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Assessment of materials from Calstock (excavations 2019-2022)

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Abstract

The submitted material with project designations CAL19, CAL21 and CAL22 weighed approximately 9.3kg and derived from 57 contexts (with 597 pieces recorded individually and 19 assemblages of comminuted material). Of this, approximately 6.1kg proved to be metallurgical residues. A further 600g was provided by concretions and corroded iron. 465g was fragments of a fine-grained pale vesicular lava, probably from imported quern stones. There was a small quantity of modern and post-medieval material present, including fresh and burnt coal and its residues (clinker and coke), a single fragment of probable tin slag and several pieces of asphalt surfacing ('tarmac'). The collections also included approximately 1.5kg of rock fragments. Non-ferrous materials also include some tiny scraps of copper ore, several pieces of sphalerite and a single piece of lead.

The archaeometallurgical residues comprised a variety of often rather blebby slag, with the blebs including both flowed slag prills and partially melted material incorporated from the hearth lining and substrate. Smithing hearth cakes, often themselves prilly or blebby in internal structure, provided approximately 2.0kg of the residues, with fragments of dense slags not attributable to SHCs with certainty a further 800g. A further 1.1kg of the slags were varieties of flowed, low density, highly vesicular slags (mostly derived from melting of the hearth ceramic) in isolated blebs or amalgamated into larger masses. These slags graded into slightly denser varieties in which the slag incorporated partially melted lithic materials, which together with isolated partially melted 'bloated' stones comprised another 750g. These materials were associated with approximately 1380g of fired clay, much of which passed into a vitrified and slagged surface.

This assemblage is generally similar to the macroscopic material investigated in two previous phases of work at the site. The residues are all compatible with production during blacksmithing work in a floor level hearth. The SHCs recovered were few in number (2 from each of trenches 10 and 12, with 3 from trench 14) and their poor preservation means their weights must be treated with caution. Four of the five examples from trenches 12 and 14 were between 92 and 108g (the other 54g), whereas those from trench 10 were heavier at 252g and 264g). The abundance of low density and gravelly slags provide a rather 'messy' character to the smithing residues. Two factors seem to have contributed to this: a ready supply of gravel-grade material into the hearth and the use of hearth clays that bloated readily. These probably reflect the use of an at least partially unlined floor level hearth and where clay was used (for the blowing wall?), it was organic-rich and perhaps wet. In turn, this may suggest the use of ephemeral smithing hearths rather than a permanent facility. Calstock is not alone is showing this style of ironworking residue, for the Roman military sites at Neath and Caerleon have produced similar gravelly assemblages, albeit in conjunction with slightly larger SHCs. The small SHCs at Calstock hint much of the ironworking being associated with very light smithing work.
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Contents

Abstract 1

Contents 2

Methods 2

Results 2
General 2
Iron smelting slag 2
Hearth structure 2
Iron and concretions 2
Other materials 3

Interpretation 3

Further work 4

References 4

Table 1: summary catalogue CAL19 5
Table 2: summary catalogue CAL21 7
Table 3: summary catalogue CAL22 13
Table 4: residue type by context 14

Methods

All materials were examined visually, using a low-powered binocular microscope where required. The material was all unstratified.

This assessment was conducted in April 2023 and was commissioned Dr Chris Smart of Exeter University. The materials derive from investigations at Calstock in 2019, 2021 and 2022 (Site codes CAL19, CAL21, CAL22 respectively).

Results

General

The submitted material with project designations CAL19, CAL21 and CAL22 had a total weight of approximately 9.3kg and derived from 57 contexts (with 597 pieces recorded individually and 19 assemblages of comminuted material). Of this, approximately 5.9kg proved to be metallurgical residues. A further 600g was provided by concretions and corroded iron. 465g was fragments of a fine-grained pale vesicular lava, probably from imported quern stones. There was a small quantity of modern and post-medieval material present, including fresh and burnt coal and its residues (clinker and coke), a single fragment of probable tin slag and several pieces of asphalt surfacing ('tarmac'). The collections also included approximately 1.5kg of rock fragments. Non-ferrous materials also include some tiny scraps of copper ore, several pieces of sphalerite and a single piece of lead.

Iron working slag

The residues that are certainly, or probably, from iron working (smithing) have been divided into seven categories for the purposes of Table 2 and of the descriptions below. All of these residues, in cases where they showed evidence for fuel, showed the use of charcoal.

Firstly, there are dense iron slags (total 2847g), which are divided into those pieces (total 2046g) identifiable as being **smithing hearth cakes** (SHCs) or fragments thereof, and those **other dense slag** pieces not certainly identifiable as being derived from SHCs (801g), although it is possible that they may have been.

The SHCs recovered were few in number (2 from each of trenches 10 and 12, with 3 from trench 14) and their poor preservation means their weights, and in some cases their identification as SHCs, must be treated with caution. Four of the five examples from trenches 12 and 14 were between 92 and 108g (the other 54g), whereas those from trench 10 were heavier at 252g and 264g).

The two larger examples were what might be termed 'conventional' SHCs, plano-convex, with a relatively solid bowl. The smaller cakes, in contrast, comprised amalgamated prills in less regularly-shaped masses. This prilly nature provides a link with the lower density iron slags described below, as do the abundant lithic clasts in the 252g example form trench 10.

The less dense iron slags (a total of approximately 1.9kg) showed prilly or blebby textures. Internally their microstructures lay on a spectrum between being rich in bloated (and other) lithic clasts (the **gravelly slags**) and those with a more generalised highly vesicular microstructure resembling that of the fuel ash slags (the **blebby vesicular slags**), probably with a greater input from hearth ceramics.

A variant of the vesicular slags has been termed '**contact slag**' here to include three small, flattened (somewhat oblate) masses of highly vesicular slag with a total weight of 8g recovered from context (12033). Although they otherwise resembled the vesicular slags described above, one of the faces of each particle is approximately planar, with a dark glassy surface, with tiny funnel-shaped pores extending inwards from the surface. Such slag particles have typically developed in contact with a metal surface, potentially either the workpiece or one of the smith's tools.

Hearth structure

The hearth ceramics and associated slags contributed a further 1.4kg to the assemblage. Table 2 divides these pieces into those pieces of **vitrified lining** with a vitrified and perhaps slagged face (883g) and those without (498g) that are simple **fired clay**. Not all of the fired clay necessarily derived from metallurgical structures, but the context of the finds suggest that most does. None supplied any useful detail of hearth morphology.

Iron and concretions

A total of 704g of iron artefacts, mineralised iron and concretion (including those examples where the core of the concretion was not observed) was present in the submitted collection.

Topsoil occurrences include a concretion containing a modern hexagonal nut from context (502) and a concretion with an unknown core from context (12001).

A major concentration of such items occurred in Trench 12, including a 10g concretion containing a possible mineralised blade fragment from context (12005), two small iron-bearing concretions from context (12017), a mineralised boot sole fragment with hobnails, three concretions with probable larger nail fragments and a concretion with an unknown core from context (12018), two probable mineralised nail fragments in concretions from context (12023), two fragmenting concretions with unknown iron cores together with a mineralised boot sole fragment from context, two fragments of mineralised large nail and five pieces of sheet iron all from context (12033).

A lesser quantity was retrieved from Trench 14, including a 32g concretion containing a mineralised curved piece of iron with a cross section of 20mm x 4mm and an effective radius of curvature of approximately 40mm from context (14042) and two possible sheet iron fragments inside ashy concretions from context (14115).

In almost all these items the ironwork was represented by mineralised crust around voids occupying most of the volume of the original objects.

The collection also included a somewhat better preserved 2.38g horseshoe nail with a tapering head (and thus likely to be of post-medieval age) from context (14346).

Other materials

The submitted material included small amounts of other classes of materials.

Topsoil layers produced a wide variety of materials, including fragments of asphalt surfacing ('tarmac') from context (501) and from TP6. Context (703) produced 2.6g of an oxidised copper ore. Context (18001) produced a green-glazed stone, possibly a waste product from lime-burning.

Context (10001) produced a 34g fragment of glassy slag, probably a tin slag resembling those from the medieval to post-medieval periods (such as those, for instance, from from Crift Farm; Tylecote *et al.* 1989, Adriaens 1996, Malham *et al.* 2002 and Malham 2010).

Coal and coke particles were recovered from contexts (14001) and (402) (which also produced clinker). Coal was recovered from context (10378) (together with a possible coke fragment) and from context (14138). Context (14138) also produced a fragment of sphalerite, as did context (14208). It is unclear if the occurrence of small fragments of sphalerite is a simply natural occurrence or if they indicate mining waste.

Context (12005) yielded a small fragment of metallic lead.

Weathered fragments of probable imported lava querns were recovered from contexts (12005), which produced 343g of fragments and (12033) which yielded 122g. Only one fragment (a 9g piece from context (12005)), showed a certain original surface and this piece showed an original angle between two faces, probably from the outer margin of a stone. The lava was a pale material with large vesicles.

Interpretation

The material is generally indicative of ironworking (blacksmithing). With 2.8kg of dense iron slag and 1.9kg of low-density slag, the assemblage is small. The overall character of the material is prilly and rich in lithic material, with gravelly clasts in the SHCs as well as in the low-density material.

The SHCs recovered were few in number (2 from each of trenches 10 and 12, with 3 from trench 14) and their poor preservation means their weights must be treated with caution. Four of the five examples from trenches 12 and 14 were between 92 and 108g (the other 54g), whereas those from trench 10 were heavier at 252g and 264g). The abundance of low density and gravelly slags provide a rather 'messy' character to the smithing residues. Two factors seem to have contributed to this: a ready supply of gravel-grade material into the hearth and the use of hearth clays that bloated readily. These probably reflect the use of an at least partially unlined floor level hearth and where clay was used (for the blowing wall?), it was organic-rich and perhaps wet. In turn, this may suggest the use of ephemeral smithing hearths rather than a permanent facility The small SHCs at Calstock hint much of the ironworking being associated with very light smithing work.

Previous phases of work at Calstock include those of 2007-2010 (Smart 2014) for which the archaeometallurgical residues were reported by Young (2011, 2014b) and the unpublished 2011 season, for which the archaeometallurgical residues were reported by Young (2012, 2023).

The published excavations in the fort produced multiple assemblages of smithing residues, particularly, but not uniquely, associated with a military *fabrica*. It was suggested that the macroresidues were cleared from the workshop and disposed-of elsewhere.

The 2011 campaign involved two trenches, Trench C, through the large Roman military enclosure ditch and Trench D. Trench C produced an assemblage of rather low-density blacksmithing residues rather similar to that of the present study (including the presence of hobnails). Trench D produced an assemblage of slightly different character, with heavier SHCs, rich microresidues and pieces of 'smithing floor' concretion, suggesting that the activity had actually taken place in that area.

As previously suggested (Young 2012), the low-density residues of Trench C and now those of Trench 12 occur alongside common finds of nails, particularly hobnails. Although a direct relationship cannot be proved, it seems likely that nailing was a major part of the tasks being performed by the smiths whose waste was deposited in these areas.

The dominance of low density, gravelly residues resembles that in the assemblages from Roman military sites at Neath (Young 2014a) and Priory Field, Caerleon (Young 2017), although they did include a proportion of larger SHCs. This may serve as a reminder that much of the ironworking in and around Roman forts may not have been concerned with the highly technical production of weapons and implements, but with more mundane needs, such as the supply of vast numbers of hobnails.

Further work

Detailed laboratory investigation and elemental analysis would probably not be capable of providing further useful archaeological information because of the intense weathering of the more iron-rich slags.

The data in this report, together with those reported previously (Young 2012 and 2023) require integration once an appropriate stratigraphic/geographic framework is available.

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Table 1: summary catalogue Calstock 2019, weights in g, assm = assemblage of fine material, s/h = spoil heap.

context	label	s wt	l wt	l no	notes
Test-pits					
10001	TP1		34.03	1	angular fragment of flow-banded glassy slag; probably a tin slag
402	TP4 lining	40	23.49	16	coal and coal shale, both fresh and burnt
			2.47	1	burnt coal in fired clay
			10.59	1	clinker
			0.99	1	quartz rich natural rock
501	TP5 industrial		7.92	1	gravelly material bound by bitumen ('tarmac')
502	TP5 lining	172	82	1	concretion on iron - including a hexagonal nut
			20	9	concretion fragments, probably from above
			1.93	1	coal
			1.24	1	concretion
			12.7	1	concretion on sheet iron fragment
			4.23	1	orange quartz-rich material, probably natural rather than ceramic
			10.38	1	iron-rich material with grit and mica in matrix, probably natural (vein rock?)
			37.57	1	gravelly material bound by bitumen ('tarmac')
	TP6 slag		66	1	coarse gritty stone partially coated in bitumen ('tarmac')
703	TP7 lining?		2.55	3	3 small grains of greenish altered rock (with malachite or similar?), coated in secondary pore-filling azurite; probably weathered Cu-ore
TRENCH 10					
u/s	slag	252	252	1	SHC (or SHC-like cake), deformed on extraction. Originally 110x80x35. High proportion of lithic casts including some with coarse quartz. One end more iron rich with slightly dimpled fayalitic slag
10029	slag		8.85	1	weathered siliceous material - possibly an originally sulphide bearing rock
			9.74	1	porous brown material overlain by yellow green smooth fine sheet, resembles material from 10032 - could be gossan type material, but surface shows similarity to slag with charcoal moulds
10031	slag		4.1	1	pale grey vesicular clinker/slag with coal clast, rare quartz grains and 'plasticky' lustre
10032	slag		2.85	2	two fragments, thin sheets of ferruginous granular material with superficial smooth yellow green surface. These could be slag from surface of workpiece, or spalls from corroded iron - either ay they are heavily weathered
10040	slag	264	264	17	probably most or all of vesicular SHC rusty base, some sightly tubular vesicles
10090	brick	82	82	assm	grey, locally red fired clay debris, some evidence for grey planar surface. Probably not brick

10193	CBM	110	110	1	dense, pinkish fired clay, with pale streaking. Shows fine mouldic porosity suggest organic temper
10275	slag	120	120	35	approximate number of pieces, highly fragmented weathered vesicular probable smithing slag with an associated fragment of convexly curved vitrified wall, charcoal inclusions
10276	slag	90	90	assm	highly fragmented pale grey vesicular slag, smithing slag, unclear if this was all one piece
10306	slag	48	48	assm	fired gravelly clay with attached gravelly pale friable sediment - probably an ash
10378	slag	1205	188	1	dense slag piece that could be proximal end of medium SHC, small area of smooth dished top, but remainder of the slag is more prilly, including some off vertically oriented near margin that could just be rods, very few potential lithic clasts
			78	1	blebby slag in form of approximately half a small SHC. Blebs appear to be lithic in many cases
			90	1	angular fragment of slag bound mass of angular siliceous grains - probably mainly sandstone, very weathered with almost bog ore like texture below altered remnant of slag skin
			204	1	irregular angular block of dense vesicular slag, has what appear to be rod encased in centre
			34	4	stones without convincing evidence for heat alteration
			1	1	coal
			2	2	possible coke
			48	11	very low density particles, brown, probably bloated stones
			136	1	blebby slag, brown, no overall morphological indication
			188	16	blebby slags in smaller pieces
			202	34	brown-surfaced stones, some with adhering slag, all heat affected? Some coarse quartz rich, some fine granite, some sandstone (dust sieved and produced no hammerscale)
TRENCH 11					
11013	slag	52	52	13	pale grey vesicular slag, highly weathered, unclear if all fragments from same piece of smithing slag, but probably so

Table 2: summary catalogue Calstock 2021, weights in g, assm = assemblage of fine material, s/h = spoil heap.

context	label	s wt	l wt	l no	notes
TRENCH 12					
12001	slag	54	54	1	SHC or SHC fragment, flattish top with prills below, dense, one side of base gently inclined the other steeper.
12001	slag	152	82	1	gravelly concretion on hidden iron, but no MD response
			70	1	prilly mass with fuel-marked voids, probably a tiny SHC, but just possibly a fragment from a larger one
12003	slag		19.01	1	rounded mass of locally blebby low density slag with dark, locally slightly reddened surface
12005	slag		4.49	1	bleb of low density slag with maroon surface, has pale clasts so could be clinker
12005	industrial	20	9.08	1	stone
			11	assm	fired clay
12005	lining		2.19	3	oxidised fired and vitrified ceramic
			6.06	1	small concretion on iron,
12005	industrial		2.7	1	shillet-rich red fired clay
			9.27	1	lava fragment - shows a neatly formed 95 degree rounded margin
12005	industrial	30	10.04	3	fragments from mineralised iron in concretion - appear to be a small blade fragment
			8.69	1	oxidised lead fragment
			3.4	1	very low density slag bleb
			0.34	1	oxidised fired clay
			5.81	1	small concretion with burnt clay and charcoal
12005	lining		1.28	1	crumb of oxidised fired clay with grit and organic temper
12005	N quad slag	334	334	assm	probably disintegrated fragment of lava quern
12005	?		14	1	spall of cleaved grey meta-siltstone
12017	lining		10	assm	highly fragmented gravelly oxidised fired lining
12017	lining	42	16.44	1	concretion on iron object
			4.21	1	concretion on iron object
			9.79	3	vitrified oxidised fired ceramic
			11	assm	debris from weathered stone
12017	NE quad slag	148	13.89	1	blebby slag
			5.43	1	highly bloated stone

			104	1	rounded lump of rusty slag with abundant charcoal. Hard nature and iron staining suggest this might be cored on a piece of iron
			10	1	ashy concretion rich in charcoal
			12	assm	debris and dust
12017	lining		16.29	1	angular fragment of pale grey/pale orange fired clay
12018	industrial	34	34	4	concretions on iron - 1 multi-hobnail piece, 2 possible larger nails, 1 unknown
12018	lining		10	1	oxidised fired clay
12018	lining?	0.69	0.22	2	greenish-grey highly vesicular (frothy) slag - probably FAS
			0.49	1	vitrified surface of oxidised clay with both grits and possible organic temper (now voids)
12018	industrial		1.24	1	vitrified oxidised fired lining
			14.47	1	concretion on rectangular section iron (c.f. nail shank) 12x6mm section, 30mm length survives
			46	1	rusty porous charcoal rich slag in rounded lump
12023	lining		12	assm	highly fragmented oxidised fired gravelly ceramic
12023	lining		20	assm	oxidised fired shillet rich clay, 1 piece with two flat surfaces at 160 degrees
12023	industrial		4.26	1	highly vesicular cream slag with grey lobate surface, small isolated bleb
12023	industrial	180	8	2	iron in concretion (poss. nail shank)
			116	6	stones
			38	14	fragments of oxidised fired clay
			10	assm	debris and dust
12023	industrial		192	2	natural rock
12023	industrial	43.13	43.13	1	slagged and bloated stone, low density
12028	slag NE quad	510	222	11	blebby slags with wide range of density
			128	6	stones
			24	1	highly vesicular slag layer overlying oxidised fired ceramic
			22	9	oxidised-fired clay
			114	assm	dust and debris
12029	NE Quad burnt material		17.4	1	stone
			6.78	1	blebby low density slag
12033	NE Quad daub		3.74	1	oxidised fired and lightly vitrified lining fragment
12033	NE Quad Burnt material	22	15.85	7	oxidised fired clay with abundant organic temper, locally vitrified and slagged
			3.12	1	blebby low density slag derived from lining

12033	lining	482	122	assm	fragments from lava quern
			233	3	micaceous microgranite
			100	2	slightly broken SHC fragment, purple tinted raised lobes on top, dense slag,
			14	1	burnt? siltstone
			6	1	lining slag, highly vesicular
			8	3	bloated grey pebble
12033	NE quad burnt material		156	assm	vitrified oxidised lining
			6	1	bleb of bloated lining slag
			14	1	burnt? stone
			16	1	pebble
12033	NE quad slag	350	8	assm	dust and debris
			8	3	low density (frothy) slags with a dark planar vesicular probable metal contact surface
			40	2	concretions on iron, starting to explode
			18	1	possible fragment of boot sole - planar sheet oxides with domed heads one side, clenched shanks the other, in 3 parallel rows
			42	4	oxidised fired vitrified and slagged lining
			4	2	oxidised fired clay
			4	4	tiny concretion fragments
			4	1	head and part shank of square-sectioned nail
			4	1	low density slag deformed to have 16mm diameter half-circular hole pushed though it - probably fragment from blowhole clearance
			<1	1	charcoal
			216	45	low density slags, some simply blebby, but most are at least cored on bloated stone fragments - mostly well-laminated slatey precursors
12033	slag	104	84	7	rounded slag blebs, often amalgamated, some blebs probably bloated stone and others vesicular slag, ashy surfaces
			14	1	dense angular stone fragment, otherwise as blebby slag
			4	1	small rounded lump of calcareous material, probably ash, contains slate and charcoal
12033	slag NE quad	370	72	5	fragment of curved sheet iron in concretion
			66	1	square sectioned rod - a large nail? - in concretion
			112	8	blebby slags blebs probably mostly lithic, moderately dense in some cases
			14	3	low density charcoal bearing concretion
			2	1	stone
			46	1	vitrified and bloated ceramic, containing a stone, passing rearwards into less bloated material. Reduced fired. Possibly poorly prepared clay on pit wall?
			20	1	dished vitrified surface on reduced fired ceramic
			1	5	charcoal
12034	NE quad slag		92	assm	ashy and stoney sediment
			28	3	stones
			24	2	low density blebby/gravelly slag
			108	1	prilly moderately dense slag mass - probably a crude SHC, very irregular in shape

12038	NE quad burnt material	134	18.15	1	charcoal rich thin slag sheet, ashy material adhering to base
			84	5	stones
			4	2	oxidised fired clay
			28	assm	ashy and gravelly sediment with some charcoal
TRENCH 13					
13001	industrial		6.36	2	partly burnt or weathered coal
13001	industrial waste	42	17.23	1	vitrified oxidised fired ceramic, planar face,
			21.45	1	soft yellow sandstone
13001	?		36.25	1	pale greenish grey fine slag of siliceous appearance, shows dark zones associated with vesicles. Could be igneous rock but some of the black areas resemble melted shale clasts.
13009	industrial	276	202	15	stones, many altered and potentially burnt, a wide variety of lithologies including slates, some highly foliated, sandstones, a boxstone fragment etc.
			60	1	vitrified surface to red clay in thin layer over gravelly rear
			12	2	fragments probably associated with above
TRENCH 14					
14001			2.18	1	coal
			4.54	1	coke
14011	burnt material		2.47	1	green, brown, khaki, grey variegated and highly vesicular iron slag
			2.83	1	low density slag, mostly pale bloated material, but some larger quartz clasts. Slag-bound gravel?
			9.54	1	grey vesicular iron slag, internal lobate with some showing elongate fayalite
14042	slag		92	1	70x60x25mm small SHC, top irregular with impressed charcoal moulds, base prilly with lots of charcoal
14042	industrial	144	32	1	concretion containing mould of iron artefact - possibly part of an 80mm diameter ring, 20mm wide and 4 mm thick with longitudinal beading
			88	3	vesicular iron slags with charcoal and imprints of charcoal, possible SHC fragments
			20	1	substantial slab of very low density vesicular FAS-type slag, surface shows some smooth areas and some replete with charcoal imprints
14042	lining		5.83	6	fragments of oxidised fired and locally vitrified clay
14042	industrial		6.04	1	very highly vesicular blebby dark slag
14049	furance lining		1.5	1	vitrified oxidised fired ceramic
14049	industrial		2.25	1	fragment of tiny prill of dense iron slag

14050	lining		20.45	2	pieces of grey vesicular slag inside concretions
14068	slag		26.39	1	quartz rich rock with localised thin dark skin of polished iron oxides, natural
14078	industrial	16	8.58	4	highly vesicular dark slag, probably containing iron particle
			1.42	1	denser blebby slag
14078	lining		6.09	2	lightly vitrified oxidised fired clay
			3.01	1	vesicular glassy with charcoal and lithic inclusions
			7.77	1	fragmented pale stone (siliceous igneous, unclear if heat affected)
14078	lining		12	8	fragments of oxidised fired clay
14079	industrial	110	110	13	grey vesicular slag with sand inclusions and locally reddened lobate surface
14079	lining		4.96	1	now broken fragment of pale indurated silty clay, unclear if fired
14084	industrial		8.63	1	vitrified and slightly slagged oxidised fired lining with strongly convex profile
14088	industrial		5.12	1	blebby slag with attached gravel and charcoal
14091	industrial		9.15	1	grey gravelly fired clay
14101	slag		94	1	dense lump of vesicular grey slag with charcoal, FAS-like zones - smithing slag
14102	industrial		60	5	grey fine, finely vesicular slag, rusty - possibly exploded lump
14115	slag	294	114	8	glassy, dark, vesicular iron slags in various blebby and slightly prilly forms, probably lining influenced smithing slags
			22.3	3	rusty fragments of vesicular and charcoal-bearing iron slag.
			96	4	vitrified hearth lining, variably oxidised and reduced substrates
			28	2	broken piece of rotten igneous rock
			6.15	1	bloated lining slag
14115	slag	220	50	1	probable SHC fragment, dense slag with some charcoal in thin plano-convex sheet fragment
			170	4	low density slags, some in very bulbous frothy lobes, lining influenced smithing slags
14115	industrial	200	17.16	5	vitrified oxidised fired lining
			138	2	charcoal rich slag material in irregular shapes - hints of possible tabular clasts in each - iron sheet??
			30	1	similar slags but with dished smooth surface - top of SHC?
			8	3	similar slags in tiny fragments
14128	slag	13.03	13.03	2	highly vesicular slag, darker piece attached to fired clay, paler piece more blebby
14129	slag	43.86	43.86	1	fragment from sheet of charcoal rich slag. Well-coated in secondary oxides

14130	slag	84	1	2	oxidised fired clay
			81	7	blebby slag, varies from low density films to dense slag with gravel.
14131	slag	36	36	3	grey, but slight variegated, highly vesicular slag (single lump?)
14131	industrial		14.49	1	vesicular and blebby slag with local maroon surface
14138	industrial	50	6.11	1	coal
			25.32	1	sphalerite?
			11.74	1	vitrified oxidised fired lining
			7.58	1	small fragment of grey vesicular slag bearing charcoal
14140	slag	7.22	7.22	1	small fragment of rusty vesicular iron slag
14144	industrial/slag		104	1	weathered blebby/prilly SHC, 70x80x50(35) mm, neat base with charcoal rich slag, top shows raised lobes either side of blowhole area
			92	1	planar mass of dense slag lobes, probably a crude SHC, rusty, accreted on base
			46	4	small fragments of lobed slag similar to above two cakes
			96	1	stone
			54	11	small fragments of oxidised fired ceramic, some showing vitrification
			284	5	fragments of vitrified wall, oxidised fired ceramic. Form hints at essentially planar wall, perhaps slightly dished-in above blowhole.
14153	burnt material	72	72	1	appears to all be buff-coloured fired clay, very fragmented
14208	slag	30	30	4	fragmented lump of mineral ?sphalerite
14219	slag	54	1.53	1	dark highly vesicular, probably FAS, but possibly coke
			2.63	1	highly vesicular in very pale grey/cream, probably bloated stone
			44	1	blebby/prilly mass of moderately dense slag in crudely plano-convex small lump, could be proto-SHC or part of a larger mass
			1	assm	charcoal
14277	slag		112	4	grey vesicular slag with abundant fine charcoal
14346	slag		2.38	1	tapering headed horseshoe nail
			3.35	1	highly vesicular white/grey variegated slag
			26.34	1	variegated grey/green and pale vesicular slag with abundant charcoal

Table 3: summary catalogue Calstock 2022, weights in g, assm = assemblage of fine material, s/h = spoil heap.

c	label	s wt	l wt	l no	notes
TRENCH 18					
18001	slag	60	60	1	elongate pebble of siltstone with vitrified outer, wood ash glaze, locally with iron oxides, which turns stoney at points of contact with former adjacent stones. Possibly lime kiln waste

Table 4: total weight of classes of archaeometallurgical residues and other materials (except rocks and asphalt surfacing) (rounded to whole g) by context.

Context	Probable ironworking residues								Concretion	Other materials						
	SHC	other dense	blebby vesicular	gravelly	vitrified lining	fired clay	contact slag	*ironworking total*	and iron	clinker	coal etc	tin slag	copper ore	sphalerite	lava	lead
TEST-PITS																
10001								*0*				34				
402								*0*		11	26					
501								*0*								
502								*0*	116		2					
703								*0*					3			
TRENCH 10																
u/s	252							*252*								
10029		10						*10*								
10031								*0*		4						
10032		3						*3*								
10040	264							*264*								
10090						82		*82*								
10193						110		*110*								
10275	120							*120*								
10276	90							*90*								
10306						48		*48*								
10378	266	204	324	138				*932*			3					
TRENCH 11																
11013	52							*52*								
TRENCH 12																
12001	124							*124*	82							
12003			19					*19*								
12005			3		2	15		*21*	22	4					343	9
12017		104	14	5		36		*159*	31							
12018		46	0		0	11		*58*	48							
12023			4			70		*74*	8							
12028			222		24	22		*268*								
12029			7					*7*								
12033	100		19	434	284	4	8	*849*	222						122	
12034	108			24				*132*								
12038		18				4		*4*	28							
TRENCH 13																
13001					17			*17*		36	6					
13009					72			*72*								

TRENCH 14																	
14001								*0*			7						
14011		10	2	3				*15*									
14042	180		26		6			*32*	32								
14049		2				2		*4*									
14050								*0*	20								
14068								*0*									
14078		9	3		6	12		*31*									
14079			110					*110*									
14084					9			*9*									
14088			5					*5*									
14091						9		*9*									
14101	94							*94*									
14102	60							*60*									
14115	50	198	290		113			*652*									
14128			13					*13*									
14129		44						*44*									
14130				81		1		*82*									
14131			50					*50*									
14138		8			12			*19*			6				25		
14140		7						*7*									
14144	242				338			*580*									
14153						72		*72*									
14208								*0*							30		
14219	44		2	3				*48*									
14277		112						*112*									
14346		26	3					*30*	2								
TRENCH 18																	
18001				60				*60*									
totals	*2046*	*801*	*1116*	*748*	*883*	*498*	*8*	*6100*	*611*	*55*	*50*	*34*	*3*		*55*	*465*	*9*

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