corr. 30, 6.15-6.5m		1	3	slag	iron slag fragment
LC 92	4388	corr. 33, 6.65-6.8m		1	+	slag	small bleb of iron slag
LC 92	4426	corr. 33, 5.5-5.8m		1	7	slag	vesicular grey slag
LC 92	4458	corr. 33, 7.8-8.3m		1	2	slag	small dense dimpled prill (green mentioned by PC superficial)
LC 92	4477	corr. 31, 0.1-1.0m		3	+	slag	1 piece of coke, 1 piece of dense iron slag
LC 92	4492	corr. 33, 5.5-5.8m		1	+	slag	iron slag fragment
LC 92	4509	corr. 34, 6.0-6.4m		1	+	slag	small dimpled slag prill
LC 92	4650	corr. 41, 3.6m		2	2	slag	1 fuel ash , very sandy bound by blue glass, 1 small dense slag scrap
LC 92	4791	corr 29/30, 3.0-3.5m (inside palisade)		3	3	slag	1 small dense prill or tubular crust, 1 ball of lining slag (possibly coke), 1 piece FAS
LC 92	4815	corr. 33, 8.3-8.6m		2	4	?	(? Not seen)
LC 92	4836	corr. 34, 6.4-7.0m		1	2	slag	blebby slag piece with dimples
LC 92	4848	corr. 35, 4.35-4.8m		1	15	slag	vesicular grey slag, with charcoal, 2 pieces, weathered
LC 92	4862	corr. 36, 5.0-5.4m		1	3	slag	probably weathered iron slag
LC 92	4897	corr. 39, 5.2-5.5m		3	15	slag	2 dimpled grey slag blebs, 1 grey slag fragment (from smithing?)
LC 92	4911	corr. 43, 2.3-2.7m		2	7	slag	large piece 6g possibly weathered slag, small piece 1g is highly vesicular fuel ash
LC 92	4929	corr. 36, 5.8-6.2m		1	2	slag	iron slag fragments
LC 92	4931	corr. 36, 6.2-6.6m		2	23	slag	2 dense slag pieces with charcoal dimples
LC 92	4947	corr. 37, 6.9-7.3m		1	1	slag	1 dense brown weathered grain, 1 small fragment of q-rich lining slag
LC 92	4992	corr. 41, 6.9m		1		slag	iron slag - tiny fragment
LC 92	5002	corr. 43, 1.6-2.0m		2	3	slag	1 piece vesicular iron slag, 1 piece of low density FAS
LC 92	5005	corr. 43, 2.0-2.3m		4	31	slag	Large piece of slag grading from indurated sand through into honeycomb olivine, others similar
LC 92	5017	corr. 38, 8.2-9.5m		1	32	slag	slightly lobate charcoal rich slag fragment - probably a smithing slag
LC 92	5031	corr. 43, 7.3-10.5m		2	20	slag	1 dense slag lump, 1 piece with slag binding gravel
LC 92	5034	corr. 44, 0-0.7m		1		slag	weathered slag
LC 92	5057	corr. -2, 0-1.7m		1	34	slag	34 g vesicular dense slag fragment. Large piece of ORS has pinhead growths of secondary malachite (i.e. Not of archaeological significance)
LC 92	5070	corr -2, 4.2-4.5m		1	10	slag	large piece of vesicular iron slag, small piece of FAS with small area of maroon on surface
LC 92	5085	corr. -3, 3.6-3.7m		3	9	slag	dense grey vesicular slag as below
LC 92	5102	corr. -3, 0-4.1m		1	4	slag	probable small dense vesicular prill

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	5146	corr. 44, 7.2-10.5m		1	35	slag	slightly curved dense slag sheet, smooth very slightly lobate base, probable charcoal moulds on top
LC 92	5160	corr. 45, 2.0-2.5m		2	15	slag	very weathered slag fragment
LC 92	5170	corr. 45, 2.8-3.3m		1	6	slag	rounded grey vesicular slag lump,
LC 92	5215	corr. 37, 6.5-6.9m		3		slag	3 tiny specks of slag, plus stones
LC 92	5241	corr. 39, 4.8-5.2m		3	2	slag	1 piece of coke, 1 piece of fuel ash slag, 1 piece of eroded iron slag
LC 92	5252	corr. 40, 3.3-3.5m		1	9	slag	eroded flat based flow lobe cf. tap slag
LC 92	5263	corr. 40, 5.6-6.1m		5	1	slag	iron slag fragment, probably one piece broken, vesicular
LC 92	5269	corr. 40. 6.1-6.3m		5	14	slag	large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag
LC 92	5277	corr. 41, 5.2m		1	57	slag	worn lump of vesicular charcoal-rich slag - probably a smithing slag
LC 92	5283	corr. 41, 6.2m		1	4	slag	well worn vesicular dense iron slag fragment
LC 92	5301	corr. 42, 4.2-4.5m		1	6	slag	small fragment of grey vesicular iron slag
LC 92	5317	corr. 43, 3.7-4.1m		1	17	slag	either slag or a concretion containing slag
LC 92	5322	corr. 43, 4.1-4.5m		1	1	slag	dense iron slag
LC 92	5329	corr. 43, 4.5-4.9m		1	5	slag	charcoal fragment and small dimpled slag fragment with ceramic infilling some lobes
LC 92	5332	corr. 43, 5.3-5.7m		3	11	slag	several pieces of very weathered probable slag and one slag dense prill
LC 92	5336	corr. 44, 0.7-1.8m		1		slag	small slag fragment, rounded
LC 92	5341	corr. 45, 3.1-3.9m		1	3	slag	vesicular iron slag
LC 92	5353	corr. 40, 5.6-6.1m		2	+	slag	chips of olivine rich pale slag
LC 92	5383	corr. 46, 4.5-5.1m		2	4	slag	small fragment of vesicular dark slag and small piece of burnt bone
LC 92	5390	corr. 46, 6.5-6.8m		2	28	slag	2 pieces of dense slag, larger brownish bearing very large platy olivine, smaller is grey vesicular slag
LC 92	5433	corr. 35, 5.1-5.3m		1	+	slag	small bleb of probable dark slag, with a thin sheet from slag bubble
LC 92	5455	corr. 38, 2.6-2.9m		2	+	slag	1 piece of coke , 1 piece possibly weathered slag
LC 93	5826	corr. 49, 1.0-1.6m		2	6	slag	2 fragments of slag, gradational from sandy lining slag into grey iron-slag
LC 89	6090	Area B, random bucket sample		1	29	slag	amorphous angular fragment of vesicular dark grey slag
2004.56h	8171	b1	7062	1		slag	large piece of vesicular slag with large platy olivines, small piece of stone
LC 2004	8178	Grid F8			1	?	(does not appear to have been seen)
2004.56h	8219	b4, sw	7077	1		slag	vesicular iron slag
2004.56h	8252	b7	7088	1		slag	vesicular iron slag
2004.56h	8591	c12		1		slag	fragment of vesicular iron slag
2004.56h	8676	c12		1		slag	iron slag, highly vesicular
2004.56h	8699	i3		1		slag	iron slag, vesicular
LC 91	?	corr. 16, 1.25m		1	72	slag	worn lump of dense dark vesicular slag - probably a smithing slag
LC 91	?	Area C, grid A16, context 5	33496			slag	11 pieces of fired clay with organic temper, 2 pieces of burnt bone, 1 piece of iron slag with charcoal
LC 92	?	corr. 35, 5.3-5.7		1	1	slag	small dark slag fragment
LC 92	?	corr. 35, 6.3-6.8m		2	11	slag	2 small blebs of dense dark vesicular slag
LC 92	?	corr. 41, 8.6-10.0m		1	5	slag	possible slag prill
LC 92	?	corr. 40, 4.6-5.0m		1		slag	coarse grained weathered slag

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
LC 92	?	corr. 31, 7.3-7.5m		1	40	?	(does not seem to have been seen - could it be incorporated in above)
LC 92	?	corr. 38, 5.4-5.8m		1	+	?	?compare with 4877
group 6: other materials							
cuprite?							
LC 92	4004	corr. 25, 5.2-6.0m		1		copper?	marked cuprite - looks like haematite
bitumen							
LC 89	3	Area A, layer 4				bitumen	? bitumen and painted surface
LC 89	58	Area A, layer 20				bitumen	? bitumen again (smell)
bone							
LC 92	4085	corr. 32, 7.9-8.3m		1	+	bone	bone?
LC 92	4346	corr. 29/30, 0-1.0m		1	2	bone	probably bone
LC 92	4434	corr. 33, 5.8-6.3		1	+	bone	bone
LC 92	4940	corr. 37, 5.6-6.1m				bone	bone
LC 92	5521	corr. 41, 5.6m				bone	bone
LC 92	5599	corr. 35, 5.5-5.8m				bone	one bone and one stone with rusty surface marks
2004.56h	8022	f7				bone	bone and broken tooth
2004.56h	8526	a10, nw	7039			bone	possible burnt bone - coked organic matter
LC 92	4441	corr. 31, 6.8-7.3		5	2	bone	1 piece of bone, plus 4 pieces (broken?) of cemented clinker and coal dust
LC 92	4606	corr. 34, 1.9-2.3m		2	1	bone	1 piece of low density FAS with charcoal, 1 piece coke, 1 tooth
LC 92	4674	corr. 42, 2.3-3.0m		4	2	bone	1 stone, 1 bone, 1 lining slag fragment, 1 fuel ash slag bleb
LC 92	4721	corr. 36, 7.6-7.9m		+	42	bone	?one piece (broken into many), highly vesicular low density FAS shattered, also burnt pig tooth
LC 92	5383	corr. 46, 4.5-5.1m		2	4	bone	small fragment of vesicular dark slag and small piece of burnt bone
brick?							
LC 92	4048	corr. 33, 6.4-6.8m		2		brick?	2 pieces of pellet buff ceramic- possible modern brick, one with adhering coal dust
charcoal							
LC 92	?	corr. 35, 1.3-3.0m		1	+	charcoal	charcoal
Fe-Mn ore?							
LC 91	3385	corr. 18, 4.9m		2	1	ore	small stone fragment, possible Fe-Mn ore fragment with botryoidally overgrown stalactites
LC 92	4750	corr. 31, 1.5-1.8m		1	3	ore	possible low grade iron ore - possible botryoids arranged as stalactites? + sandstone frag

Year	SF No	Area/	notes	P	Wt (g)	class	Comment / other material
Plaster							
LC 90	2317	Area C, Grid square A2, Victorian pit				plaster	plaster moulding & fixing hole
Plastic							
LC 92	?	corr. 42, 1.1-1.3m				plastic	melted plastic...???
Iron							
LC 90	3249	Area C, grid B2				iron	stone with adhering corroded ?nail
LC 92	5269	corr. 40. 6.1-6.3m		5	14	iron	large piece is dark sandy fuel ash slag with blue glass, 2 small pieces are FAS, 1 small Fe-slag fragment, 1 piece of bone and one piece may be rusted iron or slag
LC 92	5591	corr. 38, 1.0-2.3m				iron	iron fragments, including planar piece with nail/rivet through?
LC 91	6158	Area C, grid A16, context 2/7				iron	1. tiny concretion around iron fragment, 2. possible fired clay

GeoArch



geoarchaeological, archaeometallurgical & geophysical investigations

54 Heol y Cadno,
Thornhill,
Cardiff,
CF14 9DY.

Mobile:
Fax:
E-Mail:
Web:

07802 413704
08700 547366
Tim.Young@GeoArch.co.uk
www.GeoArch.co.uk