# GeoArch

Report 2015/29

# Assessment of archaeometallurgical residues from the Cannington bypass

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## Abstract

*This assemblage provides a sparse record of ironworking (blacksmithing) and of the use of coal, which may not have entirely been for metallurgical purposes (and which may, at least in part, be intrusive from overlying post-medieval contexts).*

*The smithing evidence points to blacksmithing (the end use of iron to fashion and repair artefacts), rather than any part of the process of iron production.*

*Small quantities of fuel ash slag in mainly prehistoric contexts is probably not associated with metallurgical activities.*

*One pit [20802] produced a quantity of vesicular lava that may have been a decomposed fragment of imported quern.*

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## Methods

The material described here derives from two areas excavated on the route of the Cannington bypass, part of the Hinckley Power Station infrastructure.

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

The examined materials are listed in Table 1.
This project was commissioned by Ed McSloy of Cotswold Archaeology.

## Results

### *Description of residues*

The submitted materials amounted to approximately

#### *Smithing slags*

There was a total of 710g of slag identified as smithing hearth cake (SHC). Six items were identified:

| | |
|---|---|
| 20107: 58g, | SHC fragment |
| 20055: 46g, | SHC fragment |
| 20199: 69g, | SHC fragment |
| 20239: 97g, | small 50x50x30mm SHC |
| 20656: 160g, | dense SHC resting on slag sheet |
| 20334: 280g, | 161g, small SHC, 55x65x45mm |
| | 119g, fragmented SHC |

The small SHCs are indicative of blacksmithing. They are typically dense, rather deep in shape and of a pale grey colour. They are similar in morphology to those from the assemblage from Uffington (Young 2015b).

In addition to the pieces indicative of being from SHCs, there was a further 80g of dense iron slag and 84g of lining slag, that are also likely to have been produced during smithing. The hearth lining itself was only represented by 19g of material.

#### *Smithing microresidues*

Very small quantities of hammerscale were recovered. No assemblages were sufficiently rich to give firm

indication of direct input of smithing residue to the context. In such small amounts, issues of residuality and intrusion must be considered.

*Fuel Ash Slag*
Very small particles of fuel ash slags (FAS; pale glassy vesicular materials of very low density) were seen in the sieved samples. They occurred particularly in Area 1 in contexts of probable prehistoric age. FAS may be produced in a variety of settings – including with cereal drying kilns and in domestic hearths (Young 2010, 2015a).

*Coal and coke*
Small particles of coal and partially-burnt coal (coke) occurred widely in low density. Larger pieces of coal/coke were restricted to deposits of Periods 7 and 8.

Use of coal during the Roman period is well established both for metallurgical and other purposes, so the fuel need not necessarily be uniquely associated with the blacksmithing activity. The presence of larger pieces of coal and coke in deposits of Periods 7 and 8 also raises issues of intrusion of smaller particles into underlying deposits.

*Other*
The only significant 'other' material was an assemblage of fragments (162g) from (20801) (a fill of pit [20802]) bagged as 'fuel ash'. These pieces are rather decomposed fragments of a siliceous vesicular lava. They bear phenocrysts of quartz, biotite and an elongate dark mineral, possibly an amphibole. The decomposition has resulted in breakage and spalling of the fragments.

Such materials are commonly seen in Roman and post-Roman contexts as fragments of imported lava querns. In the context of SW England, it is just possible, although less likely, that this lava is from one of the 'Exeter lavas', that crop out in the area around Exeter and to its NE (but there are no potential sources close to Cannington).

***Distribution of residues***
The residues are not associated with metallurgical features and presumably represent either residual material or a low level of casual disposal.

In Area 1, residues were restricted to small particles of fuel ash slag, coal and coke (burnt coal). The occurrence of coal in features of prehistoric age would not be expected, but intrusion of such small particles is possible.

In Area 2, there is a general low background level of both ironworking residues and coal/coke. No assemblages contained significant amounts of material, indicating that the focus of activity was probably outside the investigated area (or in a location destroyed by the later quarrying). Most of the macroscopic metallurgical slags (except for those from (20107)) occurred in deposits attributed to Period 5/5.2/5.3.

## Interpretation

The amount of archaeometallurgical waste recovered from the site is very low, making it unlikely that the smithing activity was conducted within the preserved areas of Roman archaeology. The material is sufficiently concentrated within deposits of Periods 5/5.2/5.3 to be confident that blacksmithing was conducted at/near Area 2 in the Roman period.

## Discussion

The limited archaeometallurgical residue from the site implies the existence of a smithy nearby, but not within the site limits.

## Further work

The material would be unlikely to produce further useful information from additional analysis, so none is recommended. A sparse collection of material found with no direct association to metalworking structures is of limited value; retention of these residues with the site archive is of low priority.

## References

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

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

Young, T.P. 2015b. Assessment of archaeometallurgical residues from Uffington, Oxfordshire. *GeoArch Report 2015-29.* 12pp.

*Table 1: summary catalogue.*

| C# | S# | Label | Sample wt | Item wt | Item no | Notes |
|---|---|---|---|---|---|---|
| **SPE1** | | | | | | |
| 10032 | 100 | coal | <1 | <1 | 2 | coal |
| 10033 | 101 | coal | <1 | <1 | 4 | coal |
| 10033 | 101 | hammerscale | <1 | <1 | 4 | 3 fragments probably burnt bone, one is probably slate. |
| 10033 | 101 | slag | <1 | <1 | 13 | 11 rounded blebs and fragments of FAS, 2 fragments of sandstone, possibly partially melted |
| 10048 | 113 | coal | <1 | <1 | 5 | coal |
| 10057 | 115 | industrial waste | <1 | <1 | 5 | 2 pieces probably coke, 3 pieces probably glassy lining slag |
| 10100 | 103 | industrial waste | <1 | <1 | 4 | pale vesicular siliceous material - FAS or bloated sandstone? |
| 10178 | 107 | industrial waste | <1 | <1 | (1) | fragmented piece of dark glassy vesicular material - probably degraded FAS |
| 10214 | 111 | industrial waste | <1 | <1 | 5 | coal and coke |
| 10262 | 114 | magnetic res. | <1 | <1 | 2 | small irregular granules - probably slag |
| **SPE2** | | | | | | |
| 20001 | | industrial waste | 5 | 5 | 1 | coke |
| 20001 | | coal | <1 | <1 | 1 | coal |
| 20001 | | coal | <1 | <1 | 1 | coal |
| 20001 | | slag | 25 | 25 | 1 | worn nub of dense iron ore with quartz inclusions (natural) |

| C# | S# | Label | Sample wt | Item wt | Item no | Notes |
|---|---|---|---|---|---|---|
| 20055 | | slag | 46 | 46 | 1 | fragment of possible proto SHC- heavily fragmented |
| 20107 | | slag | 72 | 58 | 1 | dense, almost burr-like thin sheet, probably part of a very thin SHC |
| | | | | 12 | 1 | broken small rounded nub, with a well-fluxed dense lobe on one side. |
| 20134 | 201 | industrial waste | <1 | <1 | 12 | coal and coke, with one fuel ash slag/lining slag fragment |
| 20165 | 203 | industrial waste | 5 | 5 | 1 | irregular bleb of gravelly lining slag |
| 20199 | 204 | coal | <1 | <1 | 3 | coal |
| 20199 | 204 | slag | 74 | 69 | 1 | fragment of dense SHC, dimpled top and finely dimpled base. Dense crust with tubular vesicles |
| | | | | 5 | 11 | small debris of stones, pottery fragment and burnt organic material (degraded charcoal?) |
| 20239 | | slag | 97 | 96 | 1 | 50x50x30mm, small irregular probable SHC, damaged on two steep faces - but probably almost complete. Wispy top and dimpled base, grey vesicular slag internally. |
| 20331 | | slag | 16 | 16 | 1 | gravelly slag fragment |
| 20334 | | slag | 280 | 161 | 1 | most or all of small SHC, 55x65,45mm. Vesicular, weathered, fuel clasts present but ,any ambiguous, at least some charcoal, mass appears to be made of merged denser dimpled sheets, rather than being one neat bowl |
| | | | | 119 | 8 | fragmented SHC, at least one fragment appears to show charcoal mould |
| 20364 | | industrial waste | 2 | 2 | 1 | bleb of glassy lining slag |
| 20365 | 206 | coal | <1 | <1 | 9 | 2 pieces of coal, 2 probable slag pieces, the rest stone |
| 20380 | | coal | 8 | 8 | 3 | coal |
| 20398 | 209 | coal | <1 | | 10 | 8 pieces of coal, 2 pieces may be glassy slag |
| 20398 | 209 | magnetic residue | 7 | 7 | assm | assemblage of fragments of rusty shale, some with spheroidal iron oxide crusts |
| 20416 | | slag | 5 | 4 | 1 | small fragment of grey glassy lining slag |

| C# | S# | Label | Sample wt | Item wt | Item no | Notes |
|---|---|---|---|---|---|---|
| 20455 | | industrial waste | <1 | <1 | 4 | coke |
| 20486 | 213 | industrial waste | <1 | <1 | 2 | sandy lining slag |
| 20556 | | slag | 24 | 24 | 1 | small angular fragment of slag with large (or at least medium large) charcoal moulds. Slag coarsely crystalline with equant grains |
| 20579 | | industrial waste | 2 | 2 | 3 | coke |
| 20579 | | coal | 24 | 24 | 6 | coal |
| 20601 | 234 | coal | <1 | <1 | 1 | coal |
| 20603 | 235 | industrial waste | <1 | <1 | 1 | coarse FHS |
| 20603 | 235 | magnetic residue | <1 | <1 | 6 | several pieces of thin slag, probably scale, one stone, one charcoal fragment |
| 20610 | | coal | 3 | 3 | 2 | coal |
| 20610 | | slag | 9 | 9 | 1 | irregular fragment of sandy lining slag, vesicular |
| 20656 | | industrial waste | 16 | 16 | 1 | glazed mass of siliceous fragments - unclear if gravel or a hearth wall. Glaze is clear green on pebbles, but slag elsewhere is dark and sandy |
| 20656 | 246 | industrial waste | <1 | <1 | 6 | coked organic matter, some of which appear to be formed from ?grass rather than coal |
| 20656 | | slag | 266 | 160 | 1 | small dense SHC resting on sheet of burr like material, perhaps from a very shallow hearth? Top shows probable charcoal impressions |
| | | | | 46 | 1 | concretion on sheet iron object |
| | | | | 14 | 2 | concretions |
| | | | | 44 | 2 | blebby masses of lining slag. Fuel ash slag, upper surface of each slightly dark glaze, otherwise pale, weathered vesicular. |

| C# | S# | Label | Sample wt | Item wt | Item no | Notes |
|---|---|---|---|---|---|---|
| 20665 | 248 | slag | 2 | 2 | 1 | fragment of thin slag sheet |
| | | | | <1 | 1 | bleb of lining slag |
| | | | | <1 | 1 | tiny wisp of dense slag |
| 20667 | 249 | slag | <1 | <1 | 1 | maroon gravelly slag fragment |
| 20672 | 251 | coal | <1 | <1 | 3 | coal |
| 20672 | 251 | magnetic residue | <1 | <1 | 4 | 1 rusty rod, possibly corroded iron, 3 pieces of clinkery slag, one with FHS attached |
| 20673 | | | 3 | 3 | 1 | fragment of blebby slag with tubular vesicles |
| 20683 | | industrial waste | <1 | <1 | 1 | large angular fragment of highly-bloated ceramic or perhaps shale |
| 20687 | 254 | metal residue | <1 | <1 | 3 | 1 piece of coal and two pieces of dark, probably clinkery slag |
| 20696 | 253 | slag | 2 | 2 | 4 | two fragments of glazed gravelly material, two fragments of sandy slag |
| 20713 | 252 | magnetic residue | <1 | <1 | 7 | possible FHS x2, 1 stone, 1 hollow slag sphere (SHS?), several rusty sheets of uncertain nature. |
| 20716 | 255 | magnetic residue | <1 | <1 | 2 | two dense particles, one possibly slag sphere, the other an angular fragment |
| 20733 | | slag | 39 | 39 | 1 | rounded nub of slag, smooth top, dimpled base, slightly irregular, maroon surfaced |
| 20734 | 257 | industrial waste | <1 | <1 | 21 | mostly coal and coke, one piece of burnt bone |
| 20745 | 258 | hammerscale | <1 | <1 | 1 | single spheroid 3mm diameter - probably SHS, but might just be slag droplet |
| 20801 | 260 | fuel ash | 162 | 162 | assm | vesicular rock with quartz phenocrysts. Probably fragments from an imported lava quern, but derivation from one of the quartz-bearing Exeter lavas is also possible. |
| 20801 | | slag | 4 | 4 | 1 | sandy lining slag fragment |
| 20838 | | industrial waste | 19 | 19 | 1 | piece of slagged sandy lining, broken in two. Traces of grass temper. Slag coating is dark and sandy. |

*Table 2: distribution of residues by class and context. FAS = fuel ash slag, conc. = concretion. Presence of class in sieved samples is indicated by 'y'.*

| C | context notes | period | SHC | dense iron slag | scale | lining slag | lining | FAS | coal | coke | lava | conc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| site 1 | | | | | | | | | | | | |
| 10100 | fill of p/hole [10099] | 1 | | | | | | y | | | | |
| 10178 | secondary fill of pit [10177] | 1 | | | | | | y | | | | |
| 10032 | fill of pit [10031] | 2 | | | | | | | y | | | |
| 10033 | fill of pit [10031] | 2 | | | | | | y | y | | | |
| 10048 | fill of ditch [10045] | 2 | | | | | | | y | | | |
| 10057 | fill of terminus [10056] | 2 | | | | | | y | | y | | |
| 10214 | charcoal rich fill of pit [10192] | 2 | | | | | | | y | y | | |
| 10262 | fill of pit [10263] | 2 | | | | | | y | | | | |
| | | | | | | | | | | | | |
| site 2 | | | | | | | | | | | | |
| 20455 | fill of p/hole [20454] | 1 | | | | | | | | y | | |
| 20107 | fill of pit [20106] | 1 | 58 | 12 | | | | | | | | |
| 20380 | fill of pit [20379] | 1 | | | | | | | y | | | |
| 20672 | fill of pit [20671] | 1 | | | y | y | | | y | | | |
| 20687 | fill of pit [20688] | 1 | | | | y | | | y | | | |
| 20713 | fill of p/hole [20712] | 1 | | | y | | | | | | | |
| 20716 | fill of pit [20717] | 1 | | | y | | | | | | | |
| 20801 | fill of pit [20802] | 1 | | | | 4 | | | | | 162 | |
| 20838 | fill of pit [20839] | 1 | | | | | 19 | | | | | |
| 20134 | fill of ditch [20133] | 4 | | | | | | y | y | y | | |
| 20416 | fill of pit [20415] | 4 | | | | 4 | | | | | | |
| 20601 | oven backfill [20600] | 4 | | | | | | | y | | | |
| 20603 | oven backfill/lining [20600] | 4 | | | | y | | | | | | |
| 20055 | fill of ditch recut [20054] | 5 | 46 | | | | | | | | | |
| 20199 | fill of ditch [20164] | 5 | 69 | | | | | | y | | | |
| 20398 | burnt deposit in hypocaust | 5 | | | | y | | | y | | | |
| 20696 | fill of p/hole [20697] | 5 | | | | y | | y | | | | |
| 20734 | fill of grave [20736] | 5 | | | | | | | y | y | | |
| 20745 | fill of grave [20748] | 5 | | | y | | | | | | | |
| 20165 | fill of pit [20304] | 5.2 | | | | 5 | | | | | | |
| 20239 | Backfill within robber cut [20341] | 5.2 | 97 | | | | | | | | | |
| 20364 | fill of ditch [20366] | 5.2 | | | | 2 | | | | | | |
| 20365 | fill of ditch [20366] | 5.2 | | | | y | | | y | | | |
| 20486 | dark deposits inside the drain | 5.2 | | | | y | | | | | | |
| 20656 | fill of ditch [20657] | 5.2 | 160 | | | 44 | | | | y | | 60 |
| 20665 | fill of cut [20664] | 5.2 | | 2 | | y | | | | | | |
| 20673 | destruction debris | 5.2 | | 3 | | | | | | | | |
| 20683 | fill of pit [20682] | 5.2 | | | | | | y | | | | |
| 20733 | fill of ditch [20732] | 5.2 | | 39 | | | | | | | | |
| 20331 | fill of ditch [20332] | 5.3 | | | | 16 | | | | | | |
| 20334 | fill of ditch [20336] | 5.3 | 280 | | | | | | | | | |
| 20610 | s building  s corridor wall; rubble | 5.3 | | | | 9 | | | 3 | | | |
| 20667 | fill of pit [20666] | 5.3 | | | | y | | | | | | |
| 20556 | demolition overlying S building | 5.3/6/7 | | 24 | | | | | | | | |
| 20001 | subsoil | 7 or 8 | | | | | | | y | 5 | | |
| 20579 | quarry fill | 7 | | | | | | | | 2 | | |
| 20579 | quarry fill | 7 | | | | | | | 24 | | | |

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