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Evaluation of archaeometallurgical residues from the N52 realignment, Sites 1&2 and 3

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Abstract

This report provides an evaluation of archaeometallurgical residues from 2 sites within the N52 road scheme: Site 1&2 Gorteen and Site 3 Rochfort Demesne.

Sites 1&2, Gorteen, produced a small quantity, approximately 600g, of slag. The material is strongly altered and overgrown by secondary iron minerals, in a manner rather reminiscent of the main slag dump in the stream at Clonfad, also on the N52 scheme. The Gorteen assemblage also includes concretionary material from around decomposed iron artefacts. It is unclear whether all the pieces formed around a single artefact, or whether there were several pieces of iron. However, all the pieces of iron have the same form – a thin sheet about 20mm wide, suggestive of strapping, or of a blade.

Site 3, Rochfort Demesne, yielded a small assemblage of about 8.5kg of iron-working residues. Of these residues about 6.3kg was slag in the form of smithing hearth cakes (SHCs), of which 5.3kg came from the ditches, F10 and F12. In contrast, the interior features yielded only 0.5kg of SHC, but about 1.3kg of micro-residues and associated small slag material. Such a differentiation of accumulation of residues, fines proximally and coarse slags at a distance is commonly assumed, but rarely observed. The total amount of material recovered is very small, but sufficient to indicate at least occasional operation of a smithy on the site. There are too few complete SHCs, or SHCs with estimatable original weights, to make meaningful comparison with other sites, although the weighs lie within the size range typically observed on Irish early medieval sites

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Methods

All materials were examined visually, using a low-powered binocular microscope where necessary. All significant materials were weighed and recorded to a database (Tables 3 and 4).

As an evaluation, the materials were not subjected to any high-magnification optical inspection, nor to any other form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

The material from Site 3 was given a brief preliminary examination in February 2006 and a simple catalogue produced. The material was granted an export licence and dispatched to TY in early September 2007. The slag assemblage was then “lost” in transit, only being recovered from the couriers in early November. The assemblage arrived in a very abraded state. Many of the bags had holes rubbed in them and some had opened. Rubbing of the slag pieces against each other meant that most bags contained a large quantity of dust and small fragments. Several pieces of slag were loose in the box. These pieces are indicated in the catalogue and it is believed their original contexts have been identified correctly.

In addition to the damage to the specimens, the contents did not correspond precisely to the slag catalogue. Five items were missing from the collection. Three of these were items not seen in the 2006 inspection, but two items, both significant examples of

smithing hearth cakes, were seen and summarily described in 2006.

Sites 1&2 Gorteen

Results

Material from Gorteen was restricted to context 10, from which there were two samples (7 and 10) with overlapping types of content.

616g of the material appears to heavily altered slag, most likely to be from iron-working. Slag from sample 7 comprises a dense rounded block, probably from the proximal part of the a medium-sized smithing hearth cake. The material has been strongly leached and a secondary iron –rich crust developed on the outside of the slag block. Sample 10 contained 174g (6 pieces) of a highly vesicular charcoal-rich material, apparently a rather friable slag, overgrown with secondary iron minerals.

Other materials include 260g from sample 7 and 128g probably from sample 10 (loose in box) of gravelly concretionary material, formed by cementation of the sediment around decomposing iron object(s). The iron fragments are all similar and suggest a narrow thin piece of iron – such as a piece of binding, or more likely a blade. Unfortunately the abrasion of the pieces hampers attempts to retrofit, so it remains unclear whether they are fragments of a single object or several.

Interpretation

The preservation of the slag resembles that of the residues dumped into the stream at Clonfad (Young 2006b). It is likely that these materials were deposited into a similar wet environment, although no context information was available to provide further information.

The residue material is compatible with an origin in iron-working (smithing) although the style of preservation precludes certain identification. The material is not indicative of age.

Evaluation of potential

The artefact material in the concretions would be worth examination by X-Ray in order to determine whether it does represent a blade(s).

Little further work could usefully be done with the weathered slag material.

Site 3 Rochfort Demesne

Results

The assemblage from Site 3 comprised approximately 9kg of material, of which about 8.5kg was archaeometallurgical residue (including 1.3kg of fines with hammerscale and other micro-residues). This is a very small assemblage, and indicates that although iron-working was undertaken on the site, this was either an infrequent activity, or that residues were dumped off-site.

All the residues were associated with iron-working (smithing). Distribution of the residues (Table 1) showed a marked dichotomy with the peripheral ditches yielding the larger slag pieces (including smithing hearth cakes) and the internal features containing micro-residues and small slag pieces.

	SHC	indet	tuy	micro	total	g/m3
t/s	149	30	60	0	239	0.15
f5	352	130	20	0	502	1.40
int	474	282	283	1343	2382	108.27
f12	1528	22	0	0	1550	0.83
f10	3802	2	0	0	3804	5.21
	6305	466	363	1343	8477	1.86

Table 1: Distribution of archaeometallurgical residues at Rochfort Demesne.

SHC = smithing hearth cake, indet. = unidentifiable slag fragments, tuy = tuyère sherds, lining slags and other tuyère-related slags, micro = samples of fines containing micro-residues. The slag distributional density in g/m3 was calculated from the volumes given by Channing (2007). t/s = topsoil and unstratified, f5 = C19 bank, int = internal features, f12 = outer enclosure ditch, f10 = inner enclosure ditch.

The macroscopic slag assemblage is dominated by examples of smithing hearth cakes and fragments thereof. Three SHC examples were probably complete, and three were represented by approximately half their original material.

192 (100%)
416 (100%)
428 (50%)
>820 (<50%)
1404 (?100%)
2460 (50%)

Table 2: List of smithing hearth cake weights from Rochfort Demesne

There are too few examples for the weight distribution to be very meaningful, but the range lies within that recorded at other early medieval sites, and includes no examples of a size held to be indicative of bloomsmithing (e.g. Young 2006b).

The assemblage includes some sherds from tuyères, together with a larger quantity of fired clay in a similar rather gravelly fabric which are probably of a similar origin. These are also examples of a dense slag backflow from the underside of a tuyère, and a slag fringe, probably from the lower face of a tuyère. Such remains are typical components of early medieval iron-working assemblages.

The unidentifiable slags include pieces too small or fragmented for certain identification and also pieces of

slag which are very likely to be smithing hearth slags which did not become incorporated into the main SHC.

The micro-residues include fines assemblages dominated by flake hammerscale, although bearing some spheroidal hammerscale, together with slightly coarser-grained materials including slag spheroids of up to about 6mm and pieces of slag flats (slag sheets which were probably formed either in contact with the workpiece or possibly the smith's tools). The general appearance of the fines assemblages strongly resembles those from Coolamurry Site 7, on the N30 (Young 2006a), another site of approximately 10th century age with good evidence for iron-working (blacksmithing) rather than primary iron production.

Interpretation

The available evidence suggests that the enclosure at Rochfort Demesne was the site of occasional blacksmithing. The residue assemblage is small, suggesting the smithing was not a major or continuous activity.

The distribution pattern of fines in the interior features and macroscopic slags in the ditches, matches the expected pattern of residue disposal on an enclosed site, but is which is rarely actually observed.

Evaluation of potential

Further analytical investigation of both macro- and micro- residues from this site would be likely to produce useful additional findings. However, the utility of such investigations is rather reduced by the small size of the assemblage and of the context of the finds. The micro-residues have not been tied with any certainty to actual hearth features by the excavators, and their sites of deposition have been suggested to be general rubbish pits (although the addition of other domestic waste into pits primarily of a metallurgical origin should not be discounted). The features containing the micro-residues are also not currently closely dated. The macro-residues occur as sparse components of ditch fills and are therefore poorly constrained.

Given the issues of dating and context, although further analysis would be interesting and desirable, it might be hard to argue strongly in support of such a programme in competition with other post-ex activities.

The fines assemblages are, however, good examples and I would argue for retention of the archaeometallurgical residues for possible re-investigation in the future.

The archaeometallurgical assemblage include two finds (a possible nail from f109 and a small iron disc from f413) which should be re-integrated into the finds collections.

References

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Site#	Type	Object#	Context#	Wt VJK	Wt measured	Wt of item	Notes
1 & 2	Sample	7	10	890	865	442	dense rounded lump, this has rusty crust which falls away to reveal greyish vesicular material - probably higly altered slag,
						90	stones
						260	concretionary gravel and silt surrounding iron object or objects
						73	dust
1 & 2	Sample	10	10	380	344	174	6 pieces , bag was open. 1 piece broken up to obtain fresh surfaces, This is very problematic material - and not clear if it is slag at all - some pieces appear to be vesicular slag, and there is charcoal, but much of the texture is more like bog ore. This may be overgrown material like that from Clonfad
						42	dust
						128	concretionary material like that from Gorteen - in fact this is the best piece - shows evidence for long iron fragment - probably a blade - similar to material in sample 10, although it probably came from sample 7 (loose in bag!!)
				total	**1209**	**616**	**residue**

Table 3: Summary catalogue of material from Sites 1&2. All weights in gram.

Site#	Type	Object#	Context#	Wt VJK	Wt measured	Wt of item	Notes
3	Sample	205	1	67.4			***missing - not seen in preliminary examination in 2006 either***
3	Sample	397	1	47.1	45	45	2 pieces of slightly reddened slag, both possibly from SHCs, 1 recently broken in 2
3	Sample	422	1	163.2	160	30	6 small indet iron slag pieces
						6	stone
						104	2 fragments probably from small lobate SHCs - but size not clear
						20	dust and small fragments
3	Sample	481	1	59.6	60	60	6 pieces of vitrified clay. 3 large pieces conjoin into hooded shape - probably from above blowhole, other large and the two small pieces conjoins into slightly flowed surface
3	Sample	448	10	1720	1636	1230	probably about 50% of plano-convex SHC with thin (virtually non-existent) crust, fragment 155x110x80mm, original approx 180x160x80,mm slag is charcoal-rich in the extreme, but has a slightly denser upper "burger sized" plate with hints of dimples
						406	dust and small fragments
3	Sample	479	10	730	*762*	-	***missing - recorded as an SHC in prelimary examination in 2006***
3	Sample	582	12	2.5	2	2	tiny piece of possible slag - may just be bog ore mottle
3	Sample	9	15	10.6	8	8	2 pieces of blebby dense iron slag
3	Sample	54	54	1560	1404	1110	155x120x80 mm, core of charcoal-rich SHC, most of the crust of which appears to be fallen off - though its just possible this a partially attached earlier crust, bowl 50mm deep with 20mm slag on top. Probably close to 100% including the fragments below.
						294	small fragments - probably most of the detached crust of the above
3	Sample	97	92	420	416	416	100x95x35mm, small dense SHC with flat top, seems fairly lobate suggesting slag well flowed, has fired clay suggesting low angle attachment below blowhole, 100%
3	Sample	156	97	99.8	92	92	block from near the base of a rather open textured slag with various cavities and slightly granular appearance, essentially no basal crust - piece is microprilly on outside
3	Find	177	109	16	16	16	rhomboidal cross section piece of corroded iron with 8mm sides - probably shank of a large nail
3	Find	178	109	262.8	220	142	3 main pieces, plus fragments, of granular slag similar to 92g piece above
						22	4 pieces of rusty slag exploding through corrosion,
						56	piece of granular slag starting to explode,
3	Sample	206	109	430	430	410	piece of spoon-shaped dense crust, crust microprilly/lobate on outside, inside of 12mm thick base is smooth, but crystal terminations show on steep internal sides, some charcoal rich material preserved on one side which presumably roofed the cavity, fragment 100x100x40 original size not determinable, but this can't be more than 50%, bowl 35
						20	dust
3	Sample	332	109	400	*412*	-	***missing - recorded as fragment of a large dense SHC in preliminary examination in 2006***
3	Sample	139	148	520	532	242	dense block of homogeneous dark slag, except for curved, presumably basal surface, which bears several large white gravelly inclusions
						98	dense slag, some white inclusions, conjoins 242g piece above
						12	2 pieces similar to previous two entries, these four pieces all appear to be from similar dense, thick-crust type slag, with partially melted gravel inclusions,
						70	rusting lump of slag, also has white gravel within, though form not as clear as with preceding examples
						16	2 pieces rusty low density slag
						20	lining slag, very greenish and highly vesicular - could possibly be tongue fragment

						44	strange folded or flown block, this is dense but has colour similar to preceding piece, has one markedly dimpled surface, other slight lobate, contains abundant gravelly fragments
						30	dust
3	Sample	251	178	6.6	6	6	small fragment of extremely well-indurated smithing floor with slag, spheroidal and flake hammerscale
3	Sample	280	198	450	444	262	bag of fines material dominated by flake hammerscale,
						176	bag of mainly rather dense flown slag blebs, but also some flats and other types of small-scale slag residue
						2	bag with lag from a broken curved mm thin sheet, smooth maroon surface locally,
						4	4g bag of hammerscale, essentially comprising large (4-6mm) spheroids,
3	Sample	279	199	384.5	356	356	356g, collection of small pieces of smithing debris, wide variety of slags (mainly <20mm, dust rich in hammerscale and two pieces of vitrified ceramic. Approx 70 pieces >10mm
3	Sample	447	314	29.8		-	***missing - not seen in preliminary examination in 2006 either***
3	Sample	409	315	58	58	58	(not in slag catalogue) curious heterogeneous slag fragment, contains some well flowed surfaces, also charcoal -rich material, possible pebbles and has probable straw-rich concretion attached as well. Probably smithing slag lump
3	Find	145	321	5.7		-	***missing - not seen in preliminary examination in 2006 either***
3	Sample	436	324	202.5	192	192	possibly complete very irregular and blebby SHC, 95x55x35mm, the whole piece, but especially the top, is rich in gravelly lining debris, the lower part shows some good descending lobes with charcoal contacts. Concavo-convex, very irregular
3	Sample	513	337	153.5	144	90	vitrified gravelly clay with curved surfaces - very likely to be fragments of tuyère but too comminuted to be certain
						4	dense vesicular slag in 2 pieces
						50	dust
3	Sample	488	341	163	160	160	c40 small pieces of slag, with 3 spheroids (c5mm) and dust, slag mainly rather spiky, but some well flowed material, the larger pieces are mainly a variety of thin crust
3	Sample	488	341	67.7	66	66	fines with abundant hammerscale
3	Sample	489	341	349.6	322	198	11 slag fragments, all probably smithing slag lumps - only one has shape certainly suggestive of being part of an SHC - and that would have to be a very small one, 1 piece is very dense and resembles some tuyère-attached flown slag sheets
						42	dust
						68	possble lip of SHC, slightly similar to piece in sample 39 (loose in box!)
						14	piece of vesicular iron slag (loose in box!)
3	Sample	514	350	111	108	108	fines material dominated by flake hammerscale, but spheroidal hammerscale and slag also present
3	Sample	516	350	1060	1000	202	dust and fines, very rich in flake hammerscale.
						64	dense slag from front base and below tuyère, seen as clay film on slag surface
						214	c50%? of small prilly SHC, fragment 85x80x35mm, just possibly conjoins piece above
						2	approximately half of a small iron disc in 2 pieces, possibly a stud
						129	gravelly ceramic, presumably from tuyère
3	Sample	546	413	0.6	1	1	various magnetic material including both flake and spheroidal hammerscale
				total	**9052**		

Table 4: Summary catalogue of material from Site 3. All weights in gram.

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