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Assessment of archaeometallurgical residues from Banwell Parklands (BPL18TW)

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Abstract

This project produced a slag assemblage weighing a total of 14.1kg, including two quite separate groups of materials. Firstly, there was 12.1kg (682 pieces) of non-metallurgical fuel ash slag and secondly, 2kg (36 pieces) of ironworking (blacksmithing) slags.

Fuel ash slag (FAS) was widespread and was recovered from 105 discrete archaeological contexts. It occurred in two distinct forms: a typical highly vesicular glassy material, with large and often elongate vesicles and an atypical dense glass with a very low degree of vesicularity.

Where present in large fragments, the FAS appeared to have often formed in thick (<80mm) sheets. Various origins for FAS have been demonstrated, but the most common origin for FAS in thick sheets appears to be in large hearths, probably in which the fire was maintained for very long periods of time, constructed on calcareous substrates. This appears to be particularly a feature of domestic hearths of the Middle Iron Age. The material is particularly known in the E Midlands, where it is sometimes referred to as 'Iron Age grey slag'. The FAS was widely distributed in small pieces. Only 4 discrete contexts produced more than 500g of FAS that was in pieces of larger than 15g. The production of the atypical dense FAS may be related to formation from fine-grained calcareous deposits, rather than the sandy or gravelly precursors from which the friable FAS develops, although an origin at a higher temperature, allowing degassing, is also possible.

The iron slags were typically rather poorly preserved and abraded. Just three reasonably intact smithing hearth cakes (SHCs) were present. These had weights of 231g, 235g and 400g. Such weights would be typical of SHCs produced in a general-purpose early blacksmith's workshop.

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Methods

Background

This assessment was commissioned by Bryn Morris of South West Archaeology Ltd. The materials described and assessed here arise from excavations undertaken on land at Banwell Parklands (site code BPL18TW).

Assessment

All submitted materials were examined visually in November/December 2025, using a low-powered binocular microscope where required. They have been catalogued (Table 1) and assessed. No instrumental analysis has been undertaken.

Results

General

This project produced a slag assemblage weighing a total of 14.1kg, including two quite separate groups of materials. Firstly, there was 12.1kg (682 pieces) of non-metallurgical fuel ash slag (FAS) and secondly, 2kg (36 pieces) of ironworking (blacksmithing) slags.

Details

The materials identified in the assessment were assigned to several classes, employed here and in Table 2. The FAS is divided into typical, porous, friable material and an atypical variety that has much lower vesicularity (and therefore higher bulk density). Ironworking slags are divided between pieces identifiable as deriving from smithing heath cakes (SHCs) and material that was indeterminate, although in practice likely also to be from smithing. The material classed as hearth ceramic will mostly derive from the ironworking hearths, but it is possible some pieces of less diagnostic fired clay share an origin with the FAS.

Fuel ash slag (FAS): approximately 11.k kg of typical vesicular FAS was recovered. The FAS was highly vesicular, often with only thin intervening films of glassy slag. This material is, accordingly, very fragile; the average recorded particle size was just 16.6g (but it is likely that a high proportion of the FAS would have been too small for retrieval).

The majority of the material was too fragmented to impart any information on the original morphology. Some of the larger assemblages, however, do provide some clues, e.g. a 2.2kg assemblage of 58 pieces from (10180), which mostly showed large (up to 50mm) individual flow lobes and correspondingly large, often elongated vesicles (indicating flow). The flows were commonly >50mm in thickness with the thicker pieces probably mainly from corners. There was generally an ashy adhering sediment. One piece had an area of adhering red, friable hearth wall material.

Dense FAS: this material was markedly denser and less friable than the usual form of FAS. These properties meant it was less liable to fracture and so the average particle size was larger much (75g). The slag was typically very fine grained, pale grey in colour, and with a very low degree of vesicularity. Some of the pieces somewhat resembled clinker, the particular form of fuel ash slag derived from the burning of coal, in having an almost waxy lustre.

There was a total of just 979g of this material – approximating to 8% of the total FAS.

Smithing hearth cakes (SHCs): there was a total of 1376g of slag derived from smithing hearth cakes, of which 866g (63% of this class) was comprised by three complete examples. These had weights of 231g (from context (8001)), 400g (from (8422)) and 235g (from (9369)).

Where fuel clasts or imprints were preserved, these were entirely of charcoal.

The complete cakes were plano-convex to very slightly concavo-convex, with dense, well formed slag bowls. The bowls had microdimpled bases and generally smooth tops.

Indeterminate iron slag: some 602g of dense iron slag (27 pieces) were indeterminate – mostly because fragments were too small (they were 22g on average) to be able to demonstrate the characteristic features that would enable their identification as deriving from SHCs. Some pieces might have formed in the smithing hearth outside a SHC, but no pieces showed convincing evidence for deriving from a different process.

Hearth ceramic: there was very little retrieved hearth cermaic (24g, 3 pieces), in proportion to the very low quantities of iron smithing remains overall. Despite this low amount of material, one piece (from context (8843)) provided some useful morphological information and presented the partial margin of a blowhole, 30mm in diameter. This piece showed a moderately sandy composition, was oxidised fired and

possessed a dark glassy superficial slag, locally with bright blue fuel -derived inclusions.

Other
Context (7100) yielded a 182g facetted hematite pebble. The hematite was fractured with veins filled by quartz.

Context (10266) produced a 25g piece of partially mineralised iron.

There was a 212g unstratified piece of botryoidal hematite. This showed a more massive core with rare large quartz crystals, overlain by botryoids with 12mm-long fibrous crystals.

Distribution

The residues derived from 122 separate archaeological contexts (plus some unstratified material). Conventional FAS was recovered from 105 contexts, with dense FAS from 10 contexts (5 of which produced both classes of FAS).

Ironworking residues (SHCs, indeterminate dense slag and hearth lining) occurred in a total of 21 contexts.

Both ironworking residues and FAS occurred together in 9 contexts.

This pattern indicates the widespread disposal and dispersal of small fragments of pyrotechnological residue in low densities across many contexts, rather than distinct concentrations.

Interpretation

The assemblage has two components: non-metallurgical FAS and ironworking residues.

Fuel ash slags are the product of the partial melting of a substrate under the fluxing action of elements, particularly calcium and potassium, contributed by the fuel. In practice, the critical amount of fluxing elements is usually reached in systems where the substrate also bears high levels of those same elements. They are most commonly found in contexts where the calcium and potassium of the fuel ash are augmented by a high calcium content in the substrate, perhaps a calcareous clay, a shell sand or weathered limestone for instance.

The typical texture, as seen here, is probably largely generated through the production of FAS from a rather granular substrate, usually a loose substrate in the walls and floors of a hearth (see below for what might be meant here by hearth). The areas of the substrate/ash mixture that are rich in calcium and potassium may start to melt, forming a slag, but individual grains of quartz and other more refectory materials may melt under the influence of this flux only very incompletely. These particles become bound by the glassy slag, which at the rather low temperatures involved, will be rather viscous. Gasses released by thermal decomposition of carbonate minerals, by dehydration of water-containing minerals and other materials, and to a lesser extent the combustion of the fuel, may become trapped by the viscous slag – and the partial-melt cannot degas. This leads to a porous structure, with the voids often formed by very thin films of the viscous partial melt. In geological terms, such a material is a 'buchite'.

FAS is not characteristic of any single process but indicates the use of a hearth, particularly one cut into an unconsolidated substrate, that has spent a considerable time at elevated temperature.
Several common archaeological settings may produce FAS under appropriate conditions. Metallurgical processes where the metal does not enter the hearth directly may produce FAS (e.g. heating crucibles for metal melting; Young 2017), but this is much less commonly-encountered than formation by non-metallurgical processes, particularly cereal drying kilns. (e.g. South Hook, Young 2010a, 2010b; Llandeilo, Young 2015; Bornais, Young 2012a, 2020) and large hearths (e.g. Mound1 at Bornais, Young 2012a; and probably all those occurrences described as 'Iron Age grey slags' in central and eastern England, Cowgill 2000, 2008; Cowgill *et al*. 2001; Swiss & McDonnell 2001; Young 2009, 2011, 2013; 2023, Young & Bowstead Stallybrass 2003). Other minor sources of FAS have also been postulated, including lime-burning and building conflagration (Young 2012b).

The present material, with its examples of pieces from thick sheets with large voids compares most closely with examples from large hearths at Bornais Mound 1 (Young 2012a) and from Malmesbury (Young 2009, 2011), rather than with those from corn drying kilns, typically in thinner sheets and small pieces. The particular association of FAS of this type with the Middle Iron Age is likely to be cultural, perhaps due to the continuous maintenance of a substantial hearth.

The denser FAS is unusual and there are two possible interpretations: firstly that the precursor to the FAS was a fine, homogeneous material, such as a calcareous clay, or secondly that these pieces represent FAS that has been subject ted to a slightly higher temperature (or a higher degree of fluxing) leading to increased fluidity, in turn permitting improved degassing.

The interpretation of the current material could be refined if the FAs occurs in or near a pyrotechnological feature, but no such association is known at present.

The iron working slags indicate blacksmithing, with the SHCs being of sufficient size that they indicate processes involving high iron-loss (e.g. a high proportion of welding) and/or long continuous work periods. However, the small size of the assemblage precludes detailed interpretation of the material.

The minor materials included a small fragment of iron of uncertain significance.

There were two pieces of hematite. The presence of quartz in the larger specimen suggested a relatively local origin might be appropriate (quartz is present in both the Mendip and Glamorgan segments of the Bristol Channel Orefield (*sensu* Young 2000; Young & Thomas 1998, 1999). Neither piece need necessarily have arrived on the site through human agency, although the facetted nature of the smaller piece might possibly suggest it had been used for polishing (perhaps of copper alloy).

Discussion

The residues from this site are typical of the materials recovered on Iron Age sites on calcareous geology.

A more detailed interpretation could perhaps be derived from consideration of the context within which

the materials were found. Without any linkage between the FAS and originating structures, large domestic hearths remain the most likely source.

Further work

These materials described here would only be capable of yielding very limited further archaeologically-useful information through detailed analysis.

Accordingly, no further investigation is advised.

References

All GeoArch reports are available for download from:
https://www.geoarch.co.uk/report%20library/

COWGILL, J. 2000, Assessment report on the slags recovered from the excavations at Billingley Thorpe, Thurnscoe, South Yorkshire (BDT99). Archive report produced for Northern Archaeological Associates.

COWGILL, J. 2008, Report on the slag and associated finds from Normanton Industrial Estate (NOI 06). Archive report produced for West Yorkshire Archaeology Service.

COWGILL, J, MACK, I., & McDONNELL, G., 2001, Report on the slags and related material from Grange Park, Courteenhall, Northamptonshire (GPC 99). Publication report produced for Birmingham University Field Archaeology Unit.

SWISS, A.J. & McDONNELL, G. 2001, Report on the Analysis of 'Iron Age Grey' Slag from the Conoco Site at Killingholme, Lincolnshire, CNK00. Archive report produced for Humberside Field Archaeology.

YOUNG, T.P. 2000. Chapter 10. The Paviland Ochres: characterisation and sourcing. *In*: Aldhouse-Green, S., *Paviland Cave and the 'Red Lady': a definitive report*. Western Academic and Specialist Press Limited, 205-225.

YOUNG, T.P. 2009. Evaluation of possible archaeometallurgical resides from Malmesbury, Wiltshire. *GeoArch Report 2009/15*, 2pp.

YOUNG, T.P. 2010a. Fuel ash slags from corn-drying kilns, South Hook LNG Terminal. *GeoArch Report 2010/04*, 24 pp.

YOUNG, T.P. 2010b. Fuel ash slags. p. 163 in: Crane, & Murphy K., Early medieval settlement, iron smelting and crop processing at South Hook, Herbranston, Pembrokeshire, 2004-05. *Archaeologia Cambrensis*, **159**, 117-196.

YOUNG, T.P. 2011. Possible archaeometallurgical residues pp. 89-90 in: M. Collard & T. Havard. The prehistoric and medieval defences of Malmesbury: archaeological investigations at Holloway, 2005-2006. *Wiltshire Archaeological & Natural History Magazine*, **104**, 79-94.

YOUNG, T.P. 2012a. The slag. pp. 289-295 In: Niall Sharples (ed.) *A Late Iron Age farmstead in the Outer Hebrides Excavations at Mound 1, Bornais*, South Uist. Oxbow Books.

YOUNG, T.P. 2012b. Evaluation of archaeometallurgical residues and associated material from Tai Cochion & Trefarthen Roman settlement, Anglesey (G1632-T, G1632). *GeoArch Report 2012/20*, 12pp.

YOUNG, T.P. 2013. Assessment of pyrotechnological residues from Eaton Camp, Herefordshire. *GeoArch Report 2013/22*, 3pp.

YOUNG, T.P. 2015. Fuel ash slags from Ysgol Bro Dinefwr, Llandeilo, Carmarthenshire. *GeoArch Report 2014-32*. 20pp.

YOUNG, T.P. 2017. Archaeometallurgical residues from Priory Field, Caerleon. *GeoArch Report 2017/17*, 90pp.

YOUNG, T.P. 2020. The slag. pp. 51-56 in: Niall Sharples (ed.) *The Economy of a Norse Settlement in the Outer Hebrides; Excavations at Mounds 2 and 2A, Bornais, South Uist*. Oxbow Books.

YOUNG, T.P. 2023. Assessment of materials from Flore, Glassthorpe, Northamptonshire. *GeoArch Report 2023/22*, 4pp.

YOUNG, T & BOWSTEAD STALLYBRASS, H.S. 2003. Metallurgical residues and related materials. In: Thomas, A, Holbrook, N and Bateman, C. Later Prehistoric and Romano-British burial and Settlement at Hucclecote, Gloucestershire: Excavations in advance of the Gloucester Business Park Link Road, 1988. *Bristol and Gloucestershire Archaeological Report No. 2*. 52-55.

YOUNG, T.P. & THOMAS, G.R. 1998. The cargo: iron ore analysis. pp. 105-111 *In:* Nayling, N. *The Magor Pill Medieval Wreck*, CBA Research Report 115, Council for British Archaeology. [ISSN 0141 7819, ISBN 1 872414 86 9]

YOUNG, T.P. & THOMAS G.R. 1999. Provenancing iron ore from the Bristol Channel Orefield: the cargo of the Magor Pill Boat. *In:* POLLARD, A.M. (ed) *Geoarchaeology: exploration, environments, resources*, Geological Society of London, Special Publication, 165, 103-121.

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Table 1: catalogue of submitted materials. Assm = assemblage of small particles

C		l wt	l no	Notes
6004	BPL18 (MD)	5	1	FAS
6010	BPL18 (MD)	200	13	FAS
6015	BPL18 (MD)	21	1	FAS
6027	BPL18 (MD)	11.1	2	FAS
6039	BPL18 (MD)	8.3	1	FAS
6068	BPL18 (MD)	15.1	2	FAS
6074	BPL18 (MD)	17.4	4	FAS
6076	BPL18 (MD)	6.8	2	FAS
6077	BPL18 (MD)	53	2	FAS
6081	BPL18 (MD)	9.7	1	FAS
6081	BPL18 (MD)	23.5	3	FAS
6084	BPL18 (MD)	28.1	5	FAS
6092	BPL18 (MD)	52	6	FAS
6095	BPL18 (MD)	45	3	FAS
6100	BPL18 (MD)	4.4	1	FAS
6101	BPL18 (MD)	2.7	1	FAS
6103	BPL18 (MD)	2.8	1	FAS
u/s dark layer	BPL18 (MD)	6.1	1	very eroded small nub of flowed iron slag
lower fill u/s	BPL18 (MD)	5	1	shelly dark clay
		3.7	1	dark clay with fine calcareous particles (could be pottery?)
		28.6	4	FAS
7001	BPL18 (TW)	3.8	1	dense FAS

7001	BPL18 (TW)	2.2	2	FAS
7038	BPL18TW(20)	6.3	1	rusty dense chocolate-coloured slag fragment, probably a FAS
7044	BPL18 (TW)	1.8	1	FAS
7044	BPL18 (TW)	34	1	moderately dense well-flowed FAS
7045	BPL18 (TW)	19	3	FAS
7047	BPL18 (TW)	41	2	FAS
7050	BPL18 (TW)	28	1	FAS
7054	BPL18 (TW)	100	9	FAS
7054	BPL18TW(20)	34.8	1	grey FAS, carries 15mm white rounded clast - possibly limestone pebble?
7061	BPL18 (TW)	247	1	FAS, 1 of the 2 pieces preserves a clast of fine organic material, potentially peat - this might be worth botanical investigation
7073	BPL18 (TW)	41	6	FAS
7077	BPL18 (TW)	46	1	rottenstone
		13	2	FAS
7079	BPL18 (TW)	361	14	FAS
7100	BPL18 (TW)	62	3	FAS
7100	BPL18 (TW)	182	1	facetted hematite pebble, hematite fractured with veins filled by quartz
7101	BPL18 (TW)	40	3	FAS
7118	BPL18 (TW)	45	2	FAS
7140	BPL18 (TW)	12	2	FAS
7172	BPL18 (TW)	19	1	dense pale grey slag, degassed FAS? Plastic appearance with dark-surfaced amalgamated flow lobes
7188	BPL18TW(20)	5.8	1	FAS
7192	BPL18 (TW)	5.5	3	FAS
7193	BPL18 (TW)	156	8	FAS
7208	BPL18 (TW)	59	1	FAS
7229	BPL18 (TW)	163	8	FAS

7230	BPL18 (TW)	52	1	FAS
7231	BPL18 (TW)	30	3	FAS
7241	BPL18 (TW)	20	4	FAS
7243	BPL18 (TW)	42	3	FAS
7250	BPL18 (TW)	2.4	1	FAS
7353	BPL18 (TW)	0.7	1	FAS
7254	BPL18 (TW)	21	3	FAS
7256	BPL18 (TW)	105	33	FAS
7262	BPL18 (TW)	65	3	FAS, including large well-flowed piece
7267	BPL18 (TW)	284	12	FAS
7268	BPL18 (TW)	216	3	FAS, some moderately dense
		13	1	Well-worn iron slag fragment, vesicular, dense
7277	BPL18 (TW)	16	1	vesicular iron slag, fragment with dimpled base
		9	2	FAS, larger piece has inclusions like sandy pottery
7279	BPL18 (TW)	65	2	pieces of dense iron slag in slight puddle (large piece only), somewhat lobed, with charcoal impressions in top
7317	BPL18 (TW)	18	2	FAS
				ns
7325	BPL18 (TW)	17	1	dense worn nub of iron slag, slightly lobate, hint of cereal impressions on base?
		7	2	FAS
7336	BPL18TW(20)	2.6	1	FAS
7350	BPL18 (TW)	4.8	2	FAS
7351	BPL18 (TW)	1.4	1	FAS
7363	BPL18 (TW)	2.9	1	FAS
7376	BPL18 (TW)	10.9	1	FAS
7382	BPL18 (TW)	11	1	FAS
7404	BPL18 (TW)	2.1	1	FAS

7428	BPL18 (TW)	2	5	FAS
		49	1	4 pieces fractured smithing slag, probably from one piece
		6	1	irregular fired fine silty clay, part oxidised/part reduced
7429	BPL18 (TW)	15	3	FAS
		71	3	worn dense iron slags in crude flow lobes/prills, dense, probably smithing slags
7436	BPL18 (TW)	20.5	1	FAS
7440	BPL18 (TW)	4.6	1	FAS
7441	BPL18 (TW)	2.5	1	FAS
7443	BPL18 (TW)	13.1	1	pelletal black clay, resembles some of the possible limestone pieces, but probably not limestone
8001	BPL18TW(20)	11.2	2	FAS
		231	1	65x75x25mm, concavo-convex SHC, rusty
		173	1	large part of small rather slab-like SHC, both this and above fragment are slightly fragmented
8010	BPL18TW(20)	0.9	1	FAS
8059	BPL18TW(20)	5.5	1	FAS
8102	BPL18TW(20)	8	1	FAS
8110	BPL18TW(20)	49	1	dense smithing slag fragment
8149	BPL18TW(20)	9.2	1	FAS
8149	BPL18TW(20)	1.6	1	FAS
8211	BPL18TW(20)	32	1	FAS
		29	2	sandy vesicular slag, probably FAS, but could be low density iron slag
8211	BPL18TW(20)	10	2	vesicular slag, probably iron slag, but could be FAS
		63	1	nub of gey vesicular slag rich in fine charcoal
8268	BPL18TW(20)	9	1	FAS
8277	BPL18TW(20)	3.8	1	tiny fragment of vesicular iron slag
8327	BPL18TW(20)	2	1	FAS
8422	BPL18TW(20)	400	1	Neat dense SHC, lower bowl with raised dark upper fine slab, 80x85x55mm (27mm), top slag has smooth surface with oblique grooves, hit during extraction? base microdimpled, some charcoal internally but rare, upper slag triangular in plan so parts may be missing
8442	BPL18TW(20)	25	1	dense iron slag, highly weathered but very few vesicles

8446	BPL18TW(20)	14.6	4	maybe single original piece, FAS
8537	BPL18TW(20)	17.4	3	FAS
8820	BPL18TW(20)	10.9	1	bloated sandy ceramic, unclear if hearth wall or FAS substrate, lightly glazed surface
8840	BPL18TW(20)	22.3	5	FAS
8843	BPL18TW(20)	14.3	1	fragment from margin of 30mm diameter blowhole, oxidised fired wall with dark glassy slag and locally bright blue FAS, moderately sandy wall
8798	BPL18TW(20)	268	1	2 fragments from a small dense (but vesicular and charcoal bearing) rusty SHC, c. 80x90x40mm
9111		148	2	FAS
9156		581	1	large block of the dense type of FAS, shows slightly rusty coloured planar upper surface and flows and lobes of slag descending into whatever was beneath
		52	10	FAS
		92	1	extremely dense slag piece, appears to be slightly vesicular, horizontally layered and wustite rich.
9160		14.4	1	FAS
9160		14	1	FAS
9285		176	2	FAS
9286		70	2	FAS
9369		235	1	most of a medium sized SHC, rusty, microdimpled base slightly dished top, maybe 60%
9376		447	26	FAS, one small 3g piece is of the grey low vesicularity type
9376		6	1	FAS
9376		27	4	FAS
9376		16.5	1	small fragment of dense slag, probably iron slag rather than FAS
		3.6	1	fired clay
		95	5	FAS
9376		13.4	3	FAS
9379		69	1	fragment of a dense SHC
9382		3.4	1	FAS
9382		65	5	FAS
9811		1.7	1	FAS

9829		8.1	1	FAS
9547		38	2	FAS
9248		2.7	4	FAS
9248		3.7	1	FAS
9248		1.1	1	FAS
9248		1.6	5	FAS
9248		2.4	2	FAS
		9.2	1	dense FAS material
9371		2.9	6	FAS
9371		7.9	2	FAS
9375		8.4	1	FAS
9378		69	1	dense slag fragment from SGC, tubular vesicles
9421		61	2	FAS
9429		7.8	8	FAS
9432		15.2	5	FAS
9545		9.5	1	dense FAS, grey with wite specks
9843		5.3	1	hollow bleb of iron slag
9445		96	11	FAS
		26	2	ashy concretion, possibly partly FAS
9872		9.9	1	FAS
10024	BPL18TW(20)	4	1	FAS
10025	BPL18TW(20)	6.5	1	stone (burnt?)
		29.8	5	FAS
10025	BPL18TW(20)	6.8	1	FAS
10025	BPL18TW(20)	20.2	5	FAS

10025	BPL18TW(20)	19.1	4	FAS
		4.9	1	spall of dark shelly limestone
overlying <10035>	BPL18TW(20)	1.8	1	FAS
10047	BPL18TW(20)	251	28	FAS, commonly ashy
10047	BPL18TW(20)	276	54	FAS
		23.4	1	dense rounded slag nub - dense FAS or maybe vitrified stone; just possibly, but probably not a metallurgical slag
		13.1	1	oxidised fired silty clay with white ashy coating on one vitrified and superficially reduced face
10140	BPL18TW(20)	650	14	FAS as 10180, one piece adheres to burnt bone fragment (weight includes some loose soil)
10163	BPL18TW(20)	52	1	pale FAS
10180	BPL18TW(20)	2171	58	FAS, mostly coarse with large individual flow lobes and large, often elongated vesicles, flows commonly >50mm in thickness, thicker pieces probably mainly from corners, ashy adhering sediment, one pieces has probable reddened hearth wall material on one face
		72	assm	dust, debris and soil
10125	BPL18TW(20)	6.1	1	FAS
10220	BPL18TW(20)	69	2	FAS
10243	BPL18TW(20)	37	2	FAS
10249	BPL18TW(20)	18.6	2	FAS
10251	BPL18TW(20)	75	3	dense FAS
		100	1	very dense siliceous slag - probably a thoroughly degassed FAS, slightly microdimpled base draped over an object. Could be thoroughly melted stone rather than a simple FAS to explain dense flinty texture
10258	BPL18TW(20)	29.6	1	weathered flow lobe of dense iron slag - might even be a smelting slag potentially
10264	BPL18TW(20)	10.9	1	FAS
10264	BPL18TW(20)	12.6	1	FAS, finely vesicular
10266	BPL18TW(20)	71	7	weathered and fragmented piece of vesicular iron slag
		25	1	decomposing iron fragment
10423	BPL18TW(20)	205	1	burnt ?shelly limestone
10455	BPL18TW(20)	6.5	4	FAS
10462	BPL18TW(20)	149	1	unusually dense FAS, one surface is whiter and planar - maybe stone contact?
10014	BPL18TW(20)	4.3	1	FAS
10053		1841	57	FAS, to about 60mm thick, some in thick large plastic flows

u/s S of B1 u/s post occupation black layer	BPL18TW(20)	25.1	2	FAS
u/s	BPL18TW(20)	212	1	botryoidal hematite, more massive core with rare large quartz, overlain by botryoids with 12mm fibres,
		21.6	2	FAS
u/s XXs	BPL18TW(20)	928	56	FAS largest piece 80mm thick
		33	1	Lump of friable fired clay/soil, convex lightly vitrified surface
		9	1	indurated ashy sediment? Partially FAS
u/s S of B1 u/s post occupation black layer	BPL18TW(20)	12.8	1	FAS
u/s S of B1 u/s post occupation black layer	BPL18TW(20)	25.1	1	FAS
u/s W of B1	BPL18TW(20)	4.3	1	FAS

Table 2: facies of archaeometallurgical residue by context. Weights in g.% provided for the class of the total residue by both weight and number.

C	FAS		dense FAS		SHC		Indet. Fe-slag		Hearth ceramic		Other	
	wt	no	wt	no	wt	no	wt	no	wt	no	wt	note
6004	5	1										
6010	200	13										
6015	21	1										
6027	11.1	2										
6039	8.3	1										
6068	15.1	2										
6074	17.4	4										
6076	6.8	2										
6077	53	2										
6081	33.2	4										
6084	28.1	5										
6092	52	6										
6095	45	3										
6100	4.4	1										
6101	2.7	1										
6103	2.8	1										
7001	2.2	2	3.8	1								
7038			6.3	1								
7044	35.8	2										
7045	19	3										
7047	41	2										
7050	28	1										
7054	134.8	10										
7061	247	1										
7073	41	6										
7077	13	2										
7079	361	14										
7100	62	3									182	Hematite pebble
7101	40	3										
7118	45	2										
7140	12	2										
7172			19	1								
7188	5.8	1										
7192	5.5	3										
7193	156	8										
7208	59	1										
7229	163	8										
7230	52	1										
7231	30	3										
7241	20	4										
7243	42	3										
7250	2.4	1										
7353	0.7	1										

7254	21	3								
7256	105	33								
7262	65	3								
7267	284	12								
7268	216	3					13	1		
7277	9	2					16	1		
7279							65	2		
7317	18	2								
7325	7	2					17	1		
7336	2.6	1								
7350	4.8	2								
7351	1.4	1								
7363	2.9	1								
7376	10.9	1								
7382	11	1								
7404	2.1	1								
7428	2	5					49	1	6	1
7429	15	3					71	3		
7436	20.5	1								
7440	4.6	1								
7441	2.5	1								
8001	11.2	2			404	2				
8010	0.9	1								
8059	5.5	1								
8102	8	1								
8110							49	1		
8149	10.8	2								
8211	61	3					73	3		
8268	9	1								
8277							3.8	1		
8327	2	1								
8422					400	1				
8442							25	1		
8446	14.6	4								
8537	17.4	3								
8820	10.9	1								
8840	22.3	5								
8843									14.3	1
8798					268	1				
9111	148	2								
9156	52	10	581	1			92	1		
9160	28.4	2								
9285	176	2								
9286	70	2								
9369					235	1				
9376	585.4	38	3	1			16.5	1	3.6	1
9382	68.4	6								
9811	1.7	1								

9829	8.1	1										
9547	38	2										
9248	11.5	13	9.2	1								
9371	10.8	8										
9375	8.4	1										
9379					69	1						
9421	61	2										
9429	7.8	8										
9432	15.2	5										
9545			9.5	1								
9843							5.3	1				
9445	122	13										
9872	9.9	1										
10014	4.3	1										
10024	4	1										
10025	75.9	15										
10047	527	82	23.4	1								
10053	1841	57										
10140	650	14										
10163	52	1										
10180	2171	58										
10125	6.1	1										
10220	69	2										
10243	37	2										
10249	18.6	2										
10251			175	4								
10258							29.6	1				
10264	23.5	2										
10266							71	7			25	Mineralised iron
10455	6.5	4										
10462			149	1								
U/S	1089.3	70					6.1	1			212	Botryoidal hematite
totals	*11101*	*669*	*979*	*13*	*1376*	*6*	*602*	*27*	*24*	*3*		
	79%	*93%*	*7%*	*2%*	*10%*	*1%*	*4%*	*4%*	*0%*	*0%*		

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