

CLIFF'S END FARM, RAMSGATE, KENT INVESTIGATIVE CONSERVATION OF EARLY ANGLO-SAXON GRAVE FINDS

ARCHAEOLOGICAL CONSERVATION REPORT

Sharon Penton



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Cliff's End Farm, Ramsgate, Kent
Investigative Conservation of Early Anglo-Saxon Grave Finds

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Cliff's End Farm, Ramsgate, Kent
Investigative Conservation of Early Anglo-Saxon Grave Finds

Sharon Penton

Summary

This report describes the conservation, examination and analysis of artefacts from Early Anglo-Saxon graves at this site. The material studied was selected by the finds specialist for the project and consist of both metal work and mineral preserved organics. Various analytical techniques were employed to identify the composition of individual items. These techniques included radiography, microscopy and x-ray florescence.

Keywords

Early Medieval
Mineral Preserved Organic Material
Iron
Copper Alloy

Author's Address

Sharon Penton, English Heritage, English Heritage Centre for Archaeology, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, PO4 9LD
Telephone: 02392 856787. Email: Sharon.Penton@english-heritage.org.uk

Contents

Introduction.....	I
Summary of Conservation:.....	I
Condition of Finds:.....	I
Iron.....	2
Copper alloy.....	2
Organic material.....	2
Overview of the graves and the finds.....	2
<i>Grave 2550</i>	2
<i>Grave 2557</i>	4
<i>Grave 2559</i>	6
<i>Grave 2564</i>	12
<i>Grave 2756</i>	12
<i>Grave 3066</i>	18
<i>Grave 3525</i>	21
<i>Pit 3079</i>	21
XRF Analysis.....	22
SEM Analysis.....	22
Conclusion.....	23
Acknowledgements.....	23
References.....	23
Appendix I. Measurements of sword and seax.....	24
Appendix II. XRF table.....	24
Appendix III. SEM table.....	24

Introduction

Cliff's End Farm of Ramsgate was excavated by Wessex Archaeology in 2004. The purpose of the excavation was to determine what if any archaeological remains were located at the site and the character and condition of those finds. The archaeological evidence suggests that the site was used for funerary and ceremonial activities during the Bronze Age and Anglo-Saxon periods.

This report is concerned with the Early Anglo-Saxon phase of the site. The majority of the finds have already received conservation treatment by Wiltshire Conservation Service. Those that require further analysis and specialised investigation were sent to the Archaeological Conservation lab here at English Heritage. In total English Heritage received nineteen finds from this group and one from a ditch of the same period. All the objects save one, a copper alloy brooch, are iron. This report will discuss the general condition of all these objects, the treatment they received in the lab, and the results of the investigative analysis of each one.

Summary of Conservation:

The aims of investigative conservation were to:

- Determine the material composition of each object
- Establish the nature of the objects including their function and manufacture
- Obtain as much information as possible on the details of the objects for future use in illustration, reproduction and research
- Stabilise the objects where possible for handling, shipment and storage

To achieve these aims all objects were x-rayed prior to any assessment or treatment being carried out. Standard conservation methods were used, such as binocular microscopy and mechanical cleaning with scalpel and other instruments, to remove accretions thus revealing underlying surfaces and deposits for examination.

Some metals were identified using X-ray fluorescence (XRF) while organic materials were analysed and identified with optical microscopy. When necessary, samples were removed for analysis under a Scanning Electron Microscope (SEM) to examine their cellular structure.

Condition of Finds:

The burial environment of Cliff's End Farm has led to the poor preservation of iron objects and the virtual non-existence of preserved organic materials. Besides the damage done by ploughing and other recent agricultural activities the soil is an acidic sandy loam. Those organics which have survived are few and have done so because they were in contact with iron and became mineralised in the iron corrosion products.

Further damage was caused because not all the objects had been fully excavated from the soil. There were a total of five soil blocks containing objects which were damaged during the time between excavation and treatment. As the soil has dried it has cracked causing fractures to the objects.

Iron

Iron represents the vast majority of the finds from these burials. All of the iron objects are in poor condition, covered with a thick layer of concretions and corroded throughout. Many are so badly corroded they are hollow in the middle. All the objects have suffered fragmentation and flaking as a result of post excavation corrosion. Where possible fragments have been rejoined using HMG Paraloid B72 (an ethyl methacrylate polymer).

Copper alloy

There was only one copper alloy object in this collection, a brooch from grave 2756. As this object had already been conserved by Wiltshire Conservation Service, it only required analytical investigation.

Organic material

As stated above the only organic remains are those which were in contact with iron and became mineralised. The organic materials identified during the investigation of these objects include horn handles on weapons, traces of wood and straw, leather, textile, and human bone and teeth.

Overview of the graves and the finds

The graves associated with the finds in this report are a group of twelve Early Anglo-Saxon graves. Eleven of these graves were tightly grouped around a larger central grave, **2756**. All the graves, bar one along the outer eastern edge of the group, were aligned east-west.

Grave 2550

The three objects from this grave were found together in the centre of the grave.

Table 1. Finds from grave 2550

<i>SF No.</i>	<i>Description</i>	<i>Conservation treatment</i>
157	Seax	Mechanical reduction of soil and corrosion products
1215	Knife	Mechanical reduction of soil and corrosion products
1222	Nail in mineral preserved wood	Mechanical reduction of soil and corrosion products

Iron seax with sheath <157>

The length of the seax is c. 565 mm. This object arrived in very poor condition. It had split lengthwise down the blade and there has been heavy flaking and crumbling of the material. The tang and tip have broken off, as has a piece of the edge-reinforcement on the sheath. Mineralised organics suggest a horn handle and leather sheath. Further underlying deposits of organics exist but due to the poor state of preservation a clear identification cannot be made.

The edge-reinforcer is iron and would have run up the back edge of the blade closing the

seam of the leather. The reinforcer bends to a right angle about half way up the handle where the mouth of the sheath would be. There is the slight indication in the x-ray of possible decoration or supporting fittings along the outer edge of the reinforcer. Again the poor state of preservation leaves this as inconclusive. Judging from the excavation's grave plans this edge-reinforcer became detached from the sheath during burial. Knife <1215> was either lying next to the seax or was attached somehow to the sheath. The detached section of reinforcer is in four fragments all of which are covered in leather and other indiscernible organic materials.

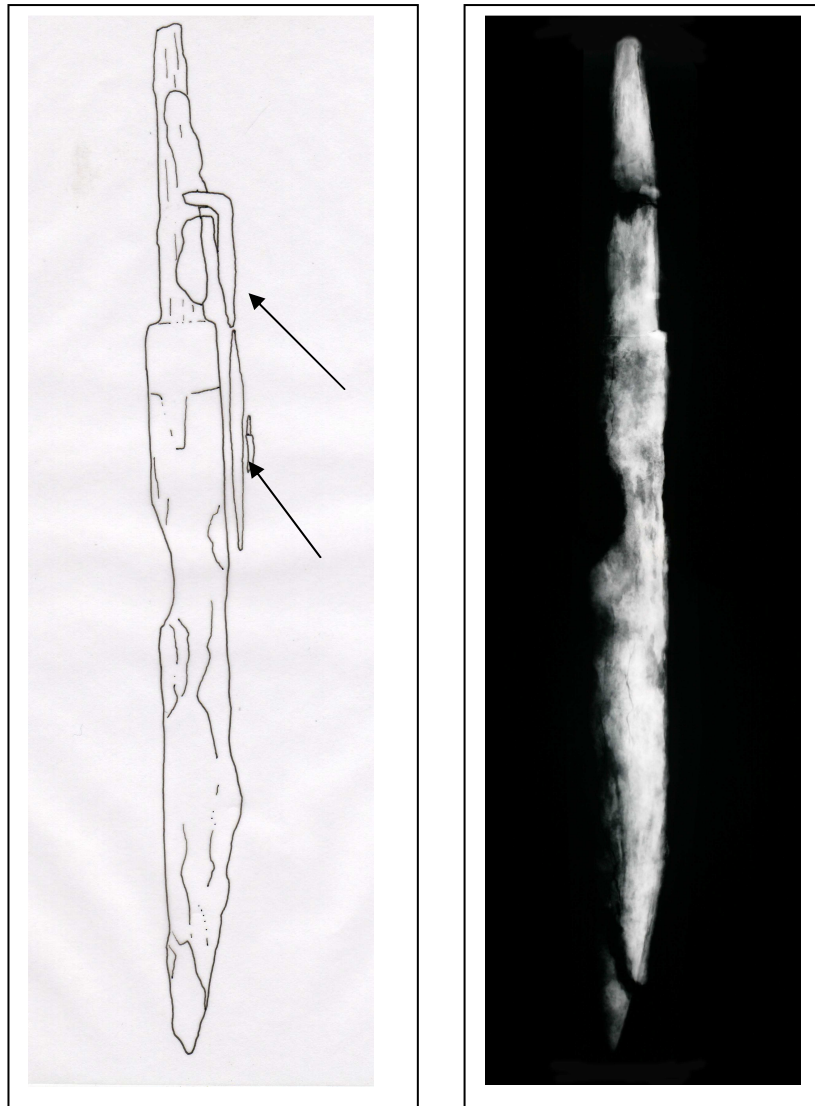


Figure 1. Seax <157> in drawing and x-ray. In the drawing the edge-reinforcer and knife <1215> are indicated by arrows.

Knife <1215>

Knife <1215> measures c. 85 mm long. Investigative cleaning revealed the mineralised remains of a wood handle and a leather sheath covering the blade and part of the handle. This knife may have been attached to the sheath of seax <157> by some kind of leather binding.

Nail in mineral preserved wood <1222>

The nail measures 27mm and is missing the point. The wood is from a piece of oak timber. Judging from the material used and the thickness of the timber the original object would have been substantial, a coffin for example.

Grave 2557

There were five objects found in this grave but only two received by English Heritage. These were attached to each other by corrosion products and found at the head of the grave.

Table 2. Finds from grave 2557

<i>SF No.</i>	<i>Description</i>	<i>Conservation treatment</i>
162	Spear head	Mechanical reduction of soil and corrosion products, sample of wood removed for analysis under SEM
166	Shield boss	Mechanical reduction of soil and corrosion products, analysis using XRF and SEM to identify components

Spear Head <162>

The spear would have been lying along the southern edge of the grave with the spear head at the top of the grave. The mineralised remains of wood were found within the socket and mineralised human bone fused to the bottom portion of the spear. The bone is likely to be the lower part of a humerus indicating that the spear was placed over the right arm of the body when buried. There is also a fragment of mineral preserved textile on the spear blade. The thread is a Z spin and the weave is a 2/1 twill (Rogers, 2007). Presumably this is from a garment worn by the deceased.



Figure 2. Mineralised textile (indicated by arrow) on the underside of spear head <162>

Shield Boss <166>

The boss was found fragmented and the top crushed when excavated. This may have been the result of ploughing. Unfortunately, not all the fragments appear to be present so a full reconstruction was not possible. What joins could be found were made allowing the diameter of the boss to be measured but an accurate profile can only be guessed at. Around the rim of the boss are four iron rivets which have been tinned. These would have attached the boss to the shield. The grip was also present but has become detached. The grip is a type IIIb long flanged (Dickenson and Härke 1992). Mineralized wood from both the shield and the grip are visible as is leather that would have been wrapped around the grip. The wood has been examined under an SEM but is not preserved enough to be identified.

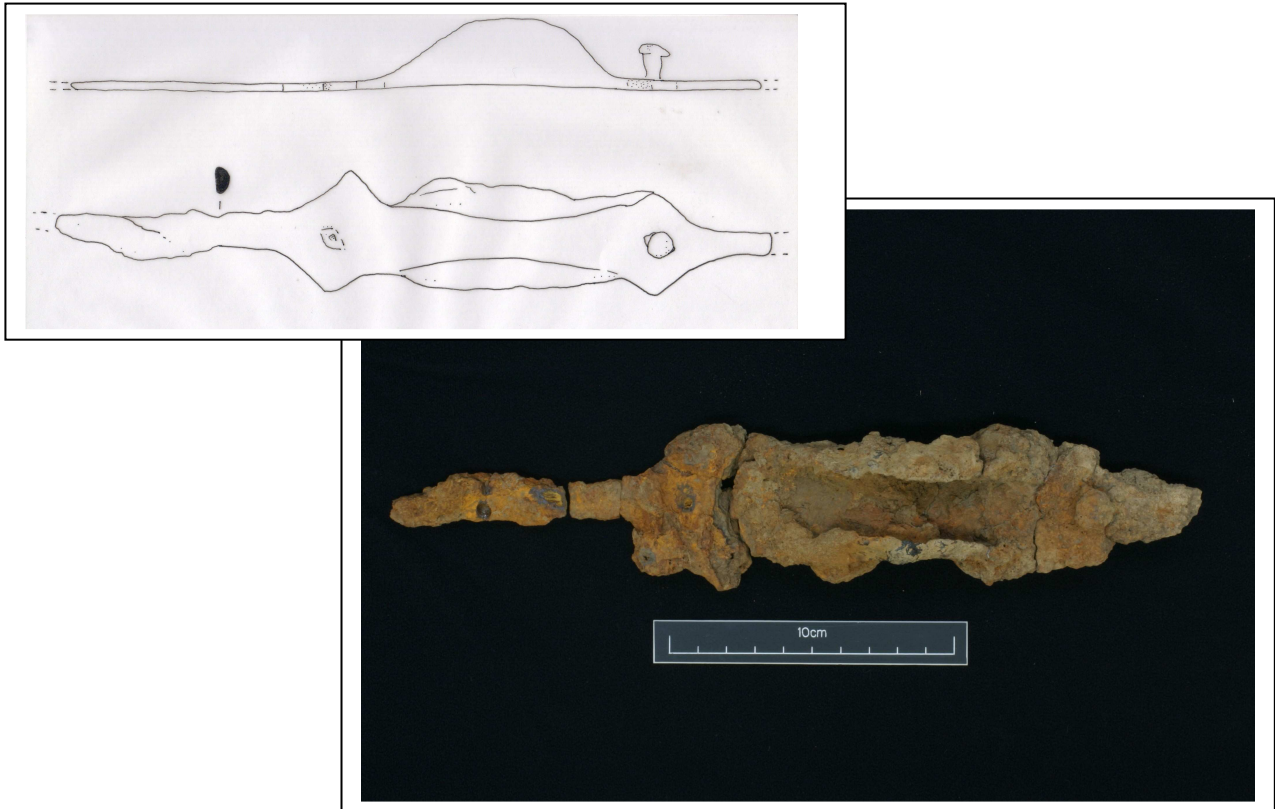


Figure 3. Long flanged grip detached from shield boss <166>

Based on the position of the shield boss over the spear, the shield would have been placed in the grave after the spear was. The shield covered the face of the interred. This was concluded upon the discovery of human bone preserved on the underside of the boss, including four teeth from the upper jaw. All that is left of the teeth is the enamel and cementum embedded in the iron corrosion products.



Figure 4. Bottom of the shield boss rim and magnification of two of the four teeth

Grave 2559

This grave was the only one out of this group to contain a long sword. The sword and knife <168 and 1216> were lying together in the centre of the grave. Spear head <167> lay at the head of the grave, the shaft of the spear would have run along the southern edge.

Table 3. Finds from grave 2559

SF No.	Description	Conservation treatment
167	Spear head	Mechanical reduction of soil and corrosion products, traces of mineral preserved organics left in place except sample of wood removed for analysis under SEM
168	Long sword	Mechanical reduction of soil and corrosion products
1216	Knife	Some mechanical reduction of soil and corrosion products

Spear head <167>

The condition of the spear head was poor. It was broken into five fragments and covered in dense concretions. The x-ray reveals how extensively the object was corroded as it is entirely hollow along the length of the blade. Part of the spear shaft is preserved within and extending out of the socket but this is extremely fragile. Samples have been taken for examination under the SEM but the wood is not well enough preserved to be identified. The spear measures c. 595 mm long. As with spear head <162>; this one also had human bone partially preserved on the surface. The bone is located on the bottom section of the socket and appears to be the remains of the right radius and ulna. Thus, indicating that the

spear would have been placed on top of the body during burial. Finally, there is a small fragment of mineralized textile near the socket. Identification of the weave is indeterminate due to the poor state of preservation.

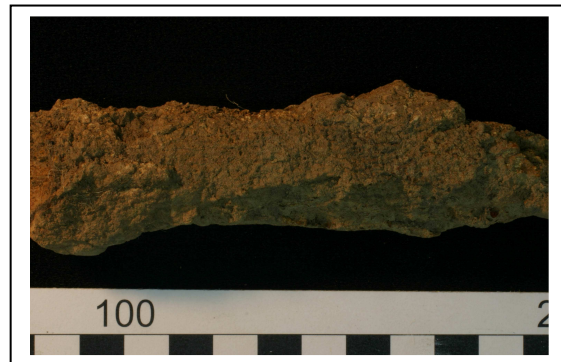


Figure 5. Socket of spear with mineralised textile (top left); close-up of mineralised textile under raking light (top right); fragment of mineralised human bone (bottom)

Sword <168>

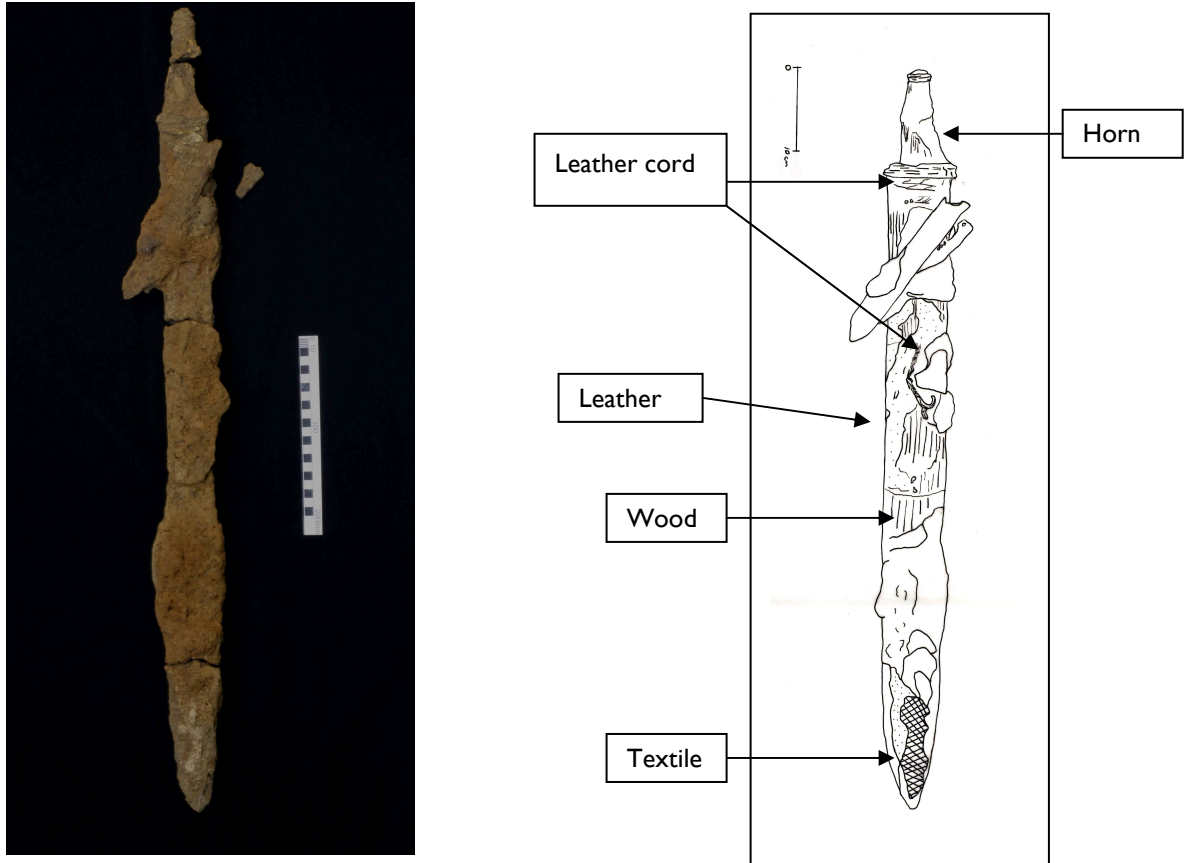


Figure 6. Sword <168> (left); drawing of sword <168> (right)

Measuring c. 920 mm long. The hilt consists of four separate pieces of horn. The sheath has an outer layer of leather 2mm thick. Beneath the leather is the wooden scabbard plate identified as willow/poplar. This is lined with fleece which is in contact with the actual sword blade. There are a few fragments of cord preserved directly below the lower guard on one side of the sword (location indicated by arrow in the figure above). The cord was leather, now mineralised, with what is probably a 2S spin direction. Based on other swords of this period this cord could be a binding cord or part of a mouth-band to decorate the sheath (Cameron, 2000).

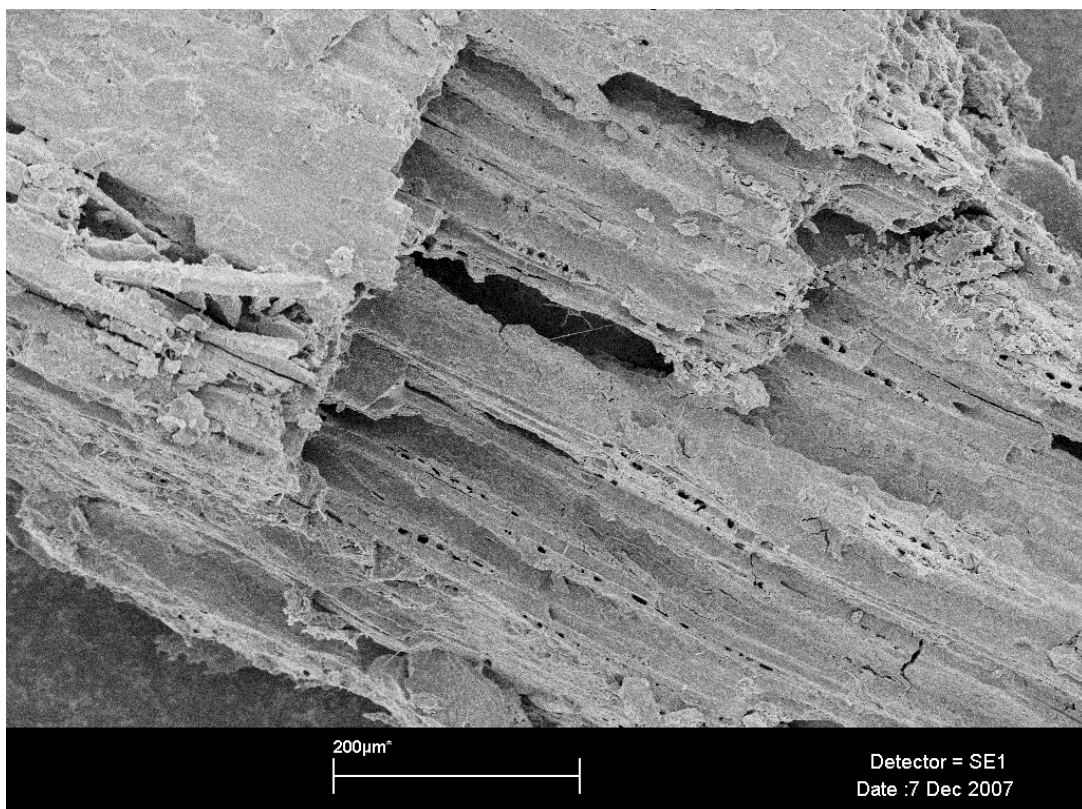


Figure 7. SEM image of wood sample taken from the scabbard; identified as willow/poplar

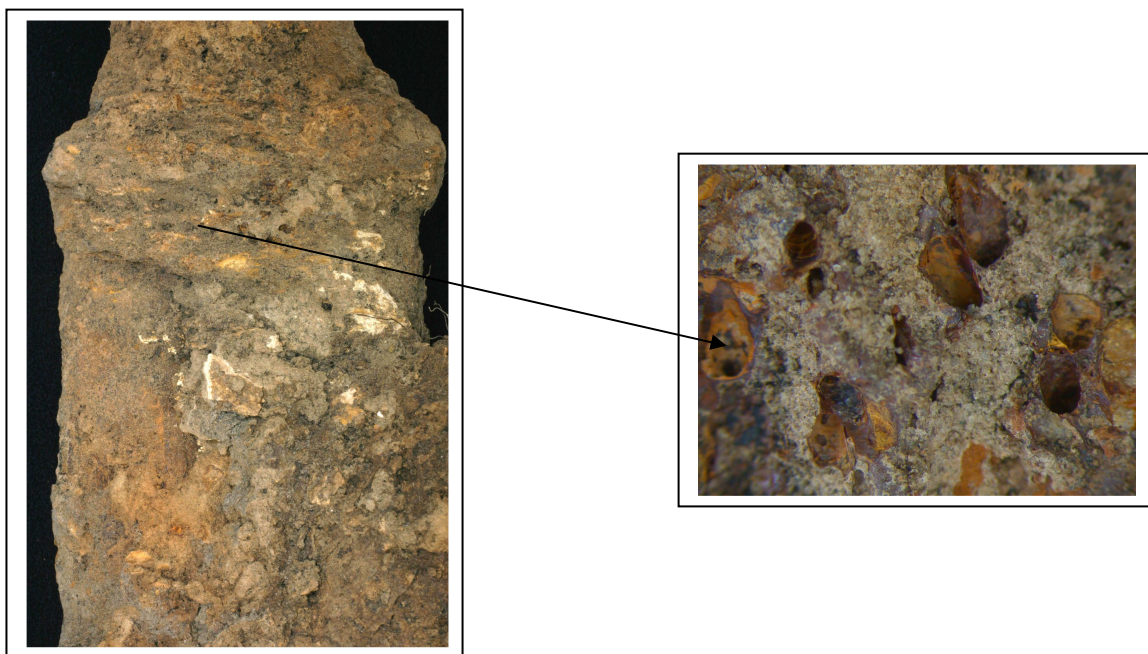


Figure 8. Cord preserved below the lower guard. Pupa cases in the cord are evidence that it was leather.

There is another fragment of cord, also leather, further down the scabbard. This cord is plaited rather than spun. It doesn't appear to be attached to the scabbard as a decoration; rather it is lying on top. Based on the location of this fragment it may be part of the binding

used to hold knife <1216> to the sword or it may be part of a shoulder strap or belt.

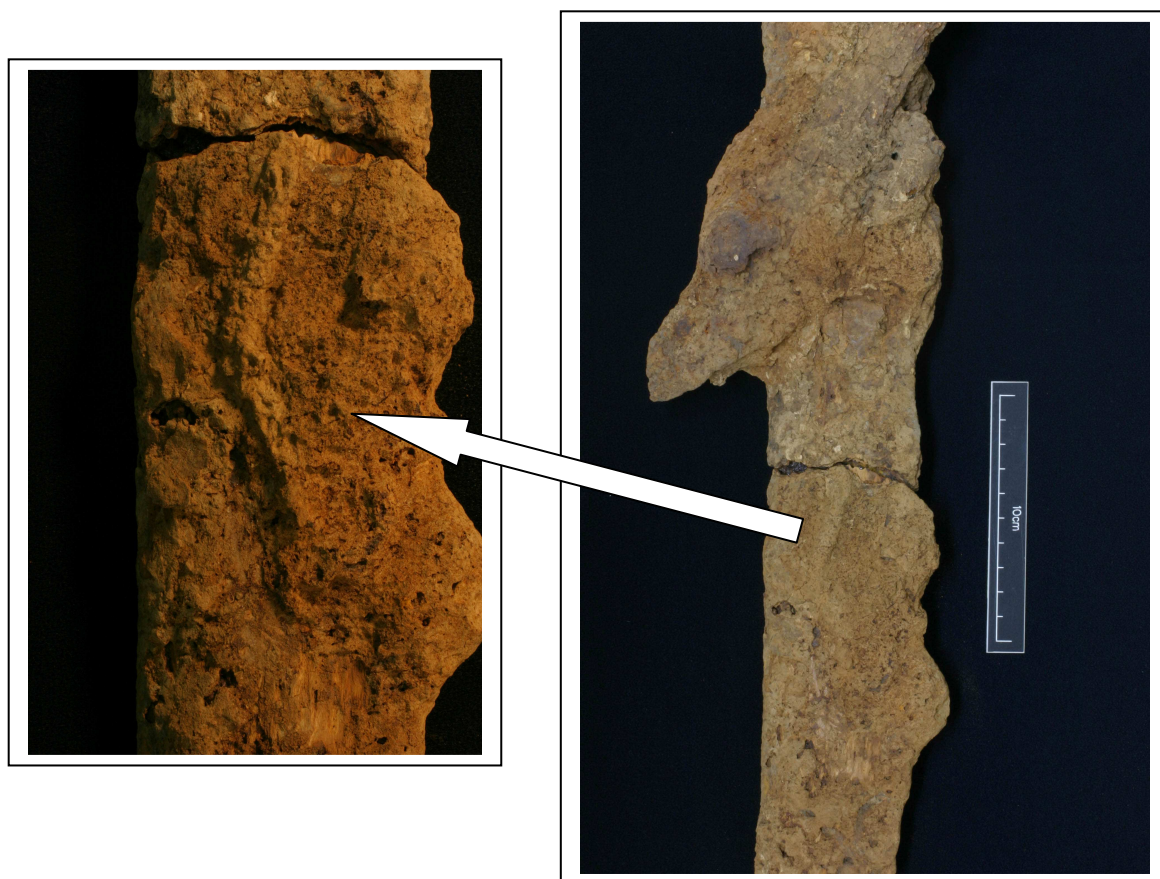


Figure 9. Plaited leather cord

On the tip of the sword is mineral preserved textile. The weave of which appears similar to that of the fragment found on the spear <167>.



Figure 10. Mineral preserved textile under raking light

Knife <1216>

C. 180 mm long with a missing tang and handle. The knife has a leather sheath still embedded in corrosion products and what appear to be unidentifiable mineralised organics making it difficult to fully articulate the knife and any fine details. These mineralised organics might be either textile or leather used to bind the knife to sword <168>. A 40 mm fragment, detached from the top of the sheath, enabled an x-ray to be taken and a section to be seen. It appears the leather is folded over a circular iron rod kept separate from the knife by stitching. The iron rod is likely to be another object, either a fire-lighter or sharpening iron.



Figure 11. Fragment broken off of <1216> (left); x-ray taken from the edge of the fragment shows the iron rod and remains of mineral preserved thread used to stitch the leather between the knife and this rod

Indications that there were iron rivets running along the outer edge of the knife blade are only just visible in x-rays. Figure 12 is a sketched reconstruction of how the object may have looked based x-rays and observations made during examination of the object.

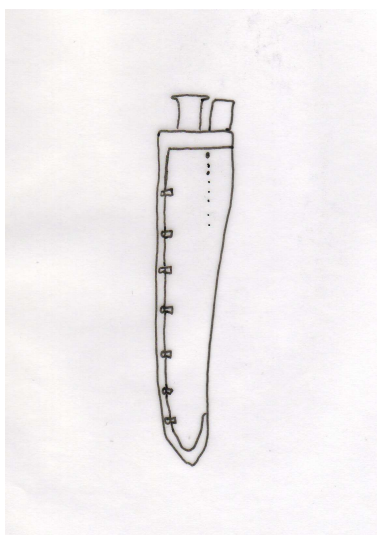


Figure 12. Reconstruction drawing of knife <1216>

Grave 2564

Only one object was found in this grave located near the middle of the grave and pointing east-west.

Table 4. Finds from grave 2564

SF No.	Description	Conservation treatment
173	knife	Mechanical reduction of soil and corrosion products

Knife <173>

The knife measures 211 mm long. On the tang there are the mineralised remains of a horn handle while covering the blade are the extensively deteriorated remains of a leather sheath. The thickness of the leather is about 2 mm.

Grave 2756

This grave was the central grave of the group and the only female. It was also the only grave to contain jewellery including glass and amber beads and two brooches. Only one brooch was received by English Heritage and it had already undergone conservation, thus only analytical investigation was carried out on this object. The other objects received came together in a single soil block, <204>.

Table 5. Finds from grave 2756

SF No.	Description	Conservation treatment
196	Brooch	Analytical investigation only
1217	Girdle hanger	Mechanical reduction of soil and corrosion products, repaired break with B72
1218	Chain fragment	Mechanical reduction of soil and corrosion products
1219	Purse or belt attachment	Mechanical reduction of soil and corrosion products
1220	Purse closure	Mechanical reduction of soil and corrosion products, repaired breaks with B72
1221	Knife with possible	Mechanical reduction of soil and corrosion products,

	lighter	repaired breaks with B72
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Brooch <196>

XRF analysis shows the brooch to be a copper tin alloy containing some lead. The brooch would have been cast in a mould then the front gilded using a gold and mercury amalgam (Skinner, Schaefer and Moujoud, 2005). There are four raised insets, three polygonal shaped ones around a central circular inset. Nothing was detected within the central inset except copper corrosion products so it is unknown what the inlay here might have been. The others are inlaid with coloured glass, one red and two green. The

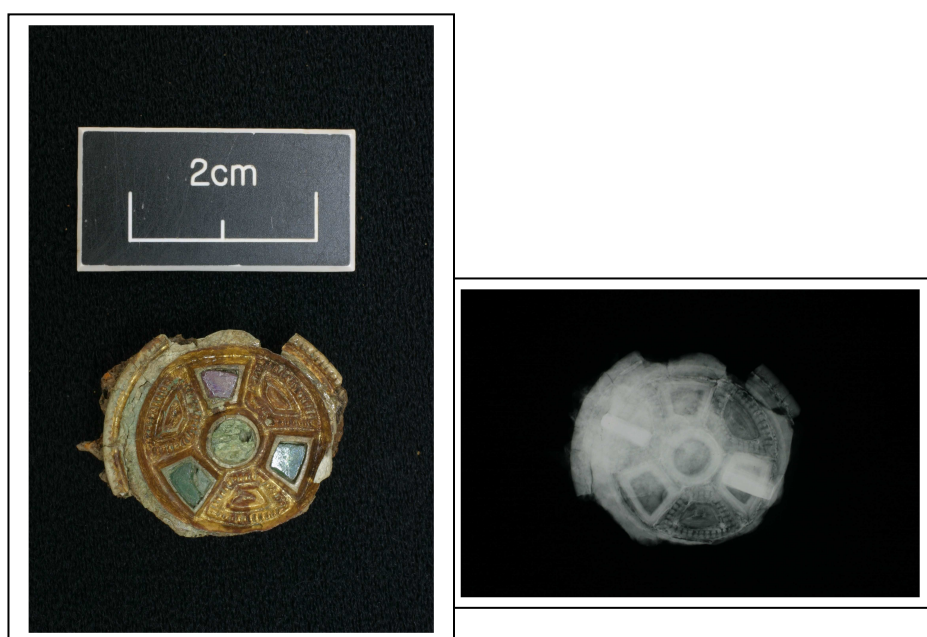


Figure 13. Brooch <196>

Light coloured, powdery copper corrosion products are visible along the outer edges of the brooch and where the gilding is missing. These corrosion products have resulted in the flaking and loss of some of the gilding. On the reverse side there is a more stable patina as the iron pin on the back acted as a sacrificial metal thus protecting the copper. Only the very tip of the iron pin is visible under a mass of iron mineralised textile. Unfortunately, the condition of the textile makes an identification of weave or pattern impossible.

Soil block <204>



Figure 14. Soil block <204> as received

The soil block contained a total of five objects grouped together. Evidence suggests the objects belong to a purse group. Mineralised remains on the objects and a dark soil stain surrounding the group suggest they were held in a leather purse. Further evidence is the existence of mineral preserved pupa cases covering the objects.



Figure 15. Mineralised pupa cases under magnification

<1220> is an iron ring used as a closure. It is possible to see where the leather was folded over the ring. <1219> is a smaller iron ring which possibly attached the purse to a belt or other garment as there are the mineralised remains of textile on one side of the ring and leather on the other. The other objects were contained within the purse. These include knife <1221>, girdle hanger <1217>, and a fragment of possible chain <1218>.

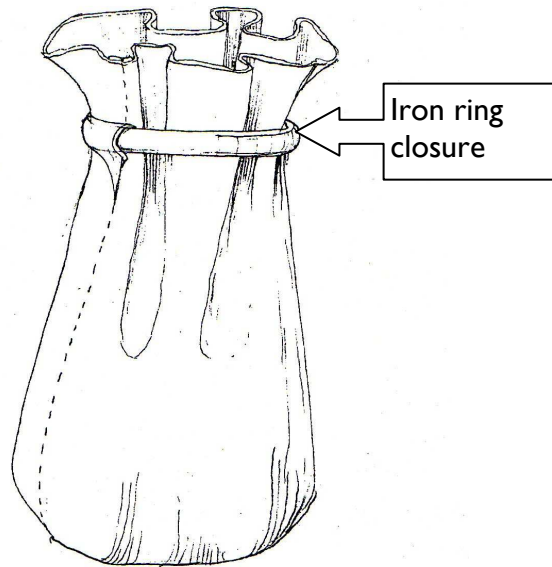


Figure 16. Sketch of how the purse may have looked (Crowfoot, Edwards and Watson, 2005)



Figure 17. Objects from soil block <204>; purse or belt attachment <1219> (top left); purse closure <1220> (top right); girdle hanger <1217> (middle left); chain fragment <1218> (middle right); knife with fire lighter <1221> (bottom)

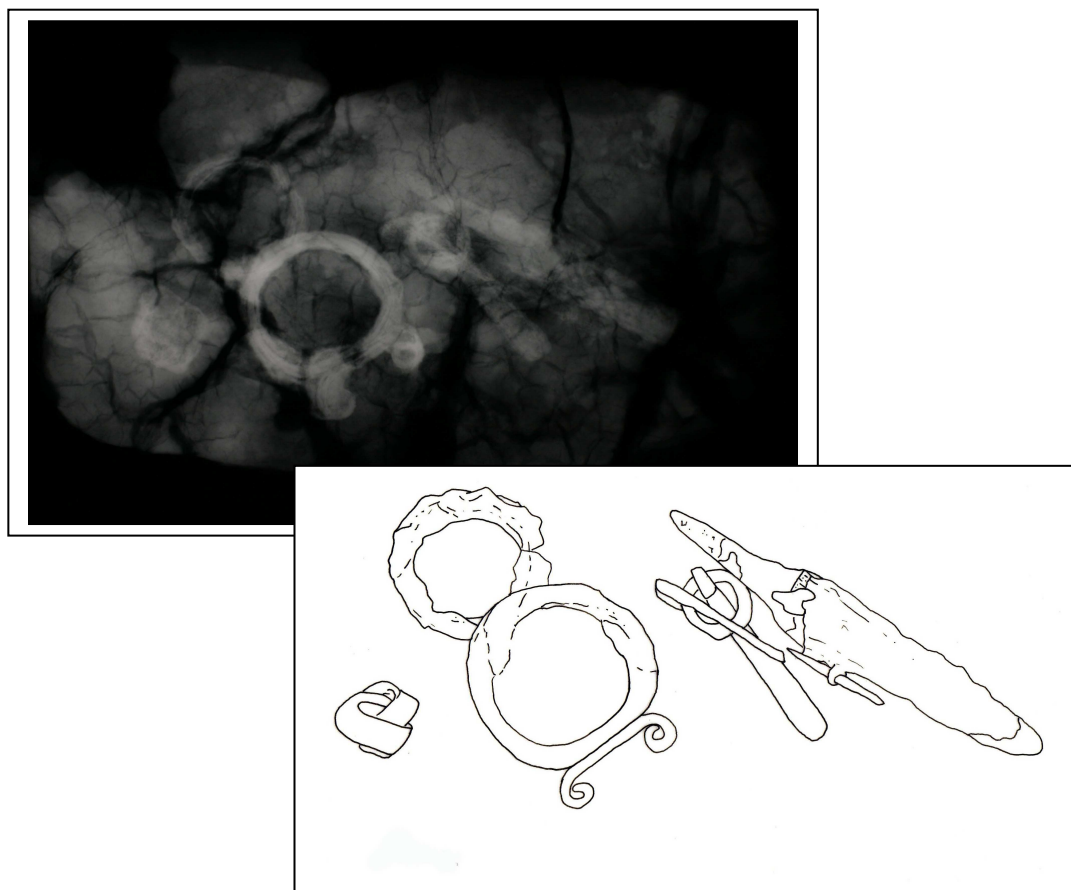


Figure 18. Arrangement of objects within soil block <204>

Knife <1221>

c. 140 mm long. There is still some mineralised horn adhered to the tang. The sheath was a coarse leather measuring c. 3-4 mm thick suggesting it may have come from a pig or cow hide. Attached to the knife with a piece of twisted thread was what is probably a fire-lighter.

Girdle hanger <1217>

Consists of a single iron ring on which are hung two iron instruments. One is a circular rod c. 45 mm long and broken at the end so the function it played cannot be determined. The other, 67 mm long, is flatter in shape and tapers out towards the end; possibly some kind of spatula.

Possible chain fragment <1218>

Due to the heavy corrosion and poor condition of this object it is difficult to make an exact identification. However, x-rays suggest this could be a chain of two or possibly three links.

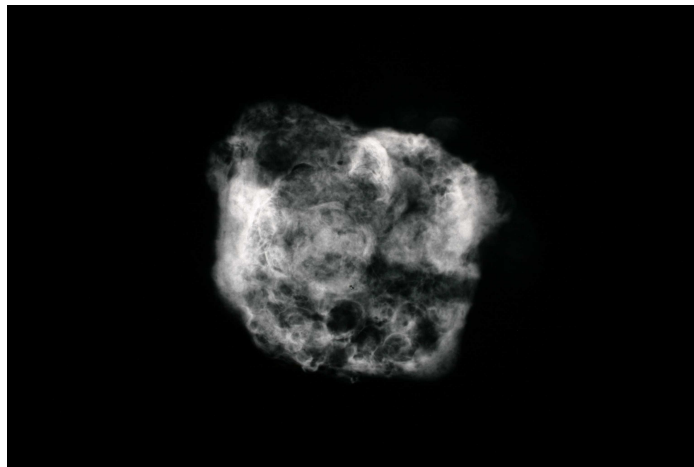


Figure 19. X-ray of possible chain fragment

Grave 3066

Most of the finds from this grave were located near the head of the grave, except for the knife <224> which was near the centre.

Table 6. Finds from grave 3066

<i>SF No.</i>	<i>Description</i>	<i>Conservation treatment</i>
218	Shield boss	Mechanical reduction of soil and corrosion products, repaired breaks with B72, samples of wood removed for SEM analysis
221	Shield fitting (associated with the same shield as boss 218)	Mechanical reduction of soil and corrosion products, analysis of rivets using XRF
222	Spear head	Mechanical reduction of soil and corrosion products
224	knife	Mechanical reduction of soil and corrosion products

Shield boss <218>

The boss is a group 3 boss with a short flat grip (Dickinson and Härke 1992). The rivets around the outer edge were copper alloy (one still remains) and the top rivet is iron. The object is extensively corroded and fragmented. Some of these fragments have been rejoined.

Mineralised organics are present on the top rivet and the underside of the boss. The top rivet has the preserved impressions of a species of barley. This may have been used as a lining on top of the grave. Under the rim of the boss there are areas of mineralised wood, particularly near where the boss and grip join. Though examined under an SEM the wood is not well enough preserved to be identified. The grip is still in place as are the mineralised remains of the leather wrapping around it.

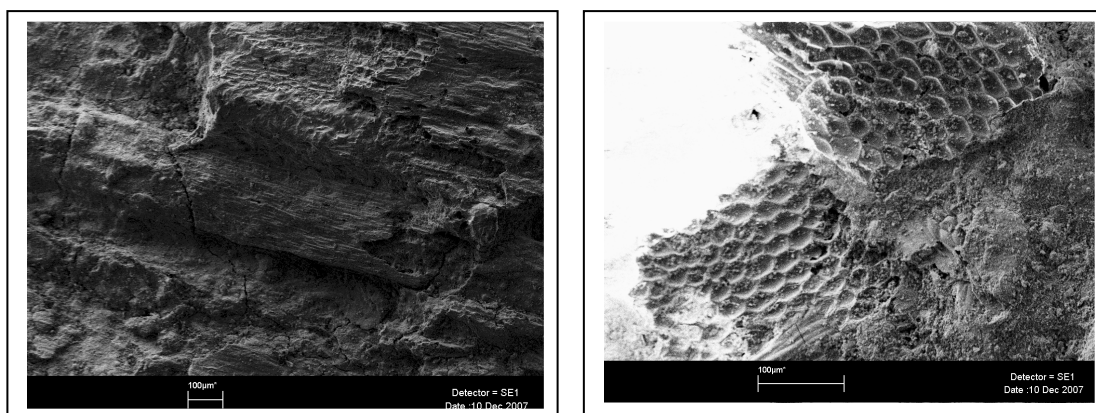


Figure 20. SEM images of organic remains on the top of the iron rivet

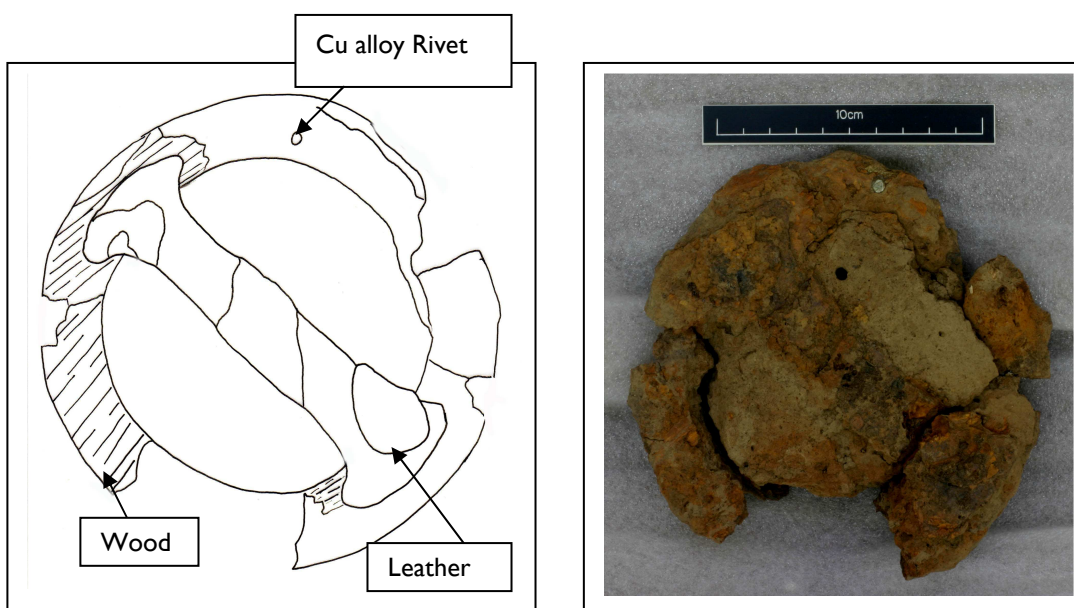


Figure 21. Drawing and photo of the underside of the shield boss with the hand grip

Attached to one rim fragment from this boss is a small portion of a human tooth. Not enough of the tooth remains to make any further identification but it indicates that the shield was laid over the face of the interred as was the case in grave 2557.

Shield fitting <221>

Based on the objects position in the grave plan this comes from the same shield as <218> and would have been fitted over the wood of the shield. It was lifted in the field as a soil block which also contained part of spear head <222>. This thin sheet of iron had deteriorated to the point of being brittle. While attempting to remove it from the soil block it completely fragmented. No decorative details have been identified on the surface of the

iron but there are mineralised plant remains like those preserved on the top rivet of <218>. These may have been used as a lining for of the grave.

Spear head <222>

Covered in a thick layer of corrosion products and fragmented. Condition of the socket is especially poor. However, there are well preserved mineralised remains of mature ash (*Fraxims species*).



Figure 22. Transverse cross section of mature ash found within the socket of the spear

Knife <224>

135 mm in length with the mineralised remains of a leather sheath and horn handle. There is a fragment of mineralised textile near the tip of the knife where it was in contact with a garment worn by the deceased. While the textile is degraded, enough survives to determine the weave structure to be a Z, Z, 2, 1 twill (Rogers, 2007).



Figure 23. Mineralised textile on the knife tip

Grave 3525

This grave was disturbed by a modern geotechnical pit. The only object recovered was the spear head located in the very north-east corner.

Table 7. Finds from grave 3525

<i>SF No.</i>	<i>Description</i>	<i>Conservation treatment</i>
267	Spear head	Analytical investigation only, sample of wood removed for SEM analysis

Spear head <267>

This object has previously been treated by Wiltshire Conservation Service. Therefore, the only treatment it received was an analytical investigation of the wood preserved in the socket. Using SEM analysis it was possible to identify the wood as hazel (*Corylus species*).

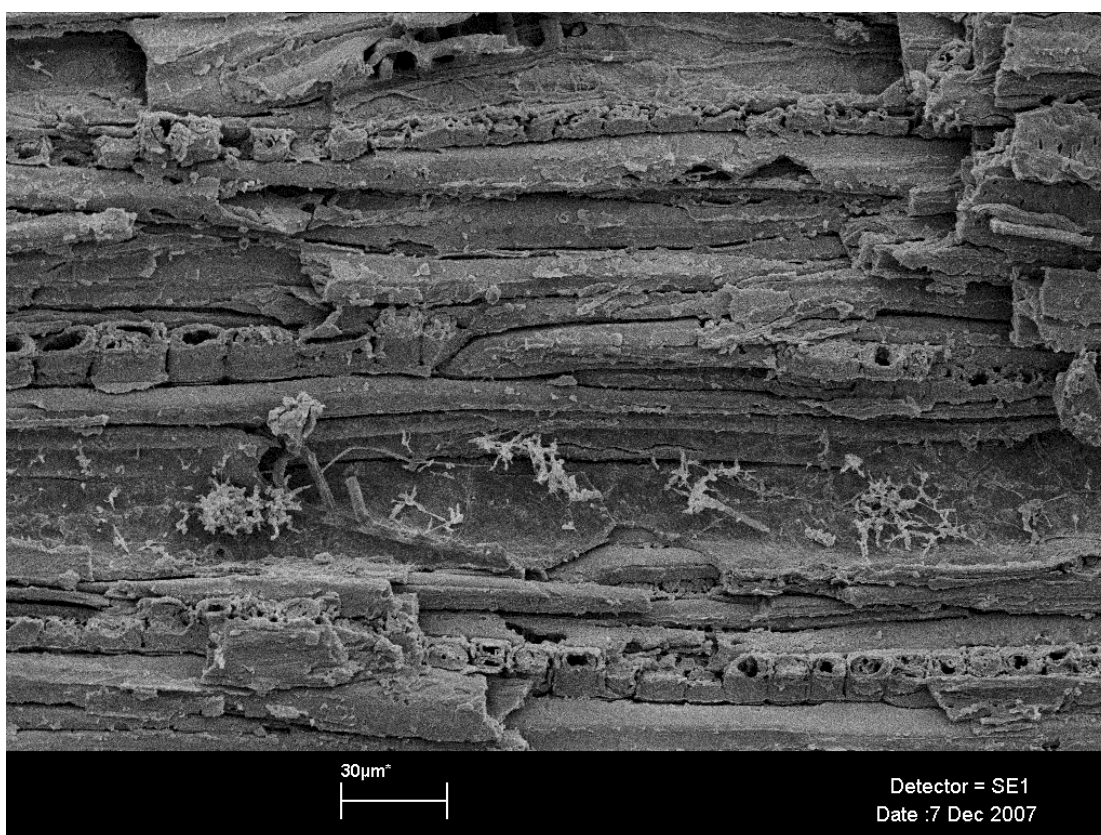


Figure 24. SEM image of wood sample from within the spear socket; identified as hazel

Pit 3079

A total of 69 pits have been associated with the Anglo-Saxon period at this site. Most have contained shellfish remains and evidence of burning. This pit also contained a single iron object.

Table 8. Finds from pit 3079

SF No.	Description	Conservation treatment
225	Spade shoe	Some mechanical reduction of soil and corrosion products, air abrasive was used to reveal details of cross section.

Spade shoe <225>

When received the spade shoe was covered with a thick layer of soil and corrosion products. The density and hardness of these accretions made it necessary to use the air abrasive in order to reveal the shape and orientation of the object. To save time only one end and the area around the break were cleaned so as to determine the cross section and profile of the object.



Figure 25. Spade shoe with x-ray and drawing

XRF Analysis

X-Ray Florescence was carried out on a limited number of objects based on their condition and whether they would fit in the machine. An EDAX-EAGLE II, x-ray florescence spectrometer was used at 40kV and set between 200 and 400mA. This form of analysis used to determine the surface composition of materials. The accuracy of the results can be affected by the often corroded nature of archaeological metals and the leeching of elements at differing rates during the deterioration of the object while in the ground. These aspects must be taken into consideration when interpreting the data.

SEM Analysis

High magnification analysis was carried out with a STEREOSCAN 440i scanning electron

microscope. Metal objects were uncoated when placed in the SEM and required a low probe current of no more than 10 Kv. For the analysis of organic materials samples were removed and mounted on aluminium stage pegs. They were then given a plasma coating of gold. This makes the sample conductive and improves the imaging capabilities of the SEM by allowing for a higher probe current to be used. In this case the probe current was set to 25 Kv.

Conclusion

Careful examination and analysis of the objects that have survived from this site has contributed to our greater understanding of Early Anglo-Saxon burial practices and will benefit further research in this field. Though there were no human remains or other organic materials encountered during the excavation of this group of graves, the process of investigative conservation has provided an abundance of information relating to these materials. From this information we can produce a more complete image of the original character of the graves.

Acknowledgements

I would like to thank Jacqui Watson and Karla Graham for all their advice and guidance during the investigation of these finds. Watson introduced me to the project and aided me in the identification of both the textiles and wood samples. Graham provided advice and technical support in obtaining radiographs of the finds. In addition I also want to pass my gratitude along to Roger Wilkes and David Dungworth for their assistance with SEM and XRF analysis as well as for the confirmation and identifications of human and plant remains made by Simon May and Gill Campbell.

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Appendix I. Measurements of sword and seax

Sword <I68>

Length of hilt	Hilt material	Upper guard	Grip	Lower guard	Scabbard	Blade width	Scabbard width
c.12.8 cm	4 pieces of horn	2.15 cm	9.1 cm	1.1 cm	79.0 cm	4.85 cm	c.8.1 cm

Seax <I57>

Length of hilt	Hilt material	Upper guard	Grip	Lower guard	Scabbard	Blade width	Scabbard width
c.17.0 cm	Horn	-	-	-	c.39.5 cm	3.0 cm	c.5.3 cm

Appendix II. XRF table

SF No.	Description	Results of Analysis
I96	Keystone brooch	Copper, tin and lead alloy gilded with a gold and mercury amalgam
	Glass inlay on brooch	Red glass has an iron based pigment / green glass has a copper based pigment
I66	2 rivets from shield boss	Iron rivets the tops of which are tinned
218	Rivet from shield boss	Iron

Appendix III. SEM table

Sample	Object	Description	Results of Analysis
I ¹	218	Iron rivet with mineralised organic remains	Some kind of straw and perhaps barley
B870	I68	Wood from sword scabbard	Identification: willow/poplar
B871	I68	Possible horn from upper guard of sword	Confirmation that the material is horn, no further identification possible
B872	I67	Wood from socket of spear head	Not well enough preserved for

¹ Sample was not coated.

			identify
B873	166	Wood from inside boss grip	Not well enough preserved for identify
B874	166	Wood from shield between boss and grip	Not well enough preserved for identify
B875	267	Wood from socket of spear	Identification: hazel
B876	218	Wood from shield boss	Not well enough preserved for identify



ENGLISH HERITAGE RESEARCH DEPARTMENT

English Heritage undertakes and commissions research into the historic environment, and the issues that affect its condition and survival, in order to provide the understanding necessary for informed policy and decision making, for sustainable management, and to promote the widest access, appreciation and enjoyment of our heritage.

The Research Department provides English Heritage with this capacity in the fields of buildings history, archaeology, and landscape history. It brings together seven teams with complementary investigative and analytical skills to provide integrated research expertise across the range of the historic environment. These are:

- * Aerial Survey and Investigation
- * Archaeological Projects (excavation)
- * Archaeological Science
- * Archaeological Survey and Investigation (landscape analysis)
- * Architectural Investigation
- * Imaging, Graphics and Survey (including measured and metric survey, and photography)
- * Survey of London

The Research Department undertakes a wide range of investigative and analytical projects, and provides quality assurance and management support for externally-commissioned research. We aim for innovative work of the highest quality which will set agendas and standards for the historic environment sector. In support of this, and to build capacity and promote best practice in the sector, we also publish guidance and provide advice and training. We support outreach and education activities and build these in to our projects and programmes wherever possible.

We make the results of our work available through the Research Department Report Series, and through journal publications and monographs. Our publication Research News, which appears three times a year, aims to keep our partners within and outside English Heritage up-to-date with our projects and activities. A full list of Research Department Reports, with abstracts and information on how to obtain copies, may be found on www.english-heritage.org.uk/researchreports

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