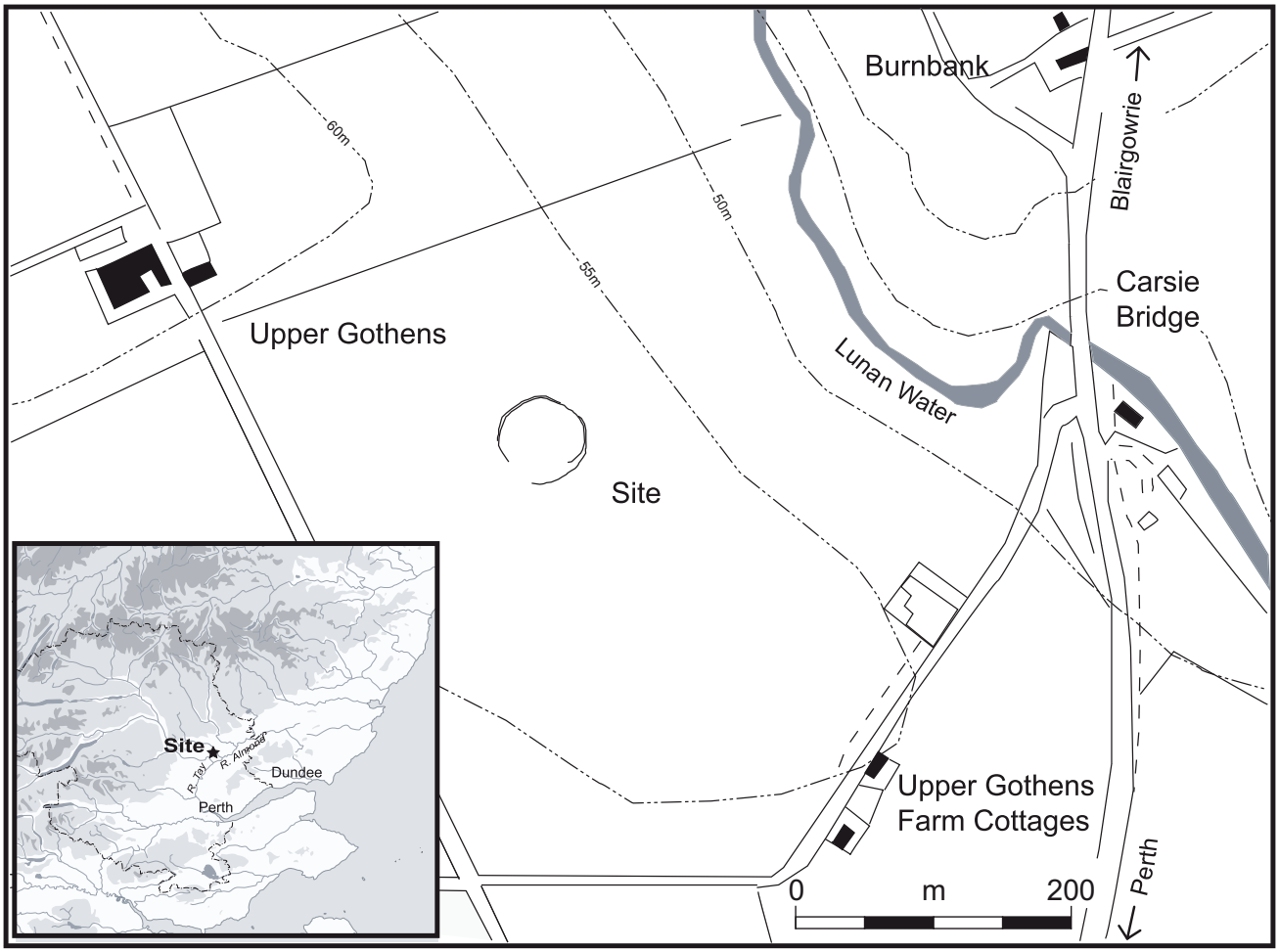
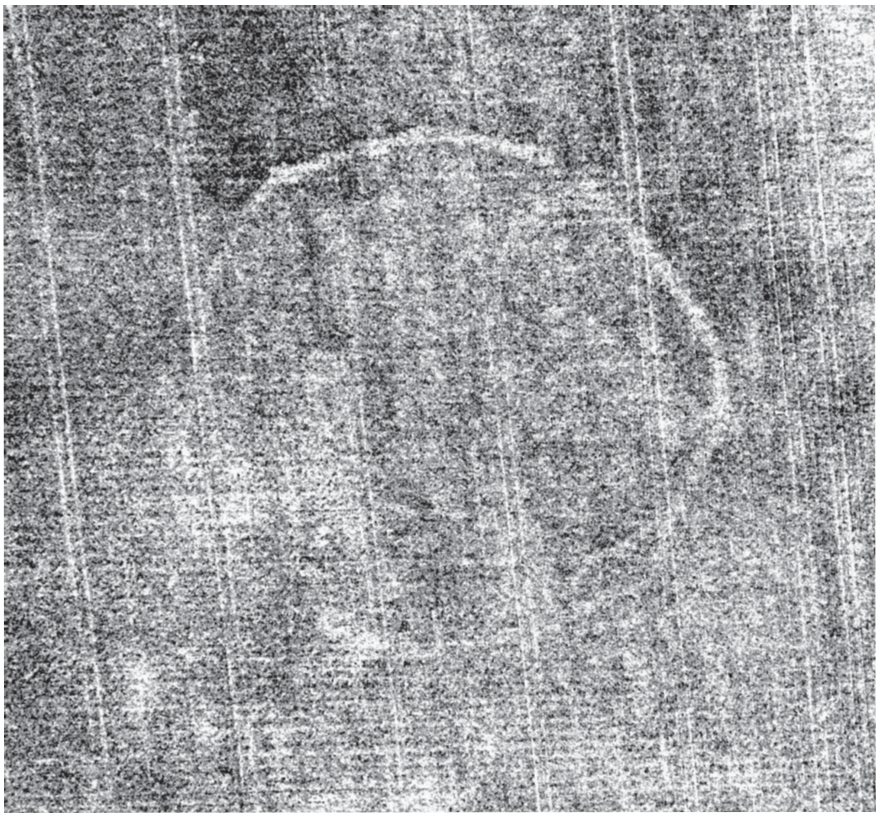


Illus 1 *Location map.*



Illus 2 *RCAHMS aerial photograph.*

The excavation of an early medieval enclosure at Upper Gothens, Meikleour, Perthshire

Gordon J Barclay

with contributions by A Clydesdale, M Hastie, E Photos-Jones

Introduction

The excavation at Upper Gothens was undertaken as part of the University of Stirling's project to investigate Neolithic settlement in east-central Scotland. The site was chosen because of the co-location of a scatter of flint flakes and a cropmark enclosure that appeared to have an irregular boundary (a characteristic of Neolithic sites in Perthshire – eg Barclay and Maxwell 1991). The flint, apparently representing a Neolithic industry, from the general area of the enclosure (local information suggests mainly to the south) was found by Mr D Campbell in the years leading up to 1969 (NMRS NO 14 SE 20). In the event the enclosure was found to be of considerably later date. Although severely truncated the site produced rare evidence of metal-working debris of the Early Historic period.

The enclosure is centred at NGR NO 1677 4151 on a slight rise (Illus 1). It was discovered from the air in 1982, at which time a handful of photographs was taken (NMRS NO14SE 43; Illus 2). Since then it has not been photographed. The subsoil on which the enclosure sits is a damp fine silt, not a material on which cropmarks would be expected to form readily. RCAHMS noted (1994, 50) that the enclosure was the largest of all the 'curvilinear enclosures' in SE Perth, and presciently noted (ibid) that the 'palisade' might be the remains of a narrow ditch.

The cropmark seemed to indicate the presence of a ditch, apparently slightly broader on the N and E, fading almost to invisibility on the W and apparently bifurcating at the S. According to the RCAHMS transcription of the enclosure it measures about 60m E–W within the inner ditch. The transcription does not show a southern edge, but the enclosure appears to be roughly circular. The photographs show no internal features. Because there were few control points on the photographs a cautious view was taken of the location and extent of the feature on the transcription. The transcription published by RCAHMS (1994, 58) seems to contain a greater degree of interpretation than that lodged in NMRS.

The excavation was undertaken over two weeks in September 2000 under the terms of a scheduled monument consent issued by Historic Scotland. A trench was opened over the eastern edge of the enclosure. It was subsequently extended to the W and S.

Description

The features can be considered in three parts (Illus 3).

Modern damage

To comprehend the archaeology it is necessary first to deal with the modern damage that had affected its survival. The subsoil bore the clear marks of repeated episodes of subsoiling as well as the regular tracks of field drains. The most damaging episode however took the form of numerous intersecting channels about 15cm deep and 20–30cm wide, of variable length, and with ends rising towards the subsoil surface. We could not certainly explain these as the result of any agricultural process, but the least unlikely explanation was that they were caused by a large number of heavy vehicles bogging in the wet topsoil and subsoil. All archaeological features seemed to have been obliterated in an area in the middle part of the site, from about 5m E of the eastern ditch, for about 12–15m. The amount of subsoil damage was so great (more than 75% of the cleaned surface under the topsoil was disturbed) that only a selection of modern impacts, mainly where drains or 'ruts' had affected an earlier feature, is shown on the site plan.

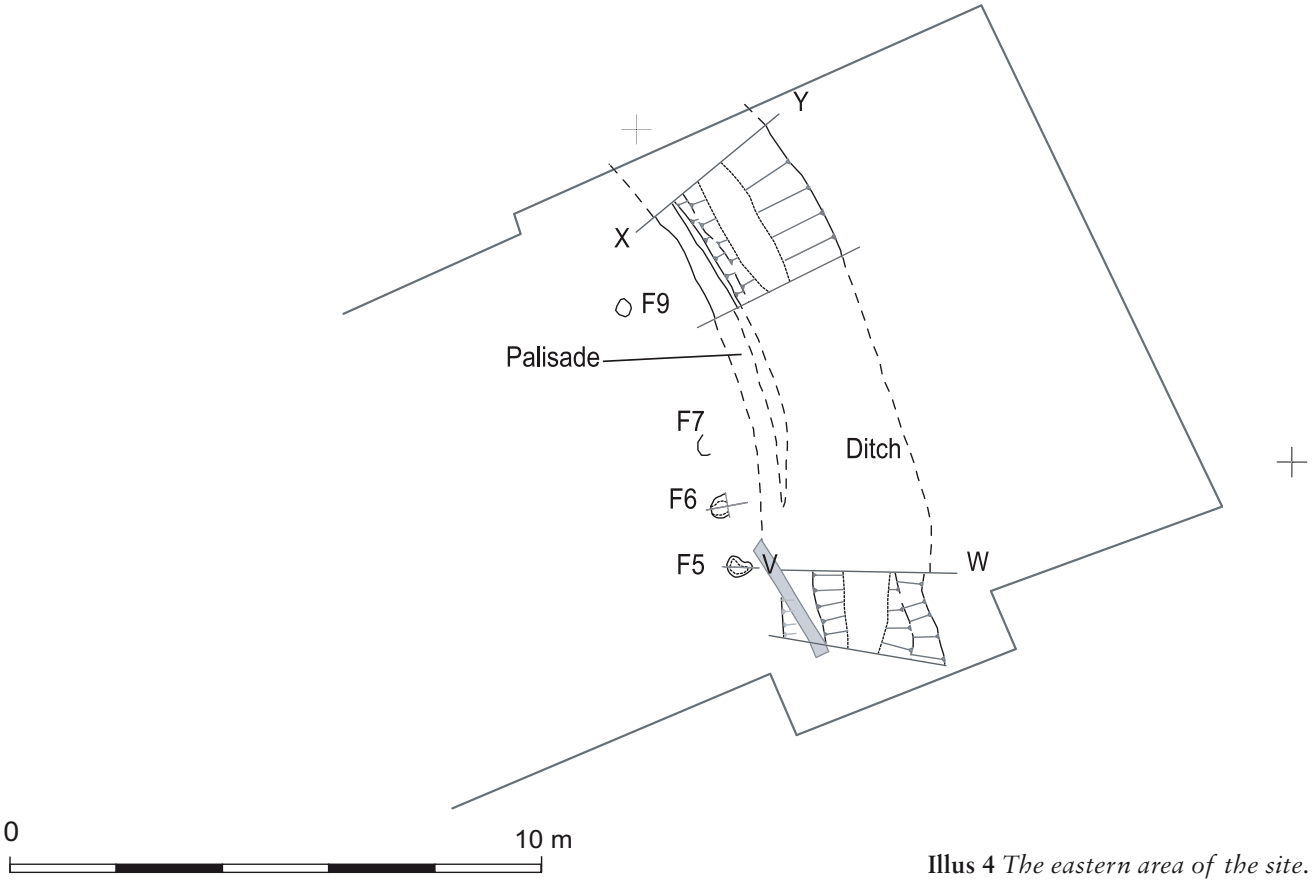
The boundary feature appearing on the aerial photographs

The boundary of the site was more complex than had appeared on the aerial photographs (Illus 4). On the E side it comprised a broad ditch. On its inner, eastern, edge there was a narrow trench (a palisade?). Some 0.5–1.5m farther to the E was an arc of four or five small pits (?postholes), roughly paralleling the line of the ditch and palisade trench, which can provisionally be interpreted as a further boundary feature.

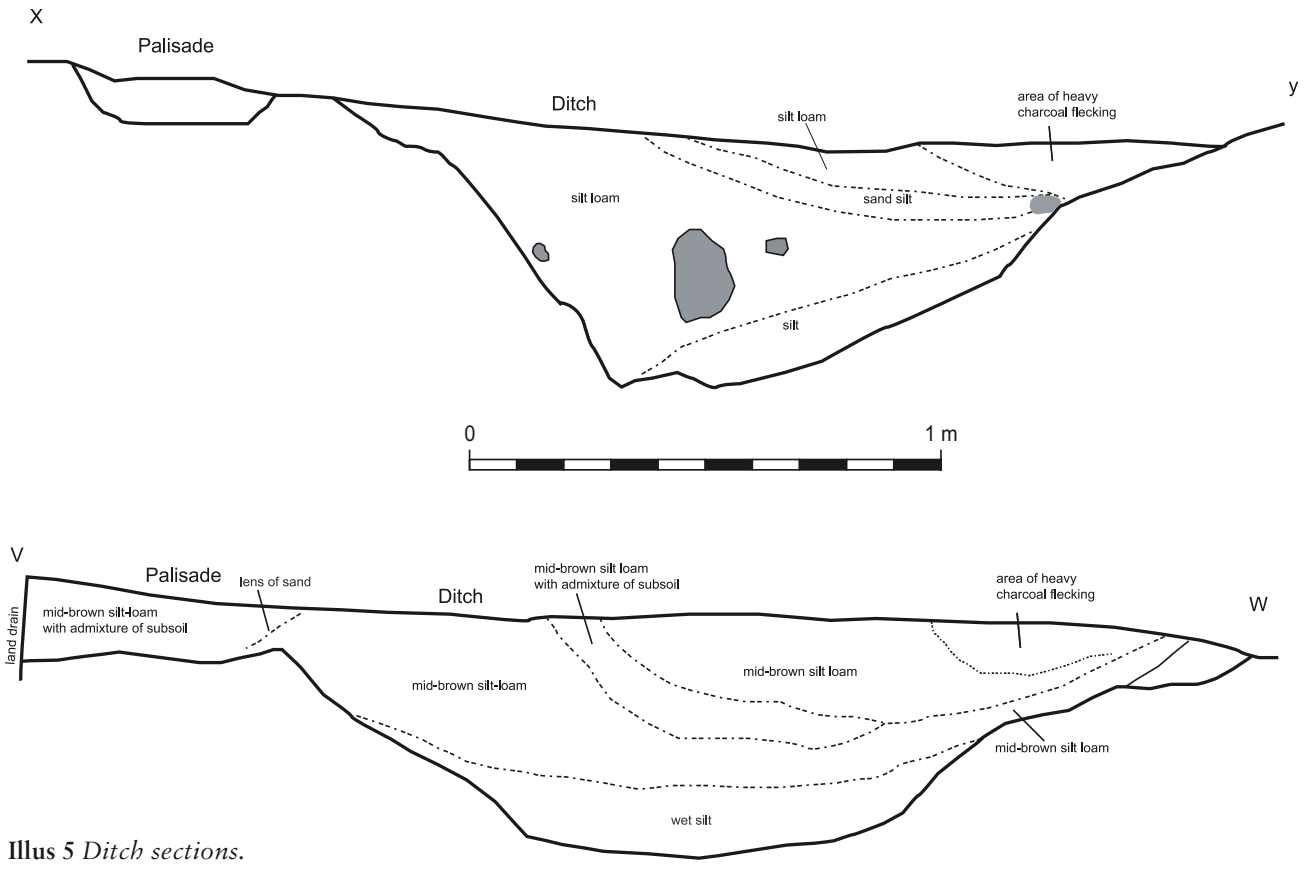
The ditch

The ditch was located only at the eastern edge of the excavation area. We made two cuts across it, and drew three of the four exposed cross-sections (Illus 5). The ditch was about 2m across and up to 0.6m deep. In both sections the ditch had clearly been recut. The recut of the ditch (which appeared consistently in the

Illus 3 *Site plan.*



Illus 4 *The eastern area of the site.*



Illus 5 *Ditch sections.*

excavated area) appeared to be about 1.4m across and up to 0.3m deep. Both cuts seemed to have silted up naturally. The outer (eastern) edge of the recut was marked by a band of charcoal-flecked soil up to 0.5m across, which in one section was clearly enough defined to suggest the possibility of a further recut.

Charcoal from this soil was submitted for radiocarbon dating. The calibrated determination was AD 895–1024 (AA–40347).

A portion of what may be a broken whetstone (find 6) 95mm long (broken), 26m deep and 15mm across (broken) was found in the charcoal-flecked soil. A small fragment (find 9) of what may a smoothed stone was also found in this context. Neither find is reported upon further here.

The palisade

On the inner (western) edge of the ditch there was a narrow slot, interpreted as a palisade, measuring about 0.4m across and up to 0.2m deep. None of the cross-sections showed clear signs of posts or packing. The relationship between palisade and ditch was not clear; in one section it appeared, although not convincingly, that the palisade cut the fill of the primary cut of the ditch (Illus 5). It would be unwise to build too much on this tenuous relationship.

The posts

Between 0.5m and 1.5m to the W of the palisade we noted four small pits (F5, F6, F7 & F9) which can be interpreted as postholes. A possible fifth feature in the sequence (F8 – between F7 and F9) had all but been obliterated by a modern field drain. The features are about 1m apart. F5 and F6 were excavated and were found to measure about 0.4m to 0.5m across and up to 0.15m deep. F5 had limited stratigraphy. A perforated piece of iron was found in the bottom-most fill of F5, near the northern edge of the feature. X-radiography revealed that this was a belt buckle (Clydesdale, below); charcoal (*Alnus*) from the upper fill produced a calibrated date determination of AD 1040–1259 (AA-40345). Dr David Caldwell, of the National Museums of Scotland, has provided the following comment on the buckle: 'A buckle of medieval or later date. Such items are often very difficult to date precisely. As far as can be ascertained from the x-ray alone a post-medieval date would seem most likely.' Although the buckle was found at the bottom of the shallow posthole, the amount of disturbance on the site must leave open the possibility that it found its way there later in the life of the site.

The features to the W and to the S

The extension of the excavation area to the W was undertaken because of the modern damage to the area first opened, to the E of the ditch (Illus 6). Three or four parallel lines of shallow ditch were exposed, no hint of which had appeared on the aerial photographs. The features ran roughly N–S and there was a E–W running gap through all the features.

All the ditches can be interpreted as palisade trenches with an entrance running through them.

To the N of the 'entrance' there were three clear ditches and the faint remnants of what may a fourth. From the W, they are as follows:

F53 A discrete segment of ditch 4.7m long, up to 0.7m wide and a maximum of 0.15m deep where excavated. The fill was charcoal-rich, but insufficient material suitable for identification or dating could be recovered.

F54 A 6.25m length of ditch, continuing into the northern edge of the excavation area, a maximum of 0.8m wide and about 0.2m deep where excavated. Charcoal from the surface of the feature near the northern baulk produced a calibrated radiocarbon determination of AD885–1017 (AA-40346).

F55 A 5.75m length of ditch continuing into the northern edge of the excavation area. At the 'entrance' end a narrow slot, only a few centimetres deep, may tentatively be interpreted as the setting for a light fence narrowing the entrance at this point.

An ill-defined area of soil similar to the fills of the other three ditches, was found to the E of F55. On excavation it was found to be only a few centimetres deep. Given the extent of the damage to the site it is possible that this represented the last remnants of a fourth ditch.

To the S of the entrance there were three clear ditches:

F52 An 8m length of ditch running on into the edge of the trench, 0.6m to 0.8m across, with a swollen northern terminal (around 0.9m broad), up to 0.18m deep where excavated.

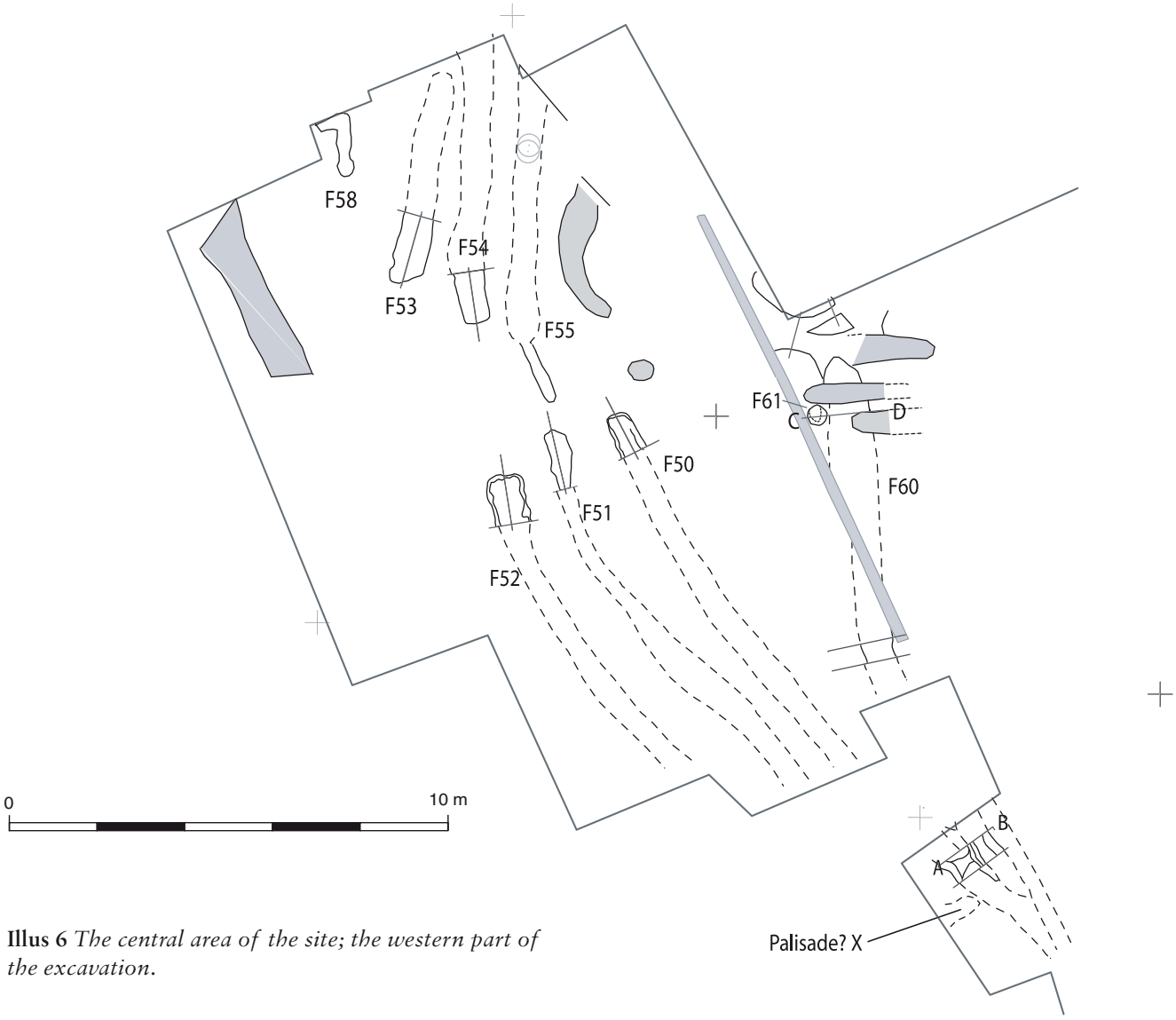
F51 An 8.75m length of ditch running on into the edge of the trench, very variable in width (from 0.4m to 0.75m) and only 0.1m deep where excavated.

F50 A 9.25m length of ditch running on into the southern edge of the trench, up to 0.6m across and 0.1m deep.

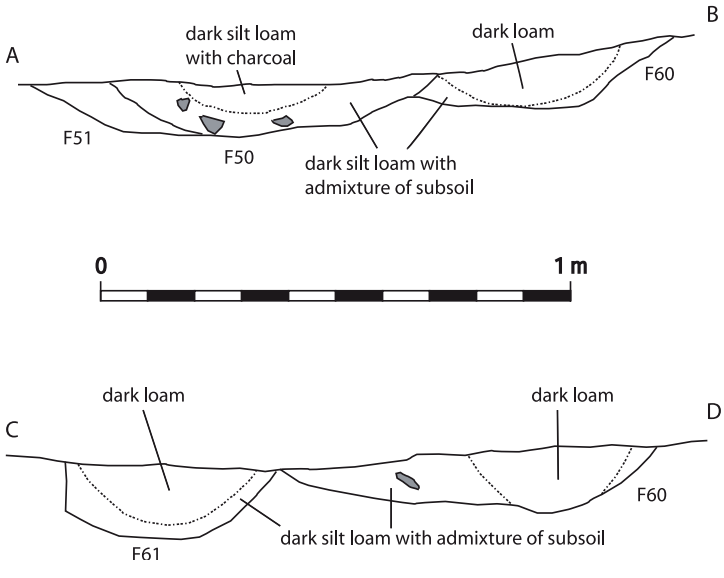
To the E of this complex of ditches was a further, rather straighter ditch (F61). It was 0.75m across and 0.15m deep where excavated. A substantial piece of metallurgical material was found in the northern of the two excavated sections: it is reported upon by Photos-Jones (below). A small post-hole (F60) was excavated immediately to the W of F61. It measured about 0.45m across and up to 0.15m deep, with two fills.

The excavation area was successfully extended to try to find a point at which some of these ditches might intersect: both F51 and F60 were cut by F50 (Illus 7). Immediately to the W was a further possible palisade section ('Palisade? X' on Illus 6).

The southern extension to the excavation area was dug specifically to locate ditch or palisade trench features showing on the aerial photographs. Unfortunately the line of the trench coincided with the line of a field drain and a broader shallower ditch, probably of



Illus 6 *The central area of the site; the western part of the excavation.*



Illus 7 *Palisade sections.*

modern agricultural origin, both of which had disrupted features in the excavation area. A few metres to the S of the main group of features were traces of a further palisade or ditch (marked 'Palisade? Y' on Illus 6). Its relationship to any of the other boundary features could not be determined. Farther S two fragments of possible palisade trench were found (F23 and F26), possibly reflecting the bifurcating feature on the aerial photographs. If they are to be identified with the marks on the photograph, then the cropmark transcription is some metres in error at this point.

Radiocarbon dating

Samples for C14 dating have been identified and submitted for dating.

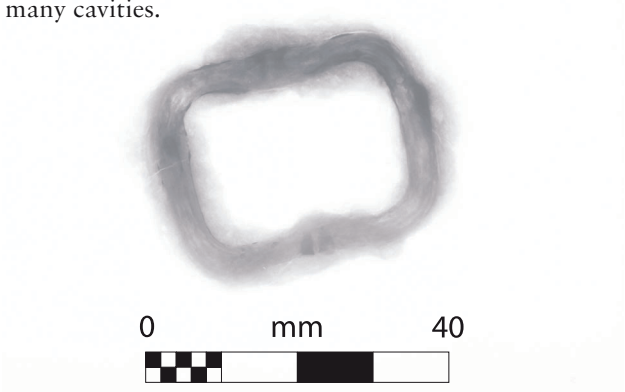
sample no.	date ref.	material and relationship to be dated	date	calibrated date
1	AA-40347	charcoal: *Salix* sp. outer edge of upper fill of ditch (F2) cutting A	1060±35 BP	AD 895–1024
6	AA-40346	charcoal: *Quercus* sp. upper fill of F54, near N baulk	1105±35 BP	AD 885–1017
10	AA-403435	charcoal: *Alnus* sp. upper fill of F5	865±35 BP	AD 1040–1259

X-radiography of the buckle

A Clydesdale

The piece (find no 26, from posthole F5) is a rectangular iron buckle, with the long slides slightly concave, measuring 37mm by 27mm. The x-ray (Illus 8) indicates a pierced, thickened feature halfway along the long sides—this was probably the fixing for the central bar, around which the pin would have been passed. Both bar and pin are missing. The x-radiograph also suggested that the buckle was originally coated with a more radio-opaque metal, most likely tin; this was subsequently confirmed (Photos-Jones below). This cannot be seen after cleaning—it would not have survived as a metallic layer, but as an extremely thin layer of brown-black powder —invisible to the naked eye, although visible on an x-ray. Three x-radiographs were taken; that reproduced here shows the shape of the buckle most clearly.

The buckle is in very poor condition—one of the three x–radiographs shows there is no metal core, and many cavities.



Illus 8 *X-radiograph of buckle.*

The Upper Gothens buckle: a technical report

E Photos-Jones

Introduction

A small buckle from Upper Gothens was presented for examination and analysis. It had already undergone conservation treatment (Clydesdale, above). The analysis aimed to verify the conservator's observation that 'The x-radiograph also suggested that the buckle was originally coated with a more radio-opaque metal, most likely tin'.

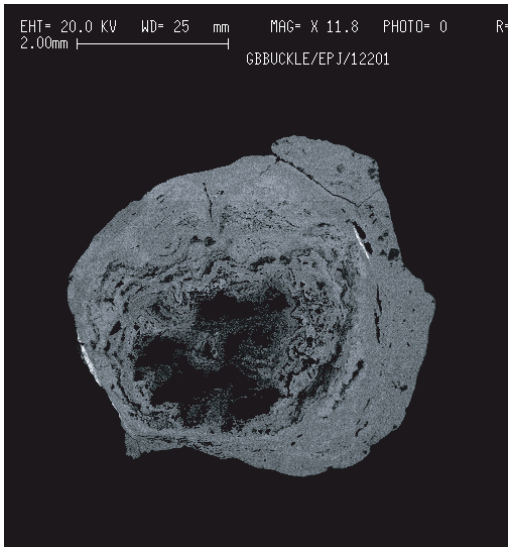
Methodology

A sample of about 3mm was removed from the buckle by cutting with a diamond saw, revealing a cross section of completely mineralised material. Despite the visible lack of evidence for any metal remaining it was decided to proceed with a polished surface, by mounting the sample on metallographic resin and grinding and polishing with 6, 3 and 1ìm diamond paste. The polished block was subsequently carbon coated in preparation for SEM-EDAX analysis (scanning electron microscope attached to an energy dispersive analyser).

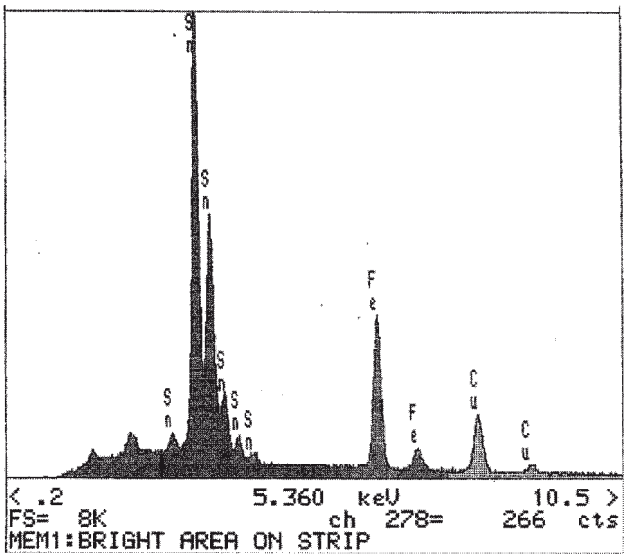
Results

Illus 9 shows an SEM-BS (scanning electron microscope backscattered) image of the section. Two areas retaining a metallic component were immediately obvious, amidst a matrix of mineralised material. The qualitative analysis (energy dispersive spectrum) of one of the two metallic remnants is shown in illus 10. It consists of tin, with smaller amounts of iron and copper, thus confirming that tinning *did* take place.

SEM-EDAX spot analyses were undertaken at various locations within the matrix and the metallic components (see Table 1). The composition of the



Illus 9 *SEM-BS image of the mounted section of the Upper Gothens buckle (bar scale 2mm).*



Illus 10 *EDS spectrum of one of the two metallic remnants showing tin as the major constituent with iron and copper as the minor ones.*

metallic components show different ratios of iron to tin (spot analyses X1-X4, Table 1). The quantity of tin ranges from a high of 92% to a low of 6% implying that 'tinning' was not evenly distributed. The presence of lead in small quantities suggests recycled pewter as the raw material. Small angular grains of tin and copper were also present within the tin –iron metallic phase (see analyses of Cu-Sn grains 1 and 2 , Table 1). It is clear that 'tinning' involved the formation of iron-tin intermetallic compounds of different composition rather than the formation of a separate layer of pure tin. The role of weathering is the creation and enhancement of these intermetallic compounds is beyond the scope of this short analytical investigation.

Discussion

Tinning of copper and bronzes for the purpose of producing a shiny surface (simulating silver) has been long practised. But tinning was also practised on iron surfaces. Jope (1956) has demonstrated on the basis of a collection of artefacts from Oxford that tinning of iron spurs was widespread among lorimers, the practice continuing over a long period from the 10th to the 17th century. It has rarely been detected on other iron objects.

Given existing archaeological evidence, it is not possible to tell whether this buckle was produced within the Upper Gothens enclosure.

The metallurgical waste

E Photos-Jones

Introduction

A sample of roughly plano-convex metallurgical slag (sample GB11/F61), possibly broken off from a larger fragment was presented for examination and analysis. The sample weighed 555g and measured 12.4cm long and 5.9cm wide. It had a dark brown exterior with a black porous interior.

Methodology

a *Sample preparation*

The sample was sectioned and sub-sampled at two places (sub-samples GB11a and GB11b). Each of the sub-samples was mounted on a metallographic resin and ground and polished with 6ìm and 3ìm diamond pastes and subsequently carbon coated for SEM-EDAX analysis.

b *Analysis*

Metallurgical slags contain a number of distinct mineralogical phases which become apparent when the sample is examined with reflecting light. Analyses are undertaken first on the entire surface of the polished block, and subsequently on each of the different mineralogical phases. Both sets of analyses are needed. The first type represents area or bulk chemical analysis and is considered to be representative of the composition of the artefact as a whole. As such it identifies the slag as a metallurgical slag of one kind or another ie ferrous versus non-ferrous. The second type is aimed at establishing the composition of each of the mineralogical phases to identify the process that generated it.

Area analysis (using SEM-EDAX) of both sub-samples (Table 2) revealed the artefact to be an iron bloomery slag. Both GB11a and GB11b are of the fayalitic type meaning an iron silicate, mildly magnetic, if at all. Dendrites of wustite, the brighter grey phase, are seen next to the darker grey long needles of fayalite. Table 2 presents the mineralogical composition of each individual phase in GB11a and GB11b, in this particular case wustite, fayalite and an interstitial glass. All three phases are formed while the slag cools from about 1050–1100°C.

Closer examination of the composition of the mineralogical phases growing within the 'glass' of GB11b revealed other phases as well, which appear to have been formed on account of the localised high concentration of particular elements.

Discussion

Iron slag in the context of a pre industrial bloomery process is broadly speaking the product of either the smelting or smithing cycle. The first encompasses all stages associated with the forming and shaping of the bloom to a workable piece of iron, the second with the shaping of the iron billet or bar to an artefact of a particular typological composition, that is a composite of iron and/or steel. Both processes generate slag which, allowing for the composition of the ore, is either of the iron oxide or the fayalitic type.

Table 1 *SEM-EDAX analyses of Upper Gothens buckle: composition in weight percent.*

N not measured
UN unnormalised

	SiO_2	SO_3	FeO	CuO	SnO	PbO	Total	UN/N
UG buckle FE-Sn spot X1	1.04	0	68.62	0.78	26.23	3.33	100	N
UG buckle Sn-FE spot X2	0.52	0	28.96	0.95	67.85	1.72	100	N
UG buckle Sn-FE spot X3	0.89	0	18.33	0.22	72.4	8.15	99.99	N
UG buckle Sn-FE spot X4	0.92	0	5.9	0	91.47	1.71	100	N
UG buckle angular Cu-Sn grain 1	0.24	0.04	1.2	38.97	58.74	0.81	100	N
UG buckle angular Cu-Sn grain 2	0.27	0.03	1.98	37.85	59.88	0	100.01	N

Table 2 *SEM-EDAX analyses of Upper Gothen slag: composition in weight percent.*

N not measured
UN unnormalised

	NaO	MgO	Al2O3	SiO2	SO3	P2O5	K2O	CaO	TiO2	MnO	FeO	BaO	Total	N/UN
GB11a area mean	*0.52*	*0.5*	*6.77*	*24.73*	*0.07*	*0.81*	*2.21*	*2.44*	*0.3*	*4.1*	*56.52*	*0.95*	*99.92*	
GB11a wustite	0.33	0.06	0.56	0.55	0	0.04	0	0.03	0.81	1.71	95.77	0.14	100	N
GB11a fayalite	0.09	1.15	0.29	28.66	0.06	0	0	0.61	0	6.23	62.82	0.08	99.99	N
GB11a halo around wustite	0.39	0.09	5.21	26.34	0.03	1.02	1.34	2.93	0.15	5.15	57	0.32	99.97	N
GB11a interstitial glass	1.29	0.09	20.21	34.85	0.34	3.04	8.15	9.36	0.18	1.65	17.63	3.19	99.98	N
GB11b area mean	*0.41*	*0.4*	*6.29*	*24.06*	*0.15*	*0.84*	*2.26*	*2.3*	*0.28*	*3.84*	*58.42*	*0.74*	*99.98*	
GB11b fayalite	0.65	1.05	0.32	28.83	0.09	0.18	0.02	0.69	0.1	5.4	62.68	0	100.01	N
GB11b interstitial glass	1.99	0	14.71	30.68	0.32	2.97	2.94	11.61	0.38	1.69	28.41	4.29	99.99	N
GB11b wustite grain in glass	0.18	0.01	6.1	11.92	0.05	0.03	4.14	0.04	0.54	1.21	75.33	0.46	100.01	N
GB11b Phosphorus rich grain	0.11	0.09	10.95	25.4	0.33	16.36	8.4	17.41	0	1.21	14.33	5.41	100	N

The sample examined here is of the smelting type on account of the variety of the mineralogical phases present, their composition which reflects the ore, and the slow rate of cooling allowing for the formation of 'halos' or intermediary phases between the main phases and the interstitial glass. The presence of barium derived from barite ($BaSO_4$) within the glassy phase suggests the exploitation of a small hematite vein deposit. Hematite deposits are relatively rare in Scotland although kidney ore of the Cumberland type is present in Muirkirk, Southern Uplands (Hall and Photos-Jones 1998) and at other localities in small veins in the South Highlands. The presence of small amounts of manganese and phosphorus may reflect mixing of this hematite with bog ore. Most Scottish iron ores are iron rich and self fluxing.

Morphologically and from the point of view of the analytical data, the GB11 sample resembles bloomery slags from Taras Farm by Forres, Inverness-shire (Will 1999; Photos-Jones 1999). These slags derived from a bowl furnace dug into the soil, consisting of a stone wall at three sides. The slag was of the non-tapping variety and quite viscous, the bloom forming below the tuyere and both bloom and slag removed at the end of the smelting cycle. Within such a construction, the slag would be accumulating at the bottom of the furnace bowl. The Forres furnace dates to around the middle of the 2nd century BC (cal BC 378–cal AD17, 2s). This type of slag is in contrast to those derived from Highland bloomery mounds (Photos-Jones et al 1998) which are of the tapping type mainly on account of their low viscosity. The high levels of manganese in association with iron oxide 'lost' in the slag contributes to them being molten and running freely out of the furnace at relatively lower temperatures. As recent excavations have shown (Photos-Jones et al 1998; Atkinson and Photos-Jones 1999), furnaces associated with the Highland bloomery mounds, rather than being bowl furnaces are actually low shafted furnaces, with only the furnace bowl lying below ground level. The Highland bloomery mounds furnaces are in their majority medieval to post-medieval in date.

The absence of any additional evidence for iron working at Upper Gothens is puzzling. The slag was a large piece which could not be moved about easily. It may be that other evidence lies within the excavated part of the site, although the truncation of the site by ploughing could have removed it.

Paleoenvironmental Samples

M Hastie

Nine samples were floated in a Siraf style tank, the floating debris being collected in a 250ìm sieve. Retent in the tank was wet-sieved through a 1mm mesh and air dried. Flot and retent were both scanned.

With the exception of small quantities of burnt bone, the samples consisted mainly of modern root/weed seeds and a low level of charred plant remains. All samples contained at least some carbonised material but in most cases this only amounted to very small quantities of wood charcoal. The sample from F53 did contain the remains of one charred cereal grain; however, it was badly preserved and further identification was not possible. The material may have been reworked.

Lithics

Some 22 pieces of struck stone (three retouched) were recovered during the excavation, some from the topsoil, some from the surrounding field and some from features. It is likely, however, that they form part of the larger scatter in the field and were incorporated by accident in features of the enclosure. The lithics will be published in the report on the wider Stirling University project.

Discussion

The site appears to comprise the very damaged and truncated remnants of an enclosure within which ironworking was being undertaken. The enclosure would have measured some 60m in diameter. The main boundary was formed by a ditch, recut at least once, which may have been backed, or replaced, by wooden fences (one in a continuous slot, the other, less certain, supported by individual posts. The sequence of construction was not clear. The cropmark suggests that different phases of enclosure may have followed different lines in other parts of the enclosure.

If contemporary with one another, the range of palisades across the middle part of the enclosure might suggest an entrance, designed to impress, to an inner enclosure. Perhaps this inner 'citadel' (measuring about 25m SW–NE by around 40m N–S) housed persons of local importance. The presence of iron-working and the tinned buckle (were it not for Dr Caldwell's reservations—above) might support the interpretation of the site as a high status settlement, perhaps an estate centre.

The wider settlement context has recently been surveyed by Foster (1996) but the excavated evidence and the cropmark record in Perthshire (RCAHMS 1994) provide no parallel for the morphology of the site. The referee of the paper has suggested that the enclosure was 'faceted' (suggestive perhaps of the style of the Anglian polygonal enclosure at Doon Hill, East Lothian) but the shape of the enclosure is not so clearly defined as to make this identification possible except in hindsight; RCAHMS (1994), for example, described it as 'curvilinear'.

There is virtually no excavated evidence from other site types in eastern Scotland with which to compare the site at Upper Gothens. Comparable dates have been obtained from excavated 'Pitcarmick-type' longhouses in an upland context (interim statements in Barrett and Downes 1994, 1995, 1997). The lowland settlement

excavated at Easter Kinnear in Fife (Driscoll 1997) was radiocarbon dated to a rather earlier part of the Early Historic period (around AD 500–700).

The vast amorphous mass of 'enclosures' known by aerial photography has scarcely been explored (Barclay 1992). The results of the excavation, while casting no light on the origins of the lithic scatter in the field, provide us with a hitherto unrecognised type of possibly high status settlement of the Early Historic period, albeit a very badly damaged example.

Acknowledgements

First, I am grateful to the Hodge family, the owners of the site, and their manager, Mr Steven for permission to work on the site and for their interest, help and advice during the project.

I am very grateful to the friends who gave up so much time to work on the excavation, in particular the members of the PSNS fieldwalking group – Ruth and Craig Brown, Robert Fyans, Irene Hallyburton, Jim Huntingford, Alan Lindsay and Paul Smith, as well as Catriona Graham, Kenneth Brophy and John Cruise.

My thanks to Sally Foster for reading and commenting on the text.

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Abstract

An irregular cropmark enclosure was partly excavated. The enclosure was formed by a ditch (recut at least once) backed, or replaced, by one, possibly two timber fences. The interior of the enclosure seems to have been divided in two by a series of palisades, intended perhaps to form an impressive entrance to an 'inner citadel'. Smelting slag was recovered, as was a tinned iron buckle. Radiocarbon dates place activity on the site to around AD 885–1024 and to AD 1040–1259.

Keywords

cropmark enclosure
Early Historic
early medieval
estate centre;
lithic scatter
metalworking

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