

# GeoArch

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Evaluation of archaeometallurgical  
residues from the FPS Factory Site,  
Bristol

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# Evaluation of archaeometallurgical residues from the FPS Factory Site, Bristol

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## Abstract

*The material includes a variety of materials derived from coal-burning, ranging from undiagnostic cinders and clinker, through to iron-working slags produced during blacksmithing. It is likely that the material does not all have a common origin. Stratigraphic evidence may suggest that the iron-working residues date from an early phase of the history of the site. It is unlikely, given the small quantities of residue recovered, that the iron-working took place within the site itself, and the material is probably derived from elsewhere.*

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## Methods

The specimens have all been examined in hand specimen and under a low-powered binocular microscope. Where required the specimens have been cleaned. None of the material has been cut, or subjected to further detailed analysis. Interpretation of the material is therefore limited, and made on the basis of its overall form and texture.

## Results

The material from the site (listed in the Catalogue) is dominated by clinkery materials derived from the burning of coal. Some of these are relatively small pieces of low density materials, which are not diagnostic of origin, with domestic coal fires as likely an origin as an industrial process, but others grade towards denser materials, of which several specimens are certainly identifiable as iron slags. All the slags (except one piece from context 1064, which has moulds probably of charcoal) contain evidence for coal/coke as fuel, where any evidence for the fuel is present; one piece of probable slag from context (1110) contains evidence for both coal/coke and charcoal.

Material from contexts (1008) (partly burnt coal), (1178) (clinker), (1212) (clinker) and (2031) (cinder) are only certainly indicative of a process involving the burning of coal. All of these materials might have been derived from iron-working, but some, particularly the

smaller pieces, could easily have been generated in other forms of hearth.

Assemblages from (1047) and (1064) include the majority of a plano-convex smithing hearth cake (original weight probably approximately 400g), and a small fragment probably from a second smithing hearth cake, together with other dense slags, which are likely to be smithing slags. Context (1067) yielded a dense tongue of slag, which whilst not strictly diagnostic, resembles the slag flows sometimes seen below the tuyère in a smithing hearth. Dense iron-working slag also occurred in contexts (1093), (1107), (1108), (1208), (2009) and (2020). None of this material was particularly diagnostic. Material which was probably iron-working slag was recovered from (1042), (1110) and (2040).

A single piece of variegated, flow-banded, vesicular blue glass was recovered from a phase 4 mortar floor (1008), and was identified by the excavators as cullet. In this instance, the cullet would be waste glass from the manufacturing process, and the provisional identification is likely to be correct. The colour is close to that of Bristol blue glass.

## Interpretation

The assemblage indicates that slag derived from iron working is present. The volume of material is small, which suggests that the present site was not the location of the activity producing the iron slags.

In examples in which the iron slags may be attributed to a particular process, there is evidence for them having been produced during blacksmithing. The moderately sized smithing hearths cakes are typical of the size expected in a blacksmiths hearth. Interpretation of the purpose of the smithing is not possible, and it must be remembered that a smithy would be a component of many industrial plants (for tool manufacture and repair, for instance) as well as occurring as small businesses of many kinds (commonly as farriers, but also other occupations such as nailers, cutlers, tool makers and so forth).

Despite many of the specimens having accretionary crusts containing coal particles, there was, surprisingly, only a single example in which hammerscale was visible within the accretion. This is possibly supportive

of the notion that the slag lumps seen here have been deposited away from the area of primary activity.

The largest assemblages of iron-working slag were in (1064) (270g; phase 2) and (1047) (690g; phase 3); both relatively early in the history of the site. Hammerscale was only found in (1042) (Phase 3). This is slight evidence that the iron-working activity was a feature of the area early in the history of the site.

The dominance of coal as fuel in iron-working is typical of areas within, or close to, the coalfields in post-medieval times, but may also represent a tradition extending back to the Roman period in those areas. The fuel remnants included within the slags and clinkers are coked (because they represent partly burnt fuel remnants), but it is likely the original fuel was coal, rather than coke, since there is large quantity of coal dust in the accretions on the specimens. The presence of charcoal associated with the slags in some instances may indicate the use of charcoal as fuel, but is equally likely to be derived from the use of wood for firelighting by the smith.

## **Evaluation of potential**

This assemblage has a low potential for producing further significant evidence. Detailed analysis would probably be capable of clarifying whether some of the clinker pieces were also products of a smith's hearth, but in a small, derived and possibly mixed, collection, this is unlikely to prove significant.

The presence of a single small piece of blue glass cullet is unlikely to be significant and of low potential for further investigation.

context	weight (g)	notes (Site 1)
1008	4.58	variegated, blue, flow banded glass; moderately vesicular; some rusty accretion attached
1008	6.02	part burnt shaley coal
1042	132	30g, accretionary material around clinker and probably iron. Accretion has a single piece of probable flake hammerscale visible. 40g, corroded nub of accretionary material around slag, but also probably iron. Accretion contains coal and charcoal debris 62g, small clinkery mass, top lobate, moderately smooth, base finely dimpled with abundant coke fragments.
1047	690	284g, majority of a small plano-convex smithing hearth cake, lots of accretion so little internal detail visible. 126g, grey vesicular iron slag. May be one with several pieces below, but certainly joins 144g piece, coal attached or incorporated. 84g, dense highly vesicular slag
1064	270	144g, dense highly vesicular slag fragment, large proportion of a pale mineral- secondary after glass or gypsum? 30g, dense but highly vesicular steel-grey slag with lots of external accretion 4g, irregular inclusion rich vesicular slag fragment
1107	42.98	110g, abraded extremely dense block of vesicular grey slag, one surface has fuel impressions which appear to be charcoal
1108	46	5.84g, small piece of lobate dense slag, prilly, has sediment inclusion with large quartz
1110	104	62g, aggregate of dense prilly lobes, surrounding coke fragments 5g, piece probably from margin of smithing hearth cake, inclined side dimpled with coke particles, top smoothly lobate, slightly reddened in places but mainly has metallic lustre; interior dense, lobed. 15.32g, corrosion around iron 6.94g, corrosion around iron
1178	5.26	14.71g, abraded flow lobe from hearth floor, top smooth, base dimpled, interior vesicular, slag dense
1208	6.28	tongue of dense slag, 70 long, 50 wide, up to 25 thick, slightly concave smooth top in long direction, base rough, convex, with shale inclusions
1208	4.03	100g irregular iron slag, fractured in two. Has many inclusions including shale and coke through to fully vitrified material
1212	577	76g mass of fused stone, joined by partially flowed melt, covered in calcareous material - probably mortar dimpled/lobed block of moderately dense slag with shale inclusions
		irregular mass of dimpled lobate slag, dimples bear coke residue and at least one shale fragment is included, v dense.
		20g, grey weathered vesicular iron slag
		84g, complexly lobed low density clinker material with smooth surface, mainly maroon. Has coked inclusions (cinders) and lots of coal in accretionary material, but also has included charcoal piece.
		irregular clinker fragment with many small shale fragments
		clinker/coke
		fragment of grey vesicular iron slag bearing small coal/shale fragments
		398g, large amorphous block of partially flowed clinkery material. Mainly maroon surface, lots of included coked material - particularly in dimples.
		110g, curious block of what appears to be very high viscosity flowed slag/clinker. It is formed of elongate strings rather than lobes, surface grey to maroon, glassy, wrinkled, interior more crystalline.
		8g, rounded melt bleb with variegated black maroon surface, glassy, incorporates several shale fragments
		2g, T-shaped melt bleb with very smooth surface - probably broadly clinker, but better flowed than most
		2g, rounded melt bleb glassy, variable black-white glass with maroon surface - "clinker"
		58g, lobed slab of low-density slag, maroon surface, internally rich in quartz - possibly a bit of melted wall, but more likely a stone inclusion?
		0.8g, coke/clinker fragment

context	weight (g)	notes	(Site 2)
2009	4.58	dimpled small aggregated flow lobes of vesicular iron slag	
2020	70	rounded nub of dense iron slag with lobate variegated top and irregular dimpled base. Adhering accretion rich in coal fines and has neomorphic gypsum. Slag grey, vesicular, dense.	
2031	2.29	clinker/coke	
2040	54	rounded nub, broken in two, of dark glassy iron slag, vesicular, with inclusions of shale etc. Outside lobate, maroon, locally wrinkled.	

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