SOUTH HOOK, LIQUID NATURAL GAS

ARCHAEOLOGICAL POST EXCAVATION RESEARCH DESIGN

Prepared by Cambria Archaeology
For RPS

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GORFFENAF 2007
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MILFORD HAVEN PEMBROKESHIRE
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Yn unol â'n nôd i roddi gwasanaeth o ansawdd uchel, croesawn unrhyw sylwadau sydd gennych ar gynnwys neu strwythur yr adroddiad hwn

As part of our desire to provide a quality service we would welcome any comments you may have on the content or presentation of this report

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General view of archaeological site as finally extended with development area and Milford Haven waterway in background. View South.

ARCHAEOLOGICAL INVESTIGATIONS SOUTH HOOK LIQUID NATURAL GAS DEVELOPMENT, LOCATED NEAR MILFORD HAVEN, PEMBROKESHIRE

SUMMARY

Excavation in advance of the development of the Exxon Mobil Liquid Natural Gas installation, at the former Esso Refinery near Herbranston, Pembrokeshire, revealed possible prehistoric settlement and a very significant early medieval ('Dark Age') metalworking site. This later activity consisted of a number of separate working areas, one of which contained a pair of iron smelting furnaces. At least four simple corn-drying ovens of the same period were also found along with associated grain deposits. This report gives preliminary results and outlines potential for further analysis and reporting.

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INTRODUCTION

Location

The former Esso refinery site at Herbranston lies on the northern side of the Milford Haven waterway, 3km to the west of the town of Milford Haven (Fig. 1). The site of the evaluation and eventual excavation was on the northern edge of the old refinery in the only area that had had light or little previous disturbance (NGR SM 8722506750). It was in a location that in the past would have had a commanding view of the entrance to the Haven waterway. Just below the excavated area there was a convenient spring. Both of these aspects have been affected by the construction of the former refinery. Further to the south, at Herbranston Pill, and west, at Sandy Haven, are tidal inlets providing sheltered anchorages.

Hard standing and roads of the former refinery together with substantial earthworks, mostly massive terraces and the remains of bunds, were still in existence during the evaluation, but many were removed during the excavation period as construction of a Liquid National Gas (LNG) terminal, storage and distribution facility progressed, one of the largest engineering projects taking place in the country at the time.

METHODOLOGY

Evaluation trenches

Seven evaluation trenches, 20m long by 2.75m wide were dug. These were excavated, in late November and into early December 2004, with a team of two, using a 30 ton 360º tracked digger using a 2.75m wide toothless bucket. The weather was reasonable to start with but became very wet towards the end of the evaluation.

Excavation. Expansion

Archaeological features were found in one of the evaluation trenches. This trench was expanded into a small area excavation, some 10m by 10m (the area of

Complex 8, Fig 2). This was started in late February 2005 utilising the same type of machine as in the evaluation, and which was also used in all subsequent extensions. The site was initially enlarged by 5m to the north (enclosing complex 7), then extended a further 10m north and 7.5m west (enclosing complex 6). A massive expansion of the excavation area took place in May uncovering all of the threatened and available area north and west of complex 9. The areas east of complex 9 were stripped in late June.

The topsoil stripping was done gradually in spits of 100mm or less to the top of the subsoil. However, in areas where archaeological features were encountered the area was machined to levels above the subsoil and then reduced by hand. In areas where no features were observed and the varied nature of the subsoil was likely to give poor definition, the top of the subsoil was further machine-reduced. No significant features were found in these instances.

Initially a team of three to four archaeologists was required, dropping to two in the early stage of excavation and then steadily increasing to a maximum of twelve before reducing slightly in number towards the latter part of the excavation. Fieldwork was completed on 1st July 2005. The weather was variable, with ground conditions generally too dry for excavation. The site had to be damped down. However, there were intermittent periods of heavy rain; this often filled all dug features to the brim, and slowed excavation of their silty clay fills. Just over one day was lost due to very bad weather, but poor conditions and removing water from the sites slowed progress on a number of occasions.

An additional watching brief was undertaken in the middle of the LNG site. Here a valley, which contained the stream (the Little Hook Pill) running from the spring close to the excavation, led down to a tidal inlet to the south. Considerable peat deposits with a thick dividing layer of silty clay were encountered overfilling an earlier streambed. A large cross-section of these was drawn and specialists from Lampeter University were called in to take palaeoenvironmental samples. A fragment of wood obtained from the base of the former streambed was radiocarbon dated to the Bronze Age. Subsequently this area was machine stripped under archaeological supervision. A few flint flakes were recovered from below a layer of marine clay and adjacent to wood within the base of the streambed. A wood specialist was called in, again from Lampeter University, to take samples. Lampeter University personnel will report this part of the site separately.

A small part of the development above the foreshore was also subjected to a limited watching brief. Here there was either modern disturbance or shale subsoil.

The discovery of a stone axe was reported in October 2006 in the middle of the development to the west of new storage tanks (grid ref SM8737706299). Consequently a site visit was made. The axe appeared to be a Neolithic polished stone axe, probably of Rhyolite from the Preseli area of Pembrokeshire, and similar to one found at the axe factory at Glandy Cross (Richard Ramsey pers comm.). Identification is to be confirmed. The axe was found on soil from a recently dug trench. This trench was inspected as well as adjacent groundworks but only natural subsoil or modern disturbances were apparent. It was concluded that a further watching brief on this area was unlikely to be productive.

RESULTS

The excavation uncovered a number of distinct groups of features, referred to as complexes (Fig. 2). Complex 6 has prehistoric and early medieval features and there is also likely to be some overlapping of elements in complexes 7 and 8, although spatially they do appear to be respecting one another.

Evaluation
Only in the final trench was anything of significance found. This consisted of a small area of tightly packed flat-stones with a lot of charcoal flecked soil above. There was no indication of how old this feature was other than two flints and a post medieval feature above it. Charcoal samples from above the stones and an adjacent feature were taken for radiocarbon dating. It was decided that no further excavation would take place until these dates had been obtained.
The dates returned were: for the adjacent feature cal AD 650 to 780 at 95% probability (Beta-198851) and for the layer or fill above the flat stones cal AD 810 to 840 and Cal AD 860 to 1180 at 95% probability (Beta-198850).

Excavation
Prehistoric (provisional):
Complex 6
Only one feature, a shallow pit to at the north end of complex 6, which contained about a third of 'domestic' Beaker or urn in the Food Vessel tradition (2500-1700BC), can securely be dated to the prehistoric period. It would appear to be the remains of a cooking pot and cooking pit rather than a funerary deposit.

Complex 10
This contained the characteristic elements of a prehistoric roundhouse, probably heavily truncated by ploughing and recent industrial activity. The main features of this complex were very large postholes with substantial packing and a worn area that could be the remains of an entrance. A shallow pit just to the north east of complex 10 produced fragments of a jet disk with two small piercings. The jet object is considered likely to be of Bronze Age date (See Jet report below).

Complex 14
Three similar pits with rounded bottoms could be prehistoric given that two of these contained hazelnut shells (often a Neolithic attribute). One of these pits also contained a few flints and fragments of worked stone. The worked stone may be part of a rotary quern and therefore would indicate a later prehistoric date, or possibly even later.

Over 340 flints were recovered during the excavation, consisting mainly of flakes and cores discarded during manufacture of tools. The source of these flakes was probably beach pebbles; they were not of the highest quality. A large number of these flints are probably residual, but early medieval flint tools are not unknown (pers. comm. Dr Alan Lane).

Early Medieval (provisional):
Complex 1 (figure 3)
This complex consisted of a large sub-rectangular hollow, 10m long by 4m wide aligned roughly north-south. There were two parts to the hollow – a deeper southern part, dug approximately 1m deep into geological deposits, and a shallower northern part, approximately 0.3m deep. Leading into the southern part of the hollow was a gully, possibly a worn entranceway. At the northern end of this gully there were the remains of some stone steps. There was a posthole on either side of the steps and at least three postholes on the central line, indicating a probable roofed building with a north-south ridge. A number of other smaller postholes existed with more in the northern part, but no distinct pattern or function was obvious on excavation.

In the northern part of the hollow there were two iron furnaces. These furnaces appeared to be part of the original layout of the hollow and designed as a pair.

The eastern furnace was less well preserved with only the northern edge of the furnace and some of the base *in situ* and with the gully to run off the furnace running to the south. A charcoal sample from the bottom of this returned a radiocarbon determination of Cal AD 770 to 1000 at 95% probability (Beta-222371). The other furnace retained its bowl including slag where the molten iron was run off. A later pit cut the southern part of the run-off gully. Within the southern part of the hollow and just by the entrance there were pits of unknown function, not heat affected and containing little charcoal in their fills.

Around much of the edge of the hollow were deposits of heat-affected material. There was no evidence for any wall around the hollow, and it is likely that the sides of this building were left open for light and ventilation. A dwarf wall of wattle or turf cannot be ruled out and would seem logical to support the eaves of the roof. There was no evidence of any demolition and the hollows appeared to have naturally silted up after the building was abandoned.

Complex 2
This was not a complex as such, but a single shallow sub-linear gully. It contained neither dating evidence nor charcoal. Possibly significant is that it appeared to align with complex 5. However it is unlikely that a definitive function of this feature can be ascertained.

Complex 3
This complex consisted of a probable truncated corn drier or hearth. Charred plant remains of wheat, oat and barley, which would support the corn drier interpretation, were recovered from its fill. Adjacent to this was one very substantial posthole and three possible much smaller postholes.

Complex 4
This appeared to be a working hollow with remains of pebble flooring. Postholes would suggest it was a roofed structure and it may have had other internal features. Within the upper fills there were a number of large stones, including a broken quern stone. They could have been used as anvils or work "tables". There were a few stone tools and some iron slag, indicating that it was probably contemporary with the other early medieval features on the site. The fill of this feature had post-medieval disturbance of its upper part and was also cut away completely on its northeastern side by a *c.* 1960s refinery feature.

Complex 5
Similarly aligned linear hollow and approximately similar dimensions to complex 2. However, this feature had deliberately laid stones with associated postholes. No dating evidence or evidence of any iron slag.

Complex 6
This complex consisted of a central hollow probably utilising a softer fault in the natural subsoil. Within it were the remains of a roughly "L"-shaped stone structure. The upper silty fill contained a few slag fragments. Surrounding all but the south side of this central feature were apparent re-deposited patches of heat-affected material. There were also shallow pits in the north and south side which were heat-affected. Along the western side of this complex there was a curved line of small postholes with very regular spacing. There were some postholes along the eastern side but these were neither regularly spaced nor with such an obvious alignment. It is therefore probable that this was a roofed structure. A large fragment of charcoal from the upper fill of the central hollow gave a radiocarbon determination of Cal AD 720 to 740 and Cal AD 760 to 960 at 95% probability (Beta-222369). There is sufficient charcoal to obtain a radiocarbon

date or dates from the later fills of this complex, but it is likely that the slag derives from Complex 1, as may the charcoal.

As mentioned above (Prehistoric Provisional Complex 6), a pit at the northern end of this complex was prehistoric and it is possible that some other features in this area could also be of the same date.

Complex 7
This complex consisted of three linear pits. The western pit was aligned approximately north - south. This pit exploited a softer geological band that was evidently easier to dig than the shale to either side. The other two pits were on a more east - west alignment and probably not contemporary with each other, at least in their final phases. However, the westernmost of these two pits had two or three phases and it is possible that its earlier phase could be contemporary with the easternmost pit. Both of these pits were surrounded by and contained quantities of burnt grain, mostly barley. A sample of this gave a radiocarbon determination of Cal AD 680 to 880 at 95% probability (Beta-222370). Near this grain there was a deposit of calcified bone was recovered. There were a large number of postholes in the area around all three pits, and it appeared likely that at least some of these are associated with the pits, indicating a structural element.

It is likely that all three pits are corn driers, given the associated carbonised grain; there is a similarity with early medieval corn driers found at Waterston, 6Km to the west (Crane 2004) and they are almost identical to those found near Welshpool Powys (Blockley K and Tavener 2002). Samples of the grain have been sent for identification and radiocarbon dating. Fragments of slag and fuel ash were only found in the upper silty fills of these features. This may indicate that these corn driers are slightly earlier than the iron working. However, this complex appears to have some spatial relationship with Complex 8 that may well be associated with iron working.

Complex 8
This consisted of a large hollow or several adjoining pits that took advantage of a soft geological strata. Part of the hollow had been surfaced with lager flat stones, as encountered in the archaeological evaluation. A very large hammer stone was found associated with these flat stones and it would appear that they are part of a work floor. A few other flat stones around the location may be anvil stones. Adjacent to these stones was a spread of charcoal, possibly a fuel store or cleaned out ash. A sample of this was taken in the evaluation and radiocarbon dated to cal AD 650 to 780 at 95% probability (Beta-198851). However, charcoal from a fill above the large flat stones produced a later date, cal AD 810 to 840 and Cal AD 860 to 1180 at 95% probability (Beta-198850). A few fragments of slag or fuel ash were found in the upper fills of this hollow but no absolute evidence for iron working and none for high temperature activity. A fragment of modern glass was also recovered so there would appear to be some recent disturbance that was not recognised during excavation. However, it could have been brought onto the excavation via a muddy boot from back fill on the adjacent pipe trench.

A pair of substantial postholes and other, probably associated, postholes may well indicate that this complex was roofed and with some type of surrounding structure. Other postholes are probably internal features. A fence or lightweight wall line or lines was represented by shallow narrow gullies, running south from the hollow. It is possible that these gullies were the bases for windbreaks on either side of a worn entrance.

Complex 9
There were two elements to this area – a small hearth or furnace, and an uneven linear hollow mostly filled with a structure of stones on two levels. This structure could be the base of a wall but is more likely to be the remains of a narrow working floor. A quern stone had been reused in the structure. It is unlikely that there is any charcoal from the hollow under this structure for radiocarbon dating, but there should be enough from the hearth. However, there is no guarantee that these two elements are contemporary.

Complex 11
This again appeared to be a worn or dug linear hollow utilising softer geological strata. Within this hollow there was a linear floor of large flat stones, incorporating one large quern stone. The southern end of these stones showed considerable signs of heat. There was a considerable amount of disturbance at this location, the area being cut by a modern drainage ditch, a modern roadside ditch and an electricity trench. On the western side of the complex was a thin curved gully similar in slight curvature to the line of postholes on the west side of complex 6. This thin gully had at least one small posthole and is probably the bottom of a fence or small wall line. There were slight traces of a similar possible gully on the eastern side but this had been heavily truncated. There were a few small postholes within this complex but these were unlikely to have been for roof supports. There were a few fragments of iron slag in the upper silting of this complex, deposited after it had gone out of use.

Complex 12
This was an irregular hollow, the southern end of which had been cut by a roadside ditch and crossed by an electricity trench. Within the hollow there were a few flat stones, closely placed together. There were also a few medium sized postholes around the edge, which could have supported a roof.

Complex 13
This appeared to be similar to complex 12, but with a lot more postholes. There was a fragment of slag in the upper fill, presumably deposited after it had fallen out of use. A sample of charcoal from the upper fill gave a radiocarbon determination of Cal AD 720 to 740 and Cal AD 760 to 960 at 95% probability (Beta-22368).

FINDS

Flints (Elizabeth Walker)
A complete list of the 343 flints has been made. They are an interesting group with a large later Mesolithic component to the assemblage as well as a scatter of Neolithic pieces as well. A fuller report will be submitted after review but it is unlikely that any will need illustrating.

Worked Stone (Mark Redknap)
The worked stone from the Esso site merits publication with either photographs, or where indicated, line drawings (see report in appendices). A range of different functions can be identified within the site assemblage. Correlating stones with known or likely phases of activity is desirable before the report is completed.

The quernstones appear to be broadly contemporary in stylistic terms with the early medieval radiocarbon dates that have been obtained from features such as the iron 'furnace' and corn driers. The activities implied by both corn driers and quernstones requires further consideration. Some of the quernstones are similar in form (but not geology) to those excavated at Dinas Powys (near Cardiff), Newton, Waterston (Milford Haven) and Llanbedrgoch (Isle of Anglesey), the

latter site also having numerous early medieval radiocarbon dates. Honestones are difficult to date, but similar to examples from early medieval sites such as Hen Gastell near Swansea.

Some utilised stone may be contemporary with earlier activity, such as that associated with the Bronze Age pit (Complex 6).

Bronze Age Pottery (Jody Deacon)
There is only one vessel from (793), possibly of 'domestic' Beaker or Food Vessel tradition (2500-1700 BC). At most, about a quarter of the pot is present, hopefully enough to get a good idea of the profile for illustration but probably not worth a full reconstruction. Two further unstratified sherds may be from the same vessel.

Romano British Pottery (Jody Deacon)
There are two sherds of diagnostic Roman pottery, one of which is a rim sherd and might be worth illustrating.

Jet (Jody Deacon)
There is a jet button or pendant probably of Early Bronze Age date that will require conservation before it can be properly identified and illustrated- it is in the laboratory for stabilisation at the moment.

Bone (Jody Deacon and Ros Coard)
There are two large bags of calcified bone from context (606) found just on the edge of a corn drier in complex 7. An initial examination by Dr Ros Coard, Lampeter University, indicates that it appears to be all animal, probably including pig.

Iron Slags and Archaeometallurgical Residues (Tim Young)
The submitted assemblage contained two main groups of residues.

Residues from iron-making dominate the collection and are represented by 53.1 kg out of the total of 60.6kg submitted material. Of this material 40.1kg was from Complex 1 and 10.4kg from Complex 4. The material from these two areas was almost identical in character, with approximately 60% by weight smelting slags, 8% smithing slags and 28% slags not attributable to either class with certainty, together with 2-6% furnace lining. A further 2.5kg of iron-making residues occurred in other complexes and as unstratified material. The smelting slags are indicative of use of a small slag-tapping furnace, probably producing a rather small volume of tapped slag per smelt. Smithing slags are apparently dominated by smithing hearth cakes with weights of between 750 and 1440g. These are fairly large, and are probably indicative of bloomsmithing being undertaken. The ore source is not immediately obvious: the tapped flows do not appear to carry unreacted ores, as is sometimes the case. The site has yielded rocks from two potential iron sources: weathered iron-rich concretions probably derived from the drift, but of Carboniferous origin and a block of mottled bog ore.

The second group of residues includes highly vesicular, friable, low density, green lining or fuel-ash dominated slags. These are most abundant within Complex 7, where they were recovered in significant quantities (1.1kg) in association with corn driers, and are therefore interpreted as being of non-metallurgical origin.

ENVIRONMENTAL
Charred Plant Remains (Wendy Carruthers)
The dried flots of 99 samples were assessed, along with 5 hand picked samples of hazelnut shell, several hand picked charcoal samples and 4 unsieved soil

samples. These were divided into four categories (A high, D low) on potential on archaeobotanical merit. See assessment report in Appendices

It is recommended that all of the grade A and B samples be fully analysed (= 23 samples) (see appendices). The selection of samples from important features in the B/C category is left to the discretion of the project manager. Any extra soil available from the samples producing bread-type wheat, possible rye and hulled wheat should be processed and the flots analysed (see table).

Charcoal (Dana Challinor)
The charcoal from the site was generally abundant and well preserved, although in some instances, pieces were encrusted with sediment, making certain anatomical characteristics difficult to see. It was apparent from the assessment that a limited range of woods were utilised for fuel. It is recommended that some analysis be carried out on the charcoal for inclusion in the final publication. This will examine: context-related variation; specifically the use of fuels for metalworking and domestic activities and also any evidence for woodland management and availability of local resources.

RADIOCARBON DATES
So far six samples have been sent for dating. Five samples were charcoal, with the other (sample No 318) charred grain. The complexes found on the site appeared to respect one another so it is likely that they are near contemporary. At 95% probability, 2 sigma range, there is an overlap of dates except for samples 303 and 304 and even here there is only a 30 year gap between them (Table below). The mean of all 6 dates is AD 727-886. However, it must be born in mind that the samples may not come from contemporary deposits.

Lab No	Results BP	Intercept	Calibrated range at 1 sigma	Calibrated range at 2 sigma	Complex No/ Sample No/ Context No
Beta-198850	1080 ± 80 BP	AD 1000	AD 910-920 and AD 960-1030	AD 810-840 and AD 860-1180	8/303/104
Beta-198851	1320 ± 40 BP	AD 680	AD 660-710	AD 650-780	8/304/200
Beta-222368	1190 ± 40 BP	AD 870	AD 780-890	AD 720-740 and AD 780 to 960	13/347/1143
Beta-222369	1190 ± 40 BP	AD 870	AD 780-890	AD 720-740 and AD 780-960	6/313/543
Beta-222370	1250 ± 40 BP	AD 770	AD 700-790	AD 680-880	7/318/584
Beta-222371	1150 ± 50 BP	AD 890	AD 810-840 and AD 860-970	AD 770-1000	1/349/1082
Average	1215 ± 18 BP	AD 846	AD 777-864	AD 727- 886	

DISCUSSION, POTENTIAL, PUBLICATION AND COSTS

Prehistoric
This is considered to be a minor part of this project, but of some importance. This information will be included in summary in the main report.

Within the main area excavated there was only one definite prehistoric feature, containing the truncated remains of a prehistoric pot. This pot warrants some reconstruction, drawing and a specialist report. The National Museum of Wales will be able to undertake a specialist report free of charge and any reconstruction. However, any illustration needed will have to be undertaken by Cambria Archaeology.

Pre-dating the Bronze Age pot there is a "background" of Mesolithic and Neolithic activity as demonstrated by the number of flints recovered, along with one Neolithic axe recovered by the contractors in the middle of the development. It is also possible that Complex 10, a roundhouse, and Complex 14, consisting of three pits, may prove to be prehistoric. These two complexes only contained small amounts of charcoal and, if these are to be radiocarbon dated, then the more expensive Accelerator Mass Spectrometry (AMS) analysis will be needed.

Early Medieval
The iron making assemblage is of the greatest significance owing to the lack of evidence for iron smelting of 8-10th century age in Wales and the paucity of evidence in SW Britain in general. The large number of sites now known from this period in SE Ireland are distinguished by the use of a an entirely different, non-slag tapping furnace type. Therefore it would appear that this site is a unique discovery, at least for western Britain in this period. For that reason it is important to undertake full meterlurgical analysis, as recommended by Tim Young (see appendices). The types of wood used for fuel will also be gained from further analysis of the charcoal associated with these features.

Each early medieval complex will need a description and illustrations. Two of the complexes (6 and 11) indicate that they had at least one bow-sided structure. Bow sided buildings have traditionally been seen as indicating Viking activity. However, this style is also recorded in post-medieval buildings at Wroxeter (pers com Charles Hill). Almost nothing is known of native building styles in West Wales at this period. Some research will be necessary to see if this fashion of building exists elsewhere in the archaeological record. Therefore it will be necessary to research parallels that could be in British, Irish, or even Scandinavian sources.

The next most important aspect of the site is the charred plant remains, calcified animal bone and charcoal associated with the probable corn driers.

Further Radiocarbon dating requirements (probably all AMS due to small sample sizes but may able to undertake standard analysis on examination of some samples):

Complex 1: from other furnace check sample 1908 from 1071 (west furnace)
Complex 1: from sunken hollow? If material available.
Complex 2 Probably un-datable
Complex 3 Possibly enough
Complex 4 Possibly enough
Complex 5 Probably un-datable
Complex 6 Probably datable
Complex 7 (corn drier) is this worth another date as we have dated grain alongside
Complex 8 Two dates already obtained. Probably no more required
Complex 9 Probably datable
Complex 10 Possibly datable charred grain only
Complex 11 Probably datable
Complex 12 probably undatable
Complex 13 Possibly datable charred grain only
Complex 14 Probably datable charred hazel nut shells
? Pit 1184 (Possible fence line) pit also contained fragment of quernstone and hammer stone (Sample 373)
Cremated bone (606)?

Publication
It is not envisaged that a full stage 3 post-excavation report will be produced as the archive is comprehensive and easily interrogated. Long specialists reports with appendices will remain in the archive. A stage 4 publication will be produced. This is outlined below.

The prehistoric material would not appear to be out of the ordinary and therefore will be covered in summary terms in the main report. The early medieval evidence would appear to be of far more significance. Therefore it is recommended that a long note on the early medieval evidence should go into Medieval Archaeology (free), as it will have an international readership, with the main report in Archaeologia Cambrensis (c. £30 per page).

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APPENDIX 1: PUBLICATION SYNOPSIS
Excavations on the former Esso Site now South Hook Liquid National Gas Terminal on Milford Haven Pembrokeshire

By Pete Crane and Ken Murphy

With contributions by
Tim Young
Wendy Carruthers

SUMMARY

INTRODUCTION
The site and its landscape and history, background to the excavations, objectives and methodology
Figure - location map
Figure - location of excavation

RESULTS
Figure - overall plan of excavations
Photo - general photo of site

Prehistoric remains
Summary of findings with references to descriptions and plans of Complexes 6, 10 and 14 below.

Early Medieval
Complex 1
Descriptive text + interpretation
Figure - plan of complex
Figure - detailed plans
Figure - profiles/sections
Photo - detailed photo
Photo - detailed photo

Complex 2
Descriptive text + interpretation
Figure - plan of complex
Photo - detailed photo

Complex 3
Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo

Complex 4
Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo
Photo - detailed photo

Complex 5
Descriptive text + interpretation
Figure - plan of complex

Figure - profiles/sections

Complex 6

Descriptive text + interpretation - refer to prehistoric section
Figure - plan of complex
Figure - detailed plans
Figure - profiles/sections
Photo - detailed photo
Photo - detailed photo

Complex 7

Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo
Photo - detailed photo

Complex 8

Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo

Complex 9

Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo

Complex 10

Descriptive text + interpretation - refer to prehistoric section
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo

Complex 11

Descriptive text + interpretation
Figure - plan of complex
Figure - profiles/sections
Photo - detailed photo

Complex 12

Descriptive text + interpretation
Figure - plan of complex
Photo - detailed photo

Complex 13

Descriptive text + interpretation
Figure - plan of complex
Photo - detailed photo

Complex 14

Descriptive text + interpretation - refer to prehistoric section
Figure - plan of complex
Photo - detailed photo

SPECIALIST REPORTS
Flints by Elizabeth Walker
Short summary report

Worked Stone by Mark Redknap
Short report and catalogue
Up to 20 drawings for publication (conflated into one or two illustrations)

Bronze Age pottery and jet object by Jody Deacon
Short descriptive text
2 drawings

Romano British pottery by Jody Deacon
Short descriptive text

Bone by Ros Coard
Short descriptive text

Iron slags and archaeometallurgical residues by Tim Young
Descriptive text and tables

Charred plant remains by Wendy Carruthers
Descriptive text and table

Charcoal by Dana Challinor
Short descriptive text

Radiocarbon dates
Table

DISCUSSION
Particularly concerning similarities or otherwise to sites in Wales, Western England and Southern Ireland, also if here is any similar evidence from Scandinavia

ACKNOWLEDGEMENTS

REFERENCES

(Estimate total length 15000 words, 29 plans/sections, 18 photos, c.22 finds drawings)

APPENDIX 2: TASK LIST

Performance indicators are based on given approval by 09/2008

Task No	Description	Personnel	Days
1	Enhancement of Excavation Archive	P Crane	20
2	Further Analysis of contextual information	P Crane	10
3	Updating Site interpretation	P Crane	10
4	Co-ordination of specialists	P Crane	5
5	Co ordinate collection and send further C14 samples	P Crane	3

12/2008 Performance indicator –completion of contextual analysis

Task No	Description	Personnel	Days
6	Reconstruction of BA Pot	P Parkes	
7	Report on BA Pot	J Deacon	
8	Metallurgical Report	T Young	
9	Charred Plant Report	W Carruthers	
10	Charcoal Report	N Challinor	
11	Worked stone and quern stone report	M Redknap	

3/2009 Performance indicator –completion of specialist reports

Task No	Description	Personnel	Days
12	Library research	P Crane	5
13	Preparation of drawing roughs	P Crane DH Wilson	5 5
14	Preparation of first draft of report	P Crane K Murphy	15 15
	Preparation of site drawings	DH Wilson	30
	Preparation of finds drawings	H Milne	15
	Preparation of report photographs	P Crane	2
	Editing of first draft	K Murphy	5
	Amendments to first draft	P Crane	3

5/2009 Performance indicator completion of second draft of final report

Task No	Description	Personnel	Days
	Proof reading and publication	P Crane K Murphy	2 5
	Preparation of research archive	P Crane	4
	Arrangements for copying and final deposition of archive and finds	P Crane	4

12/2009 Performance indicator completion for publication and archive deposited

APPENDIX 3: COSTS

FORMER ESSO REFINERY - POST EX-CAVATION COSTS

Task List & Costs

Performance indicators are based on approval given by September 2007

Task No.	Description	Salary Costs			On-Costs	TOTAL COSTS
		Personnel	Days	Cost		
1	Enhancement of Excavation Archive	P Crane	20	4200	-	4200
2	Further analysis of contextual information	P Crane	10	2100	-	2100
3	Updating site interpretation	P Crane	10	2100	-	2100
4	Co-ordination of specialists	P Crane	5	1050	-	1050
5	Co-ordinate collection & send further C14 samples	P Crane	3	630	-	630
	December 2008 - Performance indicator: completion of contextual analysis					
6	Cleaning, conservation & reconstruction of BA pot sherds at Cardiff Laboratory	P Parkes	-	N/A	722	722
7	Report on BA pot	J Deacon	-	N/A	no charge	
8	Iron Slags & Archaeometallurgical Residues	T Young	-	N/A	4416	4416
9	Charred plant remains report	W Carruthers	-	N/A	2700	2700
10	Charcoal report	N Challinor	-	N/A	1288	1288
11	Worked stone and quern stone report	M Redknap	-	N/A	no charge	
	Calcified animal bone report	R Coard	-	N/A	480	480
	Radiocarbon dating - <13 dates probably all AMS		-	N/A	4774	4774
	March 2009 - Performance indicator: completion of specialist reports					
12	Library research	P Crane	5	1050	-	1050

13	Preparation of drawing roughs	P Crane	5	1050	-	1050
		DH Wilson	5	800	-	800
14	Preparation of report	P Crane	15	3150	-	3150
		K Murphy	15	4500	-	4500
	Preparation of site drawings	DH Wilson	30	4800	-	4800
	Preparation of finds drawings	H Milne	15	2400	-	2400
	Preparation of report photographs	P Crane	2	420	-	420
	Editing of first draft	K Murphy	5	1500	-	1500
	Amendments to first draft	P Crane	3	630	-	630
	May 2009 - Performance indicator: completion of second draft of final report					
Task No.	**Description**	**Salary Costs**			**On-Costs**	**TOTAL COSTS**
		Personnel	**Days**	**Cost**		
15	Proof reading and publication	P Crane	2	420	-	420
		K Murphy	5	1500		1500
	Preparation of research of research archive	P Crane	4	840	-	840
	Arrangements for copying and final deposition of archive & finds	P Crane	4	840	-	840
	Other Costs:-					
	Travel			500		500
	Publication Costs			1200		1200
COSTS ON 2007-8 RATES:			188	***35680***	***14380***	***50060***
3% INCREASE FOR 2008-9				***1070***	***431***	***1501***
TOTAL COST				**36750**	**14811**	**51561**

APPENDIX 4: FLINTS
Preliminary Assessment of the Lithic Artefacts
Elizabeth A. Walker, Amgueddfa-Cymru – National Museum Wales

8 no context number from next to timbers below 'marine clay'
4 Natural flints and stone

Later Mesolithic flint blade core. With a single platform struck on a water-rolled
flint pebble of brown chalk flint. The core has been worked from one face.
length = 27.5mm; width = 26.2mm; thickness = 14.1mm; weight = 11.7g

102 7 Prehistoric flint flake fragment. The flake is developing a white patination.

Prehistoric flint blade developing a white patination.

104 Mesolithic flint end-scraper. Pale grey unpatinated flint struck on a heavily white patinated and cortical flint. The scraper edge is steep and marginal on the proximal end of the blade. The distal end has also had one removal struck from it.
Length = 26.7mm; width = 17.9mm; thickness = 9.0mm; weight = 4.6g

Prehistoric flint flake. Cortical primary flake of pale grey flint.

Prehistoric flint flake. Pale grey flint struck on a white patinated piece of flint.

Prehistoric flint flake fragment. The piece has a white patination.

105 Natural flint

Prehistoric miscellaneous retouched flint flake fragment. Marginal retouch in two places, some on the dorsal and some on the ventral faces. Made of pale grey flint.
Length = 16.1mm; width = 15.0mm; thickness = 3.2mm; weight = 0.7g

Prehistoric flint flake. The piece has a white patination.

Prehistoric burnt flint flake fragment. This is a thick flake with cortex along one length. It has been in a hot fire as it has shattered and has fire cracking on its surface.

Neolithic / Bronze Age flint knife fragment. The retouch shows that this is made on pale grey flint and that the retouch has been placed through an earlier heavy white patination. The retouch runs along both lengths of the blade on which the knife is made. There is a break contemporary with the retouch at the distal end of the blade. The retouch is irregular and marginal.
Length = 34.0mm; width = 22.7mm; thickness = 6.5mm; weight = 4.9g

Flint blade possibly Mesolithic. The blade has a yellowish patination.

Prehistoric burnt flint blade fragment. Recent damage through the patination shows that the flint is pale grey in colour. The blade has broken parallel to the striking platform. The proximal end survives.

Prehistoric flint blade fragment. Proximal end with a heavy white patination.

Prehistoric flint core. Multi-directional core made on a piece with an earlier white patination. The flint is pale grey in colour and has removals struck from all directions.
Weight = 22.2g

Prehistoric flint blade fragment. Proximal end of blade with a snap across the centre of the blade. The piece is made of pale grey unpatinated flint.

Natural piece of pink quartz.

105 taking down N-S baulk mixed context
Prehistoric flint spall. Pale grey unpatinated flint.

Prehistoric piece of general flint knapping debitage. Pale grey unpatinated flint.

2 pieces of Prehistoric general flint knapping debitage. Black unpatinated flint, one with traces of original cortical pebble surface.

Natural flint yellow gravel stained.

106 Later Mesolithic flint blade core with a single platform. Made on a water rolled pebble of pale grey flint.
Length = 35.2mm; width = 38.5mm; thickness = 22.7mm; weight = 38.8g

Prehistoric flint pebble core. Has a single removal struck from the core. Made of black flint on a water rolled pebble.
Length = 35.2mm; width = 34.4mm; thickness = 24.1mm; weight = 39.0g

Later Mesolithic denticulated flint scraper. This is slightly irregular in shape, but has three clear denticulations which are made through an earlier developing patination. The retouch is marginal and has been prepared opposite a remaining cortical edge.
Length = 16.4mm; width = 33.1mm; thickness = 11.6mm; weight = 5.8g

Prehistoric flint blade fragment. Distal end with a heavy white patina.

Prehistoric flint flake. Cortical primary flake. Black flint unpatinated.

Prehistoric flint flake. Some cortex surviving. Brown flint, unpatinated.

Prehistoric flint flake. Thick flake struck from a facetted striking platform. There is cortex around the edges of the flake and it has a heavy white patination.

Burnt prehistoric flint flake fragment. Striking platform survives. The piece has some crazing indicating it has been in a fire.

Prehistoric flint flake fragment. Made on a creamy white piece of flint. The piece has traces of cortex on its dorsal surface and some recent damage to the ventral face.

Two pieces of general Prehistoric flint knapping debitage. One is a cortical piece of a water rolled pebble of pale grey flint. The other is a small burnt piece with a heavily crazed surface.

107 Mesolithic flint truncated blade. A thick blade with a plain striking platform with marginal retouch at the distal end made on creamy white unpatinated flint.
Length = 33.8mm; width = 15.0mm; thickness = 6.9mm; weight = 3.9g

Prehistoric flint utilized flake. The flake itself appears to be a thermally fractured piece from which there are some removals on the dorsal face and evidence for irregular, marginal utilization scars along one edge. This edge is opposite a cortical edge. The flint is grey and unpatinated.
Length = 25.5mm; width = 25.7mm; thickness = 8.4mm; weight = 5.8g

Two Prehistoric flint blade fragments both show recent damage and whilst they do not refit are both part of the same blade, the mid-section being missing. One piece is the proximal end, the other a mid section, both show evidence of recent damage which is through a white patina. The original flint colour was pale grey.

Prehistoric flint flake fragment. Irregular fragment of brown flint. Some traces of cortex survive on the dorsal surface.

108 Post Med. Ditch fill
Mesolithic / Neolithic flint écaillé core. Core made on a split water rolled pebble of unpatinated black flint. Two blades have been struck from this.
Length = 10.6mm; width = 27.8mm; thickness = 12.8mm; weight = 17.8g

Mesolithic flint blade core. The core is exhausted having had removals all the way around leaving the small central core. The core is unpatinated of pale grey flint.
Length = 36.5mm; width = 15.3mm; thickness = 18.7mm; weight = 9.5g

Natural flint pebble.

110 Neolithic flint fabricator tip fragment. The end has evidence for use at the tip which has become quite rounded in shape. Some retouch along one of the lengths has helped to form the implement. Made of unpatinated pale grey flint.
Length = 16.1mm; width = 14.2mm; thickness = 6.5mm; weight = 1.5g

Prehistoric flint flake. Pale grey unpatinated flint with traces of cortex on one edge.

Two Prehistoric flint bladelet fragments. One is a distal end of pale grey unpatinated flint, the other a mid section piece with a heavy white patination.

Prehistoric flint spall of pale grey unpatinated flint.

112 Natural flint

Later Mesolithic flint denticulated scraper. Made on a small but thick flake with cortex on the dorsal surface. The flake scars creating the main denticulations all radiate out from a central point on the dorsal face. The retouch between these is marginal. The tool is made of pale grey unpatinated flint.
Length = 17.2mm; width = 17.4mm; thickness = 10.5mm; weight = 2.6g

Prehistoric flint flake. Has a heavy white patination.

Prehistoric flint utilized blade fragment. Made on a large blade with a very heavy white patination. There is irregular chipping along one of the lengths of this blade. The distal end was broken off prior to the development of the patination.
Length = 31.6mm; width = 26.2mm; thickness = 7.0mm; weight = 5.2g

Prehistoric flint flake. Has a white patination.

Four Prehistoric flint blades. Two are of pale grey flint and are very small, these might be Mesolithic in date. The other two are fragments, one is the distal end of a creamy white coloured flint and the other a fragment from close to the proximal end of a blade of pale grey flint.

Two Prehistoric flint spalls. One has a developing white patination, the other, a white patination.

Piece of Burnt bone

Natural piece of flint.

113 Mesolithic / Neolithic flint blade fragment with recent damage along both lengths and at the missing distal end. The original flint was black and the blade has developed a white patination.

Prehistoric flint flake. Primary cortical flake of pale grey flint.

Prehistoric flint flake fragment of pale grey flint with a creamy white patination. The piece has been broken recently.

Burnt Prehistoric flint flake. The piece is of black flint and has thermal fractures on the dorsal surface.

Two pieces of manufacturing waste or slag.

114 Prehistoric flint flake fragment. The piece has some recent damage through patina and was originally a yellowish piece of flint but with a later white patination.

116 Prehistoric flint flake fragment. Made of pale grey unpatinated flint.

119 Prehistoric flint flake. Made of pale grey unpatinated flint.

Later Mesolithic flint truncated blade. The proximal end has been trimmed with marginal retouch. The distal end of the blade shows evidence of a recent break. The original flint was pale grey in colour and it is developing a whitish patination.
Length = 22.6mm; width = 14.6mm; thickness = 5.7mm; weight = 1.8g

120 Prehistoric flint flake. The flake has a dorsal cortical surface and is developing a white patination.

121 Later Mesolithic flint microlith of lanceolate form. The microlith just has retouch along one length, the other being the natural blade edge. The tip is missing. The microlith has a heavy white patination.
Length = 16.5mm; width = 7.3mm; thickness = 2.5mm; weight = 0.2g

Prehistoric flint flake. With some cortex around one edge and with a white patination.

122 Natural flint pebble.

Possible Later Mesolithic denticulated flint scraper. Made on a cortical flake. There is one denticulation along its edge. Part of this is older and has become heavily patinated, the other side is through the patination, and exposes the pale grey flint inside. It is possible that this is a reworked or resharpened implement.
Length = 26.8mm; width = 28.7mm; thickness = 14.4mm; weight = 11.5g

Later Mesolithic / Neolithic écaillé flint flake. On flint developing a white patination.

Prehistoric flint flake. Made of grey unpatinated flint.

Prehistoric burnt flint blade. The blade is particularly thick at its proximal end.

Mesolithic flint blade This piece, like one previous removal from its dorsal surface, has hinge fractured. It is made of pale grey flint that is developing a white patination.

125 Neolithic / Early Bronze Age flint knife. Made on a flake of very poor quality flint which has a series of step fractures at the distal end on the dorsal surface where retouch ing it has been unsuccessful. The piece is made on pale grey flint which has an orange gravel stained water rolled cortex. The cortex remains on one length and provides a natural backing to the knife. The retouch runs along most of one length of the side of the flake and around the proximal end which has been thinned. The retouch is moderately invasive and scalar in nature.
Length = 40.0mm; width = 29.3mm; thickness = 8.3mm; weight = 11.7g

126 Prehistoric flint flake with a cortical surface. The flake is developing a white patination.

Prehistoric flint blade of pale grey unpatinated flint.

Prehistoric flint blade fragment. Proximal end of white patinated flint.

127 Piece of general prehistoric flint knapping debitage. The piece has a white patination.

Prehistoric flint flake. A primary cortical flake of pale grey flint.

Possible Neolithic flint scraper fragment. The flake has marginal retouch close to a break that removes the side of the flake. The tool is made of cortical, black unpatinated flint.
Length = 32.4mm; width = 25.1mm; thickness = 7.9mm; weight = 6.7g

Prehistoric flint core. Multi-directional made on a flint pebble which has a heavy white patination.
Length = 36.1mm; width = 30.8mm; thickness = 29.0mm; weight = 31.4g

Three Prehistoric flint flakes. One is of brown flint the other are both of a creamy coloured flint. None are patinated.

Piece of general Prehistoric flint knapping debitage. Of brown unpatinated flint.

Piece of burnt general Prehistoric flint knapping debitage. A Small piece heavily burnt.

A Natural piece of flint.

130 Prehistoric flint core fragment. The piece appears to be a fragment of a multi-directional core that has a yellow water-rolled pebble surface. Made of brown unpatinated flint.
Weight = 9.5g

Prehistoric flint blade fragment. Distal end of the blade with traces of the cortex on the dorsal face. The flint is a yellowish brown unpatinated flint.

Later Mesolithic core rejuvenation blade from a small bladelet core. The piece is of pale grey flint.

Prehistoric flint flake. A white patinated flint.

Piece of general Prehistoric flint knapping debitage. An irregular piece with a white patination.

Piece of burnt general Prehistoric flint knapping debitage. Heavily crazed and thermally fractured.

132 Later Mesolithic flint microlith of lanceolate form. Struck on a small blade with a plain striking platform that survives. The retouch runs along both lengths of the microlith, the tip itself is missing. The piece has a white patination
Length = 20.3mm; width = 12.8mm; thickness = 3.5mm; weight = 0.9g

Three Mesolithic flint blades. One has a white patination, the other two are of pale grey unpatinated flint.

Two pieces of general Prehistoric flint knapping debitage. One piece is of pale grey unpatinated flint, the other has a cortical surface and is of a yellowish grey flint.

137 Prehistoric chert flake. Made of a pale grey chert with a thick cortex.

138 Prehistoric flint blade fragment. With a heavy white patination. The distal end is missing.

139 Burnt Prehistoric flint spall.

Prehistoric flint flake. Primary cortical flake of pale grey flint developing a white patination.

Prehistoric flint flake. A thick flake made on a cortical piece of grey flint.

Mesolithic flint scraper. Made on a water-rolled cortical split pebble, The retouch is steep and invasive at the distal end of the flake. The flint is pale grey in colour and is unpatinated. Length = 39.1mm; width = 28.7mm; thickness = 12.4mm; weight = 16.8g

Mesolithic / Neolithic flint scraper. Of thumb nail type with a partially retouched edge. The flint is black and unpatinated.
Length = 22.8mm; width = 20.0mm; thickness = 6.9mm; weight = 3.2g

Neolithic flint knife fragment. With a heavy white patination the retouch is along one of the edges.
Length = 22.3mm; width = 22.7mm; thickness = 8.1mm; weight = 4.1g

Prehistoric flint flake. A cortical thick flake with a white patination.

Burnt Prehistoric flint flake. Has a cortical surface and a pinkish tinge typical of heated flint.

Prehistoric flint spall. Of pale grey unpatinated flint.

Prehistoric flint flake fragment. Heavily white patination.

Burnt Prehistoric flint flake. Cortical flake with crazing typical of heating in a fire.

Later Mesolithic flint multi-directional flint core. Made of a banded flint with some white patination.
Length = 26.6mm; width = 24.0mm; thickness = 18.5mm; weight = 15.7g

Neolithic oblique arrowhead tang. The tang fragment of an arrowhead. This is exceptionally long and has broken diagonally from the rest of the arrowhead. The tang has marginal retouch around its edge and it has a milky white patination.
Length = 25.9mm; width = 10.5mm; thickness = 3.8mm; weight = 1.1g

Mesolithic flint microburin. Made towards the distal end of a blade on a piece of flint that has a milky white patination.
Length = 17.7mm; width = 9.5mm; thickness = 2.6mm; weight = 0.5g

Prehistoric flint utilized blade. A thick blade of mottled flint. Both lengths of the blade have been used and have irregular chipping typical of use along the edges.
Length = 41.0mm; width = 16.6mm; thickness = 7.5mm; weight = 6.1g

Mesolithic flint blade fragment. Proximal end. The piece has a milky white patination.

Prehistoric flint miscellaneous retouched flake. Made of fresh unpatinated black flint on a cortical flake. The retouch is marginal along an end of the

flake but there is a separate area of retouch on the ventral surface. Some of this might be recent damage.
Length = 29.6mm; width = 19.3mm; thickness = 6.5mm; weight = 3.5g

Prehistoric flint flake. Cortical flake with one dorsal removal of black unpatinated flint.

Burnt Prehistoric flint flake.

Prehistoric flint miscellaneous retouched flint flake. The flake has a cortical dorsal surface and marginal retouch along its worked edge. The flint is pale grey and unpatinated.
Length = 28.6mm; width = 23.1mm; thickness = 9.1mm; weight = 5.4g

Split water rolled flint nodule that has failed as a core. Weight = 66.6g

Prehistoric flint utilized or retouched blade. There is marginal retouch or utilization evidence along one of the lengths of this blade. The flint is pale grey and unpatinated in colour.
Length = 37.5mm; width = 19.1mm; thickness = 5.5mm; weight = 3.5g

Two Prehistoric flint blade fragments. One is the distal end of a thin white patinated blade, the other is a proximal end of a brown unpatinated blade.

Heavily burnt piece of Prehistoric flint knapping debitage.

Piece of industrial manufacturing waste or slag.

Prehistoric flint blade fragment. Proximal end of the blade which has a heavy white patination.

Later Mesolithic flint blade core with a single platform. Made on a water-rolled flint pebble of mottled pale grey flint.
Length = 27.5mm; width = 28.9mm; thickness = 15.7mm; weight = 12.9g

Burnt later Mesolithic flint blade core with a single platform Heavily burnt and thermally fractured so split into two pieces.
Length = 28.8mm; width = 25.6mm; thickness = 25.1mm; weight = 23.3g

Three Prehistoric flint flakes. One has a cortical edge and has a white patination. Another is of pale grey unpatinated flint and the other is unpatinated black flint.

Prehistoric flint flake fragment. Of a milky white flint with traces of cortex along the edge.

Prehistoric flint blade fragment. Distal end of the blade which has a white patination.

Three pieces of general Prehistoric flint knapping debitage. Two are of grey flint and the other is of a pale grey colour.

Prehistoric flint flake of creamy white flint.

Prehistoric flint failed blade core. The pebble has been struck several times from a prepared platform but has failed to generate any blades of suitable length, all attempts have hit a thick layer of cortex and have ended abruptly. It appears to have broken on a subsequent attempt and abandoned.
Length = 23.5mm; width = 37.0mm; thickness = 31.0mm; weight = 28.8g

Later Mesolithic single platform blade core. Struck on a cortical pebble from a prepared platform. The flint is pale grey and unpatinated.
Length = 26.2mm; width = 19.4mm; thickness = 10.6mm; weight = 6.1g

Prehistoric flint utilized blade fragment. The proximal end of the blade is intact and the distal end has been trimmed diagonally and the edge used. The use is marginal and only on a small area of the blade.
Length = 22.3mm; width = 13.7mm; thickness = 2.6mm; weight = 0.7g

Burnt Prehistoric flint blade fragment. Proximal end of the blade.

146 Prehistoric flint blade. The blade has a hinge fracture at one end and is made of pale grey unpatinated flint.

Prehistoric flint spall of pale grey unpatinated flint.

Prehistoric flint flake fragment of milky white flint.

Piece of possible Prehistoric flint knapping debitage of banded flint. Appears to be thermally fractured.

153 Prehistoric flint knapping debitage. Made of grey unpatinated flint.

159 Prehistoric flint retouched blade with marginal retouch. Made of pale grey unpatinated flint.
Length = 13.3mm; width = 19.9mm; thickness = 4.5mm; weight = 1.3g

178 Prehistoric flint blade fragment. Made of pale grey flint and has a cortical edge to the blade. The proximal end is missing.

188 Prehistoric flint blade fragment. Distal end of the blade which is made on a white patinated piece of flint. The break is recent showing that the original flint was pale grey in colour.

Prehistoric flint flake. Primary cortical flake of pale grey flint.

Prehistoric flint flake. Struck from a water rolled pebble of which traces of cortex survive on the dorsal surface. The flint is honey coloured as seen through some recent damage to the piece. The flint is developing a white patination.

198 Prehistoric flint flake. Yellowish brown in colour and unpatinated. Traces of the original pebble surface survive on the dorsal surface.

Burnt piece of Prehistoric flint knapping debitage. Heavily crazed piece of flint with lots of thermal fractures on one face.

503 Small thermally fractured spall of pale grey unpatinated flint. Probably natural.

509 Prehistoric flint blade fragment. A thick blade with a cortical edge. Made of pale grey flint. The proximal end has snapped off.

Prehistoric burnt flint flake. The piece has been heated giving it a pale pink colouration. There is one thermal fracture on the dorsal surface.

516 Prehistoric flint blade fragment. Distal end. Of a cortical blade of flint with a creamy white patination.

Burnt Prehistoric flint flake.

Piece of general Prehistoric flint knapping debitage. Cortical and of pale grey unpatinated flint.

517 Prehistoric flint flake. Pale grey flint developing a white patination.

Prehistoric flint flake. Has a white patination.

Heavily burnt piece of general Prehistoric flint knapping debitage. Very crazed over its surface and with several scars of thermal fractures.

543 Prehistoric flint flake. Made of pale grey unpatinated flint.

Natural piece of heavily burnt flint.

550 Prehistoric flint flake fragment. Has a white patination.

Natural flint pebble fragment.

Burnt Prehistoric flint flake. The edges are badly thermally damaged but there do appear to be traces of retouch surviving on one edge suggesting it might be a Mesolithic scraper. The dorsal surface is cortical and the ends are steep, the traces of retouch are, however, marginal.
Length = 34.1mm; width = 22.5mm; thickness = 12.0mm; weight = 9.6g

Prehistoric flint flake. The piece has a milky white patination.

Prehistoric flint flake fragment. The piece is pale grey and unpatinated.

553 Prehistoric burnt flint blade fragment. The distal end of a hinge fractured blade. There is a cortical edge along one of the lengths.

Prehistoric burnt flint flake. Half the bulb of percussion survives but the flake has also been broken at right angles to this edge.

623 Mesolithic flint scraper. A burnt piece of pebble flint which has a cortical dorsal surface. The retouch is marginal at one edge of the piece. The flint is black and unpatinated.
Length = 20.2mm; width = 21.0mm; thickness = 8.3mm; weight = 3.9g

Prehistoric miscellaneous retouched flint. Made of creamy white flint There is an area of concave steep retouch on one side of this piece. The dorsal surface is also cortical.
Length = 19.4mm; width = 28.2mm; thickness = 11.7mm; weight = 7.8g

738 Prehistoric flint flake. Has an orange gravel strained cortex and heavy white patination.

755 Burnt piece of naturally thermally fracture flint.

Prehistoric flint flake. Has a rim of orange gravel stained cortex around half of its edge and is unpatinated of pale grey flint.

Large Prehistoric flint flake. Primary cortical flake of pale grey unpatinated flint.

Piece of general Prehistoric flint knapping debitage. A cortical piece with an orange gravel stained cortex and black unpatinated flint.

782 Burnt Prehistoric flint flake fragment. Heavily thermally fractured and some crazing. The piece is of black flint.

786 Piece of general Prehistoric flint knapping debitage. The piece has a creamy white patination.

Prehistoric burnt flint spall.

823 Prehistoric flint flake. Black unpatinated flint.

Prehistoric flint flake fragment. Made of a cortical piece of pale grey flint.

Prehistoric flint spall on a piece of flint with a white patination.

901 Prehistoric flint flake fragment. Made on a yellowish grey piece of flint with traces of cortex around the edge.

Prehistoric flint flake. Cortical surface showing a water-rolled pebble surface. The flint is pale grey and unpatinated.

Prehistoric trimmed flint flake. The flake is struck on pale grey flint with a yellowish tinge towards the edges near the cortex which is orange and gravel stained. There are a few removals on the ventral surface.

Prehistoric flint flake. Yellowish grey unpatinated flint with traces of cortex around part of the flake edge.

Piece of natural thermally fractured grey flint.

Prehistoric flint blade. Of pale grey unpatinated flint with traces of cortex at distal end.

Prehistoric flint flake. Of pale grey flint developing a white patination. Cortical distal end and dorsal surface.

Prehistoric flint flake. Primary cortical flake of pale grey flint developing a white patination.

Prehistoric flint blade. Made of milky white patinated flint with a hinge fracture at the distal end.

Prehistoric flint blade. Made of pale grey unpatinated flint with a cortical edge.

Two Prehistoric flint blade fragments. Cortical of pale grey flint unpatinated.

Two Prehistoric flint blade fragments. Pale grey unpatinated flint.

Prehistoric flint blade fragment. Yellowish grey unpatinated flint.

Burnt Prehistoric flint blade fragment.

Three Prehistoric flint flake fragments. All of pale grey flint one developing a white patination.

Two Prehistoric flint spalls. One is pale grey and unpatinated, the other is pale grey with a yellowish colouration.

Three pieces of general Prehistoric flint knapping debitage all pale grey flint and unpatinated.

Piece of burnt general Prehistoric flint knapping debitage.

Natural stone.

Prehistoric flint ?scraper. Very small steeply retouched blade fragment with a cortical butt. The piece is made of pale grey unpatinated flint and the retouch runs around all the edges.
Length = 15.5mm; width = 11.8mm; thickness = 6.8mm; weight = 1.4g

Prehistoric flint utilized blade. Made on a piece of pale grey flint developing a white patination. Traces of a cortex backing survive along one length. Utilization is seen in irregular chipping on the distal end and on the length. Has a plain striking platform.
Length = 42.6mm; width = 27.0mm; thickness = 7.5mm; weight = 10.8g

Prehistoric flint utilized blade. Made on a pale grey unpatinated flint. The proximal end of the blade survives and the utilization is intermittent along one length.
Length = 33.4mm; width = 16.9mm; thickness = 5.0mm; weight = 3.2g

Prehistoric flint utilized blade. Made on a black unpatinated flint with a cortical backing. The utilization is along the non-cortical length of the piece.
Length = 43.0mm; width = 18.6mm; thickness = 12.3mm; weight = 8.2g

Prehistoric flint utilized flake. Has a heavy white patination and a denticulated length to one side of the piece. The flake has a plain striking platform.
Length = 22.8mm; width = 17.5mm; thickness = 3.2mm; weight = 1.2g

Prehistoric flint retouched flake. Made of black unpatinated flint. The retouch is along one side of the piece.
Length = 21.3mm; width = 20.7mm; thickness = 8.6mm; weight = 4.7g

Prehistoric flint bifacially flaked flake. Made on a heavily white patinated piece of flint.

Mesolithic flint core tablet from a blade core. The piece appears to have been subsequently worked as a bladelet core in its own right. It has two flat faces and has been lightly burnt. The piece has a white patination.
Length = 19.4mm; width = 39.0mm; thickness = 27.2mm; weight = 18.4g

Mesolithic flint single platform blade core. The core is made on a poor quality flint pebble and has a platform at the top. Some of the removals have proved ineffective due to internal fractures within the nodule, other flake scars show hinge fracturing of the resulting blades. The flint is pale grey in colour and is unpatinated.
Length = 45.5mm; width = 43.3mm; thickness = 25.5mm; weight = 56.5g

Mesolithic flint blade core. The piece has two platforms at right angles to each other. The core is cortical and made of pale grey unpatinated flint.
Length = 39.9mm; width = 45.1mm; thickness = 31.4mm; weight = 47.6g

Mesolithic flint blade core. The core is made on a piece of black unpatinated flint which is cortical. Removals have been struck from a single striking platform. The piece is small and is possibly exhausted.
Length = 24.0mm; width = 24.2mm; thickness = 15.2mm; weight = 7.6g

Prehistoric flint multi-directional core. Made on a heavily white patinated piece of flint.
Length = 21.7mm; width = 19.1mm; thickness = 18.4mm; weight = 8.9g

Two Prehistoric flint flakes of pale grey unpatinated flint.

Prehistoric chert flint of honey coloured chert.

Four Prehistoric flint blade fragments. One has a heavy white patination, one has a creamy white patination, one is pale grey unpatinated flint and the other is of grey unpatinated flint.

Seven Prehistoric flint flakes all of pale grey unpatinated flint with traces of cortex on all of them.

Prehistoric flint flake of grey flint a primary cortical flake unpatinated.

Prehistoric flint flake of grey flint unpatinated.

Six Prehistoric flint flakes all have a white patination three have cortex surviving on the surface.

Prehistoric flint flake with a yellowish grey patination.

Two Prehistoric flint flake fragments. Black unpatinated flint.

Prehistoric flint flake fragment. Primary cortical flake of pale grey unpatinated flint.

Four Prehistoric flint flake fragments of pale grey unpatinated flint.

Prehistoric flint flake fragment. White patinated flint.

Burnt Prehistoric flint flake fragment.

Four pieces of general Prehistoric flint knapping debitage. All pale grey unpatinated flint.

Cortical piece of general Prehistoric flint knapping debitage of brown unpatinated flint.

Piece of general Prehistoric flint knapping debitage. Cortical pebble with a white patination.

Three burnt pieces of general Prehistoric flint knapping debitage.

Natural flint nodule.

902 Prehistoric flint blade fragment. Proximal end. The piece has a recent break at the distal end. The original flint was pale grey in colour but the blade has a white patination.

Prehistoric flint blade fragment. Proximal end of a cortical blade. The blade has a white patination.

Prehistoric flint flake. Made on a cortical piece of flint with a white patination.

Two Prehistoric flint spalls. Both of pale grey unpatinated flint.

904 Prehistoric flint retouched blade fragment. The fragment is a mesial fragment of a blade on which there is retouch along one edge on the dorsal surface and the other edge has retouch along its ventral surface. It is possible a knife fragment made of pale grey unpatinated flint.

Prehistoric flint flake. Made on a piece of flint with a milky white patination.

926 Natural flint nodule.

934 Prehistoric flint flake. The piece has a cortical edge to it and is made on a pale grey flint developing a white patination.

Prehistoric flint blade fragment. Proximal end. Made on pale grey flint developing a white patination.

Prehistoric flint spall. Made on a cortical piece of grey flint.

936 Prehistoric flint utilized blade. The blade has a natural cortical backing to it and has the other length has the irregular chipping indicative of use. The piece is of grey flint which is developing a white patination.

942 Piece of general Prehistoric flint knapping debitage. Has some minor recent damage to it showing that it is made of black flint and is developing a white patination.

943 Mesolithic / Neolithic flint scraper. Retouch is around all the edges of the flake that are not cortical. About half of the dorsal surface has cortex traces remaining on it. The retouch is steep and invasive into a central

point at the distal end. The rest of the retouch is more marginal and is scalar. The flint has a milky white patination.
Length = 34.2mm; width = 33.2mm; thickness = 14.5mm; weight = 12.9g

969 Prehistoric flint flake fragment. The flake has a developing white patination. And is broken near the bulb of percussion.

Prehistoric flint retouched flake. The flake is cortical and there is a small area of very marginal scalar retouch on one edge. The flint is grey in colour and is unpatinated.
Length = 32.5mm; width = 27.5mm; thickness = 9.1mm weight = 7.1g

Later Mesolithic flint blade core. The core has a single platform and is made on a pebble of flint which has a white patination.
Length = 31.1mm; width = 28.0mm; thickness = 18.6mm; weight = 16.0g

Prehistoric flint blade fragment. Made on a cortical piece of flint which is grey and developing a patination.

Burnt Prehistoric flint flake fragment. The damage to this flake is recent and was not caused during heating. The piece has a cortical dorsal surface.

Later Mesolithic flint blade core. Two platforms at right angles to each other. The piece has been exhausted. The core is made on a piece of pebble flint and has a pale grey colour developing a white patination.
Length = 20.0mm; width = 25.7mm; thickness = 14.4mm; weight = 6.6g

Mesolithic flint core rejuvenation flake. A refresh piece from the platform of a blade core. The flint is pale grey with a developing white patination. There is more recent damage to this piece.
Length = 10.9mm; width = 20.1mm; thickness = 7.6mm; weight = 1.3g

Mesolithic flint blade fragment. Proximal end of the blade with a recent break. Made of pale grey flint with a developing white patination.

Prehistoric flint flake. A cortical piece of pale grey unpatinated flint.

971 Prehistoric flint core. Multi-directional core with two stages of use. Part of the core shows that the original core had begun to develop a white patination before it
was re-used again as a core. The original flint colour is pale grey.
Length = 28.0mm; width = 24.0mm; thickness = 13.6mm; weight = 13.4g

Prehistoric flint flake. Cortical with a heavy white patination.

Natural piece of burnt flint.

1002 Prehistoric flint blade fragment distal end. Made of pale grey flint.

Prehistoric flint flake. Cortical edge and struck from plain striking platform. Pale grey unpatinated.

Prehistoric flint flake. Has a cortical edge and is made of pale grey unpatinated flint.

Prehistoric flint awl. Made on the side of a trimmed flake this appears to have been shaped deliberately at this end. The flake is of pale grey unpatinated flint and traces of a yellow gravel stained cortex survive at one edge.
Length = 27.5mm; width = 15.7mm; thickness = 6.7mm; weight = 2.8g

Later Mesolithic flint single platform blade core. Made on a piece of pale grey unpatinated pebble flint. The core has been worked until it has been exhausted.
Length = 35.4mm; width = 19.8mm; thickness = 14.3mm; weight = 10.8g

Prehistoric flint blade. Unpatinated pale grey flint. The flake has traces of cortex along one length.

Five Prehistoric flint blade fragments. Three are pale grey and unpatinated, the other two both have a white patination.

Two Prehistoric flint spalls. One is pale grey and unpatinated the other has a white patination.

Nine Prehistoric flint flakes. Four have a white patination, one has a creamy white patination, two have a yellowish grey unpatinated colour, one is black and unpatinated and one is of pale grey unpatinated flint.

Two Prehistoric flakes of honey coloured chert. One is a primary cortical flake.

Five pieces of general Prehistoric flint knapping debitage. One is unpatinated and of pale grey flint, one has a white patination. One is burnt and has a pinkish colour whilst two are more heavily burnt and crazed.

One natural piece of flint.

1003 Prehistoric flint retouched flake. The flake has been struck from an older white patinated piece of flint. The retouch is along an edge that goes through this earlier patination. The piece is made on pale grey unpatinated flint.
Length = 27.8mm; width = 24.4mm; thickness = 5.6mm; weight = 4.4g

1026 Prehistoric flint flake fragment. Distal end of a flake of pale grey unpatinated flint.

Prehistoric flint flake fragment. Made of pale grey unpatinated flint.

1032 Prehistoric flint scraper or knife. A thick flake with a cortical edge. The piece is made on a pebble of flint and the one edge has been retouched in a denticulated manner to create a cutting or scraping edge.
Length = 40.8mm; width = 32.9mm; thickness = 17.5mm; weight = 18.7g

Prehistoric flint flake. Made on a cortical piece of flint of pale grey unpatinated colour.

1039 Mesolithic flint core. This core has opposed platforms and the piece has a heavy white patination. Most of the cortex has been removed from this. Length = 19.4mm; width = 33.5mm; thickness = 24.5mm; weight = 18.6g

1044 Piece of general Prehistoric flint knapping debitage. Made of a pale grey flint.

1116 Prehistoric flint flake with a heavy white patination.

1137 Burnt Prehistoric flint flake.

1138 Prehistoric flint flake of pale grey unpatinated flint.

1163 Prehistoric stone? or flint? flake fragment. Pale grey very fine grained stone with some of the original pebble surface on one edge of the flake.

1502 Mesolithic flint blade core. A single platform core on a flint pebble of pale grey
unpatinated flint.
Length = 37.9mm; width = 32.8mm; thickness = 28.9mm; weight = 51.1g

Prehistoric flint flake. Cortical flake of black unpatinated flint.

Mesolithic flint core. Single platform core on a cortical pebble made of pale grey unpatinated flint.
Length = 25.3mm; width = 36.8mm; thickness = 18.8mm; weight = 18.6g

Prehistoric flint flake of pale grey unpatinated flint.

Prehistoric flint flake fragment of pale grey unpatinated flint

Two Prehistoric flint spalls of pale grey unpatinated flint.

Two pieces of Prehistoric flint knapping debitage. Both are of pale grey unpatinated flint.

1521 Mesolithic / Neolithic flint burin / knife. Made on a cortical blade the cortex provides a natural backing to this piece. The retouch runs the length of the blade. There is burin type removal at the distal end which gives the tool a strong working point. The flint is pale grey and is unpatinated.
Length = 41.4mm; width = 18.5mm; thickness = 8.1mm; weight = 4.5g

Prehistoric flint core rejuvenation flake. Made on a cortical pebble of pale grey unpatinated flint.
Length = 30.8mm; width = 36.1mm; thickness = 8.5mm; weight = 10.2g

1522 Prehistoric flint flake. Cortical flake of pale grey flint a pebble of orange gravel stained flint.

Prehistoric flint flake. Has a cortical edge to it and is made of pale grey unpatinated flint.

Natural piece of quartz.

1544 From cleaning after machining.
Mesolithic flint blade core. Single platform blade core made on a nodular flint pebble. Several of the removals have badly hinge fractured and the core appears to have been abandoned because of this. The flint is of a creamy white patination.
Length = 40.2mm; width = 37.8mm; thickness = 29.0mm; weight = 43.5g

1609 Mesolithic flint blade core. Single platform blade core made on a nodular piece of
flint. The core is developing a white patination but has a break on the striking platform showing that the original colour was pale grey.
Length = 32.6mm; width = 25.7mm; thickness = 13.0mm; weight = 11.6g

Prehistoric flint flake. Made on a heavy yellow gravel stained piece of flint. The entire flake has a yellowish colouration to it. The dorsal surface has a stepped appearance where flakes have hinge fractured.

1083 Prehistoric flint blade fragment mesial fragment of white patinated flint.

APPENDIX 5: ASSESSMENT OF CHARRED PLANT REMAINS

Wendy Carruthers

Introduction

Excavations were carried out by Cambria Archaeology (CA) on the site of an Exxon Mobil Liquid Natural Gas installation near Herbranston, Pembrokeshire. The site is on the northern side of the Milford Haven waterway, where it would have held a commanding view of the entrance to the estuary (Pete Crane, unpublished Interim Report).

Excavations revealed evidence of a prehistoric settlement dating to the Bronze Age, and an industrial complex of early medieval date. Iron smelting and corn drying was taking place on the site between AD650 and AD 840, a period for which very little is known with regards to metalworking technology.

Methods

Soil samples (average volume = 15 litres) were taken during the excavations by Cambria Archaeology for the recovery of environmental remains. Fifty percent of each sample was processed using standard methods of floatation by CA staff. A 250 micron and 1mm mesh were used to recover the flots, and the residues were sieved through 1mm mesh. The remaining 50% unprocessed soil was retained in reserve.

The dried flots of 99 samples were sent to the author for assessment, along with 5 hand picked samples of hazelnut shell, several hand picked charcoal samples and 4 unsieved soil samples. Prior to assessing each flot, the large (>2mm) charcoal fragments were sieved off and were checked for fruits/seeds, before being sent to the charcoal specialist, Dana Challinor, for a brief assessment and costing (see attached 'Recommendations' report and Table 2). The finer fraction was rapidly scanned under an Olympus SZX7 stereoscopic microscope until the general character, state of preservation and potential of the charred plant assemblage had been ascertained. For the small flots (c. 10ml or less) full sorting was carried out, as this took only a little more time than scanning. These samples will need no additional work, but the data will be added to the results from the full analysis.

Results

The results of the assessment are presented in Table 1. The following codes were used to indicate the potential of each sample for further analysis :
A = high potential on archaeobotanical merit alone. May be due to size of assemblage, excellent state of preservation, unusual taxa or rarity of information for a particular period.
B = reasonable potential, particularly if grouped with other samples from the same period
C = some potential, but few or poorly preserved remains. Needs to be grouped with other samples, or from a particularly important context to be worth including.
D = no further potential. Flot fully sorted or sterile. Where a few remains have been recorded, the information may be used in final report, but no further work is required.

Discussion

1. *Abundance* - In comparison with other metalworking sites studied by the author (e.g. Hadlow to High Halden, Kent, Carruthers, forthcoming), the charred plant remains were frequent to abundant in a relatively large proportion of the samples. No doubt this was due to the presence of the corn drying ovens in complex 7, the central area of the excavated site.

Most of the samples producing grade A assemblages came from corn drier fills, and all were in complex 7.

2. *State of Preservation* - The state of preservation varied from occasional, poorly preserved eroded cereal grains (i.e. redeposited background waste) to large assemblages of well-preserved charred grain and fine chaff fragments from primary contexts such as the basal fills of corn driers (e.g. sample 321 from corndrier 650). Slag and modern rootlets were present in many of the flots, but modern uncharred seeds were not frequent.

3. *Assemblage Components* - Although finely fragmented chaff was often abundant in the primary deposits from the corn driers, weed seeds were surprisingly scarce and unvaried. This observation may be amended once full analysis of the fine chaff portion is undertaken, as small seeded weeds are easily overlooked during sample scanning. Larger chaff fragments such as rachis internodes and straw nodes were not common, so it is likely that the ovens had been used to remove the husks from threshed grain. This would help to explain the scarcity of weed seeds. The larger processing waste does not appear to have been used as fuel for the corn driers or furnaces, so perhaps it was removed elsewhere and used for fodder, building materials, bedding etc.

4. *Cereal Species Composition* – hulled barley (probably 6-row hulled barley, *Hordeum vulgare* but some 2-row barley cannot be ruled out) and oats (*Avena* sp.) were the main crops represented in the charred assemblages. The fact that in many cases large deposits of both barley and oat grains were present in the corn drier fills suggests that dredge (barley and oats mixed crop) was probably an important crop. This is a useful crop that was commonly grown in the early medieval period. It is particularly useful on fairly poor soils, or in areas with unreliable summer weather. Bevan (1947) notes that dredge can give higher yields of both grain and straw than either crop grown separately. Some pure barley samples were also present, and one sample produced mainly oats (sample 396). Bread-type wheat (*Triticum aestivum*-type) and rye (*Secale cereale*) were very much more scarce, with rye only tentatively being identified from one sample. One sample 1916, produced a possible hulled wheat grain (emmer or spelt) and frequent hazelnut shell fragments, suggesting a possible prehistoric date for this context (context 1524, complex 14). Hazelnut shell was not common in any of the other areas.

   Bread-type wheat was present in small numbers mainly in complex 10 samples (three samples), with one complex 3 sample and one complex 11 sample producing this cereal. It is likely that this distribution relates to the specific use of the corn driers to parch barley and dredge crops, rather than bread wheat. The bread wheat grains are more likely to have been charred amongst domestic waste. Bread wheat is a free-threshing grain so it is not necessary to parch the crop prior to processing, unlike oats and barley. It may, therefore, be greatly under-represented in the charred assemblages. It will be interesting to examine the distribution of these taxa in more details to see whether information concerning activity areas can be recovered.

5. *Weed Species Composition* – the narrow range of weeds of cultivation included common weeds such as persicaria (*Persicaria* sp.), black bindweed (*Fallopia convolvulus*) and stinking chamomile (*Anthemis cotula*). The last of these taxa indicates the cultivation of heavy, damp soils. Occasional acidic soil indicators were present, such as the arable

weed corn spurrey (*Spergula arvensis*) and wild radish (*Raphanus raphanistrum*). Small seeded leguminous weeds (*Trifolium/Lotus/Medicago* sp.) such as clovers and/or trefoils were common in at least one sample (sample 391, complex 1), suggesting that soils were nutrient poor in some areas of the site.

6. L*ocal vegetation and resource management* - Ericaceae seeds (heather, ling etc.), bracken frond fragments and gorse/broom charcoal all point to the presence of heathland vegetation. Gorse or broom charcoal (*Ulex/Cystus*) was abundant in several of the furnaces. It is likely that many of the previously wooded areas had been reduced to heathland vegetation by this time through deforestation, although oak was dominant in some of the furnaces. The possibility of selective use of taxa to produce different metalworking conditions will be further investigated during the full analysis stage. Perhaps this will provide an answer as to why corn driers were located close to metalworking furnaces, as, like gorse, chaff is a useful, rapid burning fuel. More detailed work on the charcoal may provide evidence for woodland management, particularly where roundwood is present.

7. *Furnace and corn drier use* – more detailed examination of the charred plant macrofossils and charcoal in samples from the furnaces and corn driers will provide evidence for the use of these structures. Selective use of fuels, including both timber and waste from cereal processing can be investigated. The quality of the crops being processed in the corn driers can be examined, and further information about the soils being cultivated may be obtained using information from weed ecology. Comparisons will be made to crop plants from other contemporary sites in the region, in order to determine how typical this site is for the period with regards to arable crops.

8. *? Waterlogged Plant Remains* - Several uncharred seeds from a range of taxa including aquatic buttercups (*Ranunculus* subg. *Batrachium*), sedges (*Carex* sp.), docks (*Rumex* sp.) and alder seeds (*Alnus glutinosa*) were present in samples 370 and 384. Hand picked uncharred hazelnuts (*Corylus avellana*) were also recovered. These remains were found in site subdivision 8. Although dried out during sample processing, the assemblages have the character of waterlogged deposits, so they have the potential to answer more detailed questions about the local environment. If unprocessed soil has been retained from these contexts and the contexts are secure and datable, it may be worth sending 1 litre samples to the author for wet-sieving and detailed analysis. However, information in the context information table from Pete Crane suggests that there are some doubts over the value of samples from this site.

Recommendations for further analysis and estimate of costs

The samples were graded as follows;

Grade A = 8 samples (all from complex 7)
" B = 15 " (from 8 different complexes)
" B/C = 11 "
" C = 8 "
" D = 48 "

(plus 9 hand-picked or unsieved samples)

It is recommended that all of the grade A and B samples are fully analysed (= 23 samples). The selection of samples from important features in the B/C category is left to the discretion of the project manager. Any extra soil available from the

samples producing bread-type wheat, possible rye and hulled wheat should be processed and the flots analysed (see table). Other samples where the additional soil is worth processing are marked in Table 1. The project manager may wish to add to this list if specific features are of interest.

Allowing for the extra soil samples (processed by CA staff) and all of the B/C samples, the estimate of costs for flot sorting, identification, analysis and report writing would be;

23 grade A & B samples + 11 B/C + 14 possible extra soil samples

10 days sample sorting & ID
5 days analysis & report writing

References

Beaven, E.S. (1947) *Barley. Fifty Years of Observation and Experiment*. Duckworth.
Carruthers, W.J. (forthcoming) Charred Plant Remains. *In* A Romano-British metalworking site at Hadlow to High Halden Pipeline, Network Archaeology.

Plant table

Sample	Context	Complex	Context type and description	flot descriptic	plant remains	further potential
370			base of org. sediment	roots, no char, ?waterlogged ; <10ml flot	++ seeds; sev uncharred alder seeds; uncharred Rumex	?waterlogged B/C process extra soil?
384	****	Site sub 8	Sample from site 8 probably discard	occ lge char; occ insect; uncharred twigs; ?partially waterlogged	++ seeds; uncharred Rubus, Ranunculus, Ranunc.Batrachium, Carex, Galleopsis, Alnus, Juncus	?waterlogged B/C process extra soil?
hand picked	****	Site sub 8	hazelnut From stream bed	hand picked nuts	2 uncharred whole hazelnuts	D
382	127	8	Fill above stone structure. Same as 104? 146	<10ml flot; some lge char frags	+ seeds; 1 cf. barley frag	D sorted
305; 1927	140	7	Lens in bottom and up sides of probable corn drier 131	c. 100ml unsieved soil sample, ash stained (305) + <3ml flot	2 poor barley	D process remaining soil?
1926	143	7	Lens in top of corn drier 131	<3ml flot, occ sm char	3 hulled barley, oat awn +	D sorted
1928	151	8	Fill. Lower fill in northern part of hollow (zilch in flot)	1928- <3ml flot; occ lge char	2 poor cf. barley	D sorted
383	159	7?8?	Fill of posthole 160	<10ml flot; 5 lge char frags	4 good h. barley; 2 NFI cereal frags	D sorted
333	166	7?	Fill of pit 167	20ml flot, roots, occ lge	+++ seeds; freq good h. barley,	A

				char	Persicaria	
306	195	7?	Fill of pit 196 (possible duplicate recording wee 894)	<5ml flot, red/brown silt lumps, 1 lge char frag	++ seeds; good h. barley++; 1 Poaceae; 1 Anthemis cotula; oat awn+	D sorted; add data
386; 1925	198	7	Fill of corn drier 507	1925- unsieved soil, c. 1 litre, embedded grain visible +; ash + slag; 386- c.15ml flot, fine chaff & grain	+++ seeds; h. barley+++; oats++; oat awn +	A
316; 311	200	8	Layer? Charcoal spread associated with early phaze of Complex 8. Beta 198851 Cal AD 650-780	roots, freq sm roundwood; 5ml lge char; c. 20ml flot (311); 10ml flot (316) – sev sm char	++ seeds; occ oat frag; Rumex; Persicaria (311) ; 316 – + Fallopia, barley, Trifolium-t	Char ID seeds C
378	506	Other? 7?	Fill lower fill of pit 174	<1ml flot, occ sm char	+ seeds, poor grain, 4 oats, 1 cf. barley	D sorted
308	508	7	Fill. Lower very dark fill of corn direr 507	25ml flot, roots, sm chr, white slaggy, occ lge char	++++ barley & oats (dredge?); Anthemis cotula,	A
1924	510	7?	Layer or spread also filling small	c.100ml unsieved soil		process soil?

			hollow	(1924),		
1929	513	7?	Fill of posthole 514 near corn drier 507	<3ml flot, occ lge char	nil	D
331	532	(*plan 255)	Fill of pit 534	<10ml flot, v. little char	occ poor cereal frag, cf. oat	D sorted
310	536	6	Fill between stones of main structure in 519	c. 70ml flot, freq sm char, lge roots,sev slaggy, sev lge char (5ml)	occ poor barley frag, 1 bracken frond frag	C char ID?
312	543	6	Layer. Charcoal rich Possibly better for C14 sample than 309	100ml lge char, some roundwood, 60ml silt	occ barley, oat frag, Persicaria	C char ID
381	553	(*section 267) 8?	Fill of pit 534? * needs checing possible wrong cut number	<5ml flot, roots, couple char frags	9 hulled barley; 2 NFI cereals; 1 Poaceae	D sorted
317;318	584	7	Layer. Lenses with grain and charred wood. Same as 584	318 – C14 sample sent; 317 – 300ml flot (50ml lge char)	freq sm chaff frags, awns (318); (317) numerous good hulled barley	A + char ID
1930	605	7	Fill of posthole 607	<3ml flot; 3 lge char	nil	D
319	623	6	Layer of heat affected material, see 309 and 312	40ml flot, occ lge char, silt & fine char, blobs of white slag	sev barley, Galium aparine, Rumex	B/C
324	624	6	Layer? Fill.	60ml flot	freq barley	B

			Charcoal rich layer belwo 623 below 623	(20ml lge char)		char ID
369	636	(* section 300)	Fill of dubble posthole 604	10ml flot, occ lge char (1ml), roots, slag blobs	sev barley	B
320	637	7	Layer sealing all deposits	40ml flot, occ lge char	freq good hulled barley	A
321	642	7	Fill. Lower fill of corn drier 650	40ml flot	numerous good oats & barley, fine chaff in fine flot incl. Anthemis cotula, Rumex	A
330	675	6	Fill. Upper and main fill of 681 forming base and structure 519	<10ml flot, occ lge char (<5ml)	1 Fallopia convolvulus	D
379	684	(*section 1324)		15ml flot, 5ml lge char, occ slaggy	+++ barley; ++ bread-t wheat	B
326	707	7	Fill. Primary fill of corn drier 719. Poss rc dating?	20ml flot	freq oats & barley, Anthemis cotula+++, Raphanus capsule	A
325	710	7	Layer with chared grain in natural depression	20ml flot + 250ml grain, no lge char	numerous good hulled barley	A
327	737	8	Fill of main hollow 152. Same as 151?	<5ml flot, white/green slaggy blobs, sm char	occ barley frag	D

328 & HP	755	(*section 1344 photo 2411)see 414 for grid ref	Fill of pit 756	<10ml flot, roots, occ lge char,	hazelnut, 1 oat HP – 4 HNS frag	D
332	781?	7? other	Layer	roots, sev lge char (5ml)	sev barley, oat, Plantago lanceolata, Anth cotula	B/C
337* pot	783	6		100ml unsieved soil sample, burnt clay, no obvious grain		? process sample
1901 (336)	787	6	Lower fill of pit 784 which contained pre-hist pot	20ml flot, occ lge char, silt	+++ poor encrusted hulled barley	B process soil if good prehistoric context
352	790	6? *Check final plan and section 1442	Cut. Sample should have been within fill 791	<5ml flot occ char	nil	D sorted
353	792	6? *Check final plan and section 1443	Cut. Sample should have been within fill 793	<5ml flot, sm char	12 good hulled barley, 1 oat, 1 Anthemis cotula	D sorted
1931	840	7? *Check final plan 346 context 842	Fill of shallow pit 842	<3ml flot, encrusted, occ sm char, ?cessy?	1 barley rachis; 5 poor barley; 1 oat; 1 culm node	D sorted
334	870	7? *Check final plan and section 1386	Layer or fill with heat affected clay. In possible pit 871	10ml flot, freq sm char	sev barley + some oats	B

335;375	872	7? *Check final plan and section 1386 and 1406	Layer or fill with heat affected clay. In possible pit 871	335 - <1ml flot, occ sm char; 375 – 20ml flot, sev sm char	335 - 4 poor barley 375 – sev barley	C count barley in 375
374	902	10	Fill of posthole 903	<5ml flot, roots, occ char	5 oats; 1 cf. bread-t wheat	D process soil
355	904	10	Fill of posthole 905	<5ml flot, sm char	1 hulled barley, 1 barley, 1 cf. oat, 1 Carex (trig), 1 Chenopodiaceae	D sorted
367	906	3	Fill of possible corn drier 907	<5ml flot, roots, occ char	3 bread-t wheat; 6 oats; 1 NFI cereal; 1 Anthemis cotula	D process soil
398	909	3	Fill of possible corn drier 907	<10ml flot, roots; not great preservation	++ oats; + barley; 1 Anthemis cotula; Chenopodium album	B
400	910	3	Fill of posthole 940	10ml flot, silt, little sm char	1 Persicaria sp.	D sorted
350	913	10	Fill of posthole 914	15ml flot, mostley slaggy blobs	sev good oats (8), Persicaria, ? Ericaceae seeds	B/C
339	915	3	Fill of posthole 916	roots, sev slaggy blobs, c. 5ml lge char	sev oats, barley, Persicaria, Anth cotula	B/C
366	917	10	Fill of posthole 918	<5ml flot, roots, occ char,	1 NFI cereal ; 9 small oats & frags	D sorted
376	919	10	Fill of posthole	<5ml flot,	nil	D

			920	occ sm char, roots		
356	922	10	Fill. Lower fill of posthole 923	roots, occ sm char	1 hulled barley; 1 poor barley; 1 cf. oat; 1 trig. Carex; 1 Chenopodiaceae	D sorted
377	924	10	Fill of posthole 925	<1ml flot, occ sm char, roots	2 sm oats	D sorted
399	926	3	Fill of shallow irregular pit	<5ml flot, roots, occ lge char	2 Antemis cotula; 1 Polygonum aviculare; 1 Chenopodium album	D sorted
342	930	10	Fill of hollow 931, possibly entrance hollow	10ml flot, occ lge char	2 bread-t wheat, 1 small oat	D process soil
341	932	10	Fill of posthole 933	<5ml flot, sm char	1 bread-type wheat	D process soil
351	936	10?	Fill of pit 936 near complex 10	10ml flot	oat +, barley+, Raphanus caps, poss rye frag	B process soil
397	942	*other see 1434	Fill of shallow pit 941	<5ml flot, roots, occ sm char	2 barley; 2 oat; occ poor grain, 1 Anthemis cotula	D
368	945	11?	Fill of possible cooking pit 946 north of complex 11	72ml flot, freq lge char (12ml); occ green slag blobs	sev barley, occ bread-t wheat; occ oat	B process soil
363	947	10	Fill of posthole 948	<5ml flot, occ sm char	1 oat	D sorted
340	969	13	Later fill of hollow	<10ml flot, 1 lge char	2 barley, 3 small oats, 1 Anthemis	D sorted

			970/1150/1159 after it had gone out of use		cotula	
343	972	11	Layer. Possible hearth material above flagstones	40ml flot, freq rootlets, sm char, freq white/green slag blobs	2 barley, 1 oat	D sorted
365	991	3	fill of posthole 992	<5ml flot, occ lge char (1 ml)	+ seeds, 1 Persicaria sp.; 3 Anthemis cotula (2 in seed head)	D sorted
357	1021	5?	Fill of posthole 1022 near liner complex 5	15ml flot, silt, v. little char	nil	D
359	1024	5?	Fill of pit 1025 near linear complex 5	10ml flot, roots, occ sm char	sev poor frags; 5 oats, 2 hulled barley, 6 NFI cereals, 1 cf. Polygonum avic, 1 uncharred Rubus	D sorted
362	1028	1	Upper fill in furnace complex	180ml flot (130ml lge char)	sev good barley, occ oat, 1 Spergula arvensis	B/C
385	1037	4	(possibly contaminated with topsoil if I remember PC check **)	260ml flot incl. 150ml lge char, freq char incl roundwood	4 hulled barley; 2 oat; 1 Persicaria	B/C char ID
388;1911	1042	1	Fill large spread fill in northern part of complex. Same as 1065	388 - 640ml flot incl 240ml lge char	388 - occ hulled barley 1911 - + barley	C char ID both samples

				1911 – 220ml flot incl 120ml lge char		
361;364	1043	1	Fill of pit 1039 cutting west furnace 1071	361 – 350ml flot incl 150ml lge char, occ slaggy blob; 364 – 150ml flot (90ml lge char) ? hammer scale	361 - modern Rubus only 364 – 2 h. barley	D char ID
1914	1044	1	Fill of pit 1045	<5ml flot	4 h. barley; 2 oats	D sorted
354	1050	1	Fill. Lower fill of pit 1051	5ml flot, (4ml lge char)	1 Chenopodium album, 1 small Carex sp.	D sorted
390	1054	1	Fill in SW quadrant of furnace complex	190ml flot incl 90ml lge char, occ slaggy blobs	++ hulled barley; + oat	B/C char ID
1906	1067	1	Fill of west furnace 1071	170ml flot incl 60ml lge char	1 Plantago lanceolata; 1 Raphanus raphanistrum caps seg	C char ID
396	1069	1	Fill of possible posthole 1070	20ml flot, freq sm char	+++ oats (not great preservation); + Anthemis cotula	B oat dominated
389	1078	1	Fill of 1079, possibly south part of west	50ml flot; incl 20ml lge char	+++ hulled barley; ++ oats; + Anthemis cotula	B char ID

			furnace 1071			
395	1086	1	Fill of stakehole 1087	<10ml flot, occ lge char	1 cf. oat frag, 1 Fallopia conv.	D sorted
394	1096	1	Fill. Lower fill of pit 1096	<5ml flot; a few lge char	nil	D
346; 387; 1912	1130	11	Fill of pit 1131. Below flagstones 2 stones possibly iron ore	346 – 20ml flot (5ml lge char) 387 – 15ml flot, silt, fine rootssm char, slaggy blobs, occ lge char 1912 - <5ml flot	346 - sev poor barley & a few oats 387 - ++ hulled barley; + Poaceae 1912 – 2 Chenopodiaceae	B/C (D – 1912)
1913	1133	11	Below southern part of heat affected area of paving	<5ml flot, rare sm char	nil	D
358	1144	North of 13 Fence line?	Fill of pit 1147	125ml flot, freq char (35ml lge char)	nil	D Char ID
360	1170	13	Fill of hollow 1159/970	10ml flot, coarse roots, sm char	sev oats, Chenopodiaceae, Anth cotula	B
392	1183	North of 13 Fence line?	Fill of pit? 1184	40ml flot, a few lge char, roots, modern Rubus	++ poor cereals incl h. barley; Anthemis cotula	B/C
1907	1503	9	Structure, possible hearth	80ml flot (5ml lge	++/+++ h. barley; ++ oats	B

				char) freq slaggy blobs, silty		
1903	1507	9	Fill of heath 1503	5ml flot, occ slaggy blob, sm char	1 poor barley, 1 oat, cereal frags	C
372	1513	9	Fill of hollow 1512 below structure 1504	<10ml flot, sev sm char	nil	D
1910	1514	9	Fill of pit 1515 possibly part of hearth 1503	20ml flot, sev char frags	++ oats & barley; occ poor cereal frags	C
1909	1515	9	Pit. Should have been given fill number 1514	<10ml flot	3 poor oats, 1 cf. barley	D
1902	1518	9	Pit? Should have been given fill number 1519. Below structure 1504	<5ml flot, occ sm char	nil	D
1917	1521	14	Fill of pit 1520	<10ml flot, occ lge char	1 Persicaria	D sorted
1915 & HP	1522	14	Fill of pit 1520	15ml flot incl 5ml lge char, roots	1 hazelnut HP – 2 lge HNS frag	D sorted
1916 & HP	1524	14	Fill from pit 1523	410ml flot incl 220ml lge char	+++ hazelnut shell frag; + Prunus spinosa, + barley; + ?hulled wheat HP – 20 HNS frag	B process soil, unusual sample ?date
1904	1609	4	Fill of irregular hollow 1626 which forms	10ml flot	1 bread wheat; 5 hulled barley; 2 oats; 1 poor cereal;	B process soil

			main part of 1031		1 Persicaria	
391	1813	1	Layer of heat affected material in hollow 1001	30ml flot incl 10ml lge char, freq sm char	++ hulled barley; +++ sm Trifolium-type; + Galium aparine	B/C
393	1826	1	Fill of posthole 1827, possible heat sisturbance near top	50ml flot incl a few lge char, slag blobs	+++ good hulled barley & oats; + oat awn	B
1905	1830	1	Fill from furnace 1081	125ml flot incl 75ml lge char	+ barley frag	D char ID
1908	1853	1	Fill from furnace 1071	135ml flot incl 70ml le char, slaggy blobs	nil	D char ID

NOTES

The following codes were used to indicate the potential of each sample for further analysis :

A = high potential on archaeobotanical merit alone. May be due to size of assemblage, excellent state of preservation, unusual taxa or rarity of information for a particular period.

B = reasonable potential, particularly if grouped with other samples from the same period

C = some potential, but few or poorly preserved remains. Needs to be grouped with other samples, or from a particularly important context to be worth including.

D = no further potential. Flot fully sorted or sterile. Where a few remains have been recorded, the information may be used in final report, but no further work is required.

APPENDIX 6: CHARCOAL ASSESSMENT
Recommendations for further analysis
Dana Challinor

The charcoal from the site was generally abundant and well preserved, although in some instances, pieces were encrusted with sediment, making certain anatomical characteristics difficult to see. It was apparent from the assessment that a limited range of woods were utilised for fuel and most samples were dominated by a single taxon, usually *Quercus* (oak) or *Ulex/Cytisus* (gorse/broom). The Romans commonly used oak charcoal for iron-working, so it would be consistent for this species to be utilised in the early Medieval period. The use of gorse or broom has been used in iron-working contexts in Norfolk, where it was suggested that limited supplies of woodland resources necessitated the use of heathland resources. It would be of interest to examine the contexts to determine if the samples dominated by oak are limited to industrial activities and what the gorse/broom was used for. Since these species were rated for bread ovens in the medieval period, there may be a connection with this type of activity. Given the importance of this site, it is recommended that some analysis be carried out on the charcoal for inclusion in the final publication. This will examine:

- Context-related variation; specifically the use of fuels for metalworking and domestic activities
- Any evidence for woodland management and availability of local resources.

Almost all of the charcoal samples had potential for analysis, but since many appeared to be dominated by either oak or gorse/broom, extensive identification of further samples will not be necessary. The rate of analysis would be 2 samples/day and the assessment results would be included. The scale of the analysis depends to some extent upon the excavator being able to identify appropriate contexts (ie with clearly defined activities associated with them) from the samples with marked A or B in the assessment. It is suggested that a minimum of 8 samples are analysed in full, as this represents *c.* 30% of the analysable material. Some of the samples which were hand-picked on site for radiocarbon dating contained whole stem fragments – it is recommended that some of these are examined in more detail as they may provide an indication of management practices.

Estimate

Analysis of 8 samples	4 days
Examination of hand-picked charcoal	0.5 days
Production of report	2 days

Charcoal sample ID pre radiocarbon dating

Sample Number	Context Number	Identification	Notes	Other charcoal
313	543	*Corylus avellana* (hazel)	Roundwood fragment, no bark edge; min 4 years	Rest of sample contains lots of roundwood fragments, mostly oak
347	1082	*Quercus* sp. (oak)	Sapwood fragment	Looks like all oak
349	1143	*Ulex/Cytisus* (gorse/broom)	Large rootwood fragment heavily fissured. No bark edge; min. 8 years	None

Table 2: Charcoal assessment by Dana Challinor

Sample no	Context no	Complex no	Species	Quantity	Species	Quantity	Species	Quantity	Notes	Potential
333	166	7?	Quercus	++	Alnus/Corylus	++			comminuted	D
311	200	8	Ulex/Cytisus	+++					roundwood	C
310	536	6	Quercus	++	Prunus type	++			roundwood	B/C
312	543	6	Quercus	++++					complete stems	A
317	584	7	Quercus	++++					Some roundwood	A
324	624	6	Quercus	+++	Alnus/Corylus	+			roundwood	B
369	636	7?	Quercus	++						D
330	675	6	Quercus	+	Alnus/Corylus	+			roundwood	D
379	684	7?	Alnus/Corylus	++	cf. Sambucus/Prunus	+			mixed	B
332	781	7?	Quercus	+++	Alnus/Corylus	+			Some roundwood	B/C
334	870	7? *check final pand and section 1386	Ulex/Cytisus	+++					roundwood	B/C
339	915	3	Quercus	++	Alnus/Corylus	+			q comm. Roundwood	C
368	945	11?	Prunus type	+++						A/B
365	991	3	Quercus	++	Ulex/Cytisus	+			v large frags. Roundwood	D
362	1028	1	Ulex/Cytisus	++++					stems	A
385	1037	4	Ulex/Cytisus	+++	Quercus	++			some stems	A*
388	1042	1	Ulex/Cytisus	++++	Quercus	+			roundwood	A*

Sample no	Context no	Complex no	Species	Quantity	Species	Quantity	Species	Quantity	Notes	Potential
1911	1042	1	Ulex/Cytisus	++++					stems	A
361	1043	1	Ulex/Cytisus	++++					roundwood	A
364	1043	1	Ulex/Cytisus	++++	Quercus	+			roundwood	A
354	1050	1	Ulex/Cytisus	++	Quercus	+			Some roundwood	B/C
390	1054	1	Ulex/Cytisus	++++	Quercus	+			roundwood	A
1906	1067	1	Ulex/Cytisus	++++					roundwood	A
1908	1071	1	Ulex/Cytisus	+++	Quercus	++			roundwood	A
389	1078	1	Ulex/Cytisus	++	Quercus	++	Alnus/Corylus	+	good pres	B
346	1134	13	Ulex/Cytisus	++					roundwood	C
358	1144	North of 13 Fence line?	Quercus	++++					some sapwood; vitrified	A/B
1907	1503	9	Quercus	+++					Some roundwood	B/C
1915	1522	14	Alnus/Corylus	+++						B/C
1916	1524	145	Alnus/Corylus	++	Maloideae type	++	Quercus	+	mixed	A*
391	1813	1	Quercus	+++						B/C
1905	1830	1	Alnus/Corylus	++	Ulex/Cytisus	++	Maloideae type	+	roundwood	A

Sample no	Context no	Complex no	Species	Notes	C14 potential	
309	515	6	Quercus	lots frags	No	
301	102	8	Quercus	?roundwood	Maybe	would need further identification
1921	116	8	Quercus	v comminuted	No	
1919	129	8	Quercus	mostly held together by sediment	No	
307	199	7	Ulex/Cytisus	mostly sediment with v small charcoal frags	No	
1922	510	7?	Quercus	1 stem frag	Yes	
1918	516	7	Quercus	some heartwood; lots frags	Maybe	would need further identification
314	573	7?	Alnus/Corylus	v crumbly but poss to id	Yes	
315	573	7?	Alnus/Corylus	roundwood	Yes	
324	624	6	Quercus	roundwood; lots frags	Yes	
322	647	6	Quercus	roundwood. 3 wraps - all oak	Yes	
344	972	11	Quercus	1 large frag; sapwood	Yes	
1923	1028	1	Ulex/Cytisus	roundwood, lots frags	Yes	
348	1043	1	Ulex/Cytisus	roundwood; lots frags	Yes	
1920	1144	0ther	Quercus	some probable sapwood. Lots frags	Maybe	would need further identification
373	1183	North of 13	Quercus	comminuted	No	
371	1505	9	Quercus	some roundwood	Yes	

APPENDIX 7: SMALL FINDS
Assessment Report
Mark Redknap, Amgueddfa-Cymru – National Museum Wales

The worked stone from the Esso site merits publication with either photographs, or where indicated, line drawings. A range of different functions can be identified within the site assemblage. Correlating stones with known or likely phases of activity is desirable before the report is completed.

The quernstones appear to be broadly contemporary in stylistic terms with the early medieval radiocarbon dates that have been obtained from features such as the iron 'furnace' and corn driers. The activities implied by both corn driers and quernstones requires further consideration. Some of the quernstones are similar in form (but not geology) to those excavated at Dinas Powys (near Cardiff), Newton, Waterston (Milford Haven) and Llanbedrgoch (Isle of Anglesey), the latter site also having numerous early medieval radiocarbon dates. Honestones are difficult to date, but similar to examples from early medieval sites such as Hen Gastell near Swansea.

Some utilised stone may be contemporary with earlier activity, such as that associated with the Bronze Age pit (complex 6).

The following artefacts need illustration. [P] = photograph, [D] = drawing with cross section. Photography can be undertaken by Amgueddfa Cymru/National Museum Wales.

Utilized stone
SF 402. Honestone (boulder). [P, D]
SF 411. ?Hone. [P]
SF 412. Grooves – natural? [P]
SF 417. (Context 962?) Polished pebble – plough stone? [P. D]
SF 413. Honestone used on 4 sides [D, 4 sides]
SF 415. Honestone pebble. [P]
SF 421. Possible grooves on edge? [P]
SF 423. Pebble. [P]
SF 424. Hone/rubbing stone. [D]
SF 425. Multiple grooves (paw shaped cluster). [P]
SF 427. Natural with marks. [P]
SF 431. Possible sharpening grooves [P]
SF 433. Pebble. [P].
SF 435. (Context 1130) Small honestone. [D]
SF 436. Sharpening stone fragment. [P]
SF 437. Rubbing stone [D]
SF 438. (Context 1609) Honestone (pebble). [D]
SF 440. (Context 1522) Pebble with 2 percussion points. [D]
SF 441. Cupstone. [P, D]
SF 443 (Context 1120) Whetstone. [D]
SF 444. (Context 969) Honestone pebble. [D]
SF 445. (Context 1043) Smoothing stone? [P]
SF 446. (Context 1003) Heated pebble. Prehistoric?
SF 447. (Context 901) Honestone. [D]
SF 449. Exotic – Norwegian schist? [P]
SF 451. (Context 127) Polishing/smoothing pebble (flint). [P]
SF 453. Honestone. [P, D]
SF 454. Polished flint honestone. [P, D]

SF 455 (Context 902) 'Incised?' stone - unclear. [P]
SF 456 (Context 969) Slipstone [D, P]
SF 458. (Context 969) Small honestone. [P, D]
SF 459. 'Worked stone – polished, with mottled surface discolouration. [P]
SF 460. Small honestone. [P, D]
SF 463. (Context 969) Pebble. [P]

Quernstones
SF 418. Upper quernstone, complete. [D, P]
SF 419. [D]
SF 428. Possible [D]
SF 430. Upper quernstone. [D]
SF 432. broken quernstone. [D, P]
SF 448. Quernstone edge. [D]

Ironwork:
To be x-rayed. Probably not worth illustrating.

No action required:
SF 401. 'Decorated stone' – natural
SF 410. Natural.
SF 414. ?Hone.
SF 420. (Context 951) Pebble
SF 426. (Context 1503) ?Hone pebble.
SF 429 (Context 1183) Pebble.
SF 434. Natural bevel.
SF 442. Natural.
SF 452. Small pebble.
SF 457. 'Polished stone' – natural.

APPENDIX 8: EVALUATION OF ARCHAEOMETALLURGICAL RESIDUES

Dr T.P. Young

The submitted assemblage contained two main groups of residues

Residues from iron-making dominate the collection and are represented by 53.1 kg out of the total of 60.6kg submitted material. Of this material 40.1kg was from Complex 1 and 10.4kg from Complex 4. The material from these two areas was almost identical in character, with approximately 60% by weight smelting slags, 8% smithing slags and 28% slags not attributable to either class with certainty, together with 2-6% furnace lining. A further 2.5kg of iron-making residues occurred in other complexes and as unstratified material. The smelting slags are indicative of use of a small slag-tapping furnace, probably producing a rather small volume of tapped slag per smelt. Smithing slags are apparently dominated by smithing hearth cakes with weights of between 750 and 1440g. These are fairly large, and are probably indicative of bloomsmithing being undertaken. The ore source is not immediately obvious: the tapped flows do not appear to carry unreacted ores, as is sometimes the case. The site has yielded rocks from two potential iron sources: weathered iron-rich concretions probably derived from the drift, but of Carboniferous origin and a block of mottled bog ore.

The second group of residues includes highly vesicular, friable, low density, green lining or fuel-ash dominated slags. These are most abundant within Complex 7, where they were recovered in significant quantities (1.1kg) in association with corn driers, and are therefore interpreted as being of non-metallurgical origin.

The iron making assemblage is of great significance because of the lack of evidence for iron smelting of 8-10th century age in Wales, and the paucity of evidence in SW Britain in general. The large number of sites now known from this period in SE Ireland are distinguished by the use of a an entirely different, non-slag tapping furnace type.

METHODS

All pieces in the assemblage were examined, where necessary using a low-powered binocular microscope, and weighed. The full catalogue is presented (listed by bag to allow easy retrieval of particular specimens in Table 1. Summary data structured by complex are presented in Table 2.

RESULTS

Iron-making slags

The dominant class of slag in the assemblage comprised tapped iron-smelting slags. These provided 27.7kg (49%) of the entire assemblage. The tap slags were extremely dense slags forming accumulations of typically rather narrow (10mm) rivulets. No complete tap slag accumulations were recovered, but the shape of the largest surviving fragments suggested that the accumulations were rather small. The largest block weighed 1450g and was probably slightly less than half of the original accumulation.

In no case could tapslag blocks be related back to material from the taparch area, but a block of approximately 650g preserved dense flows from the taparch in connection with slag solidified within the furnace. The morphology of this block suggested tapping took place through a narrow (c.40mm wide) channel. Furnace slags from close to the taparch were mainly charcoal-rich and often showed a slightly lobate upper surface. Several large blocks of massive charcoal-rich slags were probably also furnace slags.

In some cases certain differentiation between blocks of charcoal rich furnace slag and poorly consolidated smithing hearth cakes could not be made. Reasonably certain identification of a few smithing hearth cakes was possible. The possible and certain SHCs are listed below:

C901 possible dense shc, 704g
C1003, certain shc, 1115g
C1004, certain shc, 776g
C1005, possible shc fragment, 264g
C1033, possible shc fragment, 334g
C1037, certain shc, 756g
C1043, possible shc, 1440g

Several of the SHCs seem to have charcoal-rich bodies with little or no crust development. The examples from c1003 and c1004 are rather more conventional in form, although the specimen from c1003 is very broad and shallow.

The slags listed as being of indeterminate origin probably derive largely from smelting furnace slags and from smithing slags. The tapped slags are recognisable in general down to very small pieces, so are probably not strongly represented amongst the indeterminate debris. Much of the indeterminate material is extremely rusty, and an origin is likely in the basal part of the smelting furnace where metallic iron is common, even away from the main

bloom. It is also possible that some of the rusty material is slag detached from the bloom during the early stages of bloom cleaning and consolidation.

Low density vesicular slags

The second group of slags comprises low-density, friable, highly vesicular slags with a "frothy" appearance. These slags are typically pale or greenish externally, but the fresh glassy slag may be very dark, almost black, on fresh internal surfaces. Most of the slag specimens are small irregularly rounded blebs, but larger pieces may coalesce to form crudely-developed sheets. Some fragments appear to show the nubs as heated small pebbles. Material that was sufficiently fluid to form smooth-surfaced green glass droplets was recorded from several contexts.

These slags have a morphology and texture typical of slags of a non-metallurgical origin. The two largest concentrations occur in c516 (544g) and c629 (320g), both upper fills of corn driers.

INTERPRETATION

Iron-making slags

The iron-making slags show that both the smelting and bloomsmithing (refining) processes were undertaken on, or close to, the excavated site. Excavation revealed the bases of a pair of small slag-tapping shaft furnaces, and much of the smelting slag may have been associated with these furnaces, although the stratigraphic distribution of slag suggests many of the contexts bearing the slag date from a period after disuse of the furances. Until detailed plans and sections become available during the post-ex process little can be said in detail about the morphology of the furnaces, but they appear to be small. The basal part of the furnaces was excavated into natural bedrock, which accounts for the large quantity of natural stone included with the tapped slag collections and locally incorporated within the slags themselves. The small size of furnaces is also indicated by the nature of the tapslags that show a small size of rivulet (typically strongly convex and approximately 10mm wide) and probably also the small size of the tap slag accumulations. It is not possible to estimate the overall size of the tapslag flows produced during a smelt, but the size of the surviving fragments suggests a figure of around 3-4kg is probably appropriate. This is small in comparison with the slag flows produced from other sites around the Bristol Channel, and corresponds to production of a very modestly-sized bloom. Construction of a mass-balance solution for the furnaces after full analysis of the slags may help to constrain this more closely.

The ore source could not be determined by examination of the slags, although this is commonly possible on other sites with the bases of tap slag flows carrying small particles of unreduced ore. The site produced examples of two types of iron-rich rocks, claystone nodules probably ultimately of Carboniferous origin but derived from the drift and a probable bog iron ore of unknown origin. It would appear rather unlikely the thin drift at this locality would produce enough iron concretions to provide a suitable source, so smelting of bog ore or an imported ore seems more likely. Further analysis of the slags should be able to determine this (Pembrokeshire ore sources are further discussed in Appendix 1).

The smithing hearth cakes are all large. Crew (1996) suggested that SHCs range from 100-2000g, with blacksmithing SHCs typically 200-600g. That all five

possible complete SHCs from this site weigh over 700g is strongly suggestive that they are from bloom refining rather than artefact manufacture.

It is very interesting that the two larger collections of slag (complexes 1 and 4) have very similar proportions of slag from the various classes (Table 2) and this presumably reflects a uniformity of taphonomic process. The question of whether this represents a proportionate sample of the residues from the iron production is impossible to answer without some knowledge of the mass-balance of the reaction. At first examination the amount of smithing slag seems very low compared with the smelting slag.

It is possible to provide some rough limits within which the production of iron equivalent to the surviving slags may be constrained. It is known experimentally that approximately one half of the bloom is lost during compaction (Crew 1991, Sauder & Williams 2002), so the weight of iron in the smithing slags is approximately equal to half the original bloom weight. Since a typical smithing slag is approximately 50% iron, then the smithing slags are approximately equivalent to the original weight of original bloom being processed (some iron is of course also lost as microresidues). In this case the weight of smithing slags is between 4.1 and 19.5kg. The weight of smelting slags is between 32 and 47kg. If the ore employed was an oxide ore, then it may be appropriate to compare with the theoretical figures produced by
Thomas & Young (1999) who calculated that each unit weight of bloom produced involved production of approximately 1.5 times that weight of slag. That would mean the production of bloom was between 21 and 31kg. Other estimates (based largely on experimental work; Cleere 1976) would suggest that smelting slags weigh three times the weight of the raw bloom produced for leaner ores. That higher ratio would suggest iron production of 11-18kg. The two ranges of estimates of bloom production overlap, with that derived from consideration of the smelting slags being 11-31kg and from the smithing slags 4-20kg. Thus despite the apparent mismatch of the quantities of smithing and smelting slags it is conceivable that the assemblages of slag from complex 1 and 4 are representative of original slag production and the original dump composition represents both parts of the process of iron production. It is to be hoped that further detailed analysis will be able to address the issue of how representative the surviving slag assemblage may be.

Corn drier slags

The vesicular slags from the corn driers can be interpreted as probably being produced from a reaction between sediment (possibly clay from the drier or mixed with the fuel) with fuel ash. The high vesicularity reflects the importance of volatile release during slag generation.

EVALUATION OF POTENTIAL

The South Hook assemblage is of enormous significance for there are extremely few other iron smelting sites known from this period (8-10th century) in Britain and none to date in this part of the country.

Early medieval iron smelting sites in SW Britain are known at Ramsbury, Wiltshire (8th century; Haslam 1980), Blacklake Wood, Devon (7-8th century) and probably at Cheddar (late 10th-11th century; Rahtz 1979). Slightly further east are Gillingham (Heaton 1992) and Worgret (Hinton 1992) in Dorset. Additional evidence is provided, for instance, by the 3 manors in Gloucestershire and 6 in Somerset that are given as paying revenue in iron in Domesday. This indicates

that the archaeologically attested iron production is only a very small part of that actually present.

In contrast, many iron-smelting sites of this period are now being recognised in Ireland (e.g. Young 2003a,b, 2005a,b, 2006a,b.), but these differ in technology, being non-slag tapping slagpit furnaces. One single example of a furnace which might possibly have been slag tapping is now under investigation at Woodstown, Co. Waterford (author's unpublished work).

Detailed description of the technology employed at South Hook would provide an important datapoint in the sparse knowledge of British smelting of the Early Medieval period and would allow full comparison with other sites in Britain and Ireland.

Detailed analysis of the slags should allow modelling of the furnace mass-balance, following the methodology of Thomas & Young, 1999. This approach would allow evaluation of the iron source, the efficiency of the operation and its likely iron yield.
The slags from the corn driers are a class of slag not closely examined elsewhere. Whilst detailed analysis of these slags is unlikely to generate data leading to enhanced understanding of the South Hook site, improved understanding of slags produced in the driers is likely to produced an enhanced potential for interpreting such slags from other sites. For this reason further analysis of these slags would be recommended.

Appendix 1: Iron Ores of Pembrokeshire

The occurrence of early iron smelting in the Milford Haven area was somewhat unexpected in view of the lack of known occurrences of suitable iron ore in the immediate area.

Iron ore is however known in Pembrokeshire in fairly small quantities from several distinct sources:

1. the Carboniferous Coal Measures.

Iron carbonate nodules from the Coal Measures have been mined extensively in the Saundersfoot area and also have been interpreted to have been the source of ore for the 17th century Canaston Furnace. Similar nodules, but highly weathered are commonly encountered in drift deposits, and might locally be sufficiently abundant to be worked for a bloomery.

2. Iron oxide ores at the top of the Carboniferous Limestone

Iron ores are found locally in small pockets with the Lower Carboniferous Limestones, particularly close to the top of the unit. These have been worked locally in South Pembrokeshire (Lydstep, Penally, Jameston). Similar deposits also seem to occur to the north of the coalfield, with occurrences of ochre noted near Haverfordwest (near Cinnamon Grove Gate, Hamlet of St Thomas, and at Greenhill Ochre Mine, Haroldston St Issells; Claughton 1976). These two localities lie on a strongly faulted zone of the northern margin of the coalfield, which to the east passes close to Minwear, where another small iron ore deposit was worked in the 17th century. This deposit was apparently described by Raspe as bog ore. However, the ochre deposits of Haverfordwest were also manganiferous, so that it is possible the Minwear occurrence is a similar orebody.

3. Bog iron ore

A possible occurrence of bog ore was claimed by Raspe at Minwear (P. Claughton pers. comm. 2006; see above), but this has not received critical moden investigation

4. Other sources

Mineralisation is also known close to the site, for a small lead mine operated at South Hook in the 18th century (Claughton 2003). It is just possible that the lead mineralisation might have been accompanied by unrecorded iron ores.

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Table 1. Slag catalogue by bag, ordered by context number

Context	Sample	Weight	Description
102		30.62	small fragment of tapslag with high-lobed flows
		2.33	low-density highly vesicular lining slag fragment
112		20.76	dense tapped lobe
119		11.06	corrosion around small iron pieces, in c.7 pieces
		8.24	larger piece of probably corrosion (not certain) attached to stone
127		0.16	low-density highly vesicular green lining slag
127		52	broken hollow bleb/flow lobe of dense slag - presumably a tapslag bleb but not classic tapslag
132		1.43	3 low-density highly vesicular lining slag pieces, greenish externally but black internally
137		1.1	melted greenish glass, probably not metallurgical
139		5.47	small dense prill
139		42	small tapslag fragment
		15.7	2 small stone pieces with buff coloured concretion, natural
139		0.58	1 grey-green low-density highly vesicular lining slag piece
168		17.4	small tapslag fragment
188		5.19	disintegrated lump of low-density highly vesicular lining slag
197		14.74	11 pieces of low-density highly vesicular greenish lining slag and vitrified lining material
		11.45	brick like reddish fired clay
197		2.82	green low-density highly vesicular lining slag
		1.1	4 pieces of burnt bone
		7.63	iron rich stone? in 2 pieces
198		124	c.40 pieces of green low-density highly vesicular lining slag in charcoal rich soil

Context	Sample	Weight	Description
508		1.47	2 rounded lumps of grey low-density highly vesicular ling slag
511		30.3	c.13 pieces of greenish low-density highly vesicular lining slag
513		78	small pieces of green low-density highly vesicular lining slag mixed with soil
515		1.63	green low-density highly vesicular lining slag fragment
516		362	pale greenish lining slags - mainly the low-density highly vesicular kind in crude sheets, but also some completely altered pebbles and at least perfect green slag sphere
516		182	63 pieces of pale low-density highly vesicular green lining slag. Some very shiny spheroidal aggregates included here
517		2.02	c.10 pieces of low-density highly vesicular green low density lining slag
517		98	complicated descending flow of tap lobes - possibly from drip area?
543		7.98	small irregular spiky bleb of low-density highly vesicular green lining slag
		226	dense block of slag, irregular in shape but has some small lobes so may be partially flowed furnace slag or very thick tapped flow
623		1.13	3 low-density highly vesicular pale lining slag fragments
629		320	large quantity of very friable lining type slag
737		3.53	greenish low-density highly vesicular lining slag in >6 pieces
901		704	dense bun shaped slag block, possibly part/all of shc?
901	(unstratified)	424	34 pieces of tapslag
		8	slagged lining
		27	2 pieces of claystone ironstone
		128	tapslag fragment
		124	42 small pieces of iron slag indet
		116	4 lumps of rusty slag - not clear if smithing slags or not

Context	Sample	Weight	Description
962		352	large block of possible bog ore
969		130	4 stones
1002		1250	large block of charcoal rich slag with lobate top - probably a furnace slag
		284	vesicular slag with irregular lobate projections - contorted furnace slag?
		228	charcoal rich furnace slag
		112	fractured pebble
		12	6 fragments of flint
		42	fractured flint/chert pebble
		22	fired pebble - possibly ore?
		14	2 flints
		6235	tapped slag -195 pieces
		962	small slag debris
		70	stones
		28	boxstone claystone ironstone fragment
		724	51 pieces of extremely corroded slag and iron - most probably iron rich slags, but at least one appears to be iron fragment - not practical to separate
		494	11 pieces of charcoal rich furnace slag
		346	curved slab of slag with charcoal on one side and smooth on other - probably a crust from with the furnace
		220	30 pieces of lining, some vitrified
1002		722	15 pieces of tapslag, up to 30mm thick, mainly thin flows, some wrinkly, lots of shale clasts on base
		86	4 pieces of lower density vesicular iron slag indet
1002		328	14 pieces of tapslag
		196	11 other pieces of dense slag
		46	6 pieces of fired lining
		22	iron-mottled soil
		10	iron concretion - rusted material?
1003	find416	1115	shc, platy dished top up to 15 thick, below which hangs finely prilly material with a small area of almost thin crust like margin. 140x150x80
		28	small fragment - possibly from lip of the above or a similar cake?

Context	Sample	Weight	Description
1003		332	three pieces of dense slags, 2 smaller are tapped, large block also has flowed top but seems internally massive at first inspection
1003			charcoal stick
		24	tapslag fragment
		158	2 small pieces of dense slag which is finely vesicular with small charcoal - could be shc or furnace bottom
		6	2 indet iron slag fragments
1004		776	105x125x55, medium sized bun like shc with dished top. Details obscured by corrosion, lots of charcoal adhering to base
		5305	87 pieces of tapslag, largest c.700g, thickest c.35mm, mainly fairly narrow flows, base mainly rough some adhering stone fragments
		408	42 small pieces of indet low density vesicular slags
		48	7 pieces of vitrified lining
		680	5 lumps of charcoal rich furnace slags
		514	two pieces including furnace slag like material but with flow lobed top, one is a large block from throat showing flow lobed surface cutting down across finely charcoal rich material and turning towards a tapslag. Length 110, 60 thick on furnace side, 30mm thick towards outside
		126	irregular dense slag fragment
		78	3 stones
		106	7 rusty concretionary lumps which may have contained iron
1005		264	block of furnace base or shc, 40 thick of which 20 appears to be a crust, top vesicular, base dense
		116	26 pieces of broken slag, mainly or entirely from a broken piece of tapslag
1005		64	5 pieces of tapslag
1028		542	95 small pieces of very rusty material, probably mainly slag
		64	5 pieces of rusty material formed around corroded iron
		132	11 pieces of flowed slag, largest certainly tapslag, smaller prills probably so

Context	Sample	Weight	Description
1033		334	part of an irregular thin crust style cake. Crust to about 5mm, inside charcoal rich or hollow, slightly rusty top, not clear if this is an shc (v odd for Britain) or part of a furnace bottom deposit (more likely?). Mainly c40 thick but with protrusion to 60.
		210	5 pieces of tap sag, single lobe thickness, grey particles on base
		54	5 vesicular slag pieces indet
		20	fired clay with smoothed grey surface
		54	vitrified lining block?
		80	vitrified surface of lining including large stone clast
1034		130	3 pieces of tapslag, to 30mm thick, shale rich bases
		14	4 tiny pieces of rusty probably furnace material
1037		756	140x115x75 shc, (bowl 60mm deep), very charcoal rich throughout, smooth top with raised lump, has no real lower crust
		5610	109 pieces of tapslag, largest about 700g
		1090	small iron slag pieces, undifferentiated
		1580	19 pieces of mainly brown fine furnace accumulation, but grading into more normal charcoal rich slag
		210	3 stones
		36	2 pieces of vitrified lining
1037		564	79 pieces of vitrified lining - mostly with orange ceramic but a few pieces are just the slag layer
		236	stone
		88	25 small iron slag pieces indet
		518	15 pieces of tapslag and prill, largest piece 256g, shows base resting on charcoal rich ashy deposit
		182	4 large lumps of amorphous slag, mostly slightly rusty, mostly charcoal bearing, one has some lobes
1037		20.79	tapslag fragment

Context	Sample	Weight	Description
1038	1039	1450	large block of tapslag - but probably only half cake at most, 160x110x40, narrow lobes, typically 10mm
		424	smaller tapslag block with strongly wrinkled lobes
		772	contorted flow lobed block, not all dense - so may be a tap arch piece, but probably secondarily folded
		1820	42 pieces of tapslag and prills
		146	dense slag piece, rounded cross section with possible flow lobed top - probably a taping channel runner
		498	dense possible furnace floor piece, attaches to the above runner, suggest channel 40 deep by 30 wide
		1115	3 large blocks of dominantly charcoal rich material with some slightly lobed surfaces - furnace slag
		14	3 stones
		1435	c.200 small indet slag pieces
		20	5 pieces of vitrified lining
		2	possible bog ore fragment
1042		82	4 lumps of ferruginous as on fired clay base - could be with cleaning later
		38	dense iron slag indet, has very large vesicles so may be a tapslag
		148	block of dense slag composed of a complicated mass of prills and lobes
1043		792	mixed ferruginous material in ashy matrix- may be determinable after washing, but matrix interesting in own right!
1043	1039	2020	slab of stone with small attached area of fine furnace accumulation - probably c.100g
		1440	object like a charcoal rich shc, 150x110x75,
		962	127 pieces of similar furnace accumulation, rusty fine charcoal rich, some containing slag blebs, others fragments of stone
		260	block of charcoal rich slag with rusty contact surface, medium sized charcoal
		42	15 pieces of fired or vitrified lining
		470	7 pieces of dense tapslag
		144	30 small or indet pieces of slag
			charcoal stick
		18	2 stones

Context	Sample	Weight	Description
1044		248	curious block with smooth flown lip above (?) zone of contact with hard substrate. Possibly the lip of a large shc, but could just be tap arch material. Dense dark vesicular slag
1048		28	11 tiny slag pieces including at least two apparently fragments of tapslag
1049		56	5 brown lumps of material (ash?) cemented by "rust"
1054	(=1003?)	34	7 fragments of slag cooled between charcoal moulds
		2.49	fired clay
		42	4 stones
1056		28	tapslag lobe
		54	3 lumps of amorphous iron slag
1083		13.91	5 pieces of non- slag material, 1 stone with attached charcoal, 2 pieces of broken iron-rich stone, 1 small pebble, 1 iron-rich lump of concretionary? Origin
1098		66	3 pieces of tapslag plus debris
1609		2.33	2 pieces of greenish low-density highly vesicular lining slag
1853		528	iron cemented ashy soil with abundant charcoal and a few lobes of both very and horizontal prilly material. Presumably some sort of furnace bottom accumulation?
1853	1071	8.79	prill in 3 pieces
		2.07	ferruginous ash?
1886	furnace 1071	644	234 stones
		734	86 pieces of indet grey slag - mainly vesicular fragments
		146	53 pieces of fired lining
		1700	91 small pieces of tapslag- mainly from small flows and prills

Context	Sample	Weight	Description
1887	1081	338	c150 small indet slag pieces
	fuel ash	76	31 small local stones
	and slag	528	37 pieces of slagged lining, variably reduced or oxidised fired
	run-off see	958	43 pieces of broken grey vesicular slags of medium density
	section 1780	278	9 blocks of dark lining slag, variable density (not the pale low-density highly vesicular type)
		500	5 pieces of thin tapped flow, rubbly bases with attached stone, top unusually flat - might just be flowed bit almost looks like base of obstruction. Max about 25 thick
		376	6 pieces from more normal, but probably small tapped flows
		100	stone
1889	slag from	150	small block from 35mm thick tapslag flow

Table 2. Summary of slag classes by complex

	Complex 0	1	2	4	6	7	8	7&8 cleaning	11	13	unstrat	total	
Tapslag	66	20484	180	6149	98		121	42			552	***27692***	*49%*
Furnace slag		4038			226							***4264***	*8%*
Indet. iron slag		11279	264	2940				5.47			944	***15432***	*27%*
Smithing slag		3359		756								***4115***	*7%*
Lining & lining slag		956.5		600		11.5					8	***1576***	*3%*
Low density green slag				2.33	12.8	1115	12.6	0.58				***1144***	*2%*
Natural stone		3770		459.9		7.63	8.24	15.7		130		***4391***	*8%*
Iron and corrosion		180					11.1					***191***	*0%*
Possible ore		52							352		27	***431***	*1%*
Other		1344				1.1	1.1					***1346***	*2%*
												60582	
Smelting slag total	66	24522	180	6149	324	0	121	42	0	0	552	***31956***	
Smithing slag total	0	3359	0	756	0	0	0	0	0	0	0	***4115***	
Indet. iron slag total	0	11279	264	2940	0	0	0	5	0	0	944	***15432***	
Lining & lining slag total	0	957	0	600	0	12	0	0	0	0	8	***1576***	
Iron slag total	66	40117	444	10445	324	12	121	47	0	0	1504	***53079***	
Low density green slag	0	0	0	2	13	1115	13	1	0	0	0	***1144***	
smelting/total iron slag	1	0.61	0.41	0.59	1	0	1	0.88			0.37	***0.60***	
Indet./total iron slag	0	0.28	0.59	0.28	0	0	0	0.12			0.63	***0.29***	
smithing/total iron slag	0	0.08	0	0.07	0	0	0	0			0	***0.08***	
lining/total iron slag	0	0.02	0	0.06	0	1	0	0			0.01	***0.03***	

Slags Proposed sampling

Analyses of iron smelting slags (4 tap slags, 2 tap arch, 2 charcoal-rich)		8
SEM investigation of iron smelting slags		4
Analyses of iron smithing slags	(2 certain, 2 possible)	4
SEM investigation of iron smithing slags	(2 certain, 2 possible)	4
Analyses of furnace lining		2
Analyses of corn-drier slags		3
SEM investigation of corn-drier slags		3
Analyses of local ores and materials to aid ore provenancing		5

Total required:

Chemical analyses	22
SEM mounts	11

Investigation of possible parallels

APPENDIX 9: BRONZE AGE POTTERY AND MISCELLANEOUS

Jody Deacon, Amgueddfa-Cymru – National Museum Wales

There is only one vessel from (793), possibly of 'domestic' Beaker or Food Vessel tradition. At most, about a quarter of the pot is present, hopefully enough to get a good idea of the profile for illustration but probably not worth a full reconstruction. Two further unstratified sherds may be from the same vessel.

There is also a jet button or pendant which is in a poor state and will require conservation before it can be properly identified and illustrated - it has gone to the laboratory for stabilisation.

Complete list of all the finds

SF no.	Context no.	Complex	Context desc.	Period	material	object	no.objects	no.parts	Comments	Cons.	Illus.
	1002	1	upper fill of furnace complex		bone		1	1	burnt, tiny fragment		
	1028	1	upper fill of furnace complex		fired clay		1	1	small, undiagnostic		
	1038	1	Fill of pit 1039, ontains lots of charcoal and slag	?	fired clay	kiln/furnace lining	1	2	vitrified surface		
	1038	1	Fill of pit 1039, ontains lots of charcoal and slag		bone		1	8	tiny fragments		
	1043	1	Fill of pit 1039 cutting furnace 1071		iron?	fragment	1	1	tiny fragment		
	1048	1	possible primary fill of furnace complex		iron?	fragment	1	1	tiny fragment		
	910	3	fill of posthole [940]		stone	hearth material????			burnt		
	1032	4	upper fill of hollow (contaminated)		bone		1	1	burnt, tiny fragment		
	1083	4	fill of hollow 1626 (contaminated)		fired clay		2	2			
	1083	4	fill of hollow 1626 (contaminated)		slag		2	2			
	515	6	upper fill of [519]		animal bone		2		fragmented, tooth		
	517	6	upper fill of [519] = 509,515,518		antler		1	1	burnt		
	543	6	charcoal rich layer		bone		5	5	burnt (human?)		
	783	6		EBA	pottery	vessel	1	44	decorated		Y
	166	7	pit fill		bone		4	4	tiny fragments, undiganostic		
	199	7	lowest fill of corndrier [507]		bone		1	1	burnt		
	516	7	upper fill of corn drier		bone		12	12	burnt (human?)		
	516	7	upper fill of corn drier		fired clay		8	8	some moulding. Possible burnt daub		
	516	7	upper fill of corn drier		bone		1		burnt, (human?)		

	127	8	fill above stone structure = 104?		bone		1	1	burnt, tiny fragment		
	151	8	Lower fill of hollow		animal bone				lots of soil		
	151	8	Lower fill of hollow		bone				lots of clay, burnt, unidentifiable really.		
	188	8	Lower fill of hollow[151] below(127).		bone		1	1	burnt		
461	936	10?	fill of pit 936 near complex 10	EBA	jet	button/pendant	1		v.fragmentary	Y	Y
	945	11?	fill of possible cooking pit 946 north of complex 11		bone		1	1	tiny fragment, undiagnostic		
	105	7,8	cleaning after machining		coal		1	1			
	781	7?	layer		bone		1		tiny fragment, undiagnostic		
	108		fill of post-med field boundary ditch [109]		coal		1	1			
	110		fill of post-med field boundary ditch [111]		coal		1	1			
	883		Fill of small pit [884]		fired clay	kiln/furnace lining? Burnt daub?			burnt, tiny fragment		
	+		unstrat	BA	pottery	urn	1	2	decorated		
	606				human bone	cremated human bone			2 large bags.		
462	146?			Modern	glass		1	1			
	1002			possibly Roman	pottery	body sherd	1	1			
439	1048			Roman	pottery	rim sherd	1	1			Y
	901			Post-Med	pottery	rim sherd	1	1			
	112			-	stone		1	1			

APPENDIX 10: RADIOCARBON RESULTS

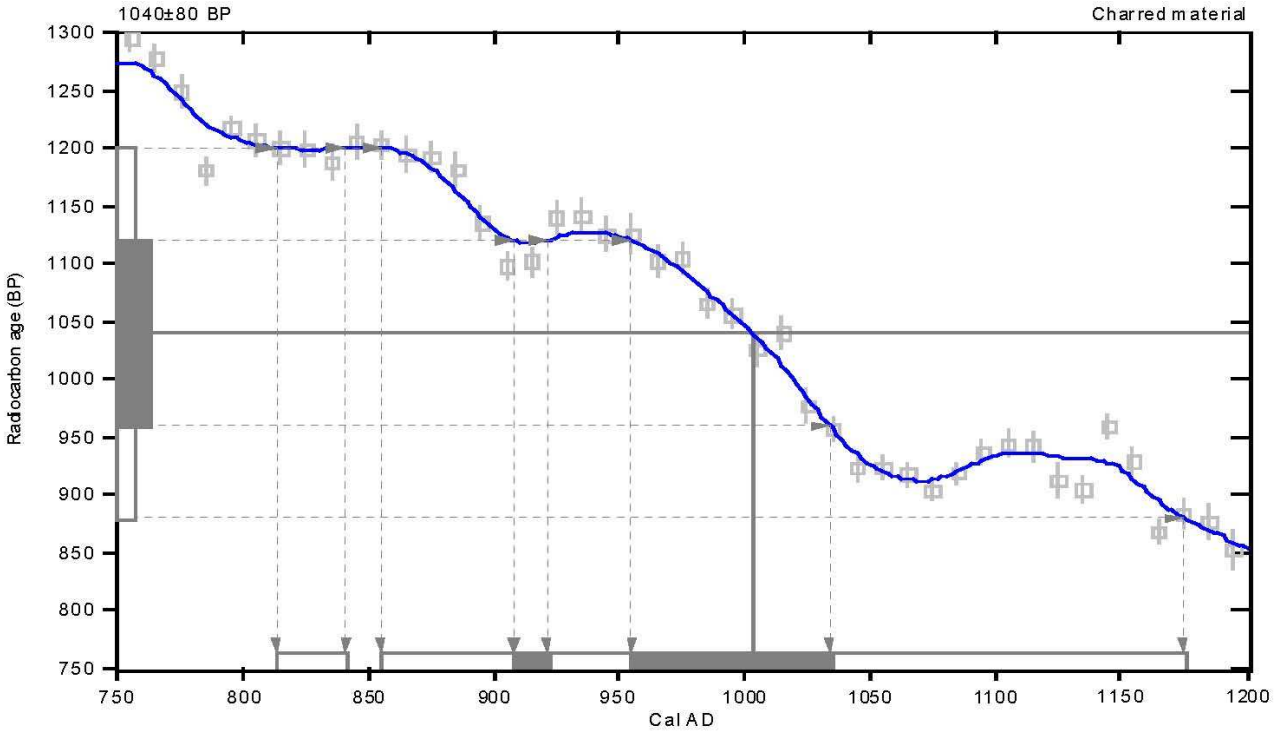
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25:lab. mult=1)

Laboratory number:	**Beta-198850**
Conventional radiocarbon age:	**1040±80 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 810 to 840 (Cal BP 1140 to 1110) and Cal AD 860 to 1180 (Cal BP 1100 to 780)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1000 (Cal BP 950)
1 Sigma calibrated results: (68% probability)	Cal AD 910 to 920 (Cal BP 1040 to 1030) and Cal AD 960 to 1030 (Cal BP 1000 to 920)



References:

Database used

INTCAL98

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.9:lab. mult=1)

Laboratory number: **Beta-198851**

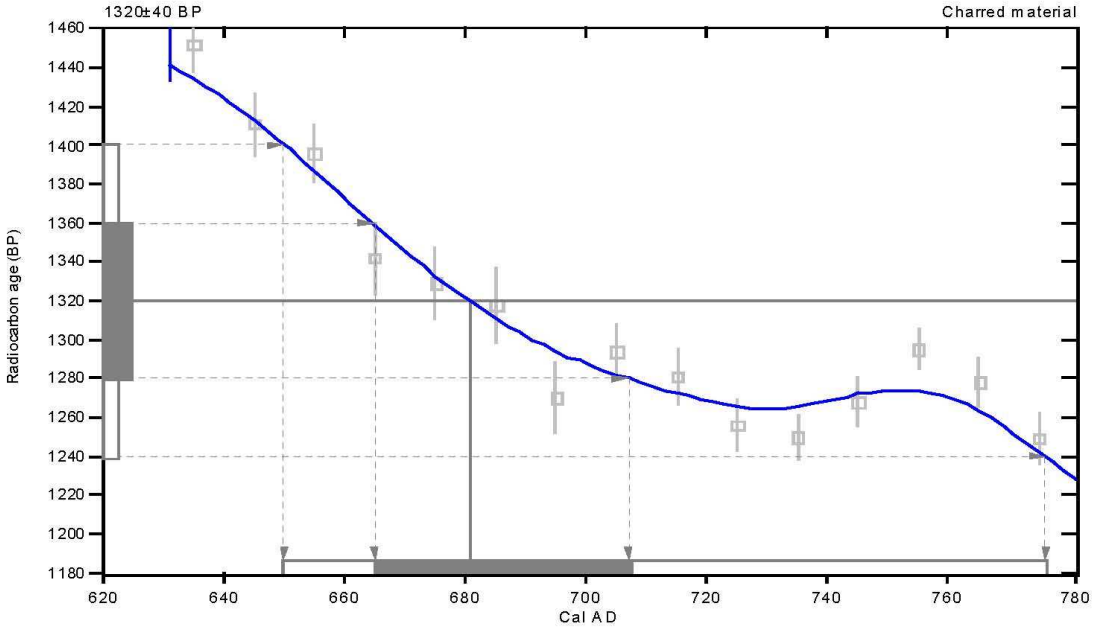
Conventional radiocarbon age: **1320±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 650 to 780 (Cal BP 1300 to 1170)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 680 (Cal BP 1270)

1 Sigma calibrated result: (68% probability) Cal AD 660 to 710 (Cal BP 1280 to 1240)



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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.1:lab. mult=1)

Laboratory number: **Beta-222368**

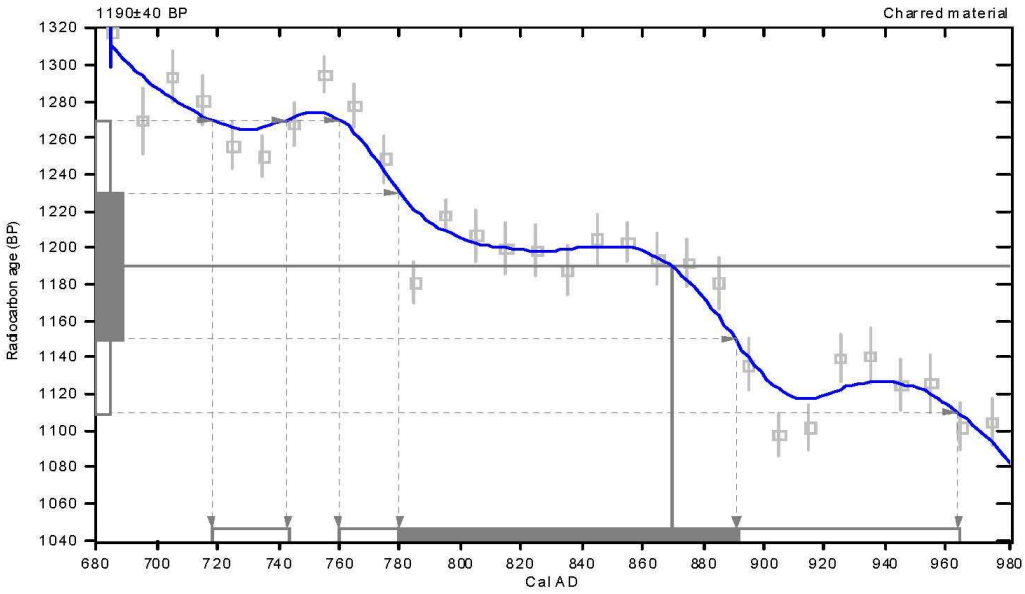
Conventional radiocarbon age: **1190±40 BP**

2 Sigma calibrated results: (95% probability) **Cal AD 720 to 740 (Cal BP 1230 to 1210) and Cal AD 760 to 960 (Cal BP 1190 to 990)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 870 (Cal BP 1080)

1 Sigma calibrated result: (68% probability) Cal AD 780 to 890 (Cal BP 1170 to 1060)



References:

Database used

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Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.5:lab. mult=1)

Laboratory number: **Beta-222369**

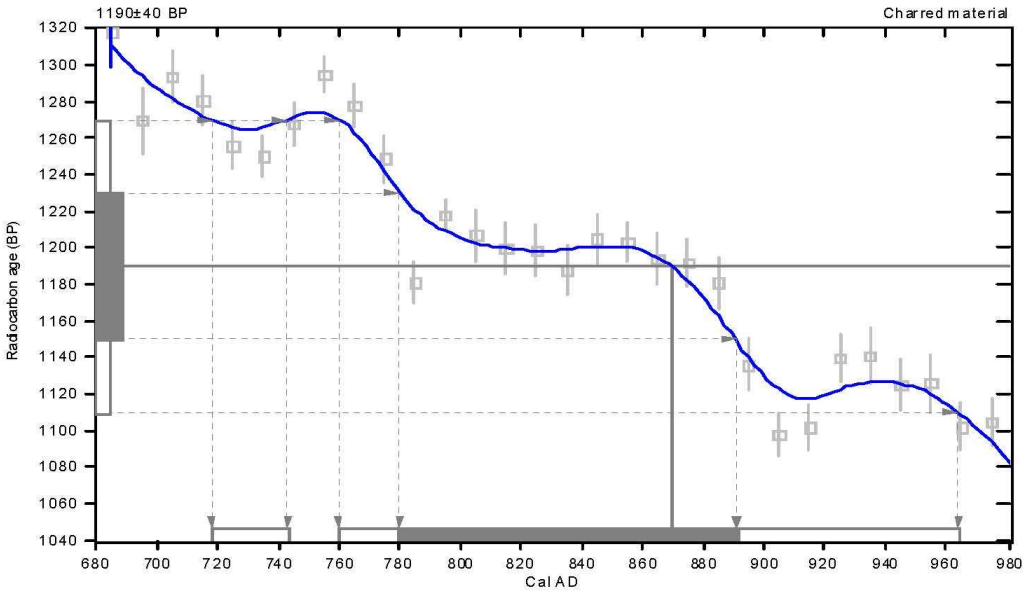
Conventional radiocarbon age: **1190±40 BP**

2 Sigma calibrated results: (95% probability) **Cal AD 720 to 740 (Cal BP 1230 to 1210) and Cal AD 760 to 960 (Cal BP 1190 to 990)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 870 (Cal BP 1080)

1 Sigma calibrated result: (68% probability) Cal AD 780 to 890 (Cal BP 1170 to 1060)



References:

Database used

INTCAL98

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.9:lab. mult=1)

Laboratory number: **Beta-222370**

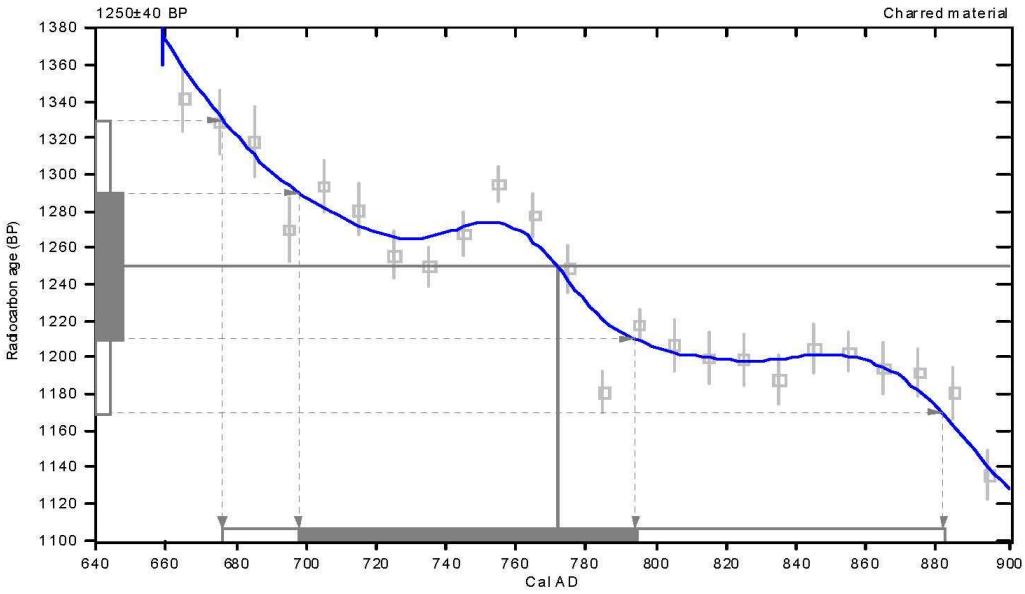
Conventional radiocarbon age: **1250±40 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 680 to 880 (Cal BP 1270 to 1070)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 770 (Cal BP 1180)

1 Sigma calibrated result: (68% probability) Cal AD 700 to 790 (Cal BP 1250 to 1160)



References:

Database used

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Calibration Database

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-20.2:lab. mult=1)

Laboratory number: **Beta-222371**

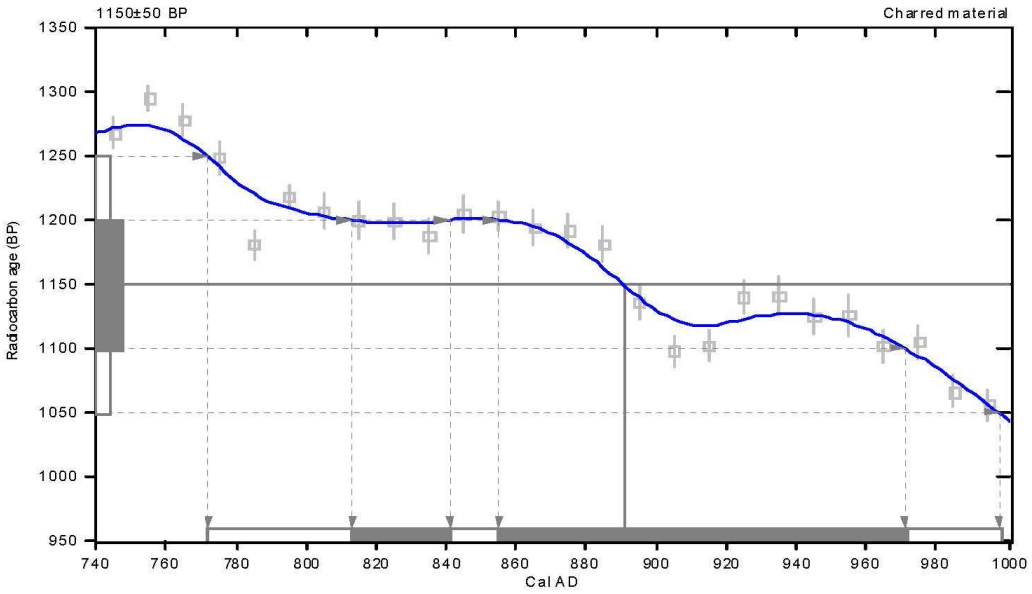
Conventional radiocarbon age: **1150±50 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 770 to 1000 (Cal BP 1180 to 950)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 890 (Cal BP 1060)

1 Sigma calibrated results: (68% probability) Cal AD 810 to 840 (Cal BP 1140 to 1110) and Cal AD 860 to 970 (Cal BP 1100 to 980)



References:

Database used

INTCAL98

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083

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APPENDIX 11: RECORD NUMBERS

Allocated 101-2100 plus photo (Excavation 2172-2616)(Axe WB 1978-1987)(Evaluation 4182-4201)
Context Numbers used total 948 of which 282 are stake/posthole cuts
Drawing Numbers total 308
Photo Numbers total: 420 digital, 175 colour slides, 175 black and white prints
Objects total 64
Samples total 131

APPENDIX 12: COMPLEX MAJOR PLAN DRAWING NUMBERS

Complex	Drawing	Sheet	Comments
1	2001	71	Main excavated plan
	1722	60	Part excavated northern part
	1757	75	Heat effected deposits
			Add cross sections/profiles
2	1464	46	Plan part sectioned
3	1427	38	Plan as excavated
	1434	41	Outlying pit excavated
4	1751	66	First Plan see also later plans.
	1797	70	Internal postholes
	2004	69	Internal postholes
			Also EDM survey
5	1490	53	First plan with baulk and section lines
	2008	73	Main plan
6	240	13	First plan of area just to north
	244	15	First plan of area
	245	16	Plan of area just to south
	256	19	Stone footings and heat affected area
	260	25	Stone footings
	1346	34	Main plan as fully excavated
7	222	9	Early plan of part of west pit
	225	10	First? Pan of north part
	226	11	Single Ph just to east
	245	16	Plan of area just to west
	246	17	Second? plan of area just to north
	255	18	Part of east pit, Phs + some heat effected areas
	269	22	Heat effected areas and cremated bone. North part
	234	23	West part as excavated + Phs
	1364	28	Final plan of northern part
	274	24	Western part mostly planned with complex 8
8	212	6	Southern edge part excavated
	214	7	Excavated plan of southern edge
	222	9	Early plan of central part
	234	23	Plan with most of structure
	274	24	Main mostly excavated plan
	1368	29	Part of final excavation plan. Overlay of 274
	1403	33	Very southern part
9	1486	52	Main plan with stones in situ
10	1428	40	Excavated Plan
11	1435	42	First main plan
	1452	43	Second Plan. Overlay of 1435
	1495	54	Third plan
	1501	56	Final plan as fully excavated
12	1471	48	Main plan as excavated
13	1740	65	Main plan as excavated
	1461	45	Part excavated
14	1800	67	Excavated plan
Site Sub 8	211	5	Main section in WB area (copied to Lampeter)
	230	12	Channel in WB area

APPENDIX 13: CONTEXT FINDS TABLE

Context	Complex	Flint Nos	Stone (obj No)	Sample No	Slag or fuel ash	Other	Context type and description
***		0		311			
***		0		329			
****		0		370			
****	Site sub 8	0		384			Sample from site 8 probably discard
****	Site sub 8	0				Hazelnut	From stream bed
102	8?	2		301	√		Fill of probable gully 101
104	8	4	449	302;303			Fill Upper fill of hollow 152. Beta- 198850 Cal AD 810-840 and cal 860-1180
105	7 and 8	16				Coal?	Cleaning after machining
106	8?	11	452				Cleaning after machining
107	-	5					Cleaning after machining
108	-	4				Coal	Fill of post med field boundary ditch 109
110	-	5				Coal	Fill of post med field boundary ditch 111
112	8	13			√		Fill upper most fill of gully 135 south of hollow 152
113	8	6				Iron	Fill of gully 135 south of hollow 152
114	8	1					Fill of gully 115 or fence line
116	8	1		1921			Fill of gully 117 for possible fence line
118	8?	0				Iron?	Lower plough soil? just above natural
119	8?	2			√		Fill of irregular cut 120, probably part of 101
120	8?	1					Irregular cut 120. Probably part of 101. Flint should have been recorded as fill 119
121	7?	2					Fill. Probably very upper fill of corn drier 131
122	7?	6					Cleaning. Unstrat.
125	7?8?	1					Cleaning. Unstrat
126	8	3					Cleaning NW side of hollow 152
127	8	11	402;451; 460	382	√;√	Bone; Iron 408?	Fill above stone structure. Same as 104? 146
129	8	0		1919			Lens on west side of hollow 152
130	7	6					Fill. An upper fill of corn drier 131

132	8	5			√		Fill. Part of fill of main hollow
137	8	1			√		Fill of southern part 134 of main hollow 152
138	8	1					Fill of western most gully 136 south of main hollow 152
139	6;7;8	36			√;√;√		Finds from cleaning initial extension to north and west plus spoil tip
140	7	1		305; 1927			Lens in bottom and up sides of probable corn drier 131
143	7	0		1926			Lens in top of corn drier 131
146	8	4	453;454			Glass 462	Fill same as 104? 127. Glass possibly Roman residual
151	8	0		380; 1928		Bone2; Iron 408?	Fill. Lower fill in northern part of hollow (zilch in flot)
153	(*plan 244)	1					Fill of posthole 154
159	7?8?	1		383			Fill of posthole 160
163	8	0				Iron?	Fill of pit 164 in northern end of hollow 152
165	8?	0	411				Structure. Possible working floor
166	7?	0		333		Bone	Fill of pit 167
168	8	0			√		Fill of posthole 169
178	8?	1					Fill of gully 179 running south from hollow 152
188	8	3			√	Bone	Fill. Lower fill of main hollow 151. Below 127
195	7?	0		306			Fill of pit 196 (possible duplicate recording wee 894)
197	7	0	401?		√?√	Iron; Iron 403	Fill, probably same as 516, upper fill of corn drier 507
198	7	2		386; 1925	√	Iron 409	Fill of corn drier 507
199	7	0		307		Bone	Fill. Lowest fill corn drier 507
200	8	0		304?;316			Layer? Charcoal spread associated with early phase of Complex 8. Beta 198851 Cal AD 650-780
503	Other?	1					Fill of posthole 504
505	8	0	412				Hearth or stone surface. Main structure in hollow 152
506	Other? 7?	0		378			Fill lower fill of pit 174
508	7	0		308	√		Fill. Lower very dark fill of corn direr 507
509	6	2	459				Fill. Upper fill of hollow 519 NE quadrant. Same as 515;517;518
510	7?	0	410?	1922; 1924			Layer or spread also filling small hollow

511	7?	0			√		Fill and possibly layer above posthole 512 near corn drier 507
513	7?	0		1929	√		Fill of posthole 514 near corn drier 507
515	6	0		309	√	Fired clay	Fill. Upper fill of 519 (recommend rc dating if no better sample recovered, see 312). (Same as 509;517;518
516	7	3		1918	√;√	Bone; Iron; Iron 404;	Fill. Upper fill of corn drier 507. Probably same as fill 197
517	6	2			√;√	Bone	Fill. Upper fill of 519. (Same as 509 515;518)
518	6	0				Iron 405; Iron 406	Fill. Upper fill of 519. (Same as 509 515;517)
532	(*plan 255)	0		331			Fill of pit 534
536	6	0		310			Fill between stones of main structure in 519
543	6	2		312;313	√	Bone; Iron 407	Layer. Charcoal rich Possibly better for rc sample than 309
550	6	3					Layer of heat affected material adjacent to corn driers 507 etc
553	(*section 267) 8?	2		381			Fill of pit 534? * needs checking possible wrong cut number
573	7	0		514;315			Layer same as 584
584	7	0		317;318			Layer. Lenses with grain and charred wood. Same as 584
605	7	0		1930			Fill of posthole 607
606	7	0				Bone 2,	Fill? Probably part of fill 605, fill of posthole 607
623	6	2		319	√		Layer of heat affected material, see 309 and 312
624	6	0		323;324			Layer? Fill. Charcoal rich layer below 623 below 623
629	7	0			√		Layer. Slagy deposit post-dating grain phase.
636	7?	0		369			Fill of double posthole 604
637	7	0		320			Layer sealing all deposits
642	7	0		321			Fill. Lower fill of corn drier 650
647	6	0		322			Layer/fill to the north of 519
675	6	0		330			Fill. Upper and main fill of 681 forming base and

							structure 519
684	7?	0		379			
707	7	0		326			Fill. Primary fill of corn drier 719. Poss. rc dating?
710	7	0		325			Layer with charred grain in natural depression
720	7	0	413				Fill of posthole 720
737	8	0		327	√		Fill of main hollow 152. Same as 151?
755	(*section 1344 photo 2411)see 414 for grid ref	4	414	328		Hazelnut	Fill of pit 756
781?	7? other	0		332		Bone	Layer
782	6	1		338*			Fill of 784, above fill 783 with Pre hist. pot
783	6	0		337* pot		Pre hist pot 337	
786	(*Plan 245see 786 for grid ref) Other?	2					Pit should have been given fill no 785
787	6	0		1901 (336)			Lower fill of pit 784 which contained pre-hist. pot
790	6? *Check final plan and section 1442	0		352			Cut. Sample should have been within fill 791
792	6? *Check final plan and section 1443	0		353			Cut. Sample should have been within fill 793
823	7?	3					Fill of posthole 823

840	7? *Check final plan 346 context 842	0					Fill of shallow pit 842
870	7? *Check final plan and section 1386	0		334			Layer or fill with heat affected clay. In possible pit 871
872	7? *Check final plan and section 1386 and 1406	0		335;375			Layer or fill with heat affected clay. In possible pit 871
883	Other ? * check plan 1403	0				Burnt mat.	Fill of small pit 884
901	1-5;10-14	79	415;425; 447		√;√	Iron, Post-med pot	Finds from unstratified machining and cleaning of final massive extension
902	10	5	455	374			Fill of posthole 903
904	10	2		355			Fill of posthole 905
906	3	0		367			Fill of possible corn drier 907
909	3	0		398			Fill of possible corn drier 907
910	3	0		400		Fired clay	Fill of posthole 940
913	10	0		350			Fill of posthole 914
915	3	0		339			Fill of posthole 916
917	10	0		366			Fill of posthole 918
919	10	0		376			Fill of posthole 920
922	10	0		356			Fill. Lower fill of posthole 923
924	10	0		377			Fill of posthole 925

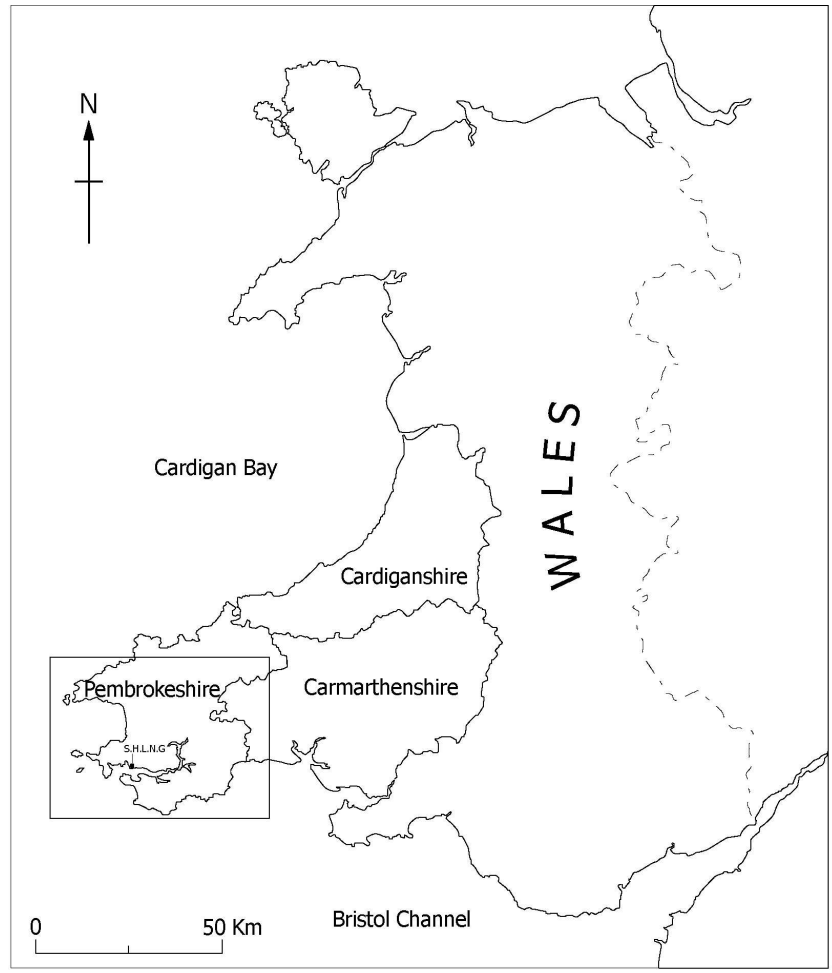
926	3	1		399			Fill of shallow irregular pit
930	10	0		342			Fill of hollow 931, possibly entrance hollow
932	10	0		341			Fill of posthole 933
934	3	3					Fill of posthole? 934 near complex 3
936	10?	1		351		Jet? 461	Fill of pit 936 near complex 10
942	*other see 1434	1		397			Fill of shallow pit 941
943		1					Fill of modern drainage ditch 944
945	11?	0		368		Bone	Fill of possible cooking pit 946 north of complex 11
947	10	0		363			Fill of posthole 948
960	11	0	448				Fill of posthole 961
962	11	0	417		√		Fill. Upper fill of hollow 964 above flagstones 963
963	11	0	418				Flagstones in hollow 964
969	13	8	444;450; 456;458; 463	340	√;		Later fill of hollow 970/1150/1159 after it had gone out of use
971	12	3					Later fill of hollow 1108/1111/1119 after it had gone out of use
972	11	0		343;344			Layer. Possible hearth material above flagstones
991	3	0		365			Fill of posthole 992
1002	1	30			√;√;√	Bone	Fill very upper fill of furnace complex
1003	1	1	1003		√;√416; √		Fill below 1002. Possible dump or spread. Same as 1054
1004	1	0			√		Fill below 1002 in furnace complex
1005	2	0			√;√		Fill of linear hollow 1006
1021	5?	0		357			Fill of posthole 1022 near liner complex 5
1024	5?	0		359			Fill of pit 1025 near linear complex 5
1026	1	1					Fill. Upper fill of natural? Feature 1036
1028	1	0		362;1923	√		Upper fill in furnace complex
1032	4	2				Bone	Upper fill of hollow contaminated
1034	1	1			√		Fill. Possible dump in pit 1039
1037	4	0		385	√;√;√		(Possibly contaminated with topsoil if I remember PC check **)

1038	1	0	419		√	Bone; Fired clay	Fill containing lot of charcoal and slag. In pit 1039
1042	1	0		388;1911	√		Fill large spread fill in northern part of complex. Same as 1065
1043	1	0	445	348;361;364	√;√	Hammer scale?	Fill of pit 1039 cutting west furnace 1071
1044	1	1		1914	√		Fill of pit 1045
1048	1	0			√	Hammer scale? Pottery 439	Pot probably RB residual. Possibly primary fill of furnace complex.
1049	1	0			√		Fill. Upper fill of pit 1051
1050	1	0		354			Fill. Lower fill of pit 1051
1054	1	0		390	√		Fill in SW quadrant of furnace complex
1056	1	0			√		Fill of posthole 1057 in NE quadrant
1067	1	0		1906			Fill of west furnace 1071
1069	1	0		396			Fill of possible posthole 1070
1078	1	0		389			Fill of 1079, possibly south part of west furnace 1071
1082	1	0		349			Fill. Sample from bottom of east furnace 1081 rc date?
1083	4	0	423;424; 430;431; 437		√	Stone, Coal, Fired clay; Iron 422	Fill upper contaminated by later material of hollow1626
1086	1	0		395			Fill of stake hole 1087
1092	1	0	427				Fill of posthole 1093
1096	1	0		394			Fill. Lower fill of pit 1096
1098	1	0			√		Fill of gully 1029
1116	12	1					Fill of probable posthole 1117
1120	12	0	443				Fill of posthole 1121
1126	13	1					Fill of posthole 1127
1130	11	0	435	346; 387; 1912			Fill of pit 1131. Below flagstones 2 stones possibly iron ore

1133	11	0		1913			Below southern part of heat affected area of paving
1134	13	0		345			Fill of posthole 1135.
1137	13	1					Fill of posthole 1136
1143	13	0		347			Fill of posthole/ stake hole 1142
1144	North of 13	0		358;1920			Fill of pit 1147
1163	Between 12 and 13	1					Fill of posthole 1162
1165	Between 12 and 13	0	421				Fill of posthole 1164
1170	13	0		360			Fill of hollow 1159/970
1183	North of 13 Fence line?	0	428;429	373;392			Fill of pit? 1184
1502	9	2	457				Cleaning over structure of complex 9
1503	9	0	426	1907			Structure, possible hearth
1504	9	0	432				Stone structure, flagstones?
1505	9	0		371			Fill heat affected of hearth 1503
1507	9	0		1903			Fill of heath 1503
1513	9	0		372			Fill of hollow 1512 below structure 1504
1514	9	0		1910			Fill of pit 1515 possibly part of hearth 1503
1515	9	0		1909			Pit. Should have been given fill number 1514
1518	9	0		1902			Pit? Should have been given fill number 1519. Below structure 1504
1521	14	2		1917			Fill of pit 1520
1522	14	3	440;441; 442	1915		Hazelnut	Fill of pit 1520
1524	14	0		1916		Hazelnut	Fill from pit 1523
1544	Sub sub 8	1					Finds from cleaning WB in middle of development
1545	Sub sub 8	5					Finds from next to timbers below “marine clay”. WB in middle of development

1604	4	0	434				Posthole should have fill number 1605
1605	4	0	433				Fill of posthole 1604
1609	4	2	436;438	1904	√		Fill of irregular hollow 1626 which forms main part of 1031
1803	1	1					Fill of posthole 1804
1813	1	0		391			Layer of heat affected material in hollow 1001
1826	1	0		393			Fill of posthole 1827, possible heat disturbance near top
1830	1	0		1905			Fill from furnace 1081
1853	1	0		1908?	√;√		Fill from furnace 1071
1886	1	0			√		Fill from furnace 1071. Fused slag and ash
1887	1	0			√		Fill from furnace 1081. Fused slag and ash
1889	1	0			√		Fill of stake hole or part of furnace 1081
Total		**343**					

ILLUSTRATIONS



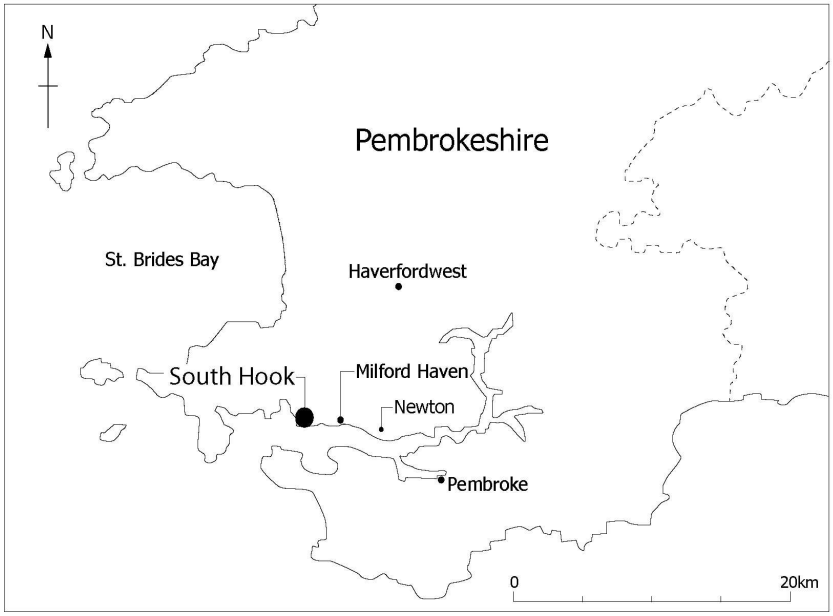


Figure 1: Site Location

Figure 2: Individual complexes

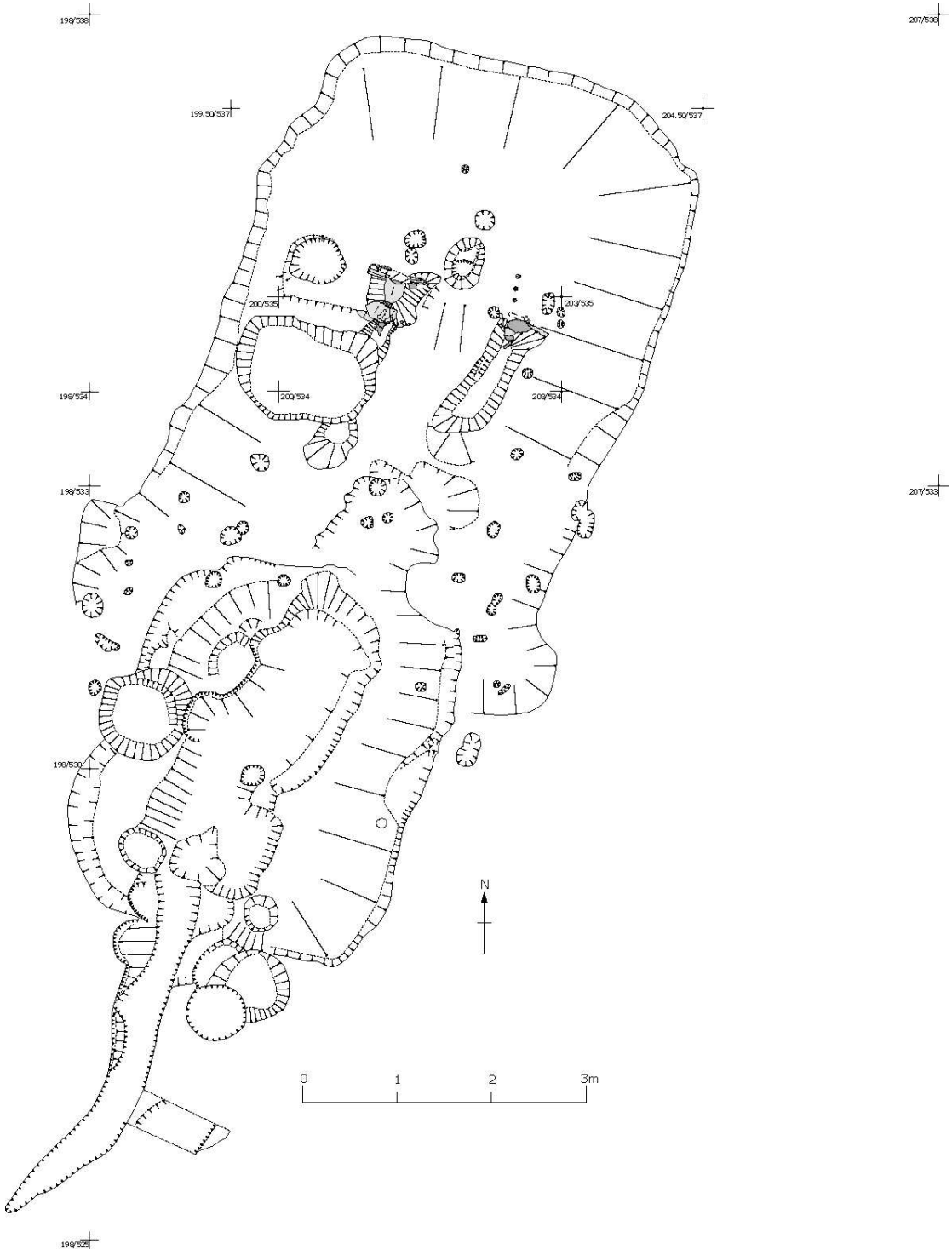
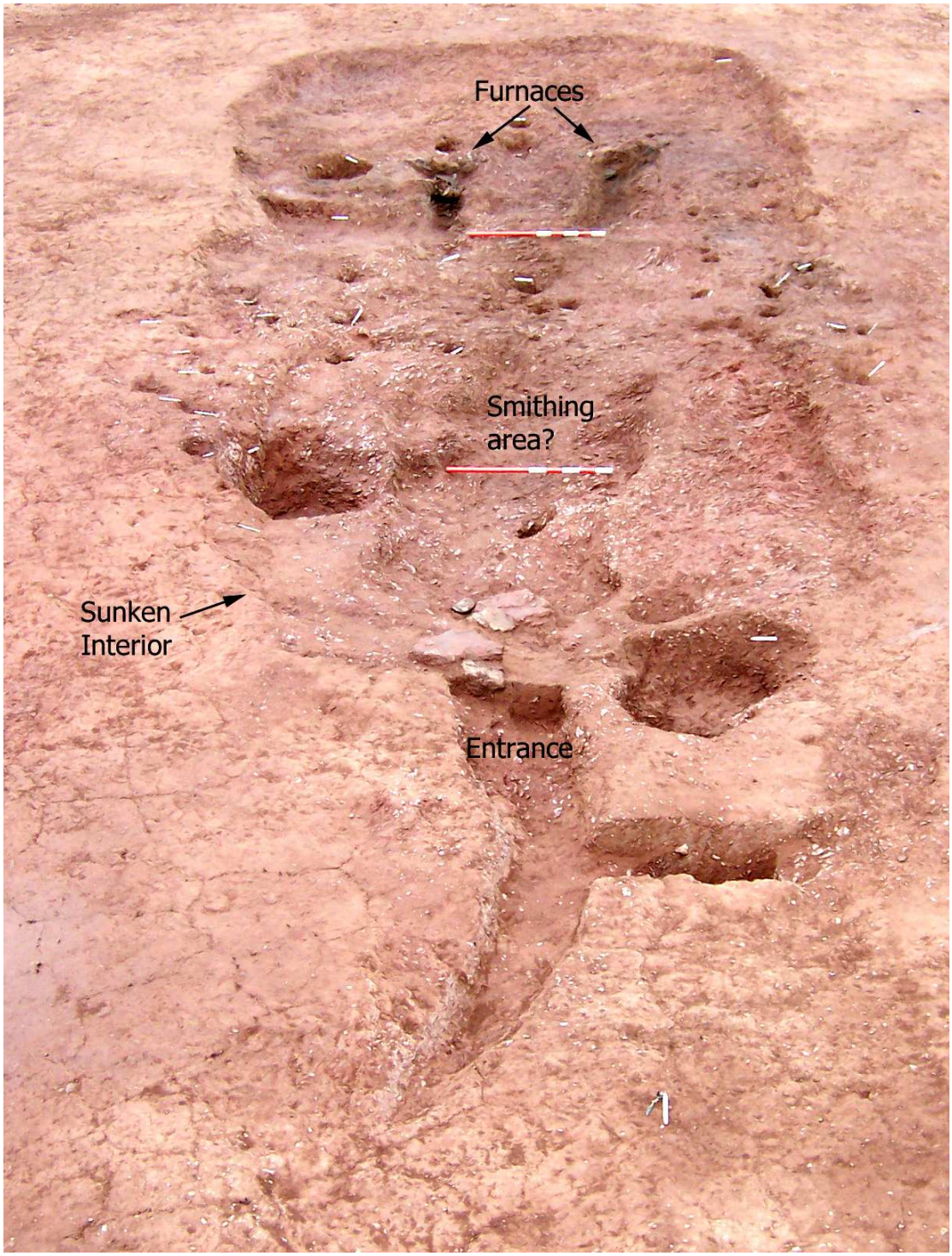


Figure 3: Complex 1

PHOTOGRAPHS

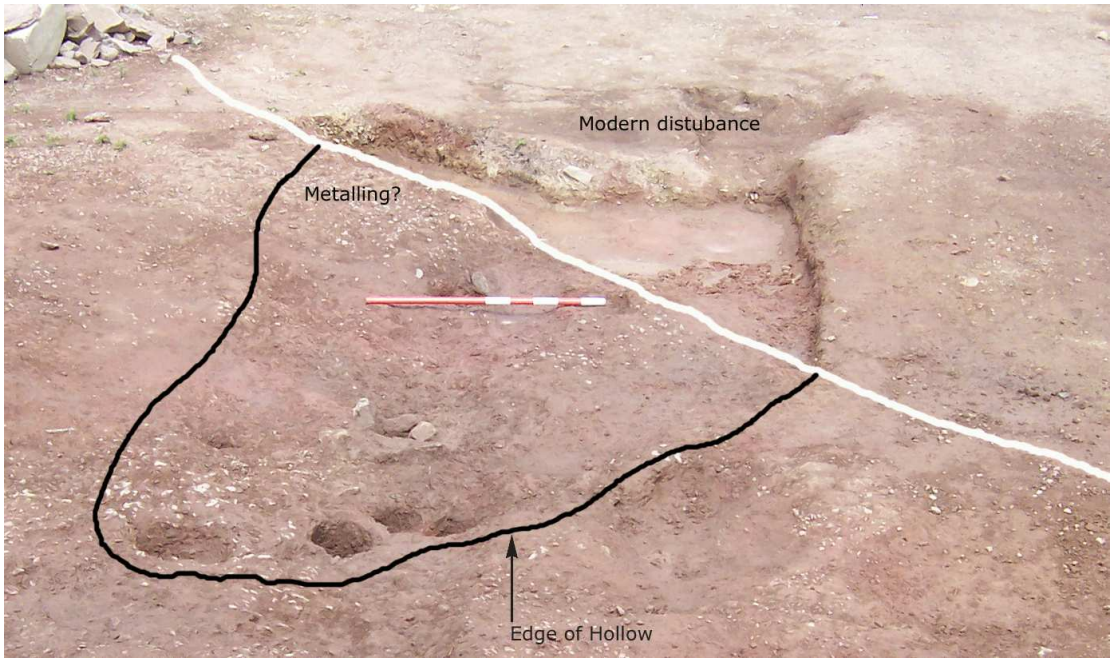


Complex 1. View N. Scales 1m

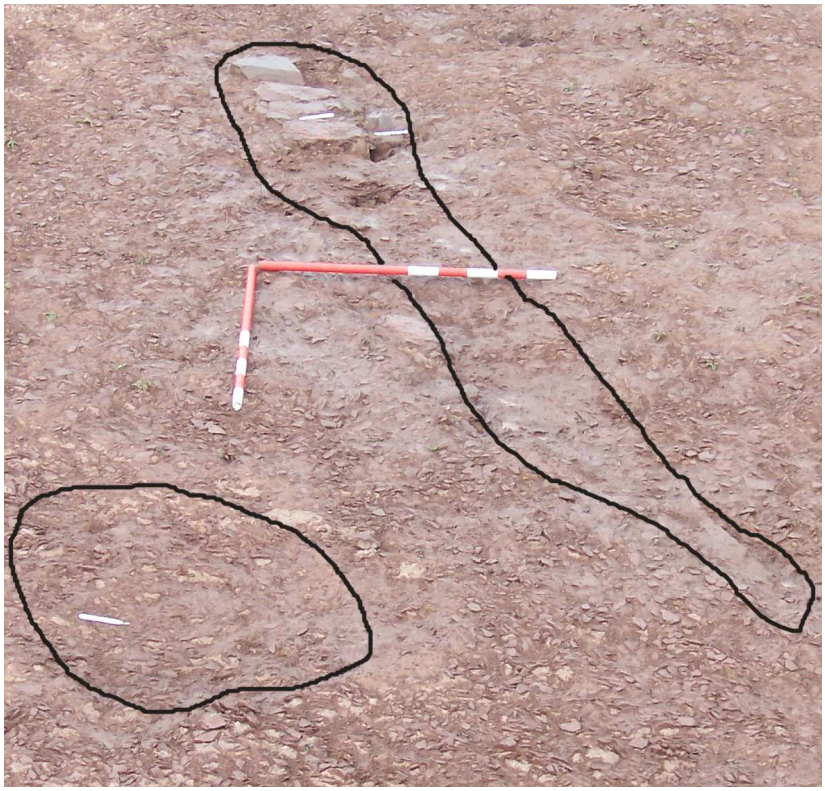
Complex 1. Twin furnaces. View N. Scales 0.5, 0.5 and 1m

Complex 2. Very shallow. View NW. Scale 0.5m

Complex 3. View N. Scales 1m and 1m

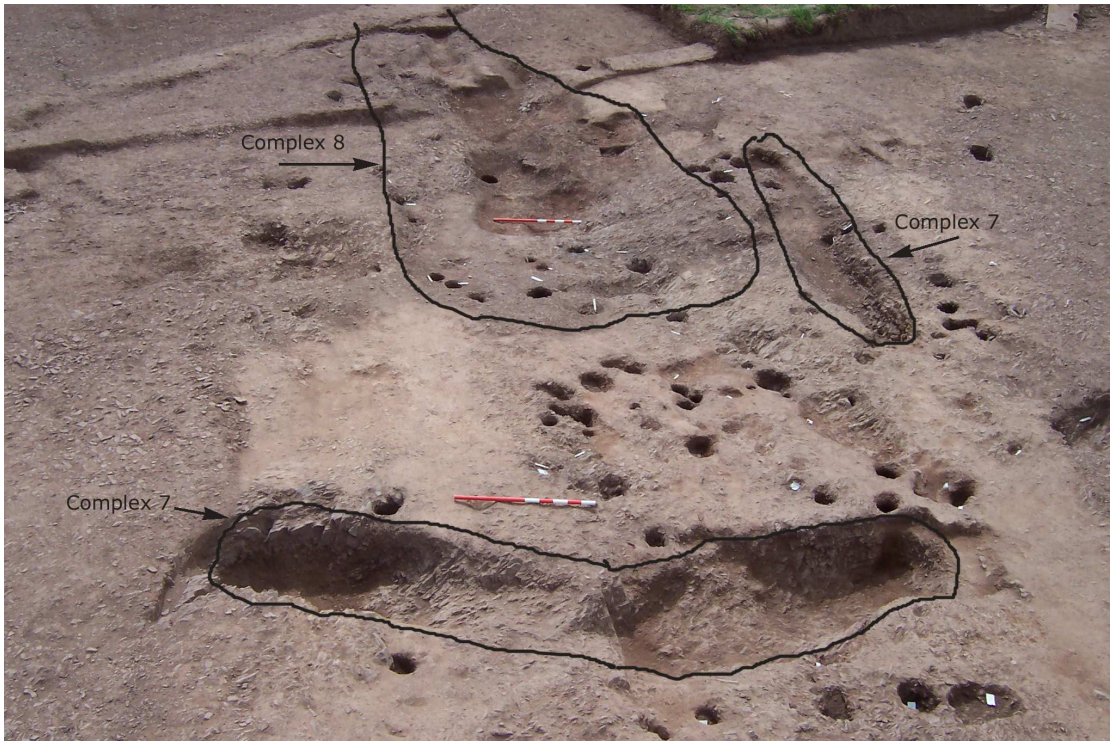


Complex 4. View N. Scale 1m



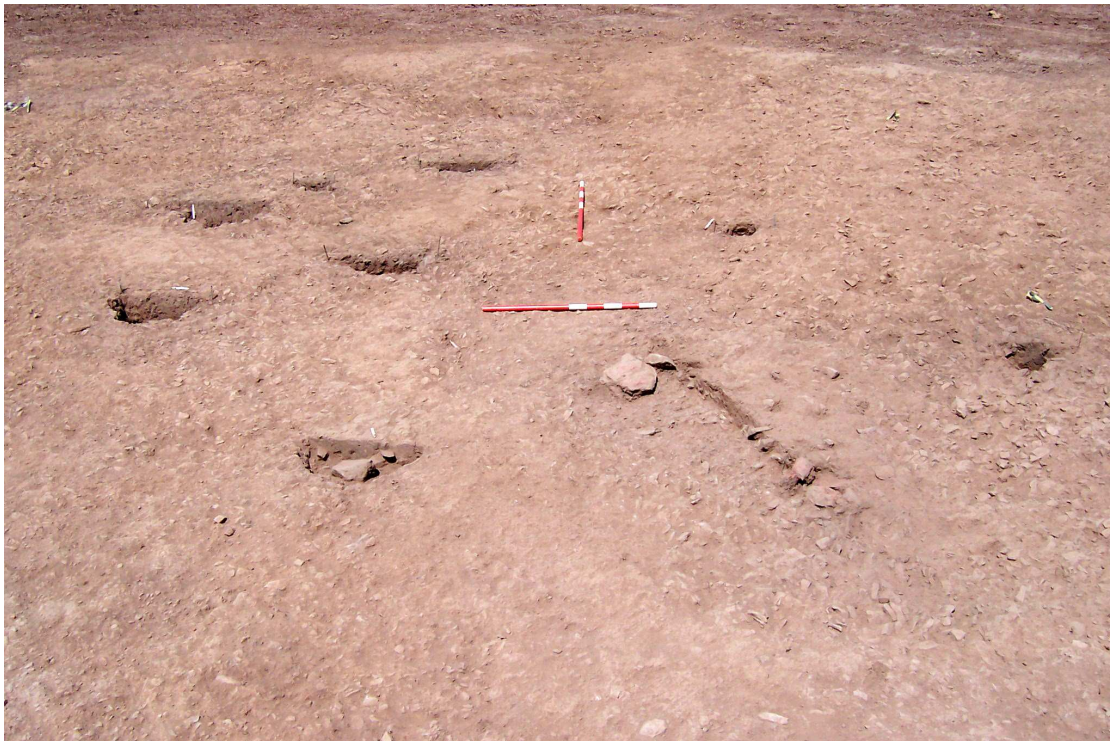
Complex 5. View N. Scales 1m and 1m

Complex 6. View S. Scales 1m and 1m



Complexes 7 and 8 with a large number of associated postholes. View S. Scales 1m and 1m

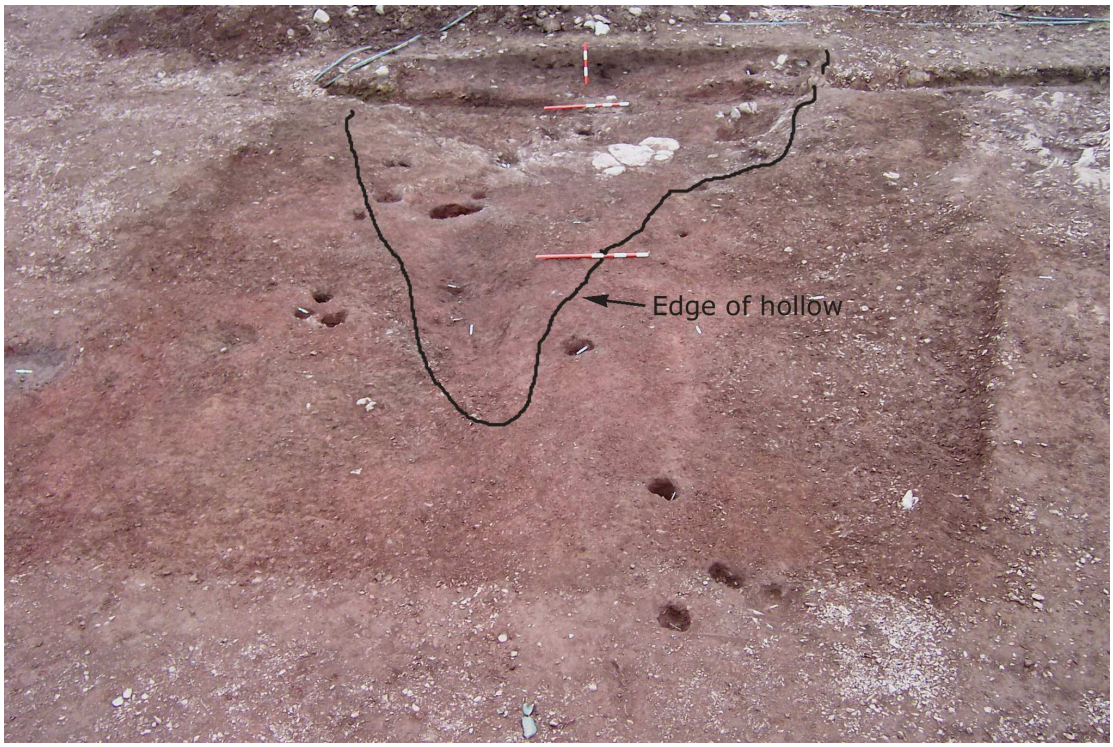

Complex 9 with hearth or furnace in background. View N. Scales 1m and 1m



Complex 10. Features half sectioned. View N. Scales 1m and 1m

Complex 11. View S. Scales 1m and 1m

Complex 12. Hollow half sectioned. View W. Scale 1m



Complex 13. View S. Scales 1m and 1m