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The plant remains from White Horse Stone, Pilgrim's Way and Boarley Farm, Aylesford and Boxley, Kent

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1 INTRODUCTION

During excavations at White Horse Stone, a total of 436 bulk environmental soil samples were collected for the recovery of macro-plant remains. The majority (88%) of these samples were from the main White Horse Stone site (ARC-WHS98), while 35 samples were collected from Pilgrims Way (ARC-PIL98), directly adjacent to the main site, with the other 15 samples coming from Boarley Farm West (ARC-BFW98), a short distance to the south. The samples were collected from deposits dating from the late Glacial/early Holocene through to the Saxon and possibly the medieval period, with most of the samples dated to the Neolithic (36% of all samples) and the late Bronze Age to middle-Iron Age period (34% of all samples).

2 SAMPLING, PROCESSING AND ASSESSMENT

The aim of the sampling strategy was to obtain a representative sample of all context types on a spatial and temporal basis to address the research questions concerning the environment and economy of the site and possible evidence of ritual activity. More detailed research aims were presented following the assessment (see below). The samples were processed using a modified Siraf tank onto a 0.25mm mesh and the resulting flots assessed. Details of the assessment may be found in Pelling (2001).

3 ANALYSIS

On the basis of the assessment, 47 samples were selected for further analysis of the charred plant remains while mineralised remains were identified from seven of these samples. Forty-one of the samples were from White Horse Stone, five from Boarley Farm West and one from Pilgrims Way.

The majority (33) of the analysed samples were from early to middle Iron Age deposits, all from ARC-WHS98, and mainly from pit fills, with 29 samples from ten pits, with the other four samples coming from post-hole fills. The other analysed samples were from Neolithic post-holes and pit fills (eight samples), a middle Bronze Age post-hole, and from Saxon, and possibly later medieval pit fills (five samples).

4 METHODS

Standard MoLSS methodology was used for the recording of the plant remains. The samples selected for analysis were sorted, prior to recording, by staff at Oxford Archaeology, who sub-sampled several of the richest flots before sorting. The percentage sorted for sub-sampled flots are shown in the tables of results. All sorted material was identified and quantified; the unsorted fractions of the rich flots were also scanned for additional species and information.

Many of the samples contained large amounts of very fragmented grain (generally smaller than 2mm), which could not be accurately counted; thus, only estimates were made of these quantities using the following rating system: + = 1-10, ++ =11-50, +++ = 50+ items. This material could not be included in statistics and therefore grain percentages are lower than reality, and other components may be correspondingly higher. Cereal awn fragments, loose cereal coleoptiles and embryos were also not counted.

Other items that were not quantified included hazelnut (*Corylus avellana*) shell fragments, stem fragments, charcoal, mineralised plant material and indeterminate plant remains. The frequency of these items was estimated using the same rating system as used for the cereal fragments. The charcoal was analysed by another specialist.

5 RESULTS

5.1 Introduction

Large amounts of identifiable and quantifiable charred plant remains were recovered from most of the samples, with the counted material consisting mainly of cereal grains (51%), followed by chaff fragments (38%) and weed seeds (11%). A breakdown of the plant remains (cereal grain, chaff and weed seeds) by period (and also by feature types for the Iron Age samples) is shown in Table 1.

Ninety per cent of the quantified plant remains were from the Iron Age samples with Table 2 showing the percentage of grain, chaff and weed seeds in the individual assemblages from these sampled features. This also shows the ratio of grains to glumes of hulled wheats to establish whether or not the grains may have been present as spikelets. These calculations are based on all wheat grains (including those not identified to species) and and glume bases with spikelet forks and bases being counted as two. These calculations, however, are only approximate because many of the grains could either not be identified (36% of all quantified grains) or counted (see above) while there is also the potential problem of the survival of fragile chaff fragments. The item density of plant remains (quantified material only) per litre

of processed soil for each Iron Age sampled context is also shown in Table 2. Full lists of plant remains by period are shown in Tables 3 to 10.

There was evidence of intrusive environmental material in most of the samples with varying amounts of uncharred weed seeds, roots and burrowing molluscs. The weeds were mainly represented by small seeds, particularly goosefoots/oraches (*Chenopodium*/*Atriplex* spp.) and chickweeds (*Stellaria media*), while there were smaller seed numbers of black bindweed (*Fallopia convulvulus*), knotgrass (*Polygonum aviculare*), bedstraw (*Galium* spp.), brambles (*Rubus* spp.), elder (*Sambucus nigra*), fumitory (*Fumaria* spp.), violet (*Viola* spp.) and occasional records of wild radish (*Raphanus raphanistrum*), wild celery (*Aethusa cynapium*), petty spurge (*Euphorbia peplus*) and campion/catchfly (*Silene* spp.). Some of these species were also well represented as charred seeds, notably goosefoots/oraches and bedstraw. It does not follow however, that the presence of this material means that the larger cereal grains are also intrusive although the question of intrusive charred material will be considered on a sample by sample basis when appropriate.

The results will be described by period, with a description and interpretation of individual sampled features within each period. This will be followed by a general discussion of the results with comments on crop husbandry and crop-processing activities and the spatial distribution of these activities within the Iron Age settlement.

Table 1: Breakdown of quantified remains by period and feature types - Iron Age samples

Period	**Feature type**	**Cereal grains**	**Chaff fragments**	**Weed Seeds**	**Total nos Items**	**% of iron age items**	**% of all remains**
Neolithic		6	-	3	9	-	0.05%
MBA		168	-	-	168	-	0.85%
IA	cremations	934	581	47	1562	9%	90%
	graves	21	21	75	117	1%	
	Postholes	1480	54	15	1549	9%	
	Pits	5292	1269	1570	8131	47%	
	Metalwkg pits	230	5274	341	5845	34%	
Saxon/med		1558	29	108	1695	-	9%
TOTAL		9689 (51%)	7228 (38%)	2159 (11%)	19076		

Table 2: Percentage of grain, chaff and weed seeds from Iron Age sampled contexts

(the ratio of hulled grains to glumes and item density of quantified remains per litre of processed soil is also included)

Context	**Fill**	**grains**	**chaff**	**Weed seeds**	**wheat grains**	**Glume bases**	**Ratio (gr:gl)**	**Nos items**	**density of items (per litre of soil)**
GRAVE FILLS									
GRAVE 2184	2291	15%	6%	81%	2	5	-	84	3.3
"	8013	22%	54%	22%	1	12	-	22	0.5
GRAVE 8012	8014	45%	36%	19%	-	4	-	11	0.3
CREMATIONS									
CREM 6132	6099	89%	8%	3%	324	57	6:1	780	78(e)
"	6130	31%	67%	2%	72	490	1:7	782	1043(e)
POST-HOLES									
PH 4334	4335	97%	3%	-	28	7	4:1	185	4.8
PH 4350	4351	c96%	4%	0.1%	123	25	5:1	681	45.3
"	4352	90%	8%	2%	30	14	2:1	151	5.9
PH 4126	4127	97%	1%	2%	82	6	14:1	532	13.3
TYPE 1 PITS									
PIT 2107	2108	88%	3%	9%	26	2	13:1	116	2.9
	2109	48%	42%	10%	258	281	1:1	710	71
	2111	54%	36%	10%	292	297	1:1	879	352(e)
	2639	84%	12%	4%	702	253	3:1	2224	5973(e)
PIT 2276	2267	95%	1%	4%	9	7	-	356	8.9
TYPE 2 PITS									
PIT 2214	2142	59%	7%	34%	78	17	4.5:1	251	63(e)
PIT 2130	2125	67%	20%	13%	319	209	1.5:1	1131	12064(e)
PIT 6110	6122	0.5%	0.5%	99%	2	4	-	683	17
TYPE 6 PITS									
PIT 2155	2104	73%	5%	22%	10	24	1:2.5	467	11.7
	2106	61%	3%	36%	8	8	1:1	323	8.3
	2153	73%	7%	20%	21	37	1:1.75	580	14.5
	2154	73%	10%	17%	5	20	1:4	195	9.75
PIT 8079	8076	71%	17%	12%	31	36	1:1	215	5.4
TYPE 8 PITS									
PIT 7007	7008	1%	91%	8%	4	1473	1:368	1823	911.5
	7015	2%	87%	11%	6	1085	1:181	1392	69.6
PIT 7201	7202	8%	90%	2%	18	1475	1:82	1806	95.0
	7203	5%	94%	1%	7	678	1:97	824	104.8

5.2 Neolithic Period (Table 3)

Eight samples were selected from Neolithic deposits at White Horse Stone, with two samples from early Neolithic post-holes [5310], [5316] associated with a longhouse, and six samples from the fills of three late Neolithic groove ware pits, [4874], [5256] (both in the same location as the earlier longhouse), and Pit [4249], to the south.

Very few plant remains were recovered from the Neolithic samples with occasional cereal grain, pulses, seeds and fruits of wild plants. The exception was frequent hazelnut shell fragments in several samples. Small amounts of very fragmented charcoal were also present in all the samples.

Table 3: The charred plant remains from Neolithic features at White Horse Stone

	Period	**Early Neolithic**				**Late Neolthic**					
	Area	**longhouse**			**8088**	**GW Pits within house (but later than house)**					**GW pit s of house**
	Subgroup	**4806**				**19400**					**19399**
	Feature	PH 5308	PH 5315	PH	PH 4929	Pit 4874	Pit 5256				Pit 4929
	Context	5310	5316	5281	5417	4876	5257	5258	5259	5259	4931
	Sample	739	742	691	891	289	673	639	637	676	634
	vol. soil (l)	32	15			28	40	22	10	20	40
	vol. flot (ml)	5	10			5	60	10	5	5	10
LATIN_NAME	**ENGLISH**										
Triticum sp.	Wheat			1							
Hordeum/Triticum sp.	Barley or wheat grain		1		1						
Hordeum vulgare L.	Hulled barley				2						
Hordeum spp.	Barley				2						
Cf. *Hordeum* sp.	?barley				1						
Cerealia	Indet. Cereal grain				10	1	2				2
Papaver sp.	Poppy seeds	1									
cf. *Vicia faba*	?celtic bean/horsebean		1								
Chenopodium spp.	Goosefoots etc.				11						
Malus domestica/sylvestris	Apple/crab apple seeds										1
Corylus avellana L.	Hazel shell fragments						+	+++	++	++	
cf. *C. avellana*	?hazel shell fragments										+
Galium sp.					1						
cf. *Euphrasia/Odontites* spp.					3						
Gramineae indet.	Indet large grass seeds				2						
Indeterminate	-	+	+	+							+
Indeterminate	Charcoal	++	+			++	+++	+++	+++	++	+++
	Total	**1**	**2**	**1**	**33**	**1**	**2**				**3**

Post-holes [5308] [5315]

The samples from the two post holes, [5308] and [5315], associated with the early Neolithic longhouse, produced just a single grain of barley or wheat (*Hordeum* or *Triticum* sp.), a poppy (*Papaver* sp.) seed, a tentative identification of celtic bean/horse bean (cf. *Vicia faba*) and two indeterminate items. The small amount of charred material in these two samples probably represents background deposits of food waste that may have been blowing around the site. There is a possibility, however, that some of this plant material may be intrusive. The sample from post-hole [5315] also contained an iron nail and glass plus a large number of burrowing molluscs and a range of uncharred weed seeds, which however, were virtually all small-seeded, for example, chickweeds (*Stellaria media*), oraches (*Atriplex* spp.).

Neolithic Pits [4874], [5256], [4249]

The six analysed samples from the late Neolithic groove ware pits also contained very few charred plant remains; the samples from the shallow Pit [4874] and deep Pit [5256] in the same area as the earlier Neolithic longhouse, contained a few indeterminate cereal grains, plus a fairly large amount of charred hazelnut shell in the four samples from the fills of Pit [5256]. The sample from the deep Pit [4929] to the south of the house contained a seed of crab apple (*Malus sylvestris*), as well as two indeterminate cereal grains and a possible fragment of hazelnut shell. Again, this small amount of material represents background deposits of cereal waste, wild food residues and woodland resources that may have been blowing around the site.

5.3 Mid Bronze Age (Table 4)

The one analysed sample from the mid-Bronze Age was from a posthole fill [573] from excavations at Pilgrims Way, adjacent to the main site. The charred plant assemblage consisted virtually entirely of several hundred poorly preserved and fragmented cereal grains, mainly of six-row hulled barley (*Hordeum vulgare*), plus a few oat (*Avena* spp.) awn fragments and a large number of uncounted cereal fragments. There was only a small quantity of charcoal fragments in the flot.

Table 4: The charred plant remains from Pilgrims Way (middle Bronze Age) post-hole

	period	MBA
	Feature	PH
	context	573
	sample	24
	vol. soil (l)	7
	vol. flot (ml)	40
LATIN_NAME	**ENGLISH**	
Hordeum vulgare L.	Six-row hulled barley	71
cf. *H. vulgare*	?six-row hulled barley	95
Hordeum/Triticum sp.	Barley Or Wheat	2
Avena spp.	Oat awn	+
Cerealia	Indet. Cereal fragments	+++
Cerealia	Indet. Cereal coleoptile	+
Indeterminate	charcoal	+
	total	**168**
	Item density (per litre of soil)	*24.0*

The charred remains represent fully processed barley grain, which may have become accidentally charred while being dried before storage or milling or possibly during cooking of whole grains over open fires, presumably in the vicinity of the sampled feature.

The assessment of material from Pilgrims Way also recorded the presence of crab apple in middle to late Bronze Age contexts and also hazel nut shell, although these samples were not recommended for analysis.

5.4 Early to middle Iron Age

The range of charred plant remains recovered from the 33 early to middle Iron Age samples is discussed in the following section, followed by descriptions and interpretations of individual assemblages by feature.

General description of the plant remains

The majority of the early to middle Iron Age samples contained very large charred plant assemblages, consisting mainly of cereal grain (46% of quantified remains) and chaff fragments (42%), plus a smaller amount of the remains of other plants (12%), with a total of 17,204 quantified items from all the samples. The individual plant assemblages were sufficiently large in many cases for interpretation of the remains.

Over a third of the grains could not be identified while many of the samples contained large numbers of uncounted cereal fragments with loose cereal embryos and coleoptiles in 14 and six samples respectively. Wheat was the best-represented grain, accounting for 31% of the quantified material in 31 samples, while wheat chaff (virtually all (97%) from hulled

wheats - spikelet forks, glume bases and some rachis fragments) was recorded from 32 samples. Just over half of the wheat grains could not be identified to species while the better preserved grains showed that the hulled wheats, spelt (Triticum spelta), and emmer (T. dicoccum) were the main cereals almost equally represented by 25% and 21% of the wheat grains respectively. Spelt chaff was almost four times better represented than emmer although most of the wheat chaff could not be identified to species. Six grains were tentatively identified as free-threshing wheat (T. aestivum/turgidum/durum), while three rachis fragments from a single sample were identified as possible hexaploid bread wheat (T. cf. aestivum s.l.). There were also a few wheat awn fragments in four samples.

Barley was the second best represented cereal in the samples accounting for 22% of the quantified grains and appearing in 30 samples although there were relatively few barley rachis fragments, which were present in ten samples. The well-preserved barley grains consisted of hulled, straight and twisted grains, indicating that the remains are from six-row hulled barley. There were a few barley awn fragments in one sample.

Oat grains were present in 29 samples but made up just 11% of all the quantified grains and in most cases did not form a significant proportion of the cereal assemblages (with several notable exceptions – see below). The small quantity of oat grains plus a small number (30) of oat floret bases in seven samples, eleven of which were identified as wild oat (Avena fatua/ludoviciana), suggests that in most cases the oat grains are probably wild, growing as crop weeds. Various amounts of oat awn fragments were present in 24 samples, being particularly numerous in the metalworking pits fills.

The remains of other plants were mainly from a fairly wide range of wild species, well distributed throughout the different samples, and most of which were from disturbed (including cultivated) ground habitats and waste places. Many of these seeds, however, could not be reduced to species, which limits ecological interpretation, although their presence in cereal assemblages suggests that the majority probably represent arable weeds harvested with the grain and charred following crop processing.

The most abundant weed species (in terms of individual item frequency and the number of samples in which they appear) were bromes (Bromus spp.), henbane (Hyosyamus niger), goosefoots etc/oraches, docks (Rumex spp.) including sheeps sorrel (Rumex acetosella), bedstraw, including cleavers (Galium aparine), medick/trefoil (Medicago/Trifolium spp.), field madder (Sheradia arvensis), campion/catchfly, chickweed, and many grass seeds (Poaceae) including cat's tail (Phleum spp.). Large numbers of stinging nettle (Urtica dioica) were present in just one sample. The interpretation of the individual weed seed assemblages will be considered on a sample by sample basis using ecological information (Clapham et al 1987; Hanf 1993; Stace 1991).

There was little evidence for other food plants in the samples, with a tentative identification of cultivated flax (Linus cf. usitatissimum) in one sample and the remains of pulses (Vicia/Lathyrus/Pisum spp.) in six samples, which may, however, be from wild rather than cultivated legumes, particularly as they tend to occur only in low numbers and together with other weed seeds. Small numbers of charred Brassica species in six samples may represent the residues of gathered foodstuffs, with large numbers of mineralised Brassica seeds (in four samples) probably more likely to represent consumed foodstuffs. The remains of wild fruits, which may have been collected and eaten, was represented by varying amounts of fragmented charred hazelnut shell in nine samples, plus occasional records of raspberry/blackberry (Rubus fruticosus/idaeus) (including a few mineralised seeds) in three samples, and sloe/blackthorn (Prunus spinosa) in one sample.

The Grave Pit samples (western group of burials) (Table 5)

The three samples from the two fills of Grave [2184] and the fill of Grave [8012] produced only small assemblages of charred plant remains with a total of just 117 quantified items and a very low item density. Cereal remains represented 36%, and weed seeds 64%, of the quantified material.

The majority of these plant remains were from the fill [2291] of Grave [2184]. Cereals (grains and chaff) in these samples consisted of small numbers of wheat, six-row hulled barley and oats, with the presence of spelt confirmed by the identification of several glume bases. Occasional hazelnut shell was present in Pit [8102]. Only Grave [2184] contained a small range of weed seeds, including docks, chickweeds and bedstraw with one of the fills [2291] producing large numbers of mineralised *Brassica* seeds from the stomach area of the skeleton, possibly the residues from collected and consumed plants. There were only small amounts of very fragmented charcoal in these samples.

Little interpretation of the charred plant assemblages may be made on the basis of these small assemblages with the material probably representing the remains of re-deposited crop-processing waste, mixed with a little prime grain, incidentally accumulating in the grave pits, possibly as part of the back-filling of these features.

Table 5: Charred and mineralised plant remains from the grave pit samples (phase 7): Early to middle Iron Age (western group of burials)

		Pit 2184		**Pit 8012**
	Context	**2291**	**8013**	**8014**
	Sample	**33**	**704**	**705**
	vol. soil (l)	**26**	**40**	**40**
	vol. flot (ml)	**50**	**10**	**75**
LATIN_NAME	**ENGLISH**			
Charred plant remains				
GRAINS				
Triticum dicoccum/spelta	Emmer/Spelt	2		
Triticum sp.	Wheat		1	
Hordeum vulgare L.	Six-row hulled barley	1	1	
cf. *H. vulgare*	?Six-row hulled barley	3		1
cf. Avena sp(p).	?Oat	2		1
Cerealia	Indet. Cereal	3	3	3
Cerealia	Indet. Cereal fragments	+	++	
Ubtotal		*11*	*5*	*5*
CHAFF				
Triticum spelta L.	spelt glume base	2		2
T. cf. *Spelta*	?spelt glume base		2	
Triticum spp.	wheat glume base	3	10	2
Avena spp.	oat awn	+	+	
Subtotal		*5*	*12*	*4*
OTHER PLANTS				
Ranunculus spp.	-	2		
Papaver sp.	Poppy	1		
Stellaria media gp.	Chickweeds	11		
Stellaria spp.	Chickweed/Stitchwort	3		
Atriplex spp.	Orache	7		
Melilotus/Medicago/Trifolium spp	melliot/medick/clover	7		
Vicia/Lathyrus/Pisum sp.	Vetch/Tare/Vetchling/Pea		1	
Euphorbia peplus L.	Petty Spurge		1	
Polygonum aviculare agg.	Knotgrass	1		
Rumex spp.	Dock	10	1	
Corylus avellana L.	Hazelnut shell			+
Lithospermum arvense L.	Corn Gromwell	3		
Euphrasia/Odontites sp.	Euphrasia/Red Bartsia	1		
Plantago lanceolata L.	Ribwort	1		
Sherardia arvensis L.	Field Madder	3		
Galium spp.	Bedstraw	10		1
Lapsana communis L.	Nipplewort	1		
cf. *Bromus* sp.	?Bromes	1		
Avena/Bromus sp.	Oat/Brome Grasses	1		
Poaceae indet	Grasses	5	2	1
Indeterminate	-	++	+	+
Indeterminate	Stems			+
Indeterminate	Charcoal	++	++	+++
Subtotal		*68*	*5*	*2*
Mineralised plant remains				

		Pit 2184		Pit 8012
	Context	**2291**	**8013**	**8014**
	Sample	**33**	**704**	**705**
	vol. soil (l)	**26**	**40**	**40**
	vol. flot (ml)	**50**	**10**	**75**
LATIN_NAME	**ENGLISH**			
Brassica spp.	Wild Cabbage/Turnip/Mustard	+++		
Lithospermum arvense L.	Corn Gromwell	+		
Indeterminate	-	++		
Subtotal				
	total	84	22	11
	Item density (per litre of soil)	*3.3*	*0.5*	*0.3*

The cremation pit samples (southern group) (Table 6)

The three samples from the two fills [6099] [6130] of a shallow Pit [6132] were very rich in charred plant remains, particularly sampled fill [6130], which produced a projected item density of over 1000 items per litre of processed soil. Only a fraction of each flot was sorted.

Cereal remains accounted for virtually all (97%) the quantified remains from the three samples, with the sampled fill [6099] containing mainly (94%) grains and very few chaff fragments, while sampled fill [6130] produced about twice as much chaff as grain. The grains were mainly identified as the hulled wheat, spelt, and to a lesser extent, emmer, with a slightly smaller amount of six-row hulled barley. Identifiable wheat chaff was also mainly spelt although there was a small number of barley rachis fragments in fill [6130]. Scanning the unsorted fraction of the flots confirmed that spelt was the main cereal in the cremation pit followed by six-row hulled barley with thousands of well-preserved grain and chaff fragments (virtually all from spelt) in fill [6130]. There were only a few oat grains, which were probably crop weeds. This fill also contained several wheat rachis fragments tentatively identified as being from hexaploid bread wheat. All three samples contained very little charcoal.

Other charred remains in the samples consisted of possible food residues - occasional hazelnut shell, sloe/blackthorn fruit stone and *Brassica* seeds. There were very few weed seeds with the most numerous being the larger weed seeds of cleavers and grasses, which made up 60% of the weed seeds, both of which characteristic of almost fully cleaned grain.

As noted above, the charred plant remains from fill [6099] contained virtually fully cleaned grain (with very little chaff) and a ratio of 6:1 grain to chaff (hulled wheats), suggesting that the hulled wheats had been de-husked. Conversely, the plant remains in fill [6130] contained a significant amount of hulled wheat chaff with a ratio of grains to glume bases of 1:7. This ratio does not, however, take account of the large number of uncounted indeterminate grains and grain fragments in this pit fill sample.

Thus, the plant remains in fill [6130] suggest that the hulled wheats (mainly spelt) may have been deposited as spikelets, together with six-row hulled barley, with the spikelets subsequently breaking up when placed in the pits and burnt, rather than the grains and the chaff being deposited separately. The other fill [6099] appears to contain fully processed and de-husked wheat grains. Their deposition in the cremation fills was probably intentional, being food offerings.

Table 6: The charred plant remains from the cremation pit samples: Early to middle Iron Age (southern group)

	Feature	**Pit 6132**		
	context	**6099**	**6099**	**6130**
	sample	**492**	**517**	**491**
	vol. soil (l)	**40**	**40**	**12**
	vol. flot (ml)	**200**	**250**	**1600**
	% flot scanned	**12.50%**	**12.50%**	**6.25%**
LATIN_NAME	**ENGLISH**			
Grains				
Triticum dicoccum Schubl.	Emmer	11	6	
T. spelta L.	Spelt	69	12	
T. cf. *Spelta*	Spelt	46		
T. dicoccum/spelta	Emmer/Spelt	23	14	3
Triticum spp.	Wheat	65	49	42
cf *Triticum* spp.	?Wheat	15	14	28
Hordeum vulgare L.	Six-row hulled barley	122	38	19
cf. *H. vulgare*	?six-row hulled barley	23	13	30
Avena sp.	Oat	1		1
cf. *Avena* sp.	Oat	1	1	1
Cerealia	Indet. Cereal	88	83	116
Cerealia	Indet. Cereal fragments	+++	+++	++++
Cerealia	Indet. Cereal loose embryos	++		++
Subtotal		*464*	*230*	*240*
Chaff				
Triticum spelta L.	Spelt spikelet fork	1	1	53
T. cf. *Spelta*	?Spelt spikelet fork			15
T. spelta L.	Spelt glume base	5	5	113
T. cf. *Spelta*	?Spelt glume base			18
T. spelta L.	Spelt rachis			6
T. cf. *Aestivum* type	Bread/Club Wheat rachis			3
Triticum sp(p).	Wheat spikelet fork	1	1	25
Triticum spp.	Wheat spikelet base	6	6	52
Triticum spp.	Wheat glume base	3	12	69
Triticum spp.	Wheat rachis		2	13
Triticum spp.	Wheat awn			+
Hordeum sativum *L.*	Barley rachis			10
Avena spp.	Oat awn			+
Subtotal		*24*	*35*	*522*
Other plants				
Brassica spp.	Wild Cabbage/Turnip/Mustard	5	2	
Silene sp.	Campion/Catchfly		1	

	Feature	**Pit 6132**		
	context	**6099**	**6099**	**6130**
	sample	**492**	**517**	**491**
	vol. soil (l)	**40**	**40**	**12**
	vol. flot (ml)	**200**	**250**	**1600**
	% flot scanned	**12.50%**	**12.50%**	**6.25%**
LATIN_NAME	**ENGLISH**			
Stellaria media gp.	Chickweeds	1		1
Vicia/Lathyrus/Pisum spp.	Vetch/Tare/Vetchling/Pea	2		
Prunus spinosa L.	Sloe/Blackthorn			1
Rumex sp.	Dock	1		1
Corylus avellana L.	Hazelnut shell		+	
Galium aparine L.	Cleavers	10	2	3
Asteraceae indet.	-	1		
Bromus sp.	Bromes	1	1	
cf. *Bromus* sp.	?Bromes			1
Poaceae indet	grasses			13
Indeterminate	-	+	+	+
Indeterminate	stems	+		
Indeterminate	charcoal	+	+++	+
Subtotal		*21*	*6*	*20*
	total	509	271	782
	Item density (per litre of soil)	*101.8(e)*	*54.2 (e)*	*1042.6 (e)*

The post-hole fill samples (Table 7)

Charred plant remains from four post-hole fills were analysed; one sample from the fill [4127] of an isolated post-hole [4126], which was not part of a recognised structure; and three samples from two post-holes [4334] (fill [4335]) and [4350] (fills [4351], [4352]) which was associated with a four-poster structure [4503].

All four samples consisted of moderately large assemblages of charred plant remains with a fairly low item density except from post-hole fill [4351]. The plant assemblages consisted mainly of cereal grain (between 90 and 97% of the quantified material in individual assemblages) although the poor preservation of the grains meant that almost three-quarters could not be identified. The cereals consisted mainly of wheat and six-row hulled barley grains with only a small number of oat grains, which are probably weeds, with the recovery of a wild oat floret in post-hole fill [4351]. The identifiable wheat grains were all hulled grains with mostly emmer and only a little spelt (although 70% of the wheat grains could not be identified). There were only a small amount of chaff fragments (mainly from hulled wheats including emmer and spelt) and only a few weed seeds in all four samples. Other potential food residues included a few fragments of hazel nutshell fragments in post-hole fills [4127] [4335] and a single seed of blackberry/raspberry in post-hole fill [4352]. There were fairly large amounts of very fragmented charcoal in the samples.

There were no significant differences between the charred plant assemblages in the post-hole fills other than in the density of the remains with post-hole fill [4351] having the greatest concentration of material (with 45 items per litre of processed soil). All four samples consisted of almost fully cleaned and very poorly preserved grains of hulled wheat (mainly emmer and some spelt) and six-row hulled barley. The grains may have become accidentally burnt while being dried before storage although it could be argued that the cleanliness of the grains (de-husked and with very few weed seeds) and the low item density could suggest accidents during activities associated with food preparation and consumption. The grains may have been re-deposited (swept or windblown) into the post-holes from activities taking place within the building(s).

Table 7: The charred plant remains from posthole samples (early to middle Iron Age)

	subgroup		**4503**		
	Feature	**PH 4126**	**PH 4334**	**PH 4350**	
	context	**4127**	**4335**	**4351**	**4352**
	sample	**91**	**102**	**151**	**152**
	vol. soil (l)	**40**	**38**	**15**	**25**
	vol. flot (ml)	**100**	**150**	**150**	**50**
LATIN_NAME	**ENGLISH**				
GRAIN					
Triticum dicoccum Schubl.	Emmer		1	20	1
T. cf. *Dicoccum*	?Emmer	2	3	28	8
T. spelta L.	Spelt			2	
T. cf. *Spelta*	?Spelt	2			
T. dicoccum/spelta	Emmer/Spelt	2	2	5	1
Triticum spp.	Wheat	70	12	59	20
cf *Triticum* spp.	?Wheat	6	10	9	
Hordeum vulgare L.	Six-row hulled barley	13	2	31	9
cf. *H. vulgare*	?six-row hulled barley	31	10	61	13
Avena spp.	Oat	3	2	8	
cf. *Avena* spp.	?Oat	3	2	5	1
Cerealia	Indet. Cereal	385	134	423	81
Cerealia	Indet. Cereal fragments	+++	+++	++	+++
Cerealia	loose cereal embryos	+		+	
Subtotal		***517***	***178***	***651***	***134***
CHAFF					
Triticum dicoccum Schubl.	Emmer glume base			2	
T. spelta L.	Spelt glume base	1		3	
Triticum spp.	Wheat spikelet fork			1	1
Triticum spp.	Wheat spikelet base	1	2		2
Triticum spp.	Wheat glume base	3	3	18	8
Triticum sp.	Wheat rachis			1	1
Triticum spp.	Wheat awn			++	
Avena spp.	Oat awn	+	+		
Cerealia	Indet. Cereal awn			+	
Subtotal		***6***	***7***	***26***	***15***
OTHER PLANTS					

	subgroup		**4503**		
	Feature	**PH 4126**	**PH 4334**	**PH 4350**	
	context	**4127**	**4335**	**4351**	**4352**
	sample	**91**	**102**	**151**	**152**
	vol. soil (l)	**40**	**38**	**15**	**25**
	vol. flot (ml)	**100**	**150**	**150**	**50**
LATIN_NAME	**ENGLISH**				
GRAIN					
Ranunculus sp.	-	1			
Papaver sp.	Poppy				1
Melilotus/Medicago/Trifolium spp.	Melilot/medick/clover	5		1	
Rubus fruticosus/idaeus	Blackberry/Raspberry				1
Rumex acetosella agg.	csheep's sorrel	1			
Corylus avellana L.	Hazelnut shell	+	+		
Galium sp.	Bedstraw	1			
Avena fatua/ludoviciana	Wild Oat floret			1	
Poaceae indet.	grasses	1		2	
Indeterminate	-	++	++	++	++
Indeterminate	charcoal	++	++	++	+++
Subtotal		***9***		***4***	***2***
	total	**532**	**185**	**681**	**151**
	Item density (per litre of soil)	*13.3*	*4.9*	*45.4*	*6.0*

Other Pit fill samples

The remaining 23 pit fill samples were divided into types according to their location and the sequence and character of fills (in terms of bone, pot, plant remains, other finds) within the pits. Eight types were established, with seven samples being analysed from Type 1 pit fills; three samples from Type 2 pit fills; five samples from Type 6 pit fills; and eight samples from Type 8 pit fills. The pit types will be used as a basis for analysing the plant remains.

Type 1 Pits (Table 8):

These pits are characterised by rich charred plant assemblages in the basal fills and animal bone and pottery in the upper fills. Plant remains were analysed from six samples in Pit [2107] (western area of the site) and one sample from Pit [2276] (north-western part).

Pit [2107] (western area):

The six samples that were analysed from four fills of Pit [2107] consisted of individual samples from fills [2108], [2109], and [2111], and three samples from an exposed section of fill [2639]. The samples produced very variable but generally very rich assemblages of charred plant remains from a size of just 116 items (and a density of just under three items) in pit fill [2108] to a very rich assemblage from pit fill [2639] (sample 182), containing 2224 items and a projected density of almost 6000 items per litre of processed soil.

Cereal grains made up the majority (69%) of the quantified plant remains from the samples in Pit [2107], followed by chaff fragments (23%) and other plants (mainly weeds) (8%). Wheat was the best-represented cereal with 47% of the quantified grains followed by six-row hulled barley (21%) and oats (6%). Several wild oat floret bases were found in the samples suggesting that the grains may also be wild.

The identifiable wheats were mainly the hulled grains, with spelt being better represented than emmer, although just over half the wheat grains could not be identified. There were also several free-threshing wheat grains. The chaff, virtually entirely from hulled wheats, also suggests spelt was the main cereal with only a little emmer chaff being recovered. Other chaff in this pit consisted of just two barley rachis fragments and some wheat and oat awn fragments. There was a moderate species range but low item frequency of weed seeds with individual species being poorly represented with the exception of the grasses, bromes, cats tail and indeterminate grass seeds, which accounted for 80% of all the weed seeds from Pit [2107]. The only tentative identification of flax from the Iron Age samples was recorded in pit fill [2109]. There were large amounts of fragmented charcoal in pit fills [2108], [2109] and [2111] but very little charcoal in the samples from pit fill [2639].

An examination of the charred remains in the individual sampled fills within Pit [2107] shows differences in the plant assemblages from the four fills.

Pit fill [2108] produced the smallest assemblage (and lowest item density of remains) of the four fills, with mainly cereal grains (including evidence for free-threshing wheat), and very little chaff and weed seeds. This represents an almost cleaned crop, possibly burnt during food preparation.

The samples from the two lower fills [2109] and [2111] produced richer plant assemblages with a large amount of grain (between 48% and 54% of the total) but with a significant amount of chaff (36% to 42%) and not many weed seeds (about 10%). All three cereals were present with spelt being the main grain with the ratio of hulled wheat grains to glume bases being almost 1:1. Fill [2111] also contained a large quantity of silica awn fragments. The weed seeds in the lower fills consisted mainly of large numbers of *Bromus* seeds, a large seed, which accounted for 60% and 70% of the weed seeds in fills [2109] and [2111] respectively. There were also other occasional large seeds, for example, corn gromwell (*Lithospermum arvense*) and bedstraw. The plant remains from [2109] and [2111] suggests virtually fully cleaned grain (including spikelets of hulled wheat), which may have been accidentally burnt during the final cleaning of the hulled wheats (before use or storage). The presence of large weed seeds is characteristic of almost fully processed, possibly stored, grain.

The three column samples from fill [2639] produced some of the richest plant assemblages from the site with high item densities; these consisted mainly of grain (84%)

with hulled wheats (especially spelt) followed by six-row barley and oats, and small quantities of chaff (12%) (mainly hulled wheat including spelt). There was a very small quantity of weed seeds (4%) including bromes, cat's tail, and indeterminate grasses, particularly in sample 182. These assemblages are mainly characteristic of fully processed and accidentally burnt grain with only very small quantities of crop-processing by-products. The ratio of 3:1 grains to glumes (hulled wheats) could suggest the presence of wheat spikelets although there was a very large number of indeterminate cereal grains and uncounted grain fragments in these samples.

Virtually completely cleaned grains are predominant in all the fills but the ratio of grains to glumes (in the case of hulled wheats only) suggest that the grains were in their spikelets in fills [2109] and [2111] (possibly prior to storage), while the poor representation of chaff in fills [2639] and [2108] suggests that the hulled grains had been de-husked either ready for use or for storage. The large weed seeds, which made up most of the weed seed assemblages, are also indicative of stored grain.

Pit [2276] (north-western area):

The one sampled fill [2267] of this pit produced several hundred quantified plant items and a low item density. The material consisted mainly of cereal grains (95% of the quantified remains) with a small range of weed seeds (4%) including docks, bedstraw and corn gromwell, and only a little chaff (1%) (wheat glume bases and oat awns).

The cereals consisted of a relatively large number of oat grains, which made up over half (61%) of the quantified grains, plus six-row hulled barley (13%) and a few (mainly hulled) wheat grains (3%). It is not possible to establish whether these are wild or cultivated oats, although the large number of grains and the presence of very few other weed seeds in the assemblage, could suggest that the oats represent the burnt residues of cultivated grains, possibly for use as animal fodder. There is the possibility that the oats simply represent large weed seeds yet to be separated from the other cereal grains although there were very few other weed seeds in this sample.

Type 2 Pits (Table 8):

Charred plant assemblages were analysed from the fills of three pits, Pit [2214] and [2130] in the western part of the site, and Pit [6110], in the central part of the site. Type 2 pit fills were similar to Type 1 pit fills but with the addition of human bone in the upper fills. The three pit fills contained very different charred plant assemblages both in the range and proportions (grains, chaff, weed seeds) of the material and in the item frequency and density of the plant remains. The only similarity in the plant assemblages was between the sampled fills of Pits

[2214] and [2130] (both in the western part of the site), which produced mostly cereal grains (although Pit [2130] contained much more material). The sampled fill of Pit [6110] (in the central part of the site), on the other hand, consisted almost entirely of seeds of other plants (mainly weed seeds). The pit fills will be described separately because of their distinct plant assemblages.

Pit [2130] (fill [2125]):

This sample consisted of many thousands of well-preserved cereal grains and virtually no charcoal with only a small fraction of the flot being sorted and quantified with an projected density of over 12,000 items per litre of processed soil.

The cereal grains accounted for 67% of the quantified remains, mainly hulled wheats, particularly emmer, with less spelt, and slightly less six-row hulled barley. There was only a small number of oat grains which are probably weeds, with three wild oat florets being identified in the sample. The chaff accounted for 20% of the quantified remains with mainly wheat glume bases (emmer and spelt) and a small number of barley rachis and oat floret fragments. The 149 weed seeds accounted for 13% of the quantified remains although 73% of the weed seeds were goosefoots (*Chenopodium* spp.), a high-seed producing plant, with only a small range of other weed species, for example, bromes, mallow.

This assemblage represents a virtually fully cleaned cereal crop, part of which may have become accidentally burnt while the grain (hulled wheat and barley) was in storage. The ratio of grains to glumes was about one to one, suggesting that the hulled wheats may have been stored as spikelets. There was only a little crop-processing waste, residues from earlier crop-processing activities. The large quantity and density of the plant remains suggests that this material was deliberately dumped into the pit.

Pit [2214] (fill [2142]:

This sample contained several hundred quantified charred plant items with 50% of the flot being sorted and quantified, giving a projected density of 63 items per litre of processed soil. Cereal grains accounted for almost 60% of the quantified remains, which were mainly of hulled wheats (with a slughtly better representation of emmer than spelt) and less six-row hulled barley. Chaff accounted for only 7% of the quantified remains although there was a very large amount of uncounted silica awn fragments. The weed seeds accounted for over a third of the quantified remains although bromes made up 89% of the weed seeds together with only a small range of other weed species.

This assemblage represents an almost fully cleaned cereal crop, with the paucity of wheat chaff suggesting that the hulled wheats may have been mainly de-husked. The grains

may have become burnt while being prepared for cooking or while being dried before storage or milling. *Bromus* seeds are characteristic of stored grain and may have been accidentally burnt along with the cereals or possibly represent the residues of fuel together with the large number of awn fragments.

Pit [6110] (fill [6122]):

This plant assemblage was distinct from the other charred botanical assemblages from the Iron Age settlement in consisting virtually entirely of the remains of wild plants with only traces of cereal grain and chaff fragments and a moderate amount of very fragmented charcoal. The density of plant remains, however, was fairly low, with just 17 items per litre of processed soil.

The weed seeds were mainly from plants of disturbed (including cultivated) ground and waste places with a number of characteristic arable weeds for example, field madder (*Sheradia arvensis*), bedstraw (*Galium aparine*). There was high species (over 30) diversity although the seed frequency of individual species was very variable. Stinging nettle (*Urtica dioica*) accounted for 30% of all weed seeds, *Galium* (bedstraw) species (including cleavers) for 23% and grass seeds (both small and large) for 19% of all weed seeds (including cat's tail, bromes and rye grass). The majority of the weed species, however, were poorly represented. Some of the weeds are indicative of nutrient rich soils, for example, stinging nettle, henbane (*Hyosyamus niger*). There were also traces of wild fruits, blackberry/raspberry, hazelnut shell, which are both potential food resources. A few hollow, rounded, thin stem fragments in the sample may belong to grasses.

This assemblage appears to mainly represent by-products of crop-processing with the separation of the weed seeds from the grains by sieving. The variation in the size of the weed seeds suggest that the remains derive from a number of separate sieving activities, with the material probably then being used as fuel or simply burnt to dispose of the remains.

Type 6 Pits (Table 8)

Charred plant remains were analysed from five fills of two pits; from four fills [2104], [2106], [2153], [2154] of Pit [2155]; and one fill [8076] of Pit [8079]. Both pits were located in the western part of the site. Type 6 pits covered miscellaneous sampled fills. These samples produced fairly large charred plant assemblages (between 200 and 600 quantified items) but with low densities of plant remains of between 5 and 14 items per litre of processed soil.

Pit [2155]:

The four sampled fills all produced similar charred plant assemblages consisting mainly of cereal grains (an average of 70%), with relatively little chaff (an average of *c* 6%) and seeds

of wild plants (an average of 24%). All the samples contained moderate amounts of very fragmented charcoal.

The cereal grains in each fill consisted mainly of oats and six-row hulled barley, with oats being the best represented cereal (between 28 and 40% of the quantified grains) in three of the four samples. Up to half of the quantified grains, however, could not be identified. It is not possible to definitely establish whether the oats represent cultivated or wild species although there were several wild oat floret bases in two of the sampled pit fills, [2153] and [2154]. There were only very small amounts of wheat grains, mainly spelt and emmer, plus several free-threshing wheat grains in pit fill [2104].

Chaff mainly consisted of oat awn fragments plus small numbers of wheat (emmer/spelt) glume bases in all the samples and a few barley rachis fragments in pit fill [2153]. Some of the few stem fragments in three of the four samples (with large ribbed hollow round stems in pit fill [2104]) may belong to cereals.

The weed seeds in these samples formed between 17% and 36% of the quantified remains with a fairly high and similar species diversity (between 12 and 17 plants). The majority of the wild plants were those that grow in disturbed (including cultivated) ground and waste places. Most of the weed seeds, however, came from only a few plants; seeds of henbane accounted for between 25% and 45% of all the weed seeds, a plant associated with nutrient rich soils in disturbed ground in farmyards etc (Clapham *et al* 1987). Henbane has medicinal properties and the relatively large number of seeds in these fills could suggest the collection and use of this plant. However, the presence of the henbane seeds as part of a mixed weed assemblage, suggests that they were probably burnt along with crop-processing waste. There are many records of henbane from the Iron Age onwards and also in earlier contexts, for example, the Wilsford Shaft (Robinson 1989, 83). Other well-represented species in these samples were docks (including sheep's sorrel), bedstraw and grasses, particularly cat's tail, while the remaining weeds were not well represented.

Potential food residues were represented by hazelnut shell in several samples and a few mineralised *Rubus* seeds in pit fill [2153]. There were mineralised plant remains in three of the samples especially in pit fills [2153] and [2154] with moderate numbers of *Brassica* seeds (also charred in several samples), which may be the residues of common vegetables. There were also the mineralised remains of a few other wild plants, for example, fumitory (*Fumaria* spp.).

The interpretation of these plant assemblages is problematic given that it is difficult to establish whether the large number of oat grains were cultivated or are simply weeds. The weed seeds and chaff in the samples mainly represent the burnt by-products from crop-processing, burnt separately or accidentally along with the oat (and barley) grains, these

cereals not being so well cleaned because they were intended for animal rather than human consumption. The low item densities of plant material in these samples suggest that the remains were not deliberately dumped into the pit although they may have been incorporated as part of backfilling.

Pit [8079]:

The charred plant assemblage from pit fill [8076] was similar to those from Pit [2155] in that cereal grains were the main component (71% of the quantified remains) with smaller amounts of chaff (17%) and weed seeds (12%) and a moderate amount of very fragmented charcoal. The density of the quantified plant remains was fairly low at just over five items per litre of processed soil.

The composition of the grain assemblage was different from Pit [8076], however, with wheat (mainly emmer and spelt) being the best-represented cereal (21%) followed by oats and barley with 9% and 7% of the quantified grains respectively. This figure, however, was based on only a small number (152) of identifiable grains, most of which (63%) could not be identified.

The chaff fragments consisted mainly of wheat glume bases and some oat awns, with a moderate amount of stem fragments that may be from cereals or large grasses or both. There was only a small range of weeds, for example, docks, bedstraw, with grasses (including bromes) representing 69% of the quantified weed seeds. There was also a very large amount of charred hazelnut shell in this sample.

This assemblage represents a fairly well cleaned cereal crop(s), possibly accidentally burnt while being dried before storage or the final cleaning (de-husking) of the hulled wheat grains. There was a ratio of almost 1:1 hulled grains to chaff (suggesting spikelets) although this was based on only a small number of remains. The weed seeds may be from stored grain deposits or from crop-cleaning activities. The low item density of plant remains suggests that the material was not deliberately dumped into the pit.

Table 8: The charred and mineralised plant remains from the pit samples (phase 7) (early to middle Iron Age)

	Pit type	**1**							**2**			**6**				
	Area	**W**						**NW**	**W**		**C**	**W**				
	feature	**PIT 2107**						**PIT 2276**	**PIT 2214**	**PIT 2130**	**PIT 6110**	**PIT 2155**				**PIT 8079**
	context	**2108**	**2109**	**2111**	**2639**			**2267**	**2142**	**2125**	**6122**	**2104**	**2106**	**2153**	**2154**	**8076**
	sample	**4**	**5**	**6**	**175**	**182**	**190**	**31**	**16**	**9**	**472**	**1**	**3**	**7**	**8**	**749**
	Column sample (depth from top (m))				**0.1-0.2**	**0.8-0.9**	**1.6-1.7**									
	vol. soil (l)	**40**	**10**	**20**		**0.25**	**0.1**	**40**	**8**	**12**	**40**	**40**	**40**	**40**	**20**	**40**
	vol. flot (ml)	**100**	**40**	**300**				**100**	**50**	**2000**	**50**	**150**	**50**	**200**	**50**	**200**
	%flot sorted			**12.50**					**50**	**0.78**						
LATIN_NAME	**ENGLISH**															
Charred plant remains																
GRAIN																
Triticum dicoccum Schubl.	Emmer	6	28	23		23	7		13	146		2	1	5	1	1
T. cf. *Dicoccum*	?Emmer	3			4	8		1	8	9		1		3	1	3
T. spelta L.	Spelt		62	81	8	69	40		6	8				1		
T. cf. *Spelta*	?Spelt	1		35	8	14	14	1	1					1	1	2
T. dicoccum/spelta	Emmer/Spelt	2	53	41	2	20	11	3	7	49	1	2		3		5
T. cf. *aestivum/turgidum* type	?free-threshing wheat	3										2				1
Triticum sp(p).	Wheat	14	115	112	52	278	144	4	43	82	1	5		8	2	14
cf *Triticum* spp.	?Wheat									25			4			6
Hordeum vulgare L.	Six-row hulled barley	12	68	89	6	197	117	21	16	228		32	21	57	15	4
cf. *H. vulgare*	?six-row hulled barley	15	4	33	7	7	25	22	33	61		34	56	55	20	7
Hordeum/Triticum spp.	Barley Or Wheat												5			
Avena spp.	Oat	4	8	15	3	79	37	88		18		58	30	51	16	9
cf. *Avena* sp(p).	?Oat	1		2	4	19	8	119		8	1	79	34	98	24	5
Cerealia	Indet. Cereal	41		43	79	433	152	78	21	120		128	46	144	63	95
Cerealia	Indet. Cereal fragments		+++	++++	++++	++++	++++	+++	+++	+++		+++	+++	+++	+++	+++
Cerealia	Indet. Cereal loose embryos		++	++	++	+			+	+++	+		+			
Cerealia	Indet. Cereal coleoptile													+		
	Subtotal	***102***	***338***	***474***	***173***	***1147***	***555***	***337***	***148***	***754***	***3***	***343***	***197***	***426***	***143***	***152***
CHAFF																
Triticum dicoccum Schubl.	Emmer spikelet fork		2													
T. cf. *Dicoccum*	?Emmer spikelet fork			2					1	12						
T. dicoccum Schubl.	Emmer glume base		10											4		
T. cf. *Dicoccum*	?Emmer glume base			4						4		1				
T. spelta L.	Spelt spikelet fork		9	56		5	6			11						
T. cf. *Spelta*	?Spelt spikelet fork			6		6										

	Pit type	**1**							**2**			**6**				
	Area	**W**						**NW**	**W**		**C**	**W**				
	feature	**PIT 2107**						**PIT 2276**	**PIT 2214**	**PIT 2130**	**PIT 6110**	**PIT 2155**				**PIT 8079**
	context	**2108**	**2109**	**2111**	**2639**			**2267**	**2142**	**2125**	**6122**	**2104**	**2106**	**2153**	**2154**	**8076**
	sample	**4**	**5**	**6**	**175**	**182**	**190**	**31**	**16**	**9**	**472**	**1**	**3**	**7**	**8**	**749**
	Column sample (depth from top (m))				**0.1-0.2**	**0.8-0.9**	**1.6-1.7**									
	vol. soil (l)	**40**	**10**	**20**		**0.25**	**0.1**	**40**	**8**	**12**	**40**	**40**	**40**	**40**	**20**	**40**
	vol. flot (ml)	**100**	**40**	**300**				**100**	**50**	**2000**	**50**	**150**	**50**	**200**	**50**	**200**
	%flot sorted			**12.50**					**50**	**0.78**						
LATIN_NAME	**ENGLISH**															
T. spelta L.	Spelt glume base		42	52	5	44	7	2	4	25		7	3	7	4	3
T. cf. *Spelta*	?Spelt glume base			7									1			
T. spelta L.	Spelt rachis		3	5			1			2				1		
Triticum sp(p).	Wheat spikelet fork	1	9	21	1	12	3		1	25		1			2	
Triticum sp(p).	Wheat spikelet base		64	19	1	24	11	2	2	18	1	2		2	3	7
Triticum sp(p).	Wheat glume base		61	26	3	53	3	1	5	48	2	10	4	22	6	19
Triticum sp(p).	Wheat rachis	1	9	16	1	6	1		1				2			1
Triticum spp.	Wheat awn			+		+++			+++	+						
Hordeum sativum L.	Barley rachis		1	1						7				2		
H. sativum L.	Barley awn									+						
Avena sp(p).	Oat floret		3	1						10						
Avena spp.	Oat awn	+	++			+	+	++		++		++	++	++	+++	++
Cerealia	Indet. Cereal awn					+			++	+						
	Subtotal	***3***	***297***	***320***	***13***	***197***	***52***	***6***	***18***	***228***	***4***	***24***	***10***	***40***	***20***	***37***
OTHER PLANTS																
Ranunculus spp.	-										4	2	1		1	
Papaver somniferum L.	Opium Poppy								1		11					
Papaver sp.	Poppy			1		1										
Brassica sp(p).	Wild Cabbage/Turnip/Mustard	1						1				4	1			
Capsella bursa-pastoris (L.) Medic.	Shepherd's Purse										5		1			
Silene sp.	Campion/Catchfly							1	1		1		1	1		
Stellaria media gp.	Chickweeds		1								3	1		2		
Caryophyllaceae indet.	-														1	
Chenopodium spp.	Goosefoot Etc.			3					3	109						
Atriplex sp(p).	Orache		1								4			5		
Chenopodium/Atriplex spp.	Goosefoots/Oraches										10		3		5	
Malva sp(p).	Mallow								1	11	20					
cf. *Linum usitatissimum*	?Cultivated Flax		1													
Trifolium spp.	clover		2													
Melilotus/Medicago/Trifolium sp(p).	melliot/medick/trefoil	1	5	1				1	1	1	16	5		7	1	
cf. *Melilotus/Medicago/Trifolium* spp.	?melliot/medick/trefoil										5					
Vicia/Lathyrus sp(p).	Vetch/Tare/Vetchling	2									3	1				

	Pit type	**1**							**2**		**6**					
	Area	**W**						**NW**	**W**		**C**	**W**				
	feature	**PIT 2107**						**PIT 2276**	**PIT 2214**	**PIT 2130**	**PIT 6110**	**PIT 2155**				**PIT 8079**
	context	**2108**	**2109**	**2111**	**2639**			**2267**	**2142**	**2125**	**6122**	**2104**	**2106**	**2153**	**2154**	**8076**
	sample	**4**	**5**	**6**	**175**	**182**	**190**	**31**	**16**	**9**	**472**	**1**	**3**	**7**	**8**	**749**
	Column sample (depth from top (m))				**0.1-0.2**	**0.8-0.9**	**1.6-1.7**									
	vol. soil (l)	**40**	**10**	**20**		**0.25**	**0.1**	**40**	**8**	**12**	**40**	**40**	**40**	**40**	**20**	**40**
	vol. flot (ml)	**100**	**40**	**300**				**100**	**50**	**2000**	**50**	**150**	**50**	**200**	**50**	**200**
	%flot sorted			**12.50**					**50**	**0.78**						
LATIN_NAME	**ENGLISH**															
Vicia/Lathyrus/Pisum spp.	Vetch/Tare/Vetchling /Pea											9	2			
Rubus fruticosus/idaeus	Blackberry/Raspberry										1					
Potentilla sp.	Cinquefoil/Tormentil														1	
Bupleurum sp.	-										1					
Apiaceae indet.	-									2	2					
Euphorbia peplus L.	Petty Spurge											4			1	
Polygonum aviculare agg.	Knotgrass													2		
Fallopia convolvulus(L.) A. Love	Black Bindweed			*						1			2	2		
Rumex acetosella agg.	sheep's sorrel												7	3	1	
Rumex sp(p).	Dock	2		3			1	4	1	3		8	11	17	7	4
Urtica urens L.	Small Nettle										7					
U. dioica L.	Stinging Nettle										198					
Corylus avellana L.	Hazelnut shell										+	+			+	+++
cf. *C. avellana*	?Hazelnut shell													+		
Lithospermum arvense L.	Corn Gromwell		1	2				2			1			2		
Hyoscyamus niger L.	Henbane										11	38	63	51	8	
Euphrasia/Odontites sp.	Euphrasia/Red Bartsia										1					
Verbena officinalis L.	Vervain										1					
cf. *Stachys* spp.	Woundwort										18					
Lamiaceae											3					
Plantago major L.	Great Plantain										9	1				
P. lanceolata L.	Ribwort							1			1	1	1	1		
Sherardia arvensis L.	Field Madder		1								30	1	1	3		
Galium aparine L.	Cleavers										94			2		
Galium sp(p).	Bedstraw	1	2	*		1		2			62	5	2	5	1	4
cf. *Valerianella dentata*	Corn Salad		1													
Tripleurospermum inodorum *(L.) Schultz-Bip.*	Scentless mayweed			1						1	6		1			
cf. *T. inodorum*	?scentless mayweed		1													
Carduus/Cirsium sp.	Thistles			1												
cf.*Carduus/Cirsium* spp.	?Thistles										8					

	Pit type	**1**							**2**			**6**				
	Area	**W**						**NW**	**W**		**C**	**W**				
	feature	**PIT 2107**						**PIT 2276**	**PIT 2214**	**PIT 2130**	**PIT 6110**	**PIT 2155**				**PIT 8079**
	context	**2108**	**2109**	**2111**	**2639**			**2267**	**2142**	**2125**	**6122**	**2104**	**2106**	**2153**	**2154**	**8076**
	sample	**4**	**5**	**6**	**175**	**182**	**190**	**31**	**16**	**9**	**472**	**1**	**3**	**7**	**8**	**749**
	Column sample (depth from top (m))				**0.1-0.2**	**0.8-0.9**	**1.6-1.7**									
	vol. soil (l)	**40**	**10**	**20**		**0.25**	**0.1**	**40**	**8**	**12**	**40**	**40**	**40**	**40**	**20**	**40**
	vol. flot (ml)	**100**	**40**	**300**				**100**	**50**	**2000**	**50**	**150**	**50**	**200**	**50**	**200**
	%flot sorted			**12.50**					**50**	**0.78**						
LATIN_NAME	**ENGLISH**															
Lapsana communis L.	Nipplewort					4	1						1			
cf. *L. communis*	?Nipplewort										4					
Leontodon sp.	Hawkbit					1										
cf. *Leontodon* sp.	?hawkbit					1										
Asteraceae indet.	-			1		3					8					
Eleocharis palustris/uniglumis	Spike-Rush										1					
Carex spp.	Sedge													2		
cf. *Lolium* spp.	Rye-Grass										3					
Lolium/Festuca sp.	Rye-Grass/Fescue										1	1				
Bromus sp(p).	Bromes		42	60	1		11		76	9	5	2		1	3	7
cf. *Bromus* sp(p).	?Bromes	1	1			3	7			6			2	3		5
Avena fatua/ludoviciana	Wild Oat floret		2	1						3				2	2	
Phleum type	Cat'S Tail	1	2	8		30			1	3	21	9	5	2		3
Poaceae indet	grasses	2	12	3		16	6	2			97	8	11	1		3
Poaceae indet	grasses culm nodes						+					+				
indeterminate	-	+	+	+		+		+	+	+	+++	+	+	+	+	+
indeterminate	stems	+									+			+	+	++
indeterminate	charcoal	+++	+++	+++	+	+	+	+++	+	++	++	+++	+++	+++	+++	++
Mineralised plant remains																
Fumaria sp.	Fumitory														+	
cf. Fumaria sp.	Fumitory													++		
Brassica spp.	Wild Cabbage/Turnip/Mustard													++	++	
cf. Brassica spp.	Wild Cabbage/Turnip/Mustard												+			
Viola spp.	Violet												+	+		
Fabaceae indet.	-														+	
Rubus fruticosus/idaeus	Blackberry/Raspberry													+		
Lithospermum arvense L.	Corn Gromwell								+				+			+
indeterminate	-														++	
	subtotal	***11***	***75***	***85***	***1***	***60***	***26***	***14***	***85***	***149***	***676***	***100***	***116***	***114***	***32***	***26***
	TOTAL	**116**	**710**	**879**	**187**	**1404**	**633**	**356**	**251**	**1131**	**683**	**467**	**323**	**580**	**195**	**215**
	Item density (per litre of soil)	*2.9*	*71.0*	*352 (e)*		*5616(e)*	*6330(e)*	*8.9*	*63(e)*	*12,064(e)*	*17.0*	*11.7*	*8.3*	*14.5*	*9.75*	*5.4*

Type 8 pits (metal working pits) (eastern side of the site) (Table 9)

The charred plant remains were analysed from eight samples from four fills of two pits; Pit [7007] (fills [7008] and [7015]) and Pit [7201] (fills [7202] and [7203]). These pits contained large amounts of metalworking debris.

These samples contained variable but generally rich assemblages of charred plant remains with generally high densities of between 47 and 911 items per litre of processed soil. The charred remains in the samples consisted mainly of chaff, which accounted for between 84% and 94% of the quantified remains in individual assemblages. The majority (89%) of the chaff consisted of the spikelet forks and glume bases of hulled wheats, emmer and spelt (which were almost equally well represented); the remaining chaff was from wheat rachis fragments (7%) including spelt, and barley rachis fragments (4%). There was a small amount of oat floret bases in one sample plus large numbers of uncounted oat awn fragments in all the samples. The chaff was generally poorly preserved and the majority could not be identified to species.

Only 230 cereal grains (4% of the quantified remains) were counted, of which almost half could not be identified. Most (78%) of the grains (including coleoptiles) were from Pit [7201]. Six-row hulled barley was the best represented of the identifiable grains followed by wheat (including emmer and possibly spelt) and a slightly smaller amount of oat grains (with two wild oat floret bases identified in Pit [7007]).

Weed seeds accounted for 6% of all the quantified remains with most (85%) of this material being from Pit [7007]. A moderate range of weeds was represented. The most frequent plants were the grasses with a large number of bromes plus cat's tail, while other weeds included docks, campion/catchfly, chickweeds/stitchworts, and goosefoots etc/oraches. All the flots from both pits contained varying amounts of very fragmented charcoal.

Pit [7007]:

One plant assemblage was analysed from fill [7008] and three others from fill [7015] of Pit [7007]; as mentioned above, these fills produced mostly chaff (average 89%) but more weed seeds (average 10%) and less grain (average 1%) than Pit [7201].

The plant assemblages from the two fills of this pit were not significantly different except in the quantity and density of the remains. The sample from fill [7008] produced the richest plant assemblage from all the metalworking pits with a density of 911 items per litre of processed soil as against an average of 70 items per litre of processed soil from the three samples in fill [7015] (Table 2). There was more spelt than emmer chaff in Pit [7007] although, as noted above, these calculations were based on only a fraction of the wheat chaff,

most of which could not be identified to species; thus, it is difficult to establish whether emmer or spelt was the best represented cereal in these fills. Most of the barley rachis fragments were from fill [7008], while oat awn fragments were frequent in all four samples together with floret bases in fill [7008]. There was little difference in the few cereal grains and the weed seed assemblages between the two fills of Pit [7007], with docks, bromes, cat's tail, and campion/catchfly being the best represented species. Most of the weed seeds were from fill [7008], which accounted for almost half of the weed seeds from this pit and 41% of all quantified weed seeds from the metalworking pits.

The charred plant assemblages in the samples from Pit [7007] mainly represent the burnt residues of chaff following the de-husking of hulled wheats (emmer and spelt) mixed with some arable weed seeds and a few grains. Fill [7008] also contained barley rachis fragments from an earlier stage of processing. The chaff may represent the residues of fuel used for the metalworking activities and then dumped into the pits along with the other debris. On the other hand, it could be argued that it is unlikely that relatively fragile chaff used as fuel for such activities would survive intact, given the presumably high temperatures needed for metalworking. Thus, the chaff and metalworking debris may originate from different activities before being dumped into the same pit.

Pit [7201]:

One plant assemblage was analysed from fill [7203] and three others from fill [7202] of Pit [7201]; as mentioned above, these fills produced mostly chaff (average 91%) but more grains (average 7%) and less weed seeds (average 2%) than Pit [7007].

Again, the individual plant assemblages from the two fills of this pit were not significantly different, other than in the quantity and density of plant remains with the sample from fill [7203] producing the richest plant assemblage. Virtually all the chaff was from hulled wheat (including emmer and spelt) although again the vast majority of the wheat chaff again could not be identified to species. There were very few barley rachis fragments but large amounts of oat awn fragments were present in all four samples.

The presence of cereal coleoptiles in this pit points to germinated grain, which is sometimes interpreted as evidence for preparing cereals for brewing. The number of coleoptiles, however, was not particularly large and may have simply occurred as a result of natural rather than deliberate germination, a consequence of the grain being stored in damp conditions. There were only a very small number of weed seeds in these samples, for example, docks, bromes.

The charred plant assemblages in the samples from Pit [7201] mainly represent the burnt residues of chaff following the de-husking of hulled wheat (emmer and spelt) although there

are also some burnt grains (possibly burnt while being dried before storage, de-husking or cooking) and very few weed seeds. Again, the chaff may have been used as fuel for metalworking and then dumped into the pits along with the other debris, although as pointed above, the fragile nature of chaff fragments could suggest different origins for the plant remains and the metalworking debris.

Table 9: The charred plant remains from metal working pits (type 8) (early to middle Iron Age) (eastern side of the site)

	Feature	**Pit 7007**				**Pit 7201**			
	context	**7008**	**7015**			**7202**			**7203**
	sample	**736**	**541**	**733**	**734**	**896**	**902**	**905**	**901**
	vol. soil (l)	**2**	**16**		**2**	**7**	**7**	**5**	**5**
	vol. flot (ml)	**60**	**50**	**10**	**10**	**50**	**20**	**10**	**20**
LATIN_NAME	**ENGLISH**								
GRAIN									
Triticum dicoccum Schubl.	Emmer	2	1				3		1
T. cf. *Dicoccum*	?Emmer	1				1	2	1	1
T. dicoccum/spelta	Emmer/Spelt			1	1	1			1
Triticum sp(p).	Wheat	1	1		1		6	4	4
cf.*Triticum* sp.	Wheat			1					
Hordeum vulgare L.	Six-row hulled barley	7	7	1	1	2	12	5	9
cf. H. vulgare	?six-row hulledbarley		3	1		11	11	2	5
Avena sp(p).	Oat	4			1	2	6		3
cf. *Avena* sp(p).	?Oat	1	2			2	2		5
Avena/Hordeum sp.	Oat/Barley					1			
Cerealia	Indet. Cereal	4	7	2		28	17	16	15
Cerealia	Indet. Cereal fragments					+++	++	+++	+++
Cerealia	Indet. Cereal loose embryos	++				++			++
Cerealia	Indet. Cereal coleoptile			+		++	++	++	++
Subtotal		*20*	*21*	*6*	*4*	*48*	*59*	*28*	*44*
CHAFF									
Triticum dicoccum Schubl.	Emmer spikelet fork	6		1	1	1		1	3
T. cf. *Dicoccum*	?Emmer spikelet fork		1						
T. dicoccum Schubl.	Emmer glume base	131	7	1		12	10	8	7
T. cf. *Dicoccum*	?Emmer glume base						2		
T. spelta L.	Spelt spikelet fork	7	7	1				2	
T. spelta L.	Spelt glume base	173	39	5	4	8	7	6	
T. cf. *Spelta*	?Spelt glume base						3	4	3
T. spelta L.	Spelt rachis	2	1						
Triticum spp.	Wheat spikelet fork	164	12	2	5	11	33	16	21
Triticum spp.	Wheat spikelet base	225	102	35	12	98	54	42	101
Triticum spp.	Wheat glume base	365	291	253	127	274	322	303	418
Triticum spp.	Wheat rachis	12	39	43	18	50	33	67	91
Hordeum sativum L.	Barley rachis	169	23		3		5		2
Avena spp.	Oat floret	5							
Avena spp.	Oat awn	+++	+++	+++	+	+++	+++	++	+++
Cerealia	Indet. Cereal awn				+++				
Subtotal		*1661*	*644*	*380*	*188*	*564*	*556*	*510*	*771*
OTHER PLANTS									

	Feature	**Pit 7007**				**Pit 7201**			
	context	**7008**	**7015**			**7202**			**7203**
	sample	**736**	**541**	**733**	**734**	**896**	**902**	**905**	**901**
	vol. soil (l)	**2**	**16**		**2**	**7**	**7**	**5**	**5**
	vol. flot (ml)	**60**	**50**	**10**	**10**	**50**	**20**	**10**	**20**
LATIN_NAME	**ENGLISH**								
Ranunculus acris/repens/bulbosus	Buttercups		1						
Ranunculus sp(p).	-	3				1			1
cf. *Ranunculus* sp.	-				1				
Capsella bursa-pastoris (L.) Medic.	Shepherd's Purse	5	3	1					
Cruciferae	-			3					
Silene sp(p).	Campion/Catchfly	16	4	3	2	1			1
Stellaria media gp.	Chickweeds	1							
Stellaria sp.	Chickweed/Stitchwort		1				1		
Silene/Stellaria sp(p).	Campion/Stitchwort	13			1				
Caryophyllaceae indet.	-	1							
Chenopodium sp(p).	Goosefoot Etc.		10		2			1	
Atriplex spp.	Orache	2							
Chenopodium/Atriplex spp.	Goosefoots/Oraches						2		
Melilotus/Medicago/Trifolium spp.	melilot/medick/clover	3							
Polygonum aviculare agg.	Knotgrass		2						
Fallopia convolvulus(L.) A. Love	Black Bindweed	2	3			1			
Polygonum spp.	-	2							
Rumex spp.	Dock	18	10	4	3	4	3	1	4
Lamiaceae indet		4	8						
Plantago lanceolata L.	Ribwort		1						
Sherardia arvensis L.	Field Madder	2	3						
Galium spp.	Bedstraw		2						
cf. Galium sp.	?Bedstraw	1							
Anthemis cotula L.	Stinking Mayweed			1					
Lapsana communis L.	Nipplewort	6	1						
Asteraceae indet.	-	1							
Eleocharis palustris/uniglumis	Spike-Rush	1	2						
cf. *Eleocharis* sp.	?Spike-Rush			1					
Carex sp(p).	Sedge	1	3						
Cyperaceae indet.	-			1					
Bromus spp.	Bromes	13	9	2			7		3
cf. *Bromus* sp(p).	?Bromes	29			3			1	
Avena fatua/ludoviciana	Wild Oat floret	2							
Avena/Bromus sp.	Oat/Brome Grasses		1						
Phleum type	Cat'S Tail	4	13	2	3	2			
Poaceae indet	grasses	12	21	11	7	13	3		
Indeterminate	-	+	++	+	+	+	+	+	+
Indeterminate	charcoal	+++	+++	+	+++	+++	+	+	++
Subtotal		*142*	*98*	*29*	*22*	*22*	*16*	*3*	*9*
	total	1823	763	415	214	634	631	541	824
	Item density (per litre of soil)	*911.5*	*47.7*	*207.5*	*107*	*90.6*	*90.1*	*108.2*	*164.8*

5.5 Saxon period (Table 10)

Charred plant remains were analysed from five samples recovered from excavations at Boarley Farm West, to the south of White Horse Stone. Three of the samples were from two fills of Saxon (650-1100) Pits [1142] and [1143]. The other two sampled fills were from Pit [1057]; the date of this feature is uncertain with potential residual and intrusive material in the fills although it is probably Saxon or later.

Saxon Pit [1142]:

This was the richest charred plant assemblage from the Saxon samples with thousands of grain and a projected density of almost 85 items per litre of processed soil in the sampled fill [1137]. Grains made up 95% of the assemblage with only traces of chaff (1%) and seeds of other plants (mainly weed seeds) (4%). There was a large amount of very fragmented charcoal in this sample.

The cereal grains consisted of almost equal amounts of oats (48%) and wheat (44%) with almost half of the latter identified as free-threshing wheat grains. A much smaller amount (8%) of six-row hulled barley grains were identified. Evidence for the presence of cultivated oats (*Avena sativa*) was shown by the identification of a small number of diagnostic oat floret bases in the sample. There were also traces of hulled wheat (grain and glume bases), which may either be residual or relics from previous harvests, although the different location of the site would suggest the latter.

This sample also contained a small number of possible cultivated flax seeds and a moderate amount of hazelnut shell fragments. There was also a small range of weed seeds, mainly from plants of disturbed (including cultivated) ground and waste places including goosefoots, docks and bromes.

Saxon Pit [1143]:

The two sampled fills [1138], [1144] of this pit produced much smaller amounts of quantified plant remains (with a low density of three items per litre of processed soil) although the composition of the botanical assemblages was similar to that from Pit [1142]. Thus, the plant remains in both samples consisted mainly of cereal grains (92% of the quantified material) with (free-threshing) wheat and oats again being the best-represented grains followed by smaller amounts of six-row hulled barley. There was no chaff in either sample while there was a small amount of hazelnut shell and just a few weed seeds, mainly from grasses.

The plant assemblages in both these Saxon pits are indicative of almost fully processed grains, which may have become accidentally charred while being dried before storage, milling or cooking. Free-threshing wheat, barley and oats are the main grains,

showing a distinct change from the prehistoric assemblages. Flax may have been cultivated or at least used at the site. The small number of weed seeds represents crop-processing waste, possibly used as fuel together with the wood charcoal or accidentally burnt with the grains.

?Saxon/medieval Pit [1057]

The two sampled fills from this pit only produced small amounts of charred plant remains and very low item densities of just one and four items per litre of processed soil for the lower fill [1037] and upper fill [1021] respectively. Most (85%) of the quantified material was recovered from the upper fill [1021]. There were mainly grains (71%) in the two samples with a little chaff (8.5%) and small numbers of weed seeds (20.5%). There was a fairly large amount of fragmented charcoal in both samples.

The cereal grains consisted mainly of wheat (including free-threshing) and six-row hulled barley plus several oat grains, although 67% of the grains could not be identified. A small number of wheat rachis fragments in [1021] included several hexaploid rachis fragments showing the presence of bread wheat. There were also a small number of barley rachis fragments.

Other potential food residues included a mineralised grape (*Vitis vinifera*) pip and a few hazelnut shell fragments in fill [1021]. There was only a small range of weed seeds, with petty spurge (*Euphorbia peplus*) and small and large grass seeds (including cat's tail) being relatively well represented. The plant remains from the sampled fills of this pit mainly represent the residues of accidentally burnt and almost fully processed grain together with a small amount of burnt crop-processing waste. The low concentration of remains may suggest that it represents material blowing around the site and settling in the pit rather than being deliberately dumped there.

Table 10: Boarley Farm West: charred and mineralised plant remains

	Period	**?saxon/medieval**		**Saxon (650-1100)**		
	Feature	**Pit 1057**		**Pit 1142**	**Pit 1143**	
	Context	**1021**	**1037**	**1137**	**1138**	**1144**
	Fill	**Upper fill**	**Lower fill**	**Upper fill**		
	Sample	**2**	**4**	**47**	**48**	**46**
	vol. soil (l)	**40**	**40**	**30**	**40**	**25**
	vol. flot (ml)	**200**	**200**	**500**	**100**	**300**
	Percentage of flot sorted			**50%**		
LATIN_NAME	**ENGLISH**					
Charred plant remains						
GRAIN						
Triticum spelta L.	Spelt			3		
T. dicoccum/spelta	Emmer/Spelt			1		
T. aestivum/turgidum type	Free-threshing wheat	2		143	7	7
T. cf. *aestivum/turgidum* type	?free-threshing wheat	3		103	3	6
T. spelta/aestivum/turgidum	Spelt/free-threshing wheat	1		4		
Triticum spp.	Wheat	4		277	18	7
cf *Triticum* spp.	?Wheat	2				4
Hordeum vulgare L.	Six-row hulled barley	9	7	59	4	5
cf. *H. vulgare*	?six-row hulled barley	9	6	39	4	3
Hordeum/*Triticum* sp.	Barley Or Wheat		1			
Avena spp.	Oat			434	20	11
cf. *Avena* spp.	?Oat	1	2	146	4	7
Cerealia	Indet. Cereal	85	10		62	35
Cerealia	Indet. Cereal	++	++	+++	++	++
Cerealia	Indet. Cereal loose embryos			++		+
	Subtotal	*116*	*26*	*1209*	*122*	*85*
CHAFF						
Triticum spelta L.	Spelt glume base			1		
T. cf. *aestivum* type	?Bread/Club Wheat rachis	3				
Triticum sp.	Wheat spikelet fork			1		
Triticum spp.	Wheat rachis	8				
Hordeum sativum L.	Barley rachis	6				
Avena sativa L.	Cultivated Oat floret			9		
Avena spp.	Oat floret fragments			++		
Avena spp.	Oat awn	+				
	Subtotal	*17*		*12*		
OTHER PLANTS						
Ranunculus sp.	-			1		
cf. *Ranunculus* sp.	-				1	
Brassica spp.	Wild Cabbage/Turnip/Mustard	2		2		
Silene sp.	Campion/Catchfly	1				
cf. *Agrostemma githago*	?Corn Cockle			1		
Chenopodium spp.	Goosefoot Etc.			14		
cf. *Linum usitatissimum*	?Cultivated Flax			9		
Medicago/*Trifolium* sp.	Medick/Clover			1		
Vicia/Lathyrus/Pisum spp.	Vetch/Tare/Vetchling/Pea			2	2	2
Fabaceae indet.	-	1				
Euphorbia peplus L.	Petty Spurge	9				
Fallopia convolvulus(L.) A. Love	Black Bindweed			2		

	Period	?saxon/medieval		Saxon (650-1100)		
	Feature	Pit 1057		Pit 1142	Pit 1143	
	Context	1021	1037	1137	1138	1144
	Fill	Upper fill	Lower fill	Upper fill		
	Sample	2	4	47	48	46
	vol. soil (l)	40	40	30	40	25
	vol. flot (ml)	200	200	500	100	300
	Percentage of flot sorted			50%		
LATIN_NAME	ENGLISH					
Rumex spp.	Dock	1		4		
cf. *Rumex* spp.	?Dock		1			
Corylus avellana L.	Hazel nut shell	+		++	+	+
Veronica spp.	Speedwell	3				
Galium sp.	Bedstraw			1		1
Anthemis cotula L.	Stinking Mayweed			2		
Lolium/*Festuca* sp.	Rye-Grass/Fescue			1		
Bromus spp.	Bromes	2	2	4		
cf. *Bromus* spp.	?Bromes			3		
Avena/*Bromus* spp.	Oat/Brome Grasses		2			
Phleum type	Cat's Tail	7		2	4	2
Poaceae indet	Grasses	9		2	4	1
indeterminate	-	+	+	+	+	+
indeterminate	Charcoal	+++	+++	+++	+	+++
Mineralised plant remains						
Vitis vinifera L.	Grape	1				
	Subtotal	*36*	*5*	*50*	*11*	*6*
	Total	169	31	1271	133	91
	Item density (per litre of soil)	*4.2*	*0.8*	*84.6(e)*	*3.3*	*3.6*

6 DISCUSSION

6.1 Research questions

The charred plant remains from White Horse Stone may be used to investigate crop husbandry and processing activities at the site with a number of specific research questions being presented following the assessment (Pelling 2001).

One research question was the role of the different cereals including the hulled wheats, emmer and spelt, and possibly oats and bromes, in the agricultural economy, and the importance (if any) of other potential economic plants represented in the samples, for example, the *Brassicas*. Only the Iron Age samples (and to a lesser extent the Saxon samples) contained sufficient plant remains to examine the importance of the different cereals at the site and potentially other aspects of crop husbandry based on the recovered weed floras. Individual plant assemblages may also indicate specific activities (for example, crop-processing) and shed light on the interpretation of the sampled features. There was adequate

plant material from the Iron Age samples to examine the nature and distribution of activities across the site and whether particular areas were being used for specific tasks. The limited botanical data from the other periods (Neolithic, Bronze Age, Saxon), however, cannot be used to carry out similar detailed investigations. Assessment data was used in the following discussion when appropriate.

6.2 The Neolithic period

The paucity and low density of charred plant remains from the Neolithic samples allows little comment on crop husbandry or processing activities at the site.

There were only traces of cereal remains in the samples including a wheat/barley grain. Low concentrations of charred cereal debris were also noted in samples of this date from other CTRL sites in the area, for example, Eyhorne Street, although there is evidence for cereal cultivation from other Neolithic sites on the chalk land areas of southern England (Greig 1991, 308). Other food remains included the tentative find of horse-bean, which is unusual given that there is virtually no evidence for botanical remains of pulses from British sites during the Neolithic period (Ibid., 301). As noted above, however, the horse-bean may be intrusive. The recovery of large amounts of charred hazelnut shell is a common occurrence on sites of this period in the British Isles, as is the presence of crab apple, with these wild plants playing an important role in the Neolithic food economy (Moffet *et al* 1989).

The extremely low concentration of charred cereal remains recovered from only four of 157 bulk soil samples from Neolithic deposits suggests that cereal cultivation did not play a significant part in the food economy of the site during this period. There is evidence, albeit limited, of the collection and use of wild food resources although again this is not particularly extensive given the large number of processed samples. The few charred plant remains, which included charcoal flecks, may have been re-deposited incidentally as windblown material or as part of the back-filling of the sampled features.

6.3 The Middle Bronze Age

The charred plant remains in the one mid-Bronze Age sample from Pilgrims Way consisted almost entirely of six-row hulled barley grain. It is difficult to establish the significance of this crop at the site on the basis of a single sample although six-row hulled barley has been previously identified as one of the main grains being cultivated during this period (Grieg 1991, 302). The high concentration of the cereal remains in this sample suggests processing activities close-by, before consumption, milling or storage.

The assessment report also noted the presence of a few charred cereal remains in samples from the main White Horse Stone site (Pelling 2001). This only consisted, however,

of occasional cereal grains, including emmer/spelt and six-row hulled barley, in four samples from a ditch and post-hole fill, plus a few hazelnut shell fragments in samples from a pit fill.

6.4 The Iron Age

The vast majority of the quantified plant remains were from the early to mid Iron Age samples, which allows a more detailed investigation into crop husbandry and processing at the site.

The cereals

The best-represented cereals at the site were the hulled wheats, emmer and spelt, followed by a slightly smaller amount of six-row barley, and a much smaller quantity of oat grains (either wild or cultivated) and very occasional free-threshing wheat grains. Hulled wheat and six-row hulled barley are usually the main cereals found as archaeobotanical remains from Iron Age sites in southern Britain although spelt generally tends to be the best represented of the two hulled wheat grains by this period with only occasional finds of emmer (Greig 1991, 308).

The results from White Horse Stone suggest, however, that emmer was a significant crop in its own right during this period. Indeed, other CTRL sites in the area have also shown a significant presence of emmer, for example, at Thurnham Villa and Eyhorne Street. There are other Iron Age records of emmer in Kent at Wilmington (Hillman 1982) while elsewhere in southern England there are finds at Hascombe, Surrey (Murphy 1977) and at Ham Hill, Somerset (Ede 1990).

The question as to whether emmer or spelt was the main hulled wheat cultivated at the site during the Iron Age, and whether the two grains were grown together or as separate crops, is difficult to answer because of the large number of indeterminate wheat grains (over half of all identified wheat grains) and unidentifiable grains (36% of all quantified grains) from the Iron Age samples. Emmer and spelt from all the Iron Age samples show an almost equal representation by grains although with a slightly larger number of spelt grains (612 to 517). There was significantly more spelt than emmer chaff in the samples although as noted above this is based on only a small fraction of the hulled wheat chaff, 80% of which could not be identified to species.

An examination of the individual charred plant assemblages from the Iron Age samples shows that there are both instances when one of the two hulled wheats is the best represented cereal and other occasions when it is not possible to establish which of the two hulled wheats is the main cultivated grain. For example, spelt is the dominant cereal grain in the grain rich cremation pit [6132] and is also better represented (by both grains and chaff fragments) than emmer in the cereal assemblages from the fills of Pit [2107] (Type 1 Pit). On the other hand, emmer is the main wheat grain in the extremely rich assemblage from Pit

[2130] (Type 2 Pit) and was also better represented than spelt in Pit [2214] (Type 2 Pit) and the post-hole fill samples, although on the basis of much smaller grain assemblages. The very rich chaff assemblages in the metalworking pit fills (Type 8 Pit) showed a fairly even representation of both spelt and emmer with spelt being better represented in Pit [7007] (although most of the hulled wheat chaff in these fills was not identified to species).

On the basis of this information, it is not possible to definitely establish whether emmer or spelt was the main cultivated hulled wheat at the site, with the evidence suggesting that both wheats were probably important, possibly at different times. The presence of either spelt or emmer as the best represented grain in some samples suggests that they were probably grown as separate crops. The evidence does not rule out the possibility, however, that they may have sometimes been grown together as a mixed crop although it is difficult to establish whether their presence together in the same assemblages is a reflection of mixed cultivation or simply the mixing of different cereals following harvesting, processing and/or the disposal of the burnt residues; most of the plant assemblages from the Iron Age samples consisted of a mix of different cereal grains and some crop-processing waste.

Just a few grains and rachis fragments of free-threshing wheat, including bread wheat, were identified in several samples and thus, this cereal does not appear to have been deliberately cultivated at the site during this period. Free-threshing wheat only occurs occasionally on Iron Age sites from southern England (Greig 1991, 308). It is unlikely that these grains are intrusive, given the absence of Roman or later development on this site although it is possible that they could be residual or represent relics from earlier harvests, with free-threshing wheat being identified from earlier Neolithic sites in southern England (Ibid. 300).

The wheat grains would have probably been used exclusively for human consumption for bread and possibly in soups and pottage, while barley may have been used for both human and animal food. The relative cleanliness of the barley grains, in most of the samples (with the exception of Pit [2155] see below), suggests that this cereal was cultivated mainly for human food. Barley was also used in brewing but very few of the barley grains (and indeed any of the other grains) had germinated to suggest such a use.

The question as to whether oats were grown as a crop or were simply arable weeds is difficult to answer. Other archaeobotanical evidence from the Iron Age suggests that oats were not an important crop at this time and were probably mainly cereal weeds. At White Horse Stone, oats are only represented by a relatively small amount of grains in most of the samples, rarely forming a significant proportion of the cereal grain assemblage. Also wild oats are indicated by the presence of a small number of floret bases. Therefore, in those cases with only small numbers of grains, the oats can be considered to be probably arable weeds.

The cereals in the four charred plant assemblages from the fills of Pit [2155] (Type 6 Pit), on the other hand, were mainly oats (and six-row hulled barley), with oats being the best represented grain in three of the four charred assemblages (although there were several wild oat florets in these samples). The majority (61%) of the identifiable grains from the sampled fill of from Pit [2276] (Type 1 Pit) were also oat although this assemblage had a very low item density. In both these pits, the presence of large numbers of oat grains could be interpreted as evidence of their cultivation and use, possibly as fodder. It could be argued that the presence of a fairly high number of weed seeds in the sampled fills of Pit [2155] could mean that the oat grains are also part of the weed flora although there was not a high species diversity of weeds, with most of the seeds belonging to just a few plants. The presence of weeds in these samples could imply the use of the oats as fodder.

The assessment also recommended examining the possible role of brome, a wild grass, in the samples; recent historical evidence shows the occasional use of this grass as a potential food resource in times of poor harvests or famine. Bromes, however, were only represented by small numbers of seeds in mixed weed seeds assemblages in the majority of the Iron Age samples, suggesting that they were not deliberately collected and used for food in most cases. In three samples, however, *Bromus* seeds did form a significant proportion of the weed seed assemblages, in the rich charred grain assemblages in the fills of Pit [2107] (Type 1 Pit), where brome seeds made up 60% and 70% of the weed seeds, and in Pit [2214] (Type 2 Pit) where *Bromus* seeds accounted for almost 90% of the weed seeds. Seeds of brome, however, are often found in stored grain deposits because being of a similar size to grains, they are difficult to remove other than by hand-sorting. Thus, their presence may simply point to the burnt residues of a virtually fully cleaned and stored grain product (prior to hand-sorting of these weed seeds) rather than a deliberate action to leave these weed seeds together with the grains in order to enhance the flour content of the cultivated cereals.

Other potential food/economic resources (the status of non-cereal crops)

There was insufficient evidence to suggest the cultivation of flax or legumes at the site although the large number of mineralised *Brassica* seeds in the grave pit fill [2291] and possibly also from the two fills of Pit [2155] may represent collected and used plants. There was also evidence for the potential collection and probably consumption of wild food resources including hazelnuts, blackberry/raspberries and sloe/blackthorn, although these remains were only present in small quantities and therefore may not have played a significant role in the food base of the site during this period.

Crop husbandry

The weed seeds in the samples may be used to examine aspects of crop husbandry although, as noted above, the inability to reduce the majority of the plants to species restrict ecological interpretation of these remains. A number of the weeds that were fairly well represented in the Iron Age samples may provide some indication of the possible range of soils cultivated around the site. Both cleavers and corn gromwell are indicators of loam soils (Hanf 1983) while several species, for example, sheep's sorrel, ribwort, shepherd's purse, knotgrass, suggest the use of loams and sandy soils and nipplewort and cleavers the use of loams and clay soils. Field madder and possibly some of the *Silene* species suggest the cultivation of calcareous soils while less common species, for example, scentless mayweed, great plantain, point to the use of heavy soils. Well-aerated soils are suggested by the presence of several species including field madder and petty spurge (an indicator of fresh to moderately dry well aerated soils). The potential cultivation of damp areas of ground is suggested by the presence, albeit very small, of several wetland species, spike-rushes and sedges, in several samples; these seeds, however, may derive from the collection of these plants for other uses, for example, as flooring materials.

It is not possible to establish whether the cereals were autumn or spring sown on the basis of the germinating time of the weed seeds although cleavers and corn gromwell are associated with winter sown cereals whereas knotgrass tends to occur mainly in spring sown crops, suggesting that cereals may have been sown at both times.

Crop processing activities

The majority of the crop-processing waste in the Iron Age samples consisted of chaff fragments, mainly from hulled wheats, and a smaller amount of weed seeds. Most of this material was from the latter stages of crop processing with little evidence for the by-products from the earlier stages of cleaning; with the exceptions of a small amount of barley rachis fragments, and possibly some of the occasional stem fragments, some of which may belong to cereals. The presence of this material, however, does not necessarily imply mixing of residues from different activities because small quantities of such crop-processing waste (for example, rachis fragments) may persist through to the final stages of cleaning.

The only instance in which weed seeds were well-represented suggesting a distinct crop-processing by-product, was from the fill of Pit [6110] in which wild plants made up virtually all the quantified remains with both small and large seeded plants, probably representing the sieving by-products of crop-processing. Weed seeds were also fairly well represented in the fills of Pit [2155] although there was low species diversity in these samples with most of the seeds belonged to just a few plants.

The weeds seeds (large and small) would have been separated from the grain by sieving although seeds of a similar size to the grains, which included the bromes, bedstraw and possibly corn gromwell in the samples, could only be separated by hand sorting from the grain. These weeds are often found in grain storage deposits.

The vast majority of the chaff (spikelet forks and bases, and glume bases of hulled wheats) represents the debris from the final cleaning of the grain by de-husking before use or possibly storage. The hulled wheats may have been stored in their spikelets to protect the grain from fungal and insect infestation and the possible presence of hulled wheat spikelets has been suggested in some assemblages on the basis of the ratio of hulled wheat grains to glume bases, the spikelets subsequently breaking up when charred.

The spatial distribution of the plant remains

On the basis of the interpretation of the individual charred plant assemblages above, it may be possible to establish the use of different areas of the site in terms of crop-processing activities, cereal storage and possibly consumption. Some areas of the site, however, are not covered by the analysed samples or only by one or two samples and thus, little comment may be made on these areas. On the other hand, it may be that these areas were found to be poorly represented by charred plant remains at assessment stage and thus not considered for further analysis, a reflection perhaps that activities associated with crop-processing and food preparation were not taking place here.

The following interpretations are based partly upon the item density of the charred plant remains per litre of processed soil in individual assemblages (quantified items only), which may provide an indication of areas where activities were being carried out. Low item densities are categorised as those assemblages with up to 50 items; moderate densities as between 50 and 150 items; and high densities as between 900 and 6000 items. The proportion of grains to chaff to weed seeds is also used in order to identify particular stages of crop-processing (both products and by-products) plus the ratio of hulled wheat grains to wheat glume bases as an indication as to whether the hulled wheats were present as spikelets. The site can be conveniently divided into two parts for ease of discussion: the western and eastern areas.

The western half of the site

The western half of the site shows a high concentration of charred plant remains in the central area in the fills of Pits [2107] and [2130] which contained very similar and rich assemblages of cereal remains with few weed seeds. There was evidence of virtually cleaned grains in these samples with hulled wheats, possibly stored as spikelets in Pit [2130] and also in the two fills [2109] and [2111] of Pit [2107]; the cereal evidence from the other fills ([2108] and

[2639]) of Pit [2107], however, suggest that the hulled wheats had been mainly de-husked (although there was a low item density in fill [2108]). The evidence from these two pits could suggest that there was a storage area close-by and that activities connected with the final cleaning either before storage and/or use were taking place here. Pit [2130] contained mainly emmer grain while Pit [2107] produced more spelt, possibly a result of two different harvests.

Immediately north of Pits [2107] and [2130] and close-by, there was a fairly high concentration of charred plant material in Pit [2214] (with a slightly better representation of emmer than spelt) with cleaned grains and very little chaff. Weed seeds made up a third of the items in this pit although these were virtually all bromes, often found in stored grain deposits. This assemblage appears to represent burnt grain from a crop following de-husking and also points to the use of this area for the final cleaning of grains either before storage or use.

Just south of the rich grain deposits, there was a fairly low concentration of charred plant remains in Pit [2155] with mainly oat grains and to a lesser extent barley, and a relatively high seed frequency but moderate species range of weeds (between 17% and 36%). This assemblage is quite distinct from the cereals represented in Pits [2107] and [2130] and may represent be the burnt remains of a fodder crop.

The other three other assemblages in the western half of the site show low densities of charred plant remains, in the graves [2184] and [8102] to the north and south of the rich concentrations, which may be from re-deposited material from the rich plant assemblages in the central area. In the extreme north west, Pit [2276] also produced a low density of remains of virtually clean grain, consisting mainly of oat and some barley grains, which may have become charred while being prepared for human consumption or as animal fodder.

The eastern half of the site

There were two areas with a high concentration of plant remains in the eastern half of the site. In the south-east quadrant, the fills of cremation [6132] consisted virtually entirely of cereal remains (mainly spelt and barley with less emmer) which pointed to the deliberate deposition of well-cleaned grains with possible spikelets of hulled wheats in the richer of the two fills [6130]. The other area of rich remains was from the fills of the metal working pits [7201] and [7007] on the eastern periphery of the site with these samples consisting virtually entirely of chaff from the de-husking of hulled wheats either before storage and/or use, with these activities possibly taking place close-by.

In between these two areas, there were a number of post-hole samples (some associated with four poster structure [4503]), which contained virtually fully cleaned cereal grains (90% plus) but with only low densities of material (except in pit fill [4351]). This may have been an area where cleaned grain had been accidentally burnt while being prepared for milling or cooking (that is, an area of preparation and/or consumption).

The other charred plant remains from this area included a fairly isolated assemblage from Pit [6110] in the central eastern part of the site, which consisted almost entirely of weed seeds, which may represent burnt waste from crop-processing activities following the sieving of the grain. This could point to an area where the early stages of grain cleaning were taking place although this plant assemblage only had a low item density of plant remains. The final charred plant assemblage from this area was from the extreme south of the site from Pit [8079], with mainly cereal remains (grain and chaff) and again only a very low item density of quantified plant material, indicative of small scale activities, possibly the final cleaning of the grains before storage and/or use.

On the basis of the evidence above, some tentative interpretations on the use of space at the Iron Age settlement may be presented. The western central area of the site (in the vicinity of Pits [2107] and [2130]) may have been an area for cereal storage of hulled wheats, emmer and spelt (including as spikelets) and barley, and/or possibly for the final cleaning of the grains before use as human food. Just to the south, around Pit [2155], the presence of semi-cleaned oats and barley grains could point to the residues of a crop being prepared as animal fodder. The fairly large number of weed seeds in Pit [6110] to the north-east of this area may represent an area where earlier processing (sieving) activities were taking place (although as pointed out above, the density of plant remains here is low). Further to the east, the evidence suggests an area where the final cleaning of the hulled wheats was taking place in the vicinity of the metal working pits [7201] and [7007] (either before storage and/or use) while the evidence from the four-poster structure [4503] would suggest activities associated with the preparation and possibly consumption of the grains. The plant material in the cremation pit [6132] probably represents deliberately deposited grain, probably as food offerings considering the context.

Other areas of the site were only represented by small amounts of plant material, probably representing incidentally re-deposited charred plant remains, which may have been burnt before storage, milling or as a result of cooking accidents. The low densities of plant remains in these areas would suggest that these parts of the site may be more associated with living areas, possibly including cooking and consumption rather than large scale processing and storage.

6.5 The Saxon period

The charred cereal remains in the Saxon pits [1142] and [1143] and Saxon/?medieval pit [1057] consisted of free-threshing wheat (including hexaploid wheat in [1057]), six-row hulled barley and oats. This range of species is consistent with other archaeobotanical finds from the Saxon and medieval periods in Britain (Greig 1991, 351, 321), for example at West Cotton (Campbell 1994). Only Pit [1142] produced a high item frequency and density of

charred cereal grains, with free-threshing wheat and oats being the main cereals in this sample.

This range of cereals shows a distinct change from those grown during the Iron Age at White Horse Stone, with a shift in the post-Roman period from hulled to free-threshing wheats and the emergence of oats as a definite cultivated grain, while six-row hulled barley continued to be grown. This pattern is repeated throughout the country. It should be noted, however, that the Saxon features were from excavations at Boarley Farm West, to the south of the main White Horse Stone site, reflecting a separate settlement development with no evidence of occupation of either site in the Roman period. The use of similar areas for cereal cultivation around the site, however, is suggested by the presence of several hulled wheat grains and a spelt glume base in Pit [1142], probably relics of previous harvests. Wheat, barley and oats may have all been used as human food while barley and oats could have also been used as animal feed. There was no evidence for any of the grain being prepared for malting.

Two other economic species were present in the Saxon and Saxon/medieval samples; flax, represented by charred seeds in Pit [1142], may have been cultivated locally or at the very least used at the site. Flax has been recorded from other Saxon sites in Britain, for example, at Staunch Meadow, Brandon (Greig 1991, 318), with the fibres being used for textiles and the seeds as food. A single mineralised grape pip from the Saxon/medieval pit [1057] may reflect the consumption of this species although it is impossible to comment further on the basis of one seed although grapes were cultivated in the early medieval period and also imported as dried fruit. The presence of charred hazelnut shell in several Saxon samples also suggests the local collection and use of this wild food resource.

There was only a moderate species diversity of wild plants in the Saxon samples, mainly of disturbed (including cultivated) ground and waste places, with only low item frequencies of individual species. Most of the weed seeds were from Saxon Pit [1142]. These are probably arable weeds harvested with the cereal grains and charred (accidentally or as fuel) following their separation by sieving. Information on crop husbandry on the basis of these weed seeds, however, is limited because most of the seeds could not be identified to species while individual species were only represented by low item frequencies. Grasses, including bromes and cat's tail, made up 46% of the quantified weed seeds while there were a number of characteristic arable weeds, docks, bedstraw, stinking mayweed, black bindweed, albeit represented by just one or two seeds. Stinking mayweed is an indicator of waterlogged loams and clays (Hanf 1983) and is often found in association with free-threshing wheat grains. Black bindweed is common on acidic soils (but not exclusively) and is found especially in spring cereals. Petty spurge (in Pit [1057] only) is widespread in gardens and

rubbish tips but only rarely on arable land in moderately dry well aerated soils. It is difficult, however, to draw any firm conclusions on crop husbandry practices on the basis of such a small amount of weed seeds although stinking mayweed suggests the use of heavy clay soils and is often associated with the cultivation of free-threshing wheat.

All the plant assemblages were dominated by cereal grain (particularly in the Saxon pits [1142] and [1143]) (and charcoal), indicative of almost fully processed grain, accidentally burnt during drying before storage or milling or food preparation. There was very little evidence for crop-processing activities except for a few chaff fragments (from threshing of the cereals) and weed seeds (both small seeded species, separated by sieving and large seeds eg bromes, bedstraw, corn cockle, which would have been removed by hand-sorting from the grains. This material may have become burnt either accidentally or through the use of these by-products as fuel. The larger charred grain assemblage from Pit [1142] was probably deliberately dumped into the pit although the low concentrations of charred plant material in the other features probably represent re-deposited remains, either incorporated into the pits as part of backfills or through being re-deposited (by being windblown) into these features.

7 CONCLUSIONS

The analysis of the botanical remains from White Horse Stone has shown that a number of wild plants were exploited and cereals cultivated (or at least used) in the area since the Neolithic period, although the paucity of charred remains in all but the Iron Age and Saxon periods, does not allow comparisons on arable agriculture to be made between the different phases of the site.

The few plant remains in the Neolithic samples consisting mainly of wild fruits plus very occasional cereal remains, does not suggest a well-established settlement and certainly no definite evidence for crop cultivation around the site. The presence of just one rich hulled barley grain assemblage from the Bronze Age period of the site also allows little comment on the development of crop husbandry in this area, although the paucity of plant remains from other assessed samples of this period suggests only limited cultivation by this time.

The rich plant assemblages from the Iron Age settlement, however, shows that arable agriculture had become established in the area by this period, with the cultivation of a range of cereals, mainly the hulled wheats, both emmer and spelt, and six-row hulled barley, with tentative evidence to suggest that oats may have occasionally been grown. The weed seeds suggest the exploitation of loam soils around the site. Wild fruits appear to continue to have been an additional food resource, while there is some evidence to suggest the cultivation and use of brassicas.

Most of the activities taking place in the excavated areas of the site are concerned with the final cleaning of the grains, either before storage or use, with little evidence for crop-processing waste from the initial stages of crop cleaning. The evidence suggests that some of the hulled wheats may have been stored as spikelets. The distribution of the plant remains suggest possible areas for crop storage and the final cleaning of the grains while other areas with low concentrations of charred material may be indicative of living areas or areas of food preparation and consumption.

The botanical remains from the Saxon period show a change in the range of cultivated cereals with the replacement of hulled wheats by free-threshing wheat and the definite appearance of cultivated oat, in addition to the continuous presence of six-row hulled barley, although these remains were from a site to the south of White Horse Stone (Pilgrim's Way) and represent a separate development within the area. There is also tentative evidence to suggest the cultivation, or at least use, of flax at this time.

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Appendix 1: The charred plant remains from a medieval corn-drier at Pilgrim's Way (ARC-PIL98)

Introduction

Two charred plant assemblages were submitted to the author from the fills [391] and [695] of a medieval corn-drier from excavations at Pilgrims Way (ARC-PIL98) (adjacent to the main White Horse Stone site (ARC-WHS98). The charred plant remains from these two samples were analysed for potential information on the range of plant foods and the possible function of the feature.

Methods

The original size of the two soil samples is not known and the flots had not previously been assessed. The charred plant remains were sorted by the author and then identified, quantified, and recorded on the MoLAS ORACLE database.

Results

The results are shown by sample in Table 11. Almost 350 items were quantified although up to 50 potentially identifiable items have yet to be identified from fill [391]. Preservation of the plant remains was very poor.

The majority of the material consisted of cereal grains (almost 95% of the quantified botanical remains), which did not include large numbers (totalling several hundreds) of grain fragments smaller than 2mm that were not counted. Sixty-four per cent of the quantified grains, however, were not identifiable.

The identifiable cereal grains consisted mainly of wheat (*Triticum* spp.) with the better preserved grains being identified as free-threshing wheat (*Triticum aestivum/turgidum*); the tentative identification of the upper parts of single wheat rachis fragments from both samples suggest the presence of hexaploid free-threshing wheat (*T. aestivum*). The second best represented grain was barley, with the well-preserved grains being identified as six-row hulled barley (*Hordeum vulgare*) while there was a smaller number of oat (*Avena* spp.) grains, which may be either wild or cultivated species. Other cereal remains consisted of a single barley rachis fragment in fill [391] and a small number of round, hollow stem fragments in both samples, which may be from grasses including possibly cereals.

Other plant remains in the two samples consisted of a small number of leguminous seeds, which, however, were only identified as vetch/tare/vetchling/pea (*Vicia/Lathyrus/Pisum* spp.). These plants may be from wild rather than cultivated species. The remaining seeds were from a small range of wild plants (individually poorly represented) of disturbed (including cultivated) ground and waste places, eg. *Polygonum* spp, dock (*Rumex* sp.), buttercup (*Ranunculus acris/repens/bulbosus*), oraches (*Atriplex* spp.) and grasses

including possibly brome (cf. *Bromus* sp.). These weeds were probably accidentally harvested with the grain.

There was also a large quantity of very fragmented charcoal in both samples and a number of as yet unidentified items, particularly in sampled fill [391].

Table 11: Pilgrims way (ARC-PIL98): The charred plant remains from a medieval corn-drier

	context	**391**	**695**
	sample	**30**	**34**
LATIN_NAME	**ENGLISH**		
Cereal grain			
Triticum aestivum/turgidum type	free-threshing wheat grain	11	12
T. cf. *Aestivum/turgidum* type	?free-threshing wheat grain	7	23
Triticum spp.	wheat grain	12	20
Hordeum vulgare L.	barley grain	3	2
cf. *Hordeum* spp.	?barley grain	5	10
Avena spp.	oat grain		6
cf. *Avena* spp.	?oat grain	4	6
Cerealia	Indet. Cereal	65	143
Cerealia	Indet. Cereal fragments (<2mm)	+++	+++
Cereal chaff			
Triticum cf. *aestivum*	?hexaploid wheat rachis	1	1
Hordeum sp.	barley rachis		1
Other plants			
Ranunculus acris/repens/bulbosus	buttercups		1
Atriplex spp.	orache		2
Vicia/Lathyrus sp.	vetch/tare/vetchling		1
Vicia/Lathyrus/Pisum sp(p).	vetch/tare/vetchling/pea	1	4
Polygonum sp.	-		1
Rumex spp.	dock		2
cf. *Bromus* sp.	?brome	1	
Poaceae indet.	grasses		2
Indeterminate	-	++	+
Indeterminate	indet. stem fragments	+	+
Indeterminate	indet. thorn fragments	+	
Indeterminate	wood charcoal	++++	+++

Discussion

The charred plant remains from the corn drier show that both free-threshing wheat including possibly hexaploid grains, and six-row hulled barley were being used at the site; both cereals were being extensively cultivated and used during the medieval period in southern England (Grieg 1991) while free-threshing wheat (including hexaploid wheat in [1057]), six-row hulled barley and oats were found in Saxon pits and a Saxon/?medieval pit at Boarley Farm West (ARC-BFW98), a short distance to the south of Pilgrims Way (Giorgi 2006). It was not possible to establish whether the oats in the corn-driers at Pilgrims Way were wild or cultivated or a mixture of the two although oats were also being grown and used at this time. The grains may have become accidentally charred while being dried in the corn drier, as these features having multiple uses. The main uses of corn-driers would be to ripen the grain; to harden the grain to facilitate milling and threshing (particularly for glume wheat spiklelets but also for hulled barley and oats); to prepare the seed corn for sowing; to stop the germination process in grains in preparation for brewing; to reduce the moisture content of grain (including whole ears) and thus discourage germination, mildew and fungus before storage (particularly after wet summers) and to fumigate the grain for insect pests like the grain weevil. (Monk 1981; van der Veen 1989):

The drying of the free-threshing wheat grains (the best represented cereal in the samples) may have either been carried out to facilitate milling of the grain, which is more important for free-threshing wheat than for some of the harder grains like spelt (Monk 1981, 223), or to dry the grain before storage; free-threshing grains are more vulnerable to infestation than hulled wheat grains, which may be stored in their husks. Drying the grain for storage requires gentle heating whereas higher temperatures are required for drying grain for milling although the risk of accidental burning of grain in corn-driers was high (Monk, 1981, 219) with the poor condition of the grain suggesting that this was the case in this corn-drier. There is no evidence to suggest that the cereals were being prepared for brewing, no germinated grains or loose coleoptiles being recovered from the samples. The presence of barley in the samples suggests the mixing of residues from different uses. The small numbers of weed seeds in the samples are likely to be the residues of plant material used as fuel following crop-processing together with the large amount of wood charcoal.

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Appendix 2: Other charred plant remains from Neolithic deposits at White Horse Stone (ARC-WHS98)

Introduction

Charred plant remains from two additional early Neolithic samples from excavations at White Horse Stone site (ARC-WHS98) were submitted to the author for analysis. This material was from the fills of two postholes, fill [5281] (sample 691) from the early Neolithic longhouse, and fill [5417] (sample 891) (containing early Neolithic decorated pottery), from activity area 8088, south of the longhouse.

Methods

The original size of the two soil samples is not known and the flots had not previously been assessed. The charred plant remains were sorted by Oxford Archaeology and were then identified, quantified, and recorded on the MoLAS ORACLE database by the author.

Results

The results from the two samples have been added to the original table of results of plant remains from the Neolithic samples (Table 3). The material will be discussed by context.

Posthole Fill [5281] (sample 691)

This sample produced a single charred grain, which was identified as wheat (*Triticum* sp.) on the basis of the general morphology of the grain although part of the dorsal surface has been destroyed and therefore it was not possible to reduce the grain to species. An indeterminate charred plant item was also recovered from this sample.

Posthole Fill [5417] (sample 891)

This sample produced by far the largest charred plant assemblage from the Neolithic samples, with a total of 33 quantified items. This included sixteen cereal grains, an estimated ten of which were too poorly preserved for identification. The better-preserved grains consisted of five barley grains (with four definite and one tentative identification), with two of the grains being identified as hulled barley (*Hordeum vulgare*). The other two barley grains are also probably hulled but their surfaces are poorly preserved. The remaining grain was identified as either barley or wheat (*Hordeum*/*Triticum* sp).

There were also a small number of weed seeds, mainly goosefoots (*Chenopodium* spp.), plus several seeds possibly belonging to euphrasia/red bartsia (*Euphrasia/Odontites* spp.), a single seed of bedstraw (*Galium* sp.) and two fragments of large grass seeds, similar to oat (*Avena* sp.), but with the absence of the characteristic depression behind the embryo.

Discussion

The charred cereal remains from these two early Neolithic samples have added important evidence to the poor representation of charred plant material from the previously analysed Neolithic samples, which produced only traces of cereals, with just one grain identified as wheat/barley (Giorgi 2006). While the quantity of cereal remains is still relatively small and does not allow significant comments on the role of cereal cultivation in the area during this period, the new evidence does show that hulled barley was being used at the site, and possibly grown nearby, with the weed seeds possibly being from plants accidentally harvested along with the cereals. The cereals may have been unintentionally charred while being dried or cooked while the weed seeds may represent burnt fuel. This material may then have been re-deposited incidentally as windblown material or as part of the back-filling of the sampled features.

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Appendix 3: Hazelnut shell from White Horse Stone (ARC-WHS98)

Three tubes of hazelnut shell were sent to the author for confirmation of identification and to add to the database. The three samples consisted of between 50 and 100 charred hazelnut shell fragments from the fill [4945] (sample 645) of a grooved ware pit [4943] (provisionally dated to between 2900 and 2300 BC), and smaller amounts (up to ten shell fragments) from fills [5127] and [5130] of contexts [5125] and [5128] respectively, both provisionally dated to between 220 and 1700 BC. Previous results from the site showed the presence of hazelnut shell in many samples (Giorgi 2006). The material has been submitted for radiocarbon dating.

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Appendix 4: Charred plant remains from an two undated cremations at Pilgrims Way (ARC-PIL98)

Introduction

Flots from fills [949] (sample 95) and [854] (sample 53) of two cremations were submitted to the author for the sorting and analysis of the charred plant remains.

Methods

The charred plant remains were sorted, identified, quantified, and recorded on the MoLAS ORACLE database by the author.

Results

The results are summarised in Tables 12 and 13.

Fill [854] (sample 53) (Table 12)

This flot consisted of a small quantity of charred plant remains- a possible charred free-threshing wheat (Triticum cf. aestivum/turgidum) grain, a free-threshing wheat hexapolid rachis fragment, several weed seeds including knotgrass (Polygonum aviculare) and field madder (Sherardia arvensis), and several tubers, tentatively identified as false oat-grass/onion couch (cf. Arrhenatherum elatius) plus a few stem and stalk fragments.

Fill [949] (sample 95) (Table 13)

This flot consisted mainly of a very large number of molluscs (including burrowing species) and rootlets with several uncharred probably intrusive weed seeds, eg goosefoots etc (Chenopodium spp.), nettles (Urtica spp.). The charred plant remains consisted of very fragmented charcoal and a small quantity of very thin thorny stalks which were not identifiable, a single weed seed of field madder (Sherardia arvensis) and a moderate quantity (*c* 20 fragments) of tubers/rhizomes, which were tentatively identified as false oat-grass/onion couch (cf. Arrhenatherum elatius).

Table 12: Pilgrims Way (ARC-PIL98): The charred plant remains from a cremation

	context	**854**
	sample	**53**
LATIN_NAME	**ENGLISH**	
Cereal grains		
Triticum cf. *aestivum/turgidum* type	?free-threshing wheat	1
Cereal chaff		
Triticum sp.	free-threshing wheat rachis fragment	1
Other plants		
Melilotus/Medicago spp.	melilot/medick	2
Polygonum aviculare agg.	knotgrass	2
Sherardia arvensis L.	Field Madder	1
indeterminate	stalk	+
indeterminate	stem	+
indeterminate	tubers	3

Table 13: The charred plant remains from an undated cremation at Pilgrims Way (ARC-PIL98)

	context	**949**
	sample	**95**
LATIN_NAME	**ENGLISH**	
Sherardia arvensis L.	field madder	1
cf. Arrhenatherum elatius	?false oat-grass/onion couch tubers	++
Indeterminate	twigs	+++
Indeterminate	charcoal	+++

Discussion

The presence of free-threshing wheat was interesting in this context while possible oat-grass/onion couch tubers have previously been found in association with cremation deposits, for example in Bronze Age deposits at Beechbrook Wood (ARC-BBW98) (Giorgi 2006). The wheat from [854] and onion couch tubers from [949] have been submitted for radiocarbon dating of the two features.

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