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Assessment of archaeometallurgical residues from Keyford Lane, Frome [KLF/23/SME]

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Abstract

The investigated materials comprised a complex array of material including a hand-picked collection of 349kg (1888 pieces) of 'slag', 3.3kg of hand-picked 'fired clay' (120 pieces), 38.6kg of 'slag' separated from bulk samples (5190 pieces), 1.7kg (1704 pieces) of 'fired clay' separated from bulk samples, 3.6kg of 'magnetic residues' from samples and 3.1kg of slag-rich fine residues from bulk samples.

The residues derive from iron smelting in a non-slag tapping bloomery furnace. Unlike most Iron Age furnaces of this broad type, the basal chambers/pits of which were packed with green wood, these examples were packed with straw (or a similar material). Most of the slag produced during the smelt flowed down into the pit and accumulated amongst the straw, forming a substantial (c.14kg) biconvex slag cake. The later stages of slag accumulation entailed the deposition of flow slags with charcoal inclusions on top of the initial slag cake. A small proportion of the slag assemblage formed higher in the furnace, including a slag pad that may have formed just below the bloom and a fluid puddle against the wall just below the blowhole. Approximately 10% of the slag assemblage drives from these upper levels in the furnace, suggesting that the overall slag production might have been in the order of 16kg per smelt.

Many contexts contained hammerscale, but no certain macroscopic smithing slags were recovered. It is likely that the hammerscale was formed during initial compaction of the bloom, probably without reheating in a hearth.

The assemblage contained a significant amount (a total of approximately 1.9kg) of oxide (goethite and possibly hematite) iron ore, indicating that ores from the Bristol Channel Orefield were employed for the smelting. The nearest potential source for such ores is just north of Nunney, 4km to the west of the site.

The most significant cluster of metallurgical features yielded 340kg out of the 386kg total collection of residues. Within this cluster, two features were identified as the bases of furnaces during excavation, while at least three of the other pits within the cluster showed heat-affected bases. It is argued that the other, more poorly-preserved pits within the complex would have been unlikely to function as 'raking pits' and may also have been furnace bases. Other assemblages of smelting residues from elsewhere on site suggest that the main excavated cluster was not the only locus of smelting activity.

Contents

Abstract 1

Contents 1

Methods 2

Results 2
- General description of the assemblage 2
- Macroscopic residues 2
- Microscopic residues 3
- Iron ore 3
- Furnace ceramic 3
- Distribution of residues and features 4
- Other materials 4

Interpretation 4

Further work 5

Glossary 6

References 7

Table 1: summary catalogue 9
Table 2: Material by class and context 49
Table 3: Total materials 51

Methods

All materials were examined visually, using a low-powered binocular microscope where required. As an assessment, 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.

This assessment was conducted in March 2024 and was commissioned by Dr Rhiannon Philp of Archaeology Wales.

Results

General description of the assemblage

The investigated materials comprised a complex array of material including a hand-picked collection of 349kg (1888 pieces) of 'slag', 3.3kg of hand-picked 'fired clay' (120 pieces), 38.6kg of 'slag' separated from bulk samples (5190 pieces), 1.7kg (1704 pieces) of 'fired clay' separated from bulk samples, 3.6kg of 'magnetic residues' from samples and 3.1kg of slag-rich fine residues from bulk samples (Table 1). This material has a total weight of 399kg of which 386kg were identifiable residues.

Macroscopic residues

The majority of the macroscopic residues were associated with primary iron smelting in a non-slag tapping furnace. The exceptions were a very small quantity of material that probably indicated reheating of the blooms for their initial compaction.

There was some variability in the form of the residues created during the smelting, but the variability was limited and it is likely that all the smelting was intended to undertaken in the same manner. The inevitable chance variation during the smelting process has produced the variation, rather than any significant intent.

All of the residues recovered were removed from their point of origin and had been broken during the process. The degree of fragmentation varied, but it is clear that extraction of the main slag mass from the base of the furnace was rarely accomplished with the deliberate breaking of the slag block into pieces. Some indication of the degree of fragmentation in different contexts is provided by the mean weight of hand-picked slag pieces provided in Table 3. Only 41 pieces of slag exceeded 1.5kg in weight. The largest pieces of were 2 between 7kg and 8kg, 3 between 8kg and 9kg, 2 between 12 kg and 13kg and single example over 13kg.The extraction of these large pieces indicates that the frontal furnace arch was at least 300mm wide in some instances, or that a degree of damage was made to the furnace.

The large blocks of slag were all from the lower part of the slag mass. This typically had a rounded base and a biconvex morphology. This slag mass could be up to 450mm in width and extend 260mm from the back wall according to the dimensions of the single, almost complete, basal mass (13.7kg, context (2137) NE quadrant). Evidence from some of the slightly less complete cakes suggests that they may originally have been slightly larger.

The bowls typically show prilly or flow-lobed bases. The bases occasionally have inclusions of small stones picked-up by the flowing slag. The top of the bowl also shows flow lobes, particularly around the margins. In the interior of the bowl, the slag is typically massive, with scattered large vesicles and at least in visual inspection it would seem that the original flow lobes homogenised away from the margins where they were preserved by chilling.

Prior to smelting, the basal chamber of the furnace appears to have been filled with straw (or possibly some similar material such as grass or reed). Moulds of the cereal stems are commonly preserved on the base and margins of the cakes, particularly along the distal margin. Occasionally, layers of straw are preserved (as moulds) within the body of the slag bowls and in some cases were observed as moderately steeply-dipping layers dipping down from the back wall towards the front. Some of these straw-rich layers passed into highly vesicular patches of slag.

In some instances there are moulds of fuel particles within the slag bowl, even close to the base. These may be particles of charcoal carried with the slag through the straw.

Although the bowls are typically formed of a dense iron slag, there are some instances where groups of flow lobes within the cake, particularly near its base, may instead be formed of a lower-density, pale yellowish green slag. In many instances the basal flows within the slag cake have a particularly hard, dark character, with a very shiny surface. These to contrasting types of slag suggest that in the initial stages of a smelt that the slag within the furnace is not well mixed, and that slag from the wall and from the reaction of the ore may take separate paths into the furnace pit. Later in the reaction, when the slag around the nascent bloom develops, the slag becomes more homogeneous.

The distal margins of the basal cakes may be particular rich in evidence for straw, as the distal ends of individual slag flows into the straw gave rise for abundant opportunities for contact surfaces between the two to be preserved. Although in most cases the slag cakes appear to have been sub-circular in plan, in some instances (e.g. the almost complete 13.7kg example from the NE Quadrant of (2137)) they were close to semi-circular – not extending across the full width of the furnace base in a distal direction. Very few examples were sufficiently complete to determine the degree of symmetry and the likely location of blowing, there was sufficient to suggest that the furnace was blown from a single point either in the back wall or slightly oblique to it.

In a few examples the anterior margin of the basal slag mass showed an area of damage, apparently from the use of an approximately 15mm square section tool. This is likely to be the tip of a bar hammered into the slag in order to dislodge it.

In the upper part of the basal slag cakes, the occurrence of straw becomes progressively less and inclusions of charcoal (or moulds after charcoal) become more prominent. These accompanying slags may be strongly flow lobate in morphology. The convex upper part of the basal mass, 100mm or more above the base, is typically formed of these lobate slags with charcoal moulds.

What lay above these lobed slags with charcoal is not entirely clear. Overlying slags are typically fractured away during extraction. Some slabs suggesting coarse charcoal bearing slags continued up the back wall of the furnace.

Higher elements of the slag assemblage include a thin zone of slag attached to the back wall that is very finely prilly and contains very small fuel moulds. This passes up into a plate (or puddle) of dense slag. This puddle must have been highly fluid and it is commonly associated with complex slag intrusions into the back wall of the furnace. The wall in these pieces is typically formed of a very pale, almost white, fine fired clay. These pieces are assumed to have formed just below the blowhole, close to the level of the developing bloom. There is no evidence for the original height of these materials above the slag cake in the base of the furnace.

Also from the upper part of the slag assemblage are pieces of dense slag, with a crudely plano-convex or sheet-like morphology. These are commonly very rusty in appearance and pass downwards into slags with abundant charcoal moulds.

There are two possible interpretations for these pieces. They could either be the slag from directly below the bloom, or they could have formed during re-use of the furnace for bloom compaction (or even have formed during both of those activities sequentially.

The total weight of slag that could be identified as coming from these various upper parts of the assemblage and/or being associated with wall, is 33.3kg. The total weight of all the slag that can be identified as coming from the basal slag mass is approximately 330kg, suggesting that only 9% of the slag developed during smelting lay outside the basal mass.

The pattern of slag accumulation in the basal chamber of the furnace is noteworthy. The main basal slag mass (the bowl-shaped slag mass) appears to have accumulated sequentially, with the lowest flows (which are the ones that show the evidence for a lack of mixing) accumulated first – intruding into the straw filled chamber. Later accumulations tended to carry fuel particles downwards into the pit/chamber. The upper surface of this overall slag mass shows well-formed lobes and must have formed at a level well below that of the bloom – which appears to have been associated with a much smaller mass of charcoal-bearing slags with a less well-reserved prilly structure, and with a denser slag 'plate' immediately below the bloom.

This gives rise to a slight problem of nomenclature. In the most common forms of Iron Age furnace the bloom formed directly on the top of the slag mass that formed in the wood-packed pit. Such a mass is commonly termed a 'furnace bottom'. Where a pit packing of straw was employed, it is much more common for the majority of the slag to accumulated low in the pit, with a 'free upper surface' and a much smaller mass close to the bloom. In this instance, as at Frome, the 'furnace bottom' thus encompasses two almost discrete entities. In such settings, the term 'basal puddle' has been employed for the lower mass. This nomenclature will require some revision in the future.

Despite the common occurrence of hammerscale (see below, the slag assemblage did not include examples of certain smithing hearth cakes.

Microscopic residues

Microscopic residues (flake hammerscale, FHS; spheroidal hammerscale, SHS; slag flats; nomenclature after Young 2011a) were recovered from a wide range of contexts. The abundance of scale in the samples is indicated using a scale of x (trace) through X, XX, XXX, to XXXX (abundant) in Tables 2 and 3.

In general, hammerscale was presented by FHS in most samples where it occurred. In the richest samples, some hand-picking had been undertaken during sample processing – and that picked material was very coarse FHS passing into slag flats. Spheroidal hammerscale was rare.

Iron ore

The assemblage contained a significant amount (a total of approximately 1.9kg) of oxide (goethite and possibly hematite) iron ore. The ore shows a variety of textures, including botryoidal and layered microstructures, probably with variously quartz and calcite as gangue components filling voids.

The larger pieces include some that were rather low grade and therefore probably discards, but the finer grade of angular fragments is likely to represent lost furnace feedstock.

Furnace ceramic

Furnace ceramic (fired clay and vitrified clay) together provided over 12kg of the assemblage. This is a relatively low proportion of the whole assemblage, but it is likely that much, particularly of the more poorly fired material, was not retained.

The furnace clays showed several distinct compositional groups. It was not possible to determine with certainty how the different clays had been used.

In several examples, a strongly foliated clay appeared to be associated with the region of the blowhole.

A pale, highly indurated fine clay is associated with examples of a slag puddle and wall intrusions, believed to derive from just below the blowhole.

The most common type of clay was sandy reduced fired clay that is believed to derive for the upper part of the basal chamber's walls.

A minority of the fired clay pieces showed organic temper.

Distribution of residues and features

Features from Area 1 did not produce certain examples of bloomery iron smelting slag, although various pieces of fired clay and assemblages including low-levels of hammerscale occurred widely.

Similar low backgrounds of microscopic residues were noted across parts of Area 2. Two pits (pits [2142] and [2146]) and two fills (fills (2130) and (2132)) of linear

[2129] produced more significant residue assemblages.

The main cluster of features identified as associated with the iron smelting produced 340kg out of the 386kg total collection of residues. This cluster is complex and multiphase. Multiple bowl-like hollows are intercut, and have a broad, merged fill (2137). Some of the features (Furnace (2199), with basal cut [2200] and Furnace [2202] with basal cut [2203]) were identifiable in the field as furnaces, mainly on the basis of heat alteration of the substrate and 'furnace lining'. Other bowl-shaped cuts were deemed to be 'raking pits':

Furnace [2199] (0.58m x 0.66m x 0.25m)
The basal cut [2200] is abutted by clay lining on NE side of the cut) and overlain by (2295) (a charcoal-rich fill), and in turn by (2294) (a dark grey charcoal rich matrix with large slag blocks, interpreted during excavation to be *in situ*) and finally by (2201) (silty grey clay, with bone). Cut [2200] cuts (2190), a fill of [2189].

Pit [2189] (0.85m x 1.0m x 0.24)
The basal cut [2189] is overlain by dark fill (2190) containing slag, limestone and bone. This pit is cut by the cut for Furnace [2199] and is cut into the fill (2198) of pit [2197].

Pit [2191] (0.9m x 0.9m x 0.25)
The single fill (2192), slag-rich, contains bone, and has a stone slabbed base which shows burning.

Pit? fill (2368)
This stony deposit was not fully excavated, It appears to have been cut by pit [2224] and truncates pit [2197]. It was not established whether there was a real cut below this fill.

Pit [2224] (0.5m x 0.6m x 0.3m)
This pit was filled by fills (2207) and (2225). Fill (2207) was formed by fired clay superstructure that had collapsed into the pit. The upper fill (2225) was waste. The western part of the pit's cut was burnt. The pit post-dates cut [2368].

Pit [2195] (0.6m x 0.7m x 0.25m)
The cut [2195] appeared to cut pit [2224].

Pit [2197] (2.3m x 2.8m x 0.3m)
This was the large central pit, with fill (2198). This fill was lumped with the other 'raking pit' fills (i.e. fills (2196), (2225), (2194), (2198), (2190) and (2193) as group (2137).

Furnace [2202] (05m x 0.6m x 0.3m)
This furnace was over basal cut [2203]. The basal fill (2495) was a dark orange-brown silt and this was overlain by a general furnace waste deposit (2494) with a fired clay lens (sampled as <226>) in its upper part.

Pit [2193] (0.9m x 0.6m x 0.15m)
Pit [2193] had a single fill (2194) of mixed furnace waste that was placed in group [2137]

Working hollows (as they are usually termed) outside non-tapping furnaces are moderately common in the Iron Age, but are by no means seen in association with all furnaces. They are seen where the frontal arch of the furnace is set at least partially below contemporary ground level – and removal of the slag is easiest down a slope, or at least up as shallow a slope as possible. In the most common form of Middle to Late Iron Age furnace, the basal cut for the furnace is pear-shaped, with the angular end where a shallow ramp leads down into the furnace pit through the arch. Working hollows do not normally show any significant 'lip' between the base of the furnace and the external hollow, since this would interfere with dragging out the heavy furnace bottom slags.

The concept of the 'raking' of hot, not fully solidified, slag from the furnace, as an alternative to tapping, appears to have arisen in the 1980s/90s as an (erroneous) explanation for the apparently contorted flow slag prills found in non-tapping furnaces, now interpreted as slag that has cooled in the interstices of a wood pit-packing. No confirmed instances of the raking of unconsolidated slag from the furnace have been published.

An external hollow with a lip between hollow and furnace pit might make practical sense as a place to drag the bloom from the furnace, moving it over the top of the slags still in the lower part of the furnace, perhaps into a reheating hearth. This practice has, however, not been documented elsewhere.

External bloom reheating hearths are known in the archaeological record, but in general reheating the bloom during compaction using the residual heat in the furnace itself is more efficient. Practical bloom smelters usually attempt to consolidate the bloom to a billet, and to cut it if desired without reheating, since reheating such a large object once it cools is very difficult. Once reduced to billet, or cut into smaller pieces/billets, blooms are dually moved elsewhere to a dedicated smithy for their final working into bar iron.

Some of the 'raking pits' at Frome show evidence for extensive heating (e.g. pits [2189] and [2224]). Pit [2224] also contained a significant amount of furnace lining against its SW side. Although some transfer of heat would be achieved through dragging hot slags out of the furnace , there is no evidence for hot deformation of the slags from Frome, and it is more likely that they were removed cold, or almost so, after the bloom had been compacted.

The richest assemblages of microresidues derived from contexts (2137), (2143), (2192), (2225) and (2296), with only slightly lesser assemblages from (2201), (2204) and (2207). None of these contexts provides evidence for being directly associated with a smithing hearth and most are general waste assemblages.

Other materials

Besides the occurrence of occasional local natural stone, there were numerous examples of polished iron oxide pebbles. These were probably present through natural agency.

Two contexts ((1050); (2137) SW quadrant, 2nd spit) yielded fragments of pottery (now removed from the archaeometallurgy collection).

One context (context (1000)) produced a small angular fragment of post-medieval bast furnace slag. This context also produced a fragment of asphalt road surfacing.

Small pieces of coal and/or coal residue were recovered from several contexts: (2000) 8.2g of coked coal, (2003) 6g of coal, (2067) 2g of coke, (2126) 2g of

possible clinker, 2137 (NE Quad) 1g of coal. The coal may have arrived on the site through natural agency and coal was used as fuel from Roman times. Much coal, coke and clinker in agricultural settings tends to be residues from the use of steam power agricultural machinery in the late 19th and 20th centuries.

Interpretation

The archaeometallurgical materials form a tightly coherent suite of residues from the production of iron in a bloomery furnace and the subsequent compaction of the bloom.

The use of a cereal-packed basal pit in a non-slag tapping furnace is unusual. Examples from the Iron Age are extremely rare. An example from Folly Court, Berkshire (Young 2018a) lay alongside a 'dome' furnace probably of the 2nd century BC and was dated through the presence of straw-bearing residues within the dump of slag from the adjacent dome furnace.

Slags from a cereal-packed furnace were recovered from a wide range of contexts at the Lockleaze Roman villa (34km NW of the present site; Young 2018b, 2021a), but with a significant concentration in the early/middle Roman period; no furnace was found, however, and the slags exhibit a high degree of residuality. It is unclear whether any of the occupation on the site preceded the Roman invasion, so the slags are likely to be Roman rather than Iron Age. The only well-documented Roman occurrence is from Leda Cottages, Kent (Paynter 2007, Fig 4).

The evidence permitting recognition of this technology is quite subtle, and it is likely that other early occurrences may have gone unrecognised. Evidence for Iron Age smelting sites in the Bristol Channel Orefield is very sparse, despite the good evidence from currency bars for a major industry in various sectors of the orefield.

Evidence from the Iron Age of southern Britain points almost ubiquitously to the use of wood-packing (e.g. Threemilestone, Tolgarrick, Tregurra and Probus in Cornwall*;* Twinyeo, Berry Hill and Chudleigh in Devon; Fleethill Farm, Hartshill Copse and Wokingham in Berkshire; Stocksbury in Kent (Young 2007b, 2021b; Young 2016a; Young 2016d, 2022; Young 2023b; Young 2014, Farnell 2015; Young 2007a; Young 2023a; Young 2016c, Hardy & Young 2019; Young 2020; Young 2018a, Young & Anelay in press; Girbal 2019).

Cereal-packed non-slag tapping furnaces are much better known in the region from the early medieval (e.g. Churchills Farm, Devon Young 2016a, Smart *et al.* 2018; Clearwell, Gloucestershire, Paynter 2002; Yorkley, Gloucestershire, Young 2015). Further afield, they have been recorded at Eckington, Derbyshire (Young 2017; Allen *et al* 2018), and they are also known from early medieval Ireland (Young 2011b, 2012).

Although the present assemblage shows closer similarities with early medieval examples than with most Iron Age furnaces, there are also some significant differences. In particular, most cereal-packed furnace assemblages show a basal mass with a flat top, indicating that the slags formed a fully fluid puddle. In the Frome material this was either not the case, or it has been masked by the descent of further slags forming a lobate layer over the top of the 'puddle'.

Although the residues provide considerable technological detail, the furnaces themselves are poorly preserved. It is normal that such furnaces would be cleared of residues immediately after a smelt (unless serious failure meant they could not be reused). This appears to have been the case at Frome: in almost all cases, the fills of the furnaces (both those surviving and identified as such and those that are badly eroded and probably form the so-called raking pits) are of a general waste deposit, rather than materials left over from a particular smelt.

During excavation, context (2294) was claimed to be an in-situ slag mass. The stratigraphy suggests that this may be unlikely, but site photographs should be checked to examine the 'way-up' of the slag blocks as found and the assemblage should be examined in detail to see of the fragments from this context do derive form a single 'furnace bottom'.

The morphology of the furnaces is this uncertain. The basal slag masses have diameters of about 450mm. This corresponds to a mid-sized furnace for the British Iron Age (comparable with the furnaces from Fleethill Farm, Hardy & Young 2019, and fractionally smaller than those from Tregurra, Young 2022). It is also worthy of note that the slag puddles in the cereal-packed furnaces of the early medieval at Churchills Farm, Hemyock (Young 2016a, Smart *et al.* 2018) were also 450mm in diameter. It is difficult to achieve penetration of the air blast across a diameter of 450mm. It is therefore quite likely that the furnaces were tapered, or bottle-shaped, with a narrower shaft than basal chamber/pit. The wider base may have reduced adherence between the basal slag mass and the walls, making clearance easier and necessitating fewer repairs after each smelt.

The lack of smithing slags suggests bloom compaction was undertaken at the smelting site, but not full working down to usable iron.

The approximately 1.9kg of oxide iron ore indicates use of ores from the Bristol Channel Orefield (*sensu* Young & Thomas 1998, 1999; Young 2000). These ores are hosted in the Mendip area by voids within the Carboniferous Limestone. The nearest source, although others exist just a little further away, is just north of Nunney [ST 73677 46404], 4km W of the site, where several hundred tons were raised in the 19th century (Cantrill *et al.* 1919).

Further work

The assemblage would benefit from some additional detailed analytical investigation, in order to clarify issues of furnace yield and ore provenance, as well as better to characterise the technology. Such an investigation should involve a suite of investigations of microstructure of slags and ores by scanning electron microscope, as well as a more comprehensive suite of elemental analyse of materials (ores, slags, furnace ceramics). This approach allows modelling of the mass balance of the furnace operation, leading to modelling of the furnace productivity.

The dating of the activity should also be addressed carefully. The details around radiocarbon dating substrates are different here to most non-tapping furnaces, since there is no basal wood packing. The

bases of the furnaces should contain carbonised remains of the cereal pit packing, particularly stems rather than cereal grains. These should be examined carefully through the detailing of the charred plant remains that remain in the very bottoms of the pits. Context (2295) is perhaps the only context in which such material might survive *in situ*, but it may exist reworked in other contexts. Work on carbonised plant remains from the Late Iron Age of Denmark has provided much information on seasonality and crops (e.g. Henriksen 2003; Mikkelsen 1997). The Danish material is, however, contained within single use furnaces that did not suffer the disturbance that the multi-use furnaces at Frome will have done.

Glossary

Blacksmithing: the working of iron and steel. Often restricted to the secondary smithing – i.e. the smithing of iron to produce or repair artefacts, as opposed to the smithing involved in the production of billets or bar iron from raw iron blooms.

Bloomery: a furnace for smelting iron from ore in which iron is produced as a solid material. The bloomery process was employed mainly prior to the introduction of the later blast furnace from the late 15th century.

Bloomsmithing: The process of reworking a raw bloom, through repeated reheating and hammering, to reduce its content of slag, to remove unwanted inclusions and to draw out the remaining slag into elongate inclusions. The end product may be a bar or billet. Usually taken as an alternative term for bloom-refining.

Blowhole: A hole through a furnace or hearth wall through which air is blown.

Fayalite: the iron-rich end member of the olivine group, Fe_2SiO_4. Abbreviated to Fa.

Flake hammerscale (FHS): fine, thin flakes, of iron oxides spalled from the surface of the workpiece. They result from the oxidation of iron at high temperature. They typically have shiny surfaces.

Hammerscale: material, usually detached, formed by oxidation of the surface of hot iron. Closely related terms forge scale and mill scale are also often sued for modern materials.

Haematite (hematite): anhydrous iron (III) oxide, Fe_2O_3

Olivine: a group of silicate minerals of the form $(M^{2+})_2SiO_4$ where M can commonly be iron, magnesium, calcium (up to half the M^{2+} ions) or manganese.

Smelting: a process involving the reaction of raw ore to produce a metal,

Smithing: the activity involved in forming a metal object, including, but not limited to, forging metal and joining metal by welding.

Smithing hearth cake (SHC): a typically plano-convex slag mass that forms below the blowhole in a smithing hearth from the reaction of iron/iron oxides lost from the workpiece, melted hearth ceramic and fuel ash.

Spheroidal hammerscale (SHS): are very small (<2mm diameter) spheroidal droplets, with a shiny surface, formed by chilling in air of droplets of melted iron oxides forcibly expelled from workpiece during hammering. They may be generated purely from the melting of the superficial oxide film (as generated the flake hammerscale), from the expulsion of melted slag included within the iron, and their generation may be enhanced by the use of a smithing flux

Vesicle: a void or pore, usually rounded and formed as a preserved gas bubble in a solidified melt.

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Table 1: summary catalogue of items retrieved as archaeometallurgical residues, listed by context and bag. Weights in grams.

Sample	Context	Bag notes	Sample wt	Item wt	Item no	Description
	1000		49.64	49.64	4	fired clay; variably sandy; two show slightly red inclusions
	1000	area 1	102	86	1	limestone gravel in tar - asphalt road material
				16	1	rounded, fractured nub of vesicular very dark green slag - probably a hot-blast blast furnace slag
5	1038	[1034]	9.07	3.82	1	silty oxidised fired clay with sparse rounded quartz; large planar surface
				0.92	1	silty oxidised clay with some grit and possible organics
				4.09	5	silty fine clay, sparse grit; possible organics in at least one; grades to almost black in some pieces
5	1038	[1034]	3.6			tiny amount of slag, trace FHS
1	1047		1.72	small bag		small amount of slag, FHS, trace SHS
	1047		18.78	18.78	2	oxidised-fired slightly silty fired clay with white specks
8	1050		16	1.72	1	limestone-tempered pottery
				0.34	1	sandstone pebble
				7.19	2	probable weathered slag fragment
				6	11	tiny fragments of fired clay; a mixture of oxidation
8	1050		2.98			FHS, trace SHS
8	1050				12.7	8.02g FAS, 5.50g polished iron ores including internal mould of brachiopod, 0.85g slag
	1058		20.21	20.21	1	silty oxidised-fired clay with limestone inclusions
3	1068		6.61	6.61	2	soft silty fired clay; oxidised; some voids but no certain inclusions

3	1068	11.59			fired clay
4	1069	2.41			low amounts of slag, slag droplets, FHS
4	1069	16	16	5	silty oxidised-fired clay; locally with pale inclusions; one apparently slagged on one side, others often show darkening
4	1069			1.33	FAS bleb, broken
6	1072/1081	16	16	10	mostly fine fired clay with coarse grit; one piece probably natural
6	1072/1081	2.96			FHS, slag droplets
7	1074	4.87			FHS, slag, slag droplets, lining slag, trace SHS
7	1074	60	60	69	natural stones
			1	2	possible pottery
2	1094	66	66	125	oxidised-fired clay; mostly silty; some grades to dark grey,
	2000	8.22	8.22	1	coked coal
	2000	162	120	3	dense flow slags with fuel moulds
			30	1	dense low slag with straw moulds
			12	1	worn dense slag fragment
	2000	187	160	1	worn very dense slightly vesicular iron slag lump
			26	1	flow slag with small fuel moulds
			1	1	coke
	2001	1	1	1	tiny chip of iron slag with fuel moulds

	2003		114	108	3	very worn flow slag fragments
				6	1	coal
209	2009	<2	3.08	big bag		slag, slag droplets, SHS, trace FHS
209	2009				0.63	slag
	2027		1	1	1	flow slag fragments
	2023		10700	1680	1	neat base of bowl, upper part missing; bowl apparently filled with porous slag with large fuel moulds. 190x150x80(50)mm, base microprilly
				2840	2	slightly broken large bowl fragment, fill 120mm deep, has inclined layers of straw, straw present on top, base coarsely lobate non-wetted, some limestone clasts, some wood/charcoal fragments inside bowl, but rare, just a few incipient lobate horizons at margin, but distal part is missing, radius of bow = 140mm, but probably not circular and wider than this
				1015	1	another block from this, or very similar bowl, coarsely lobate on base, some limestone, part of bowl fill is highly vesicular around straw
				994	1	fragment from base of bowl with multiple layers of very dense tapslag-like lobed material, coarser-grained than tapslag, slight hint of reddening on lobate top; 70mm thick
				1065	1	fragment from 75mm thick bowl of dense tapslag-like material, stained with lime, some very coarsely crystalline large vesicle linings, mass of straw on base
				46	1	low density lump of straw-rich vesicular slag
				1390	1	block from dense FB; planar floor with non-wetted lobes; lower 50mm shows much straw between flat flow layers; above that there is fuel - including particles of up to 50x70mm - probably though still fuel; 110mm thick
				452	1	block with prilly base with some straw; slag becomes more simply vesicular above this at 65mm above base, just below top of this piece
				226	1	lower part of bowl; base microprilly with 15mm of poor crust then becomes more vesicular, but texture not well seen
				324	1	irregular fragment of dense slag with prills and straw seen but texture not well shown
				406	1	bowl fragment, crude sheet with planar surface with crystal terminations 30-45mm above base, base shows fine fuel moulds
				128	1	claw-like flow slag piece, very dark, flows over an object but not conclusively a fuel clast
				72	2	smaller fragments of dense slags with straw moulds, one prilly
				62	1	small angular fragment of dense vesicular slag

	2027	area 2	48	48	3	broken single fragment of flow slag with straw moulds
200	2052	>5mm			0.66	slag
	2059	area 2	10	8	2	rounded polished iron oxide pebbles
				2	1	worn iron oxide fragment - pocked marked surface
202	2060		1.64	1.64	8	tiny fragments of fired clay; mixture of oxidised- and reduced-fired; mostly well gritted; one piece may be natural
202	2060	<2			4.21	slag droplets, slag, ore, some FHS
201	2065		0.08	0.08	4	oxidised-fired clay chips
201	2065	<2			0.85	slag, slag droplets, some FHS
201	2065				0.92	slag, slag droplets
	2067	area 2	4	2	2	coke
				2	1	dense flow slag fragment
208	2068	<2			0.64	FHS, SHS
	2069	[2068]	18	18	1	fragment of dark vitrified hearth lining, fractured into 3 pieces
	2071	[2072]	6	2	1	finely prilly slag with fuel moulds
				1	1	indeterminate iron slag chip
				1	1	extremely lustrous small flow slag prill
	2082	area2	1405	536	5	fractured single block from a basal puddle, dense grey slag with straw impressions above and on one side. One side (opposite the mass of straw) shows inclined non-wetted surface with lobes visible - but internally homogeneous

				270	1	part of a plano-convex mass of porous slag, thin basal crust, then vesicular to top of bowl (25mm up) then vesicular and charcoal-bearing above, total 60mm thick
				78	2	fragments of dense amalgamated flow slags
				528	1	very dense angular fragment, some vesicles - from core of a FB
	2086	area 2	918	918	1	rounded nodule of oxidised sulphide? 95x85x70mm; angular protuberances to at least 17mm across
207	2090		0.52	0.52	10	oxidised-fired clay fragments
207	2090				5.1	slag, rock
207	2090	<2	2.3			FHS
	2093		114	114	4	rusty masses with charcoal and cracking - completely weathered slag (with iron?)
	2093		2.02	2.02	1	brown silty fired clay with 5mm inclusions; mostly white, some possible slag
205	2093	<2			1.42	FHS, slag
206	2095		0.92	0.92	3	oxidised-fired clay fragments
206	2095	<2	4.42			slag, slag droplets, FHS, SHS
204	2105		27.45			rock, slag
	2120		25.21	25.21	4	probably one piece; oxidised-fired soft gravelly clay with planar buff surface
214	2120	<2			1.72	low slag, FHS, SHS
214	2120	2-5mm	1.42			angular slag debris
	2126	area2	2	2	1	small prill of dark slag with pale inclusions - clinker?

	2126	area 2	11.32	11.32	4	oxidised fired fine clay
210	2126		3	1.88	4	variegated white-pink fired clay
				1.1	1	clay with rounded 'lumps' ?natural
210	2126	<2	4.96	small bag	4.37	slag, slag droplets, FHS, SHS
210	2126		116			slag, limestone
	2128		41	41	1	dense wustite-rich slag with large fuel moulds
	2130		16	14	1	irregular rusty fragment of vesicular iron slag
				2	1	highly polished iron oxide-type iron ore
211	2130	>5mm >1000ml	2264	2250	1	150x170x105mm, pale base of FB; curious mixture of flows; indurated floor/wall and highly vesicular material, all pale; abundant straw throughout, including spectacular section with straw at angle to floor
				14	3	debris
211	2130	>5mm >1000ml	2895	794	1	c. 40mm thick slab from base of furnace - shows very dense dark slag with abundant straw (photo?)
				1060	1	large block of amalgamated prilly dense slags that is hard to orientate, one face is wall contact like - non-wetted lobes with traces of limestones; face at c. 110 degrees shows contact with convex ceramic surface - could be base of tuyère, fallen block, plate or the orientation of the block is wrong - for instance non-wetted surface the sloping floor and the ceramic the side of the arch?
				358	1	dense dark slag weathering brownish, basal sheet of flow lobes shows straw top and bottom, passes up into more massive slag with charcoal moulds; base non-wetted aligned flow lobes
				134	1	sheet of slagged, mostly reduced furnace wall with two slag layers; very slightly convex underlying ceramic surface
				258	1	very dense brown block of amalgamated prilly slag, locally with straw moulds
				92	1	very dense amalgamated flow slag fragment with small fuel/wood moulds

				102	1	edge of block of dense, but variably coloured, cake with lobing and straw moulds on both top and bottom
				62	1	fragment with fresh break of highly vesicular, locally pale, rough slag with straw moulds; probably part of edge of larger piece
				44	1	as above, but apparently no join
211	2130	>5mm >1000ml	2270	686	16	general dense FB fragments, generally prilly; generally with fuel moulds
				534	1	large angular block from bottom of FB, dense amalgamated prills with straw
				594	1	wedge-shaped block of highly vesicular slag; most dark, with straw impressions; equant grained throughout
				48	2	prilly/flow lobed slags, dark dense, with straw impressions
				76	2	dark dense slags with basal non-wetted planar contact; internally equant grained, with straw, dark vesicular
				184	1	dense, vesicle-poor slag in amalgamated flow lobe, greenish colour, very shiny surfaces
				54	3	reduced-fired clay with slagged surfaces, clay coarsely tempered with angular and rounded ?quartz to 2mm
				92	1	coarsely sandy reduced fired ceramic wrapped around a dense slag core/intrusion
211	2130	>5mm >1000ml	2520	378	11	small fragments of flow lobed dense slags with straw
				1105	1	large block of flow slag full of straw; from margin of bowl at least 90mm deep
				112	1	fragment from dense basal puddle in pale slag, one surface has flow lobes and straw; lobes on top; 35mm deep puddle below with rare straw and a few vesicles; olivine is vertical for 7mm along the base
				52	1	dense slag with slightly bronzy surface and very highly shiny flow lobes, trace of straw
				26	1	buff colour oxidised lining with vitrified front face
				174	1	small tongue-like mass on slightly oxidised wall, tongue openly lobate mainly pale passing down into grey microprilly material; just above tongue top is base of blowhole approximately 22mm in diameter; wall extends for 60 to left, 40 to right and 55 below blowhole axis with no indication of any change in material
				658	7	dense, brownish slags with fuel moulds
211	2130		3499	3485	3	large blocks to c85mm max bowl depth, dense slag with straw throughout, base non-wetted with straw displaying lobes usually not visible internally

				14	2	dense prills
211	2130	<2	3.62			FHS, slag, slag droplets
211	2130				14.41	slag, ore (1.58g)
	2132	area 2	464	32	1	dense slag attached to grey wall
				268	1	tall block (inverted cone?) of slag with fine fuel moulds - top might just be sub-bloom surface
				52	1	dense flow slags in large, amalgamated lobes, straw impressions, secondarily reddened
				80	2	worn lumps of very dense highly vesicular slag - centre of FB?
				20	6	small fragments of dense flow slag lobes
				8	6	indeterminate small fragments
				1	1	worn fragment of slightly vitrified grey lining
232	2133	<2	6.47			slag, slag droplets
	2137	SW quad		24	2	very soft (?roasted) ore
				8	1	angular fragment - part-reacted ore?
				394	23	limestone and chert
				1275	23	slag with coarse fuel moulds and generally thin slag sheets between - typical FB material
				952	12	dense, very dark, amalgamated flow slags showing flow around fuel lumps; shiny black surfaces
				166	4	dense, very dark, amalgamated flow slags; shiny black surfaces
				156	8	pale amalgamated flow slags, some with flow around fuel lumps; internally coarsely crystalline with equant grains
				718	6	dark amalgamed flow slags with glossy, locally micaceous-appearing, surfaces; locally quite brown; some show flow around fuel moulds
				1420	13	brown flow slags with abundant straw, grades into lobate material downwards, with lobate terminations forming floor
				708	4	large blocks, including base of FB, with finely prilly surfaces; brown-weathering rather massive slags; all show some straw, but may also show fuel moulds; often very fine and associated with microprilly base

			1355	5	brownish slags with regions of dense straw and high vesicularity, may grade down to a lobate base or up to slags dominated by fuel moulds; one piece shows an internal tapslag-like surface overlain by more massive material
			1690	6	very dense slags, rusty; locally with fuel moulds but commonly passing into dense sheets; likely to be from the upper part of the FB
			332	9	vitrified, and locally slagged, lining; rather heterogeneous, fissured and irregular material, mostly reduced
			22	1	very fine pale cream ceramic intruded by black slag
			12	6	beige grey and orange fired clay
			762	25	smaller fragments with abundant fuel moulds
			588	22	smaller fragments with flow lobes
			104	5	smaller fragments of brown flow slags with straw
			54	6	smaller fragments with high vesicularity and straw
			48	2	small fragments showing convex basal crust to 10mm
			162	8	smaller fragments of more massive rusty slags
			402	assm	fine debris and dust
2137	SW quad	19292	1135	1	brown flow slags, showing lobate base and then straw associated with dense lobate flows
			954	1	ditto
			454	1	ditto
			376	1	ditto
			440	1	ditto
			298	1	ditto
			442	1	ditto
			368	1	ditto
			224	1	ditto
			172	1	ditto
			46	1	ditto
			968	1	open-textured block with descending dark slag prills passing into horizontal movement through straw, lobate base, some voids are large, but not certainly around wood/charcoal, dominated by almost black shing dense prills
			186	1	distal end of dense flow sheet; flow lobes visible on base, straw on top
			1025	3	FB material with large fuel moulds to 40mm, largest example shows some fissuring, so use of wood fragments not entirely excluded

54	1	dense flow slag with straw impressions below and fuel on top
22	1	dense isolated blebs of amalgamated flow slag draping fuel clast
566	1	dense block of brownish flow slag, smoothly lobate top; appears to be curving down and forwards over large fuel moulds but below straw distally
740	4	large very complex block of slagged pale wall material, fissured and probably failed, both concave and convex surfaces present
464	1	block of wall; very fine grey/cream colour clay, intruded by dark slag (probable source of small piece in previous box); overlain by dished dark dense slag with smooth surface, suggests a worn embayment below blowhole with smooth blown slag; slag to 20mm
306	1	dense concavo-convex slag sheet, dense crust 20-25mm thick, overlies very rusty fragmental material - suggests top of FB passing onto furnace wall
412	1	base of bowl with poor crust increasing to 15mm in centre, has very crude tubular vesicles; flat top formed by layer of straw; this joins the thin crust fragments in previous box
568	1	curious block - probably a reject ore with calcite surrounding a straw-like iron oxide?
2430	1	crudely plano-convex block of low density; base microprilly, just a hint of straw; probably mainly degraded charcoal as holes; thickens towards fractured edge, suggesting this is probably from furnace side rather than base; however it is oriented, it does not suggest a very large diameter furnace base - probably less than 400mm
638	1	very dense block from base of furnace; perhaps slightly lateral as flow lobes near base protrude only a little; dense vesicular slag, some straw on top of protruding lobes, but no straw or fuel internally
2175	1	very dense block as above, but with slightly more protrusion of flow lobes and with sweeping curves of straw locally internally; away from distal margin shows fuel moulds, particularly near top, very massive bowl fill
1935	1	very dense block, probably slightly more central than previous two which may lie to either side; more developed distal lobes; top highly vesicular suggesting straw but has large fuel moulds impressed on top; 90mm thick, 180x110mm in plan
1080	1	dense block from distal margin of FB; dominated by coarse flow lobes, many with straw impressions, but even close to prilly base there appear to be some large fuel moulds
130	1	small fragment of basal bowl, 20mm of poor crust overlain by highly vesicular slag
180	1	fragment of basal sheet - microprilly with small fuel moulds
190	1	fragment from curving dense sheet with sliver of ceramic incorporated into base; unclear if a lost fragment near base of FB or if this is FB top- probably the latter
314	1	angular fragment from dense vesicular bowl, probably from near margin of bowl

2137	SW quad	27114	8210	1	250mm long back wall slag, passing into 140mm almost planar floor (proximally-distally) curved laterally; dense iron slag to 100mm above floor; away from the fresh face, the base become more sheet like (flows with straw between) and above is a thick layer of highly porous material; only very top shows fuel moulds - at a minimum of 140mm above the base
			1630	1	block from basal part of cake; top lobate with straw impressions; internally highly vesicular with strongly inclined straw, passes towards side into lobate material (pale below, dark above); bowl side (non-wetted lobes) at 45 degrees to top), 90mm thickness seen, base of bowl not reached
			1330	1	slag sheet 40mm thick, slightly dished top, indurated wall contact, passes down and laterally into material with fuel moulds; indurated wall 50mm deep
			4350	1	large block from deep, dense bowl fill; not circular in plan, has a slightly straight edge, but whole would suggest at least 600mm diameter; edge descends at 60 degrees to top; margin is lobate but overprinted by fine debris; base of piece shows impression of flow-lobed surface - so bottom not reached; top is slightly convex with marginal lobes showing straw impressions; 150mm tall; probably biconvex with side 45 degrees to horizontal; basal crust 30mm, bowl 70mm and entirely dense fill, top shows rare fuel moulds
			4640	1	distal part of base of bowl; shows shallow dense bowl with distally extending flow lobes with straw; bowl overlain directly by slag with large fuel moulds; bowl maximum of 90mm deep and 190mm half width?; 70mm of slag with fuel on top; base prilly with small fuel moulds
			4900	1	part of shallow bowl; lower fill flows with straw 30-60mm thick (perhaps even 90mm where open-textured); overlain by flow lobes with fuel moulds (locally to 70mm long); probably up to 80mm thick
			8	1	vitrified wall fragment, pale
			458	1	basal part of cake with lobate brown slag with straw
			632	1	lobate basal material; small part is pale green; very dense; no straw or fuel moulds; close to the margin flows which are locally slightly 'micaceous' in appearance
			512	1	upper angle of basal bowl, lobate, non-wetted on side, straw impressions on top
			444	4	smaller fragments of lobate slags from lower part of cakes; straw seen in most
2137	SW quad	22287	602	5	complex pieces of vitrified and slagged lining, all on pale ceramic; indicate deep fracture and failing of lining in blowhole area
			4700	1	distal margin of bowl with large inflated lobes with straw impressions close to margin; 270x230x120mm, although orientation not clear; straw later overlain by more large lobes with deep holes of large fuel clasts to 40mm, upper part fractured away proximally to mid-point of bowl; base finely prilly with fuel moulds, little straw

3935	1	distal margin of dense bowl; dense large lobes with straw on top around margin; two holes 15mm across on margin could be tool used in extraction; biconvex; internally all dense slag but rather cavernous; 300 wide (not full width) x 170 x120mm; base prilly with straw; small area of secondary reddening and very small component of pale green slag
210	1	limestone
478	1	angular fragment of possibly roasted ferruginous sandstone
2425	16	amalgamated flow slag with large fuel moulds, many pieces also show straw moulds
1254	1	large block dominantly formed from pale green friable slag, rich in straw and occasional fuel moulds to 40mm; probably upper surface as some smooth, slightly lobate areas, but is covered in rusty material; probably 100mm deep below this, maybe with straw near wall and fuel inwards
322	1	dense slag attached to rather broken areas of wall; slag appears to be dense plate over fine prills with fine fuel moulds
376	1	dense block with slag containing 50x45mm fuel over green fragmental material (cf 1254g block).
1830	1	block from near distal margin of very dense bowl; very rich in straw, very dense; bowl 50-70mm thick; thinner edge shows 18mm square hole that may be from extraction; rising part of base is more prilly
238	1	dense fragment with indurated wall skim - probably from burr region; base of dense lag shows fuel moulds
112	1	fragment of dense wustite-rich slag with large hole that appears to be fuel, but dark material inside may be ore grain
678	1	fragment from base of a very prilly cake; small lobes; some fuel moulds even close to the base, which itself shows straw impressions; the base shows limey adhesions - so just possible it is wall not base
670	1	distal margin of cake with well-developed flow lobes, some straw on top; lobes may go over fuel moulds below but obstructions not well defined
636	1	fragment from margin of very dense bowl, all slag slightly brownish and straw present throughout
410	1	marginal fragment from biconvex cake; very dense slag with large fuel moulds internally, but straw top and bottom
744	1	dense deep flow of brown slag, lobate with straw top and bottom, internally some large vesicles but fuel clasts rare
358	1	thin slab; non-wetted lobate base with quite large lobes and prills; top less coarsely lobate with straw
70	1	lower density slag with mass of straw and a few small fuel clasts
78	1	small fragment from margin of flow with inflated large brown lobes and straw impressions
188	7	small fragments of slightly lobate slag

			432	2	very dense masses of amalgamated dense flow slags; some straw; surfaces very shiny and locally 'micaceous'
			60	2	small amalgamated flow slag fragments
			1425	5	blocks of finely prilly fine pale green slag with abundant straw; bases prilly; just rare inclusions of denser iron slag
			56	1	flow slag with straw; even mix of dense iron slag and the green slag
2137	NW quad	17177	3451	13	dense massive slags, some showing marginal wall contacts, some a degree of internal lobing, but all dominantly massive with varying vesicularity; some show some external surfaces with straw, some show rare fuel clasts
			482	63	small slag debris
			370	9	iron ore
			1360	15	very dark dense flow slags with very shiny dark, or slightly greenish or locally 'micaceous' surfaces
			2180	26	dark dense flow slags with dull surface; most show either straw or fuel clasts in low amounts
			60	3	pale green flow slags
			68	1	lobate piece with iron
			40	5	limestone and chert
			214	8	vitrified lining, all on pale grey
			316	4	dense slags attached to indurated wall
			180	1	dense slag attached to indurated wall; large vesicles or deep dimples below, smooth on top; probably smooth top at bloom level
			6	6	fired clay - some reduced some oxidised
			38	2	lining slags pulled from indurated wall; smaller piece is oxidised and shows an even curve - so just potentially from tuyère
			50	1	dense slag in highly shiny sheet, probably pulled from floor not wall
			22	1	very thin basal crust, less than 5mm thick
			156	1	thin basal crust to 8mm, overlain by upstanding slags with moulds of fine fuel and straw
			178	1	margin of thin basal crust to 20mm; prolongs into spike with lobes, vesicles and impressions
			298	1	basal crust apparently incorporating large pale object - spall from floor, stone?
			3360	11	dense brown basal slags with flow lobes and straw impressions; lobate bases
			1295	1	large block of cake base with brown colour flow lobes; some straw but not dominant; some internal large fuel clasts to 40mm

			2185	18	dense slags with abundant large fuel moulds, some pieces from near base also show a little straw
			310	1	dense slag with large fuel moulds plus elongate twig or large straw piece
			558	3	slags vary to pale green and vesicular suggesting high straw content
2137	NW quad	28559	7260	1	270x200x130mm; 260x70mm deep main channel, to rear has another up to 60mm on top; incomplete distally but appears only lower not narrower; mostly rather smoothly lobed on top; base lobed to prilly, but covered in slag 'sand'; rear of base is starting to curve up at 220mm from broken tip; hint of inclined straw in this area
			88	2	vitrified lining
			120	assm	debris and dust
			2655	1	friable furnace floor mass; very porous because of high proportion of very fine fuel moulds; 270x170x140mm; attitude uncertain; show slightly denser sheet mid-thickness, curving away from microprilly base; no certain straw
			8855	1	large biconvex dense bowl; bowl around 100mm deep; flow slags form this with plenty of evidence for straw; there are several stone clasts up to 50mm across in distal part; the deepest part of the bowl is 200mm from the front margin; rear 100mm must have been steeper but is less well preserved; 240mm width seems complete; presumed proximal part has highly porous grey/pale saccharine slag on top of dense flowed material, but entire thickness includes dense slag with straw; best example of a dense cake so far!
			1510	3	brown slags, prilly, with abundant straw; two pieces show external surfaces with large non-wetted lobes
			840	1	dense brown slag with abundant large fuel moulds below; upper surface looks blown despite cross-cutting moulds
			1465	1	large block of open textured amalgamated prills; lower part rich in straw from preserved base up to 80mm above; has prilly open contact surface to side; the upper part has larger lobes with rare fuel clasts to 40mm
			654	1	dense block with rounded 'base' with two raised ridges across rough base; slag is massive and slightly vesicular - so apparently a basal crust with tool marks, but other orientations are possible; each ridge is 30mm wide and about 8mm tall, ridge to ridge is 40mm
			1100	3	large pieces of flow with very dense dark slag in well-formed flows with traces of straw
			982	2	coarse amalgamated flow slags with fuel clasts, surface lobes are large and inflated; rich in wustite
			668	1	large block from basal puddle; base is prilly; at least 70mm thick; some straw inclusions, otherwise massive with sparse vesicles

		710	1	dense dark piece with one surface showing a low rounded ridge - unclear if this is burr-related or possibly toolmark-related as above; hint of tubular vesicles suggests it may be basal
		516	1	angular block of variable colour with high vesicularity in places, but probably fine fuel rather than straw
		158	1	35mm thick sheet of slag with small fuel inclusions on both surfaces
		978	1	unusual very dense block; one side typical lower flow with straw impressions on top; side of cake blown, below which the piece has fractured off from tapslag like surface, on other side there is a curving, almost burr-like contact, around entire side - just maybe this could have been created by rolling on a substrate, or the slag might have formed against the side of an arch; deformation seems possible -if so the only hot deformed piece in the assemblage thus far
2137	SE quad	224	3	iron rich lumps
		46	1	iron ore
		3335	18	brown dense basal flows with abundant straw; locally carry small blebs of pale slag
		1655	33	slags with large fuel moulds
		1230	22	dense brownish flow slags from basal flows; little or no straw visible
		278	6	dense dark flow slags from basal flows with black shiny surfaces
		266	10	flow slags from basal flows showing contact with fuel clasts, dull coloured
		556	8	flow slags from basal layers with pale or variegated colour, but dominantly pale
		216	4	fragments of dense slags that are thin crusts, or objects possibly from thin crusts
		244	1	prilly flow slag with rusty accretions all over
		240	1	dense slag piece from rounded margin of a larger cake; probably from basal cake but could just be an SHC margin. 45mm thick, flat top overlain by a second curving planar layer 5mm thick; base neatly rounded but has an extra dimpled layer on one part,
		294	1	pale, highly vesicular slag with fine fuel moulds and one larger one, just above a flow slag lobe level; probably from upper part of basal mass
		288	1	dense massive, slightly vesicular, dark slag block with protruding large-lobed flow layer, below which there is a dimpled basal surface - presumably this is from the margin of a slag bowl
		1085	20	vitrified and slagged furnace wall; almost entirely reduced; some show fissuring, intrusion or embayment etc.
		166	1	large piece of furnace wall with 45 degree or so change of angle, slagged on one side clean on the other; slagged side shows two slagged layers superimposed
		126	6	small limestone pieces, two burnt
		32	5	burnt/fired fine clay, variably oxidised

		6	1	thin peeled slag layer; convex sandy lining
		32	1	dense slag with moulds attached to wall
		100	1	complex slag with fuel moulds attached to and ?intruding grey wall ceramic
		86	1	dense slag attached to indurated burr-like contact; planar
		138	1	fragment of very dense slag to 30mm in sheet-like form, attached to oxidised fired sandy wall
		126	1	dense burr-like slag with tubular vesicles attached to partially melted wall
		66	1	burr-like contact, but formed by curving slag body sandwiched between two grey wall layers
		286	assm	debris and dust
		602	7	dense brown slag, at least partially lobate, from near base of mass
		222	8	dense brown slags, massive or finely granular
2137	SE quad	24	2	limestone
		164	1	thin sheet of brown slag with straw; straw mineralised with anatomical details.
		68	1	small scrap of a basal sheet margin, prilly base
		226	1	dense basal flow-lobed flow with straw impressions on top; rather rusty; one fracture shows margin of a pale lobed material within
		1580	1	brown-surfaced slags formed of small lobes or prills with straw impressions
		1285	5	brown-surfaced slags with microprilly bases, with moulds of both fuel and straw
		1620	1	rounded corner of slag cake, prilly base and variably internally lobate; impressions of straw on periphery and some large fuel moulds internally
		1860	1	block from margin of slag cake 100mm thick; top lobed with deep holes and fuel moulds; periphery has straw impressions; internally, the slag is massive with large rounded vesicles; some cavities are lime-coated and there are some intact lime inclusions, as well as angular limestone pieces forming part of upper layer
		2710	1	large block from margin of cake; prilly slag of various sizes; rare straw impressions on the margin and hint of fuel moulds on top
		190	2	pale green flow slags; larger piece full of straw and has iron slag bleb entrained within; smaller piece has larger lobes and is vesicular
		1570	9	wustite-rich dense flow slags; variably dull to shiny surfaces; all with large flow lobes and superficial straw impressions
		214	6	duller flow slags, brown with fuel moulds and straw

1160	1	rather massive lobate cake margin; some inflated lobes very large and ?deflated; very rare straw impressions
700	1	angular fragment of slag cake; basal layer rich in aligned straw; central part appears paler and possibly vesicular/fragmental; upper part with large fuel moulds, 35-70mm thick
1225	1	extremely dense wustite-rich slag; base is fractured off flow slag surface, then 30-80mm of very dense massive slag, followed by up to 60mm with large fuel moulds
1525	1	(broken in two) very dense slag sheet; vesicular and with preserved charcoal; slightly lobate steep margin; base slightly dimpled; top with hints of straw and fuel moulds
1730	1	angular block from centre of slag cake; 130mm thick; base prilly with fuel dimples, 20mm; then, 50mm of vesicular but very dense wustite rich slag; then 60mm of continued dense slag but with large vesicles and fuel moulds
1900	1	margin of block; base dimpled lobes grading to microprilly; up to 45 mm of dense wustite-rich slag then becoming rich in fuel moulds; rare straw impressions on margin
1175	2	blocks from margin of cake; prilly bases, in one case with stone inclusion, passing up into more massive material, then lobate tops with both fuel and straw moulds
142	1	vesicular slag passing up into lobate top with secondary reddening
126	1	lobate grey iron slag over vesicular massive layer; rare straw on top
26	1	spall of vesicular slag
98	1	irregular small slag piece with fuel moulds and rounded large vesicles
1470	10	Iron slags with fuel moulds
70	1	grey fine slag with abundant straw
758	1	curving slag sheet with smoothed-over fuel moulds; wall contact; fine pale grey microprilly slags with abundant fine fuel moulds; suggests slab covering around 160mm height of wall
1655	1	possible within furnace smithing slag? Dense slag sheet 140mm wide x 90mm deep x c30mm thick; has possible smooth top at same level as rest of the top of a protruding semi-oval plano-convex mass. 100mm w x 90mm l in front of sheet and up to 45mm thick; top appears fractured and is covered but rust full of fuel debris, base appears relatively smooth
386	1	small burr like wall patch attached onto irregular slag block; possibly some lining slag on top of mass; smoothish top (but obscured) and finely prilly base around fine fuel debris; 70x100x50mm
932	1	elongate grey burr (120x60mm) with mass of slag 160x85x90mm deep with coarse fuel moulds.
724	1	rounded finely dimpled base, overlain by slag puddle with crystal terminations and exits from tubular vesicles; 95x100x40mm
114	1	curving slab of highly indurated wall; smooth hematised slag surface curves through about 95 degrees; base of curve shows adhering fragment of this same layer and behind this the wall is intruded; wall mainly very highly foliated fine white-grey clay

		158	4	grey sandy lining, often deformed and fissured; some incorporating denser slag
		80	1	small piece of lobate and vesicular slag with lightly maroon surface attached to oxidised burr in sandy ceramic
		94	1	small piece of grey lobate slag with straw impressions
		402	1	wedge-shaped block of slag with large fuel moulds; probably foot of wall, surface layer seems smoothed, this surface converges with a microprilly contact surface - but way up is uncertain
2137	SE quad	342	3	small fragment of amalgamated flow slag, dense, dark; smallest piece has some secondary reddening
		1090	1	large block of dense, mostly wustite-rich slag, with some paler lobes; in at least 3 layers, lower inclined with respect to top; top has large inflated lobes with straw impressions; 75mm thick but base is fracture off flow-lobed surface
		782	1	margin from biconvex bowl; lower part wustite-rich prilly slags with some fuel clasts; upper part browner and rich in straw; 80mm maximum thickness
		364	1	small fragment of flow, mostly in wustite-rich slag, but some pale lobes; straw impressions on top
		1760	1	shallow bowl - or distal part of bowl; lobes of varying size and rich in straw throughout; 160x160x75mm
		1095	1	170x90x75mm; fragment from margin of dense bowl; lower layer to 30mm, dense wustite-rich with tubular vesicles; upper layer also wustite-rich, raised above margin; upper surface with abundant straw impressions
		1210	1	lobe of cake margin; brownish slag with coarse lobes and abundant straw impressions on top; basal part smaller prills/lobes with some fuel clasts
		1290	1	margin of open-textured cake with large lobes around small fuel particles; straw impressions on upper surface
		942	1	margin of cake or most of isolated puddle; strongly lobate, brown-surfaced slag; wustite-rich, with fuel inclusions and straw impressions on top
		452	1	lateral margin of cake; steep; almost vertical side of non-wetted flow lobes; internally, variously lobed or massive with internal and top straw impressions
		360	1	large piece of indurated wall showing large, near right-angled curving embayment; slagged surface is iron-rich and speckled on what appears to be flat lower part, with wall curving into smooth area, with large vesicles and reddening on upper part; below lower part there is considerable intrusion into wall; wall is variable; superficial layer appears quite coarse, behind which is much pale, finer, foliated clay
		112	1	block of vitrified hearth wall; irregular surface; grey, fissured, apparently slightly gravelly ceramic
		116	2	small fragments of open-textured amalgamated flow slags with smallish fuel clasts

1035	1	block of mostly finely prilly (microprilly?) slag; one side shows attachment to wall, or wall inclusion; grey sandy ceramic with some pendent pale green slag lobes; presumed upper surface comprises a zone of dense slag around 40mm thick, fronting the wall fragment and then a sub-circular mass 75x110mm extending forwards of this; this area is c30mm in thickness and has further finely prilly slag descending below it centrally and near the wall; piece has the appearance of a crude SHC; the upper surface has some adhering material including fired clay, coarse sand and fine charcoal
488	1	SHC-like mass, neatly plano-convex, 90x110x50mm; slag underneath is microprilly; upper surface appears smooth but partially obscured by rusty material
610	1	fragment shaped like half a cone; upper surface slightly dished and rusty; below this is rusty slag with large fuel moulds, potentially upper part of FB
1040	1	curious mass with lower(?) surface with pale granular material with fine fuel debris, this seems to form the base of a sheet that has been rolled up somewhat, and the top of which is irregularly dimpled and rusty, possibly from hot extraction of upper part of slag mass?
330	1	fragment from margin of cake, shows non-wetted inclined lobate wall; slag is vesicular with moderately large fuel moulds
2135	1	crudely plano-convex piece with various possible interpretations; the base is microprilly and shows a slightly angled profile rather than a simple bowl, but this is modified by at least three low amplitude ridges, potential tools marks from either extraction of hearth floor preparation; where seen, the basal layer is a dense crust c15mm thick, but it presumably thickens into the centre of the bowl-like shape; the upper surface is irregularly microprilly and appears to show the centre displaced outwards and downwards; the most likely interpretation is that this piece derives from the rear or lateral wall of the furnace - in which orientation it would extend 160mm up the wall and 80mm forward of the wall, with the potential tool marks concentrated on the basal part. The whole could be interpreted as a very open SHC, but this seems less likely
1890	1	another curious piece, just possibly suggestive of hot deformation; 150x140x110mm; base is rough and shows a neat angular fold, suggesting floor/wall angle across base; however parallel to this is a lobate surface with straw impressions - this suggests the floor crease is an angle in the base of the bowl; in this orientation the lower bowl fill is massive and 60mm thick, overlain by 50mm of lobate slags showing straw on top on margin but which internally has large fuel moulds
2745	1	large very dense block of basal bowl; marginal slags show straw impressions on top, probably straw also in inclined layers dipping down from rear; slags mainly lobate become massive, but layered internally, almost all very dense wustite-rich slag
2100	1	large, somewhat porous, block from margin of a bowl; upper surface is within 30mm thick layer of large fuel moulds and is slightly concave; below this the slag is straw rich; most likely this represents a back (proximal) side to the bowl

		2345	1	block probably from rear margin of bowl, top dish, with moderately large fuel moulds; below this layer the slag is difficult to see, but appears to be 100mm thick with much straw
		4290	1	block probably from base of rear wall; extends 150mm up wall, decreasing to 25mm thick, and 100mm in front of wall at base; in this orientation the main wall section is planar with curved right angle at RHS (viewed away from wall) where 80mm seen at 100 or so degrees; wall contact is mostly microprilly with some areas of flow; the base shows 60mm of massive slag with very large rounded vesicles against the wall, passing forward into slag with fuel moulds
2137	NE quad	106	1	cavity fragment with botryoidal goethite lining
		80	1	yellowish host with quartz and some ?hematite
		24	1	quartz-rich piece with hematite
		10	1	fine grained (roasted?) ore fragment
		16	1	Quartz-rich ?goethite
		26	2	red sandstone
		2	1	limestone
		1	1	coal
		955	73	slag scraps - no lobes
		922	50	small pieces of dense flow-lobed slags
		826	50	slag scraps with lobes/prills
		326	20	slag scraps with fuel moulds
		4532	42	dense flow slags with straw impressions
		2101	46	very dense flow slags with shiny surface, wustite rich?
		857	14	pale green (some with Fe-rich components) flow slags, most with straw, some with fuel moulds
		4126	90	dense iron slags with abundant large fuel moulds
		1496	47	fragments of mostly grey sandy wall, together with slag coatings and intrusions on some pieces; no clear diagnostic shapes, many highly fissured
		90	1	curved indurated wall with maroon surfaced slag coat, the piece is concave vertically and convex laterally; the ?lower part has the indurated surface expanding into a 15mm thick layer of dense slag, still with the maroon surface
		54	1	convex surface 10-15mm thick layer of dense slag over almost white lining that is further intruded by the dense slag
		152	1	slag with small and micro-prills with small fuel moulds attached to indurated burr-like area
		408	1	very dense block of sandy pale grey furnace lining - this must conceal a very large amount of intruding dense slag
		70	9	pale grey foliated fired clay

			70	9	orange oxidised fired fine clay, passing to vitrified surface in two small pieces
			6	1	slag-coated ?sandstone pebble
			552	1	block from distal part of cake; 90mm thick; abundant straw at base passing up into slag with fuel moulds, all dense slags
			254	1	planar base of non-wetted pale grey lobes, passing up into slag with both straw and small fuel moulds
			860	1	rather worn-looking fragment from cake, 90mm thick, base of dimpled prills with abundant straw; body massive with some straw; upper 40mm has moderately large fuel moulds
			628	1	90mm thick section though slag cake, prilly base, almost tapslag-like flow slag top; in between massive, but vesicular
			490	1	possibly worn; very dense block of wustite-rich slag; carries fine fuel debris, some straw and some vesicles
			324	2	rather microprilly slags with voids from minor fuel debris, one shows micro-prilly base
			334	3	pieces of slag cake with non-wetted lobate base, overlain by more massive but vesicular material
			172	1	fragment of a small basal puddle with horizontal top; base of section shows good tubular vesicles, possibly disrupted during hot extraction?
			515	4	miscellaneous pieces of basal cake with prilly internal structure
			496	2	smaller fragments of cake margin - lobate around periphery but massive slag with vesicles internally
			710	5	fragments from within basal cakes, all rather non-descript slags with some vesicularity and fuel moulds
2137	NE quad	26548	4115	1	large bowl - probably about 60%; base prilly, some fuel moulds, gets more finely prilly towards margins; the dense bowl is very thin (30mm maximum) and is overlain in centre by 100mm of fine slags with abundant straw moulds; towards one side, the fine greenish granular material hosts medium-sized fuel moulds instead, probably more proximally than centre and mostly off-axis - although that may just be the way its broken
			2985	1	complex bowl section; base shows large flow lobes and large fuel moulds towards distal side(?) and is finer/rougher towards back wall; top is dished and look damaged; central hollow; scrappy slags around edges, probably with abundant straw and small prills; this overlies a dense bowl; wustite-rich; massive to 50mm in centre; orientation of piece is not clear - but damage probably lies close to rear wall
			1980	1	upper part of cake spalled off lower flow slags; the top of the piece is slightly brown and smoothed morphology (prills, straw moulds etc) - look modified by air blast? from open arch? Internal structure within bowl poorly seen, but appears to be chaotic

948	1	large block of slag with fuel moulds attached to wall; wall attachment 130w x 70h, planar; slag forms intrusion along the base of this wall area - as if there was a seam to exploit; rough base to slag dips away from wall at 60 degrees below this - so is this a shaft pit join? base of lining extended into pit?
3055	1	thick biconvex cake fragment that looks like a tapslag cake, except for colour and presence of straw impressions on top; none seen lower down in bowl; bowl maximum 70mm, rising top max 50mm; very large, wide flat lobes around cake periphery
1305	1	complex bowl fill of dense flow lobes with patches of pale green lobes; upper flows almost silvery in appearance; some patches of straw inclusions and straw impressions occur on higher parts seen
1460	1	piece has prilly base, then plano-convex bowl to 35mm thick, above which is an inclined mass of flow slag with abundant straw, becoming flow-lobed on margin; straw layer 45-55mm thick
1500	1	very irregular fragment; through thick slag bowl, base rich in straw, dimpled prills; central part dense with rounded vesicles at various scales; neat margin; straw lies on top of lobate margin 100mm above base; 120mm thick overall; uppermost part preserved has large rounded vesicles
1130	1	section through slag cake near the centre; 90mm thick; basal layer of dimpled prills with some straw 25mm, above which it is massive for 50mm with just occasional vesicles and straw fragments; top is 15mm or so of poorly-preserved small fuel moulds
344	1	incredibly dense iron slag with flat top resting into rounded notch in highly indurated, partially melted, wall; the puddle is up to 30mm thick and is on horizontal surface cut back into wall for 50-60mm; the wall curves up and is seen for 50mm above corner; there is a large amount of fine intrusion into the wall
218	1	amalgamated flow slags with large fuel moulds
612	1	large mass of grey ceramic, showing vitrification and sloughing - perhaps over an overhang?
784	1	wedge-shaped block of pale flow slag with straw tipping down onto almost planar lobed base; some fuel moulds; base is mostly dark slag
808	1	dense dark block of slag with straw covered base; other surfaces obscured by dark surface coating; one face appears blasted smooth
264	1	lobate flow slag from near margin of mass; high proportion of pale green lobes; top dark
474	1	margin of cake with pale grey weathering; beige lobes with abundant straw; beige parts tend to be finely vesicular
250	1	large slab of slightly sandy lining slag; planar; attached to very lightly oxidised wall?
172	1	very dense, dark, large flow lobes with straw impressions on upper and lower faces
612	1	conchoidally-fractured slag piece from inside massive textured slag puddle

			366	1	very irregular mass of reddened clinker-like material, spikey in places; blasted smooth in others; appears to be wrapped around the mould of square-sectioned (?) tool 13mm across; possibly a second cruder mould of same tool on other side
			584	1	fairly thin basal sheet; lobate; top and bottom rich in straw; overlain by a large inflated slag nub in area with fuel moulds; sheet to about 30mm, nub another 30mm
			108	1	dark flow slag forming larger irregular lobes
			52	1	dark flow slag with lobes draping fuel particles
			732	2	irregular prilly lump from FB; details and way-up uncertain
			162	1	dense flow slag sheet with straw top and bottom; coated in secondary oxides and reddened, probably blasted
			554	1	dense piece from within cake; finely prilly on base; 70mm thickness seen; some fuel moulds and some probable straw close to top
			162	1	fractured lump from very wustite-rich coarse flows lag flow; has fuel moulds
			80	1	thin slag sheet; prilly below; fuel moulds immediately above
			178	1	irregular fragment with fuel moulds
			50	1	fragment of very thin sheet with straw and very fine fuel moulds
			504	2	rather amorphous dense slag lumps; orientation uncertain; fuel moulds present
2137	NE quad	29228	12575	1	biconvex slag cake, 260x320x180mm; fractures on two sides at 140 degrees and section spalled from top; one of the fractured parts was probably the distal flows, the other faces towards the descending slag; overall diameter of 350mm not unreasonable; bowl approximately 110 mm deep; base prilly; rear part shows possibly truncated fuel moulds zone, but precise symmetry difficult to determine given missing sections; typical straw-bearing surfaces present at bowl top level
			1660	1	fragment from margin of biconvex cake; bowl has prilly base, rare straw; margin lobate, top is mostly one large inflated rise, straw on top; minor lobes at very top near break; internally bowl looks like a single fill with large rounded vesicles
			442	1	large block of sandy grey wall; wall steps back into glazed hollow below which are pendent lobes of green slag
			950	1	rather rough margin of slag bowl; fuel moulds on top, some straw and rather rough base, all rather indistinct
			18	1	iron ore, grey goethite?
			560	7	smaller FB fragments showing a rather granular appearance - either from the slag or more likely the fine inclusions
			154	5	smaller FB fragments showing a lobate structure in lower density slag

			4052	20	FB fragments - flwo slag, brown with straw impressions
			1235	1	margin of slag cake; prilly slag with some fuel moulds
			2335	16	slags dominated by medium to large fuel moulds
			2775	25	dark slags, with clean shiny -surfaced flow lobes and prills
			782	2	massive slags with large rounded vesicles - angular fragments from centre of slag bowl
			158	1	dished surface to fine oxidised fired clay with curved slag sheet; intrusions behind sheet at lower end (ie reduced side); broadly resembles other angled sheets examples, but note oxidation and smooth, less altered surface
			86	1	limestone
			10	1	slagged fragment of foliated very fine clay; oxidised fired
			232	7	mainly reduced grey sandy lining, surface in typically complex forms
			538	1	dense block of coarse vesicular slag, like burr material; part of the mass is in pale yellow-green not grey slag
			222	1	dark granular appearing slag, like an SHC base texture, but possibly from a cake margin?
			4	1	fine grey, reduced fired clay
			200	1	dense slag with smallish fuel moulds; attached to indurated wall which forms a narrow strip extending into the slag - so not a usual burr morphology
			240	1	slab of slagged slightly oxidised fired sandy lining; slag forms pendent lobes suggesting the wall was overhanging
2137	NE quad	31378	44	1	iron ore, grey fine ?goethite
			46	1	iron ore, fine, dark grey internally, red on surface - roasted
			130	1	fine orange oxidised fired clay with attached slag; inner face of the clay is slightly concave and could represent, for instance, clay applied to the outside of a sub-conical tuyère, but cannot be proved; if so tuyère would be very large
			12895	1	partial FB; strong slope to top 200-140mm above planar floor? but this orientation is uncertain; lower part dense, but very restricted - no real bowl; 80mm? inclined; then dipping layer 80mm thick of lobes, then 80mm more massive but finely vesicular, again sloping; top has accretionary material with fired clay debris suggesting this is bloom extraction area; possible that much of bowl has fractured off base; lower part is open prills with smaller fuel moulds; slight trace of straw at mid-height, but not prominent; hard to related this piece to the bulk of other materials from the site

			13680	1	large cake with relatively shallow bowl, which locally has well-formed tubular vesicles; asymmetric in plan: long axis 43mm, with highest point 170mm along, short axis 290mm, highest point 80mm from side; 270mm down probable real axis, which is slightly oblique; distal part on this axis corresponds to area of damage - hole, rust etc.; point on short side of highest point shows secondary reddening; towards distal part of axis, floor is planar over area 350x230mm; highest point 170mm above this; bowl lip to 90mm above proximally and curving down to this plane distally; straw visible most of the way round; highest point shows fuel to 45mm or so; base finely prilly with fuel moulds on planar section, becoming more coarsely prilly onto rising area to back and side; from underneath the cake appears more semicircular - so to 70mm above floor - 450mm across and 260mm deep behind planar front
			2	1	fine orange clay chip
			126	5	small slag debris with fuel moulds
			78	17	slag debris
			126	4	mixed ore and related materials
			4	1	quartz pebble
			882	18	flow slags with fuel moulds
			844	4	pale greenish flow slags
			1185	11	dense flow lags with straw moulds on surface
			460	15	dense dark flow slags with clean shiny surfaces
			390	1	dense puddle resting on step of highly altered and vitrified wall; fine-grained wall; slag smooth on top, where abraded, crystal terminations show; fine prilly with small fuel moulds below
			96	1	dense grey slag with rough maroon surface to almost 20mm, lying on 90 degree bend in indurated grey sandy wall material
			344	17	grey vitrified, and locally slagged, sandy wall material.
			12	5	small fragments of fine-grained grey and orange fired clay
			34	1	grey sandy wall intimately mixed with dense slag - probably mainly intruding
2137	NE Quad 1st spit	34.34	34.34	5	oxidised-fired softer sandy fired clay; largest piece shows blackened surface area with laminae perpendicular
2137	NE Quad, 3rd spit	28.75	28.75	4	oxidised fired fine clay; one piece grades into reduced fired material in which laminae turn at right angles
2137	SW Quad 2nd spit	12.28	3.52	1	oxidised-fired silty clay with embedded slag or other iron oxide

				8.77	1	well-fired coarsely sandy clay, variegated orange-grey smooth surface, grey behind (resembles medieval pottery!)
	2137	SE quad spit 2	3.18	3.18	2	oxidised fired fine clay
	2137	SE Quad	54	54	1	small burr-like mass of slag with tubular vesicles extending into oxidised fired sandy wall without other indications of intense heating; one face is neatly dished like possible tuyère contact surfaces recoded before, but slag nub has deformed this surface
	2137	SE Quad 2nd spit	25.48	12.75	1	soft sandy oxidised-fired clay with slagged surface
				2.15	2	soft sandy oxidised-fired clay
				3.45	1	oxidised-fired fine laminated clay
				7.42	2	reduced fired coarsely gritted clay; laminated
212	2137	SW quad	434	400	76	general FB debris
				16	2	pale fine flow slag
				20	11	dark dense fine flow slag
212	2137		1526	54	27	fine dark hard shiny prilly/blebby material
				362	582	fine fragmental material indeterminate
				20	6	oxide iron ore
				1	1	polished iron oxide' type material in small fractured pebble
				60	24	pale greenish flow slags
				214	29	blebby and prilly flow slags
				72	5	flow slags with straw impressions
				438	58	flow slags with fuel moulds and FB fragments with fuel moulds
				292	45	rough slag and other featureless material
				30	10	vesicular pale slag
				1	4	possible slag flats
				1	7	ceramics
212	2137	ne quad	1564	220	37	flow slags with no fuel moulds
				422	50	flow slags with fuel moulds

				34	4	pale flow slags
				32	3	flow slags with secondary reddening
				24	2	probable ore
				10	1	pale vesicular slag with straw
				514	42	dense flow slags with straw impressions
				276	47	rough and massive slag fragments
				20	1	convex vitrified lining, reduced
				14	5	grey ceramic
				10	assm	dust
212	2137	NE quad, <2	108			FHS, slag, slag droplets, SHS
	2137	<2	172			FHS, slag, slag droplets, SHS
	2137	SW Quad , <2	88			FHS, slag, slag droplets, SHS
	2137	SW quad	3.81			Picked hammerscale
	2137	NE Quad	2.57			Picked hammerscale
212	2137		44	24		sheet of fired clay; reduced surface; oxidised internally; surface shows strange lobate forms, perhaps clay applied to inside of furnace very wet?; some small limestone clasts
				22		small fragments of similar clay
212	2137		64			fine flow slag assemblage
	2143		2045	948	1	(broken in 2) extremely dense block showing gently inclined base with lobes overlain by flat-lying straw, forward of which the floor drops over a step and the greenish flow lobes cascade distally rather steeply 140x140x70mm, flat top extends distally for 120mm
				180	6	pieces probably broken from above, but not readily joinable
				320	13	low bulk density iron slag with abundant straw and vesicles
				46	2	dense rusty large isolated flow lobes
				472	2	rusty dense slag with fuel moulds, rust concentrated on top - probably immediately sub-bloom pad
				80	1	dense slag with very large fuel moulds to 35mm
	2143		916	10	1	small angular chip of iron ore, dense goethite with slight fringes in pores, some vugs of ?calcite

				38	2	yellow ochreous material with denser grey seams - possible iron ore
				14	1	dense iron ore with ?quartz veins
				2	1	dense fine iron ore with botryoidal surface
				6	1	dense Fe-rich material, possibly iron ore
				8	1	layered goethite ore with quartz veins?
				2	1	poor iron ore with calcite? crystals
				306	1	dense slag with non-wetted lobate base, internally equant saccharine texture, trace of straw
				104	14	pale lobate slags with straw impressions
				152	18	dark dense finely prilly slags with straw
				182	10	dense dark slags with fuel moulds
				24	2	grey reduced ceramic, one with slag intrusions
				64	11	rusty and other indeterminate slag fragments
213	2143		1750	68	45	iron ore - mostly very fine grained with calcite? veining
				6	23	slag flats
				220	1	dense slag lump with upper surface with crystal terminations, lower face has poor fuel moulds, 30-35mm thick
				854	1	brown lobate flow slag with fuel clasts, much adhering furnace clay
				600	665	slag debris - mixture of all types, much of it rather weathered
213	2143		8	3.24	4	sandy oxidised fired ceramic; locally vitrified/slagged
				2.85	11	variegated pink/white very fine fired clay
213	2143	2-5mm	86			slag, slag droplets, slag flats, FHS, ore
		<2	124			FHS, slag droplets
215	2147		2200	58	13	pale lining type slags, though could be from basal interaction
				24	2	pale coarsely equant crystalline slag with straw moulds
				22	3	finely prilly pale slags
				4	1	pale fired clay
				6	3	scraps of vitrified oxidised fired lining
				358	51	dense flow slags

				1725	571	general FB debris
				12	8	fine hard grey material - fired clay fragments?
215	2147		64	45.13	5	reduced-fired clay; locally very dark; fine with coarse grit; abundant organic temper
				8.24	7	oxidised-fired clay with organic temper and some coarse grit
				3.57	1	fine oxidised-fired clay with grits and slag; least one visible piece of included hammerscale
				2.35	3	oxidised-fired silty clay
				0.47	1	reduced-fired fine clay with grits, but no visible organics
				1.52	1	oxidised-fired clay with grey core; probably a pot rim
215	2147	<2			2.47	slag, slag droplets, some FHS and SHS
215	2147	>5mm			0.52	slag
216	2185		578	24	1	reduced fired clay with pale slightly vitrified surface
				302	1	fragment of FB 55mm thick; convex base with fine non-wetted dark prills; internally locally paler, abundant straw moulds; dipping down parallel to steeply dipping margin
				222	4	coarsely lobate amalgamated slags with charcoal moulds
				30	assm	debris
	2188		630	478	2	worn and weathered slags with straw impressions, one shows more vesicular straw-rich areas, one has more flow lobes
				2	4	debris
				146	1	dense vesicular slag lump, rough surface
	2188		36.31	36.31	1	dense lump of oxidised fired silty clay
	2192		2.07	2.07	1	dark orange/red fired sandy clay
220	2192		716	396	4	lobate slags with straw impressions
				52	1	lobate slag with straw one side and fuel moulds the other
				190	5	lobate slags with fuel moulds
				22	8	very dense dark slags in small prills

				66	assm	debris
220	2192		28	1.16	1	iron ore
				0.75	1	slag
				24	45	extremely sandy oxidised-fired lining locally with slagged surface; sand abundant and very coarse
220	2192	<2	148			(5.67 including inner bag of coarse hammerscale picked) dominantly FHS, but high proportion of slag, some SHS, but most spheres are dull
220	2192	slag	416			mixed flow slag assemblage, small amount of ore (14g), 4 slag flats
	2201		5750	48	assm	debris
				540	11	dense dark flow slags with shiny surfaces
				2096	12	very dense dark slags, often with shiny surfaces, all with straw impressions, accumulation to 100mm
				170	3	low density highly vesicular pale slags with straw impressions
				72	1	rounded dense slag nub
				124	3	lumps of limestone
				560	17	furnace bottom fragments with large fuel moulds
				78	3	featureless massive slag fragments
				508	1	45mm slag with large fuel moulds passing up into 15mm dense sheet. This has crystal terminations on the top and the exits of tubular vesicles, probably the upper part of FB
				736	1	sub-circular in plan, 55mm radius; indurated burr contact on one side, 70mm deep, steep sides, finely prilly slag below irregular rusty top. Probably FB top
				812	11	indurated, fissured and slag reduced fired lining, lining slag rich in quartz, fissures deep and irregular, one piece shows an oxidised surface behind reduced outer layer
	2201		588	154	2	burnt limestone
				66	1	crudely lobed lining slag attached to small area of laminated fine ceramic
				30	2	oxidised fired silty clay
				62	10	variably oxidised fragments of fine clay, larger pieces all show complex laminae

				184	1	large block of complexly foliated fired clay; foliation folds through right angle behind some vitrification; one corner orange and it might just be close to blowhole - in which case this might just be a part of a tuyère block; curious rounded hole in clay could be finger print - but if so the location is not compatible with the orange being the blowhole
219	2201		22	18	65	variegated white/pink/orange fine fired clay
				0.28	2	fine dark fired clay; probably with organics
				0.28	1	fine pale fired clay with slag or FHS clast
				0.86	1	flow slag with straw moulds
				2.55	9	fired clay, locally vitrified; extremely rich in coarse rounded quartz grains
219	2201	<2	68			slag, FHS, slag droplets, SHS
		>5	84			slag, ore
		>2 hammerscale	1.8			Picked FHS
		<2 hammerscale	0.96			Picked FHS
219	2201		382			10.84g of ore fines (16 pieces), in assemblage dominated by brown slag material, including many pieces with straw moulds
	2204		314	8	1	rounded polished iron oxide pebble
				136	3	basal dense flow, unwetted lobate base, straw impressions on top
				52	4	finely/micro-prilly slag with fine fuel moulds
				120	8	Iron slags with large fuel moulds and thin skins, rusty
218	2204		62	58	312	variously white/pink/grey fine fired clay
				4	1	very coarsely and abundantly gritted oxidised-fired clay
218	2204	<2	64			FHS, slag, SHS
218	2204		694			46g of ore, slag flats, probable tool moulds, all in very mixed slag assemblage
223	2207	<2	76			slag, ?goethite ore, FHS

223	2207	>5mm	2990	24	4	goethite iron ore
				318	137	dense small scale flow slags, blebs and droplets
				8	1	angular fragment coated in rust, probably ore that hasn't reacted
				44	10	small scale dense flow slags with secondary reddening
				414	28	large scale dense flow slags with fuel impressions
				360	20	dense flow slags with straw impressions
				378	1	roll like slag mass from burr, 60x60mm cross section with indurated zone 30mm wide
				224	2	small pieces of irregular slag with narrow indurated attachment
				156	13	dense slag pieces with incorporated wall (or floor?) material
				58	20	fragments of vitrified furnace wall face, variably oxidised
				12	9	fired clay fragments, fine, variably oxidised
				1015	246	rough slags, rusted, may include some minor prilly component, furnace floor material
223	2207		404	2	assm	dust
				50	13	reduced-fired clay with abundant quartz
				120	59	oxidised-fired clay with abundant coarse quartz; some vitrified
				174	85	reduced fired clay with sparse quartz; note grooves etc - deformed laminae or finger wipes?
				54	69	oxidised fired clay; little quartz; often variegated
223	2207	2-5mm			2.3	slag
	2210		7.42	7.42	4	oxidised fired silty fine clay with some white inclusions and one with grass/straw
228	2223	1 of 2	8657	7255	1	FB fragment; triangular in plan, 300x270x135mm; indurated contact partially preserved; worn; charcoal-rich; localised gravel near top and edge; base and top rusty; slag pale near base; no preserved pit packing
				812	17	fragments probably broken from above
				134	17	small FB fragments less certainly, but probably, also broken from above
				452	1	mostly rather pale FB fragment, passing into saccharine texture
				4	3	limestone gravel
228	2223	<2	2.47			FHS, slag, slag droplets

228	2223			2.22	limestone; green flow slag prill, slag fragment
	[2224] +2225	2700	1400	7	open textured amalgamated flow slag around large fuel moulds
			262	8	finely prilly very dark slag with abundant straw impressions
			202	1	very dense slag fragment with some straw impressions
			122	1	dark coloured slag runner - one side and top complete, presumably from furnace base
			112	1	pale mass of prilly flow slag, rare straw moulds
			146	1	dense slag fragment from burr region,
			134	1	low density slag very weathered, rusty
			296	2	indurated and heavily slagged reduced fired wall
	[2224] 2225	2555	960	5	dense flow slags with straw
			998	5	dense flow slags, almost black on basal surface, with straw and fuel moulds
			330	11	dense iron slags with abundant fuel moulds
			128	1	pale greenish lobate basal slag with straw
			144	1	very dense tapslag like flow with grey very shiny surfaces
			2	1	chip of fine black mudstone
	2225	930	36	1	goethite ore with quartz veins
			18	1	worn fragment of goethite ore with quartz veins
			44	1	reduced fired wall with c45 degree angle across which it is eroded in (if evidence from strongly laminated wall is used) and has rusty accretions
			18	3	vitrified slag layer from wall
			56	1	burr fragment c25mm on dense slag attached to wall
			20	2	dense shiny flow slags
			120	5	flow slags with straw impressions
			98	1	FB fragment - thin slag films around large fuel moulds
			496	13	dense flow slags with fuel moulds
			36	assm	debris
	2225	470	180	3	complex irregular lining slag attached to small amount of reduced fired grey sandy ceramic

			32	1	wedge-shaped piece with slagged oxidised lining rising towards surface of dark slag; lining fine grained, silty; well preserved inner surface resembles that of possible tuyère-mounting from slag samples; no evidence this is not planar
			138	1	grey sandy ceramic with burr-like inclusion; apparently forming an overhang with pendent lining slag lobes
			98	1	grey coarsely sandy ceramic (this piece big enough to sample)
			22	1	rough very dark slag in thin laminae
217	2225	1395	2	3	tiny fragments of dark material, 1 reddened, just possibly ore
			124	29	dense dark flow slags with shiny surfaces
			<1	1	slag flat
			104	21	pale flow slags with straw impressions
			84	191	fired clay
			52	20	lining slag fragments
			30	1	burnt chert
			16	11	limestone
			975	962	FB fragments and associated debris
217	2225	1380	202	82	finely dark dense shiny small-scale prills, blebs and associated materials
			24	14	fine grained dense slags, some with straw impressions and secondary reddening
			24	1	polished iron oxide type ironstone - but possibly with quartz?
			22	5	oxide iron ores
			78	8	flow slags with straw impressions
			4	1	pale green flow slag prill
			154	15	lobate flow slags
			28	1	lobate flow slag with secondary reddening
			18	32	small fragments of fired clay mostly reduced
			20	9	scraps of lining slag and vitrified lining
			2	1	vitrified stone
			390	37	slags, mostly lobate with fuel impressions/moulds
			384	205	rough and indeterminate slags
217	2225	350	85	253	oxidised debris and dust

				72	45	fine grey fired clay
				6	9	quartz-rich grey fired clay
				58	104	fine orange oxidised-fired clay
				64	31	sandy orange oxidised-fired clay
				36	9	slags
				24	11	natural
217	2225	<2	636			FHS, slag droplets, ore, SHS
		2-5mm	960			slag, FHS, slag droplets
217	2225				4.62	slag droplets, flow slag fragments
	2294		9119	414	28	assorted debris, prilly part of this shows straw impressions
				8705	1	280x280x160mm, widely conical prilly FB; distal part shows large flow lobes with micaceous appearing surfaces extending forward from top of 110mm thick dense bowl; base of bowl prilly with straw impressions; top irregular (probably not true top) with abundant charcoal (to 30x25x20mm); obliquely fracture on blowing wall away from side
	2294	[2199]	4365	1720	1	large angular block, 105mm thick from base of FB; base prilly, mostly pale, paralleled by internal twigs (some branching), passes up into structureless highly finely vesicular material, much of which is very pale
				1040	1	angular block up to 80mm; base openly prilly, non-wetted, dark, convex, with stack of flow-lobed sheets, mostly dark ,but not all; very shiny surfaces, some almost bronzy, tiny amount of clear maroon
				434	1	lump of partially amalgamated prilly slag, brown
				190	1	block of amalgamed prilly pale slag; finely vesicular; texture almost blast furnace slag-like
				294	1	rough angular FB fragment with charcoal moulds
				102	1	rounded amalgamated flow, probably from base of furnace, some straw impressions
				106	1	brownish amalgamated flow slags - lobes visible on one round external surface - from lateral margin of FB?
				48	1	finely prilly dense slags with some straw moulds, very shiny surfaces
				120	1	irregular finely prilly slag with ?fuel moulds (small), partly amalgamated into dense sheet
				82	1	amalgamated flow slag in larger lobes formed around large moulds of wood or charcoal

				78	1	dense slag with some twig/straw moulds
				42	1	surface of rather pale slag, with internal charcoal (and twig? impressions) and external larger upper? contact onto wood?
				46	1	dense prilly slag with ?fuel impressions
				12	1	dense prilly slag with ?fuel impressions
				18	assm	dust
221	2295		2085	342	142	fine dense flow slags in isolated fragments
				2	1	possible ore (dark skin, yellow core - could be weathering)
				138	18	flow slags with straw impressions
				188	14	dense lobate slags
				212	36	dense slags with fuel impressions
				102	13	vitrified and locally slagged furnace lining, reduced
				56	1	microprilly slags with small area of attachment to indurated wall
				206	33	pale lobate slag with fuel impressions
				24	2	limestone
				36	1	angular fragment of massive dense slag with large rounded vesicles
				646	191	indeterminate and rough slag pieces
				10	assm	dust
221	2295		9.94	1.44	1	natural
				2.79	1	grey fired clay with organics
				5.64	16	oxidised-fired fine clay with rare quartz and organic temper
221	2295		14.63			picked coarse FHS
		2-5mm	60			slag, ore, some FHS
		<2	386			FHS, slag, slag droplets, ore
221	2295		132			shiny dense flow slags in small prills and sheets
	2296	[2199]	840	214	6	reduced fired wall material with low degree of alteration; probably does not include surface
				6	4	small fragments of vitrified wall surface

				240	2	two fragments, probably from same blowhole area, oxidised wall at various depths below front face, complex vitrification, possible blowhole margin with flaring into wall - but clay so laminated it is hard to be sure this is hole, or just deformed clay behind hole
				76	2	adjoining fragments from near blowhole, probably adjoin small pieces above, no blowhole but some external lining slag adhesions
				30	2	slagged fissured wall fragments
				98	1	dense finely prilly slag with fuel moulds
				8	1	thin sheet of wall slag
				6	2	dense prill fragments
				126	1	rough, microprilly sheet with some straw impressions
				20	1	small FB fragment, thin slag films around fuel moulds
				16	assm	dust and debris
	2296	[2199]	678	484	27	reduced fired clay, variably sandy, most show complex laminations
				164	12	oxidised fired clay, variably sandy, some show neat curved surfaces, but unclear if real surfaces or a result of delamination
				16	1	oxidised fired clay with grey surface
				10	assm	debris
227	2318		0.03	0.03	2	oxidised-fired clay chips
227	2318	<2	2.07			slag FHS
227	2318	<2	2.07			slag FHS
	2325		6.14	6.14	1	probably well-fired bleb from sandy clay, but resembles rock
224	2345		9.46	0.22	1	oxidised-fired clay with abundant quartz
				0.31	1	fine silty oxidised fired clay
				8.93	10	natural
224	2345	<2	5.2			slag, slag droplets, some FHS

224	2345					0.75	green flow slag fragment
	2404	[2202]		1148	184	3	oxidised fired soft sandy wall, with slightly more buff planar surface
					158	1	oxidised-fired soft sandy wall; passes into slightly more indurated embayment with iron-rich particles attached to surface, these particles show strong secondary oxide botryoidal coatings
					330	2	oxidised soft sandy wall; passing over slight ridge/overhang onto areas with some adhering slag
					76	2	oxidised soft sandy wall with external slag layer
					114	1	oxidised soft sandy wall; crudely lobed (or fissured?) slagged surface layer, underlying clay rises towards surface at one end
					282	1	pale oxidised-fired soft sandy wall; apparently eroded into slight gully with smooth slag surface one side and more lobed slag the other; orientation uncertain; probably pillulous slag lies below an overhang but not certain
							(note: joins could not be found between these pieces, but they probably all arose from a small section of all)
231	2426	<2		3.32			slag, slag droplets, SHS, FHS all in low quantity
230	2427	<2		1.77			slag, slag droplets, SHS, FHS all in low quantity
230	2427					34.09	slag
229	2428	<2		3.43			slag, slag droplets, SHS, FHS all in low quantity, probable goethite ore
226	2494	fired clay 'lens'	501		48	1	pale oxidised-fired clay with abundant well rounded quartz grit; with convex surface with a grey colour
					14.72	14	iron slag fragments
					376	200	oxidised-fired debris ranging from fine foliated to coarse soft fired clay
					60	assm	dust and debris
225	2494	2-5mm		234			slag
		<2		220			slag, ?ore, some FHS
225	2494	>5mm		1195			64g of iron ore (including some dubious pieces), very mixed slag assemblage, rich in vitrified lining from blowhole area, including one piece with c40-50mm striated bore margin

2500=502	RB quarry pit surface finds	56		4	1	goethite/hematite iron ore, laminated
				38	1	very dense black flow slag from margin of flow
				14	1	worn indeterminate iron slag fragment
u/s			30	30	2	pale fragile green flow slag with fuel moulds

Table 2. Material by class and context

Context	Non-metallurgical			Furnace wall-related materials							Microresidues				Ore	Furnace bottom slags						Iron-bearing	Tool cast	indet slag
	Polished ore	Other materials	coal/ coke/ clinker	fired clay	vitrified clay	slag on lining	intrusions/ puddles	upper dense sheet	lining slag	dense wall slag?	FAS	FHS	SHS	droplets		straw	fuel	prill	massive vesic.	bowl frags	bowl debris			
1000		102		50																				
1038				5								tr												x
1047				19								X	tr											x
1050	6	2		6							8	X	tr											8
1058				20																				
1068				17																				
1069				16							1	x		x										tr
1072/1081				16								x		x										
1074		71										XX	tr	x										x
1094				66																				
2000			9													30	146	0	160					12
2001																	1							
2003			6															108						
2009												tr	x	x										X
2023																118		128	62	10392				
2027																48		1						
2052																								X
2059	10																							
2060				2								x		x	x									x
2065				0								x		x										x
2067			2															2						
2068												x	x											
2069					18																			
2071																	2	1						1
2082																			78	2203				
2086		918																						
2090				1								x												x
2093												X												x
2095				1								x	x	x										x
2105																								x
2120				25								x	x											x
2126		1	2	13								x	x	x										X
2128																	41							
2130	2				214	174	92					x		x	2	7644	750	1258		686				x
2132	8				1	32										52	268	20	80					
2133														x										x
2137 SW		1082	0	24	1682	22	464	2386		8210		4	x	x	600	12663	6012	1852	1690	43140	402			274
2137 NW		40		6	302	316	180		38						370	5428	6286	3600	1378	27050	120	68		554
2137 SE		150	0	48	1534	212	804	3173	3697	7401					46	10852	4903	4208	222	31112	286	224		248
2127 NE	276	124	1	226	3526	200	1746		250	1100		XXXX	x	x	494	13126	9147	8373	2584	68450	88		366	73
2137 (undiff.)	1			47								XXXX	x	x	20	72	438	392						684
2143				3	3		244					XXXX		X	148	882	1543	46		1128				664
2147	1725	2		76	6				58			x	x	x		24		380			1725			X
2185				24												302	222							
2188				36												478					2			146
2192					24							XXXX	x	X	15	448	190	422			66			X
2201		278	0	111	999			1244	66			XXX	x	x	11	2267	560	612	78		48			300
2204	6											XXX	X		46	136	172						X	XXXX
2207				290	178	758						XXX	X		32	360	414	362			2			1017
2210				7																				
2223		4										x		x				x		8653				x
2225	24	72		487	528	202			252			XXXX	X	X	78	2988	2714	798		962	36			576
2294																168	260	624		11967	432			
2295		25		8	102	56						XXXX		X	2	138	418	662	36		10			646
2296				878	352											126	118	6			26			
2318				0								x												x
2325				6																				
2345		9		1								x		x				1						x
2404				184	960																			
2436												x	x	x										x

| | | |

Table 3. Total materials (handpicked plus samples) with an average particle weight for the hand p[icked material (in parenthesis if data from samples)

context	total materials				average macro residue particle weight
	clay	slag	scale	all residues	
1000	50			50	[12]
1038	9		x	9	[1]
1047	19		X	19	9
1050	6	8	X	14	1
1058	20			20	20
1068	17			7	[3]
1069	16		x	16	[3]
1072/1081	16		x	16	[2]
1074			XX		-
1094	66			66	[1
2000		348		348	50
2001		1		1	1
2003		108		108	36
2009			x		-
2023		10700		10700	669
2027		49		49	12
2052		tr			-
2059					-
2060	2		x		-
2065	tr		x		-
2067		2		2	2
2068			x		-
2069	18			18	18
2071		4		4	1
2082		1412		1412	157
2086					-
2090	1		x	1	-
2093	2	114	X	116	23
2095	1		x		-
2105		tr			-
2120	25		x	25	25
2126	14	2	x	16	3
2128		41		41	41
2130	214	10604	x	13440	[204]
2132	1	452		461	26
2133		τp			-
2137 SW	1706	77115	4	79643	268
2317 NW	308	45018		45616	211
2137 SE	1582	67342		68802	261
2137 NE	3752	105503	XXXX	109808	150
2137	47	1586	XXXX	1633	[2]
2143	6	4528	XXXX	4534	33
2147	82	2187	x	2270	[3]
2185	24	524		578	[91]
2188	36	626		662	83
2192	24	1126	XXXX	2	[10]
2201	1109	5208	XXX	6517	80
2204	62	1000	XXX	1066	1
2207	468	2913	XXX	3409	[5]
2210	7			7	2
2223		8653	x	8653	[240]
2225	1015	8528	XXXX	9622	82
2294		13451		13451	312
2296	1240	258	XXXX	1498	24
2318			x	0	-
2325	6			6	6
2345	1	1	x		-
2404	1144			1144	114
2426			x		-
2427		34	x	34	-
2428			x		-
2494	424	75	x		[2]
2500-502		38		56	19
u/s		30		30	15

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