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Technical report: Environmental evidence from excavations at various sites along the Lutton (Northamptonshire) to Huntingdon (Cambridgeshire) gas pipeline (site code: LHP97).

by

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Summary

A series of small sites were excavated along the proposed route of the Lutton to Huntingdon gas pipeline. Pottery evidence suggests that most of the sites were mid to late Iron Age and early Roman in date. Two of the sites produced evidence of later Roman (3rd to 4th century) occupation. Sediment samples and a small collection of hand-collected bone from seven of the sites were submitted to the EAU for analysis.

Two of the sediment samples (Contexts 1023 and 1170) gave small assemblages of land and freshwater snails. Only very limited ecological reconstruction was possible as, in general, the remains were poorly preserved and not identifiable to species level. The small amount of information obtained was consistent with the on-site archaeological interpretations of the features.

Individual bone assemblages from each site proved to be too small to provide any detailed conclusions. Combining the data from all seven sites showed that cattle predominated in the area at all periods represented. Caprovid remains also contributed a significant proportion of the assemblage, whilst horse, pig and dog were present in small amounts.

Detailed analysis of the vertebrate data is of limited value because of the small size of the assemblages and the inevitable bias towards larger taxa, the result of hand collection. However, material from these sites represents a useful archive which can contribute to a regional framework for future research.

Keywords: LUTTON; HUNTINGDON; ROMANO-BRITISH; IRON AGE; VERTEBRATE REMAINS; MOLLUSCS

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Introduction

A series of small sites of Iron Age and early Roman date were excavated by Field Archaeology Specialists Ltd (Department of Archaeology, University of York) along the proposed route of a gas pipeline from Lutton, Northamptonshire, to Huntingdon, Cambridgeshire, early in 1997. The pipeline stretched for 18 km and eight sites were excavated along its length. Vertebrate remains were recovered from seven of these sites, from north to south - Fields 8, 13, 28, 36, 59, 62 and 64. Twenty-three 'BS' samples (*sensu* Dobney *et al.* 1992) were taken from deposits from six sites (Fields 8, 28, 36, 59, 62, 64). In total 23 samples and three boxes of hand-collected bone (two approximately 27 litres and one approximately 46 litres) were presented to the EAU for analysis.

Methods

Sediment samples

All of the sediment samples were examined in the laboratory; four were selected for further investigation and these were described using a standard *pro forma*. Two were selected for recovery of mollusc remains and two to recover any small bone (fragments of which were visible in the sediment). The selected samples were sieved through 500 µm mesh and the resultant washovers and residues examined for biological remains.

Vertebrate remains

Vertebrate data were recorded electronically directly into a series of tables using a purpose-built graphical input system and *Paradox* software. Briefly, semi-subjective, non-quantitative data were recorded for the material from each context regarding the state of preservation, colour, and the appearance of broken surfaces ('angularity'). Additionally, semi-quantitative information was recorded for each context concerning fragment size, dog gnawing, burning, butchery and fresh breaks.

Identification was carried out using the reference collections of the Environmental Archaeology Unit. Detailed recording of the assemblage followed the protocol outlined by Dobney *et al.* (forthcoming). Selected elements ('A' bones) were recorded using the diagnostic zones method described by Dobney and Rielly (1988). Remaining elements which could be identified to species ('B' bones) were merely counted. Other fragments, (classified as 'unidentified') were, where possible, grouped into categories: large mammal (assumed to be horse, cow or large cervid), medium-sized mammal (assumed to be sheep, pig or small cervid) and bird. As well as counts of fragments, total weights were recorded for all identifiable and unidentifiable categories.

Caprovid tooth wear stages were recorded using those outlined by Payne (1973; 1987), and those for cattle and pigs followed the scheme of Grant (1982). Cattle, pig and caprovid mandibles were

assigned to the general age categories outlined by O'Connor (1989) whilst, in addition, recording of caprovid mandibles and isolated teeth were assigned to the age categories detailed by Payne (1973; 1987).

Mammal bones were described as 'juvenile' if the epiphyses were unfused and the associated shaft fragment appeared spongy and porous. They were recorded as 'neonatal' if they were also of small size.

Measurements (unless otherwise specified) followed von den Driesch (1976). Additional measurements, not detailed by von den Driesch, followed those described by the sheep-goat working-party (Davis 1992 and Dobney *et al.* forthcoming). Withers height for horses was estimated using calculations devised by Kiesewalter (in von den Driesch and Boessneck 1974). Withers height for horses is expressed in hands (hh), where 1 h = 4 in = 101.6 mm.

Although similarities between the bones of sheep and goat often make it difficult to distinguish between them, certain elements can readily be differentiated and recorded to species level with the aid of good comparative specimens and using the criteria outlined by Boessneck (1969). Differentiation was typically attempted for horncore, distal humerus, distal radius, metacarpal, distal tibia, calcaneum, astragalus, metatarsal and all phalanges.

Since the assemblages were so small, a single standard method of species quantification for bone was employed: this involved simple fragment counts, where calculation of the total number of bone fragments involved the simple counting of all recorded identifiable fragments (number of individual skeletal parts or NISP). Unidentifiable fragments were recorded and quantified separately. At best, quantification using simple variations in numbers of fragments provides data of limited value with regard to absolute numbers of individuals present in the assemblage.

To enable meaningful analysis to be carried out on the data from the vertebrate remains, the contexts were grouped by date into five date categories: Iron Age (IA); mid Iron Age /early Roman (MIA/ERo); Iron Age/Roman (IA/Ro); 1st to 2nd century AD (1-2C); and 3rd to 4th century AD (3-4C). These groups were created by amalgamating combinations of the thirty-three different date categories detailed in the pottery report (see Table 1). Vertebrate remains from the 'not used' group were not included in the analysis as the dating of the contexts was too broad to be of any interpretative value.

Results

Sediment samples

The results of the investigations of the selected samples (including sediment descriptions) are given below. Archaeological information provided by the excavator is given in square brackets. Lists of recorded mollusc taxa are presented in Tables 2 and 3.

Field 8

Feature 30 [Ditch/gully which apparently cuts or overlies a similar but narrower ditch (F43) possibly of a much earlier period]

Context 1049 (50 kg) [The nature of this fill suggest organic material and waste, possibly from domestic occupation]

Moist, mid to dark grey, brittle (working plastic), slightly silty clay with patches of pale olive brown clay. Very small and

small stones (chalk and flint, 2 to 20 mm), brick/tile and fragments of bone were present in the sample.

The small washover was mostly rootlets with some undisaggregated sediment (to 0.5 mm), a little charcoal (to 3 mm) and a few unidentified shell fragments.

The small residue was mostly stones (to 80 mm) with some undisaggregated sediment (to 2 mm) and fragments of bone.

The fragments of bone were as follows: 1 large-sized mammal fragment; 24 medium-sized mammal fragments; 1 small mammal fragment and 30 unidentifiable fragments. Together these weighed 23.3 g.

Field 59

Feature 3 [A substantial 'U'-shaped ditch running next to a roundhouse (?part of an enclosure complex containing the buildings?]

Context 1004 (33 kg) [Relatively loose fill, substantially different in character from the solid clay fills within the remainder of the ditch]

Moist, mid to dark grey brown, crumbly (working plastic), slightly sandy silty clay. Very small to large stones (2 to >60 mm) and fragments of bone were present in the sample.

The small washover was mostly fine rootlets with some undisaggregated sediment (to 0.5 mm) and a few unidentified shell fragments.

The small residue was mostly stones (to 90 mm) with some undisaggregated sediment (to 2 mm) and fragments of bone.

The fragments of bone were as follows: 1 caprovid lower molar; 1 caprovid lower 4th premolar; 1 cattle lower molar; 3 small mammal fragments; 8 medium mammal fragments and 40 unidentifiable fragments. Together these weighed 18.4 g.

Context 1023 (34 kg) [The slight grey colour and very heavy clay content suggests this may have accumulated under waterlogged (gleyed) conditions, probably derives from the washed ditch sides]

Moist, light to mid brown to light to mid grey brown, stiff (working crumbly), slightly silty clay. Very small to large stones (chalk and flint, 2 to >60 mm), rotted charcoal and land and freshwater molluscs were present in the sample.

The small washover was mostly of rootlets and snails, with some small lumps of undisaggregated sediment (to 3 mm). Preservation of the snails was variable—smaller forms being fairly well preserved whereas larger forms were, generally, less well preserved (ranging to poor). Additionally, there were very many unidentifiable mm-scale shell fragments.

The small mollusc assemblage was mostly of terrestrial taxa. Although many of the shells were identifiable to species level this was not done (except where the identification was obvious) as the context had been described by the excavator as 'undatable' and as such any data provided by the assemblage would be of little or no interpretative value. Some freshwater and waterside forms were also present but were too poorly preserved to allow the species

level identifications neccesary to determine water quality.

The terrestrial mollusc assemblage showed two distinct components. The first of these was indicative of damp, well vegetated areas and the second of dry exposed conditions. This, together with the small freshwater snail assemblage, is consistent with the excavators' suggestion of a snail community inhabiting a wet or waterlogged ditch with an influx of drier environment taxa 'washed in' from the ditch sides.

The small residue was mostly undisaggregated sediment (relatively gentle processing to recover the molluscs had failed to removed all of the stiff clay matrix) and stones (to 90 mm).

Field 62
Feature 123 [?Drainage ditch]

Context 1170 (10 kg) [This fill could represent a backfilling by topsoil/ploughsoil to level the feature at a date after its initial construction]

Moist, light to mid grey brown with light orange brown gleyed patches, stiff and brittle (working plastic and sticky), slightly sandy silty clay. Very small and small stones (2 to 6 mm), charcoal and freshwater molluscs were present.

The small washover was mostly rootlets and planorbid snails with a little sand and a few land and waterside snails. Preservation of the snails was generally poor─species level identification of the planorbids was not possible. The mollusc remains strongly suggest the aquatic deposition of this layer but the identifiable remains were too few in number to provide a closer definition of water quality or of the adjacent terrestrial ecology.

The small residue was mostly stones (including flints, to 70 mm) and undisaggregated sediment (to 2 mm).

Vertebrate remains

More detailed results from the individual sites can be found in the appendix. The following text discusses the material from the sites as a whole.

Preservation

The small assemblages of bone were, overall, reasonably well-preserved. However, the variability of colour and 'angularity' (nature of the broken surfaces) noted between and within contexts and the inclusion of human bones (Field 59, Context 1005 and Field 62, Contexts 1102 and 1120), suggests that some of the bones could have been redeposited after originally being disposed of elsewhere. The mainly low incidence of dog gnawing, however, does not indicate prolonged exposure prior to their being incorporated into the deposit.

Main domesticates

Individual assemblages from each site proved to be too small to provide anything other than a very tentative interpretative framework of the relative importance of the main domesticates through time. Total fragment counts from all the sites were therefore combined (by date group) to see if valid information for the area could be obtained.

Remains of cattle appear to predominate at all the sites regardless of period. It is

possible from the combined total fragment counts to see that during the Iron Age and early Roman periods the percentage of cattle and caprovids is roughly equivalent (Table 4). However, the obvious difference in carcass size means that cattle would have provided more meat than sheep. The later periods (1-2C and 3-4C) show a marked increase in the importance of cattle in comparison to caprovids (Table 4).

A similar picture can be seen from the proportions of large to medium mammal fragments in the unidentified fraction (Table 5), although large mammal fragments are slightly more numerous during the Iron Age increasing the ratio of 1:1 for cattle:caprovid (calculated from the total of identified fragments) to 1.5:1. Figures for the unidentified fraction in date group 3-4C show a ratio of 3:1 (large mammal:medium mammal) which significantly increases the importance of cattle in this period.

Horses are represented on all the sites and form 21% of the whole assemblage, with fragments recovered from all periods (Table 4). However, almost half of the identified fragments are isolated teeth and a further 13 represent the hind leg of a single individual. It must also be borne in mind that their utilisation and subsequent disposal can be very different to that of cattle and caprovids. Their relative importance is, therefore, very difficult to assess.

Low frequencies of pig and dog remains are a feature of most of the sites, and four chicken bones were recovered from Site 62 (Table 4).

Skeletal representation

Whilst it is apparent from all seven sites that cattle and caprovid remains were dominated by mandibles, isolated teeth and distal limb elements from the Iron Age through to the 4th century, large and medium mammal counts show a high proportion of shaft fragments. The assemblages, therefore, appear to represent both primary butchery waste and domestic refuse.
Bones from all parts of the horse skeleton were represented but as previously stated teeth were prevalent.

Age-at-death

Although cattle mandible fragments were present, only nine (from all the sites) were able to provide any data concerning the age of the animals present. Seven of the nine mandibles were assigned to the adult or elderly category, but numbers were too small to be of any real interpretative value. Similarly, fusion information from all phases suggested that most of the cattle were mature, but again the data sets were extremely limited in size.

As for cattle, both sets of data (fusion and tooth wear) for caprovids were very limited in extent and provided insufficient evidence for any useful conclusions to be drawn. Although isolated teeth were present in some numbers, they too contributed little additional information.

Limited fusion and tooth wear evidence indicates that most of the horses present were mature individuals of five years or over. Only a single deciduous premolar indicates the presence of a younger animal of less than 3 years in age.

Biometry

An archive of all measurement taken can be found in the appendix. There were insufficient measurable fragments within each date group for meaningful graphical representation.

However, it was possible to calculate estimates of the withers heights for horses from greatest lateral length measurements of four complete elements. These produced a range of height values from 1313 to 1477 mm for three of the five periods represented (Table 6). The values, when converted to 'hands', indicate the presence of ponies of between 12.3 and 14.2 hh (the modern maximum for a pony is 14.2 hands). The smallest ponies came from Iron Age/early Roman contexts, whilst the larger individuals were from deposits dated to the mid 4th century.

Butchery

Forty-nine fragments of bone showed direct evidence of butchery. Of these fragments 37 were cattle, six were horse, three caprovid, two pig and one dog. The greatest proportion of the cattle, caprovid and pig fragments showed chop marks consistent with the primary butchery and jointing of carcasses. Two cattle fragments (metatarsal and radius) had been split, possibly suggesting marrow extraction.

The proportion of horse bones showing evidence of butchery was small, (six out of a total 84 fragments). There were two pelves with chops on the acetabulum or ilium (both IA/Ro), a single metatarsal chopped mid shaft, a scapula chopped through the glenoid cavity (both IA), and a femur (1-2C) chopped through the distal condyle. These marks could all be classed as primary butchery evidence. The sixth bone was a first phalanx (MIA/ERo) with knife marks above the distal articulation, probably indicative of skinning.

The only evidence of butchery on dog remains consisted of a single knife mark on the shaft of a tibia from a 3rd to 4th century deposit.

Pathology

Several incidences of pathological conditions and abnormalities were noted within the assemblage. The presence of an extra foramen on the lateral aspect of the mandible, below the premolars, particularly of caprovids, was noted in nine cases (out of 17 mandibles with this area present), three positioned below the 3rd premolar and six below the 2nd premolar. One case of a double mental foramen, thought to be a genetic trait, also occurred.

Dental problems were noted on both caprovid and cattle jaws. A single cattle mandible exhibited moderate calculus on both sides of the cheekteeth and three caprovid mandibles showed slight calculus on both sides of the cheekteeth. Two cases of periodontal disease were noted on caprovid mandibles. In one case the whole tooth row was moderately affected, whilst the second case was most severe in the region of the 4th premolar and 1st molar. This latter case also showed evidence of a periapical abscess and an impacted 4th premolar. An additional mandible fragment exhibited another apical abscess with evidence of pus drainage via a cloaca.

Other pathological conditions were noted on postcranial fragments. A single horse third phalanx showed slight ossification of associated cartilage. A cattle first phalanx

showed a slight extension of the distal articular surface onto the anterior face of the bone. A single cattle calcaneum exhibited an unusual pathological condition which has recently been noted in moderately high frequencies at the middle-late Saxon site of Flixborough, N. Lincolnshire (Authors, unpublished). It consists of a layer of new bone growth extending up the medial side of the body of the calcaneum from the sustentaculum (i.e. the region where the deep digital flexor tendon passes over the bone). The example from this site showed a moderate amount of extra bone growth, but no explanation can be offered as to the aetiology of this condition.

A single dog radius showed evidence of trauma, the bone having been fractured across the shaft. The site of the fracture was very well remodelled, although the two halves were misaligned, and a large spur of bone had formed at the fracture site on the lateral side of the shaft.

Discussion

Sediment samples

Only four of the sediment samples were deemed worthy of investigation for biological remains. Two (1004 and 1049) yielded small amounts of animal bone and two others (Contexts 1023 and 1170) gave small assemblages of land and freshwater snails. The preservational condition of the recovered biological remains was, in general, poor; in most cases preventing identification to species level. Such ecological reconstruction as was possible from the mollusc remains was consistent with the on-site archaeological interpretations of the features.

The recovered bone fragments included small mammal remains, suggesting that a systematic programme of on-site sieving would have produced a useful additional assemblage which could have provided a check on the bias of the main hand-collected assemblage, as well as some data for ecological reconstruction.

Vertebrate remains

Unfortunately, only very small assemblages of bone were recovered from each site, producing little clear information regarding the economy at individual locations. Comparisons of the relative importance of different species through time was particularly difficult.

However, there did appear to be a preponderance of cattle in most of the assemblages, and combining the numbers of fragments from all the sites showed that there was a gradual increase in the importance of cattle during the early and later Roman periods. Sites of Iron Age date where cattle predominate are fairly scarce but include Pennyland (Holmes 1993) and Wavendon Gate (Dobney and Jaques 1996) in Buckinghamshire. Data from these sites are at odds with those from others in the south of England, such as Danebury, (Grant 1984) and Winnal Down, Hampshire (Maltby 1985), where caprovids are the dominant species.

Whilst caprovids formed a significant part of the economy, pigs were extremely poorly represented on all sites. This could be a factor of preservation as typically pigs are slaughtered at a young age and the fragile bones of juvenile animals tend to be more prone to fragmentation and ultimate destruction. On the whole, the remains of young animals were few.

Cattle and caprovids (including large and medium mammal categories) were mainly represented by a range of elements, suggesting that no large scale butchery or provisioning was being undertaken at these sites, or that refuse from these activities was not finding its way into ditches. The evidence suggests that these were small producer sites.

There is some possible evidence for the occasional consumption of horse meat, although it is highly unlikely that this was the primary use of these animals or that horse meat formed a significant part of the diet. Several sites including Danebury (Grant 1984), Winnal Down (Maltby 1985), both in Hampshire, and Ashville, Oxfordshire (Wilson 1978) have provided some evidence of horse butchery in the Iron Age. The chop marks in this assemblage could be seen as primary butchery evidence, although equally they could represent activities associated with the dismembering of carcasses for easier disposal. The knife marks present on the 1st phalanx are possible evidence for skinning, although the marks are surprisingly far down the leg, being more usually seen on the metapodials (Johnstone 1997; Jones 1986; Holmes and Dobney 1994).

It was tentatively suggested by the excavators that the articulated hind limb of a horse, recovered from Field 8, Context 1049, may represent a ritual deposit. Articulated skeletons and limbs of horses have been found at other sites of Iron Age and Roman date, and have, as a result of their deposition or association with other finds, been seen as ritual or special deposits. At Danebury in Hampshire (Grant 1984) there were several examples of these so called special deposits. However, the limb from Field 8 shows some dog gnawing and the first phalanx has evidence of knife marks, both of which suggest that this was waste from skinning and unlikely to be a ritual deposit.

The reconstructed withers heights, although few in number, indicate the presence of ponies consistent in height with those from other sites of a similar date (Holmes and Dobney 1994; Jones 1986; Dobney and Jaques 1996), with Roman horses being bigger than their Iron Age predecessors.

In conclusion, although the small size of the assemblages precludes any detailed conclusions being drawn about the economy of individual sites, the importance of these data sets is to provide an archive, which can be used in conjunction with information from other sites in the region to provide a wider framework for future research.

Archive

All extracted fossils, washovers and vertebrate remains are currently stored in the Environmental Archaeology Unit, University of York, along with paper and electronic records pertaining to the work described here.

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Table 1. Left column shows multiple date categories taken from the pottery report. Right column shows the amalgamated categories used in this report.

Date categories from pottery report	**Combined date groups used for vertebrate remains**
IA	IA
IA?	
MLIA	
LIA	
LIA?	
MLIA/ERo	MIA/ERo
LIA/ERo	
IA/>L1	
LIA/Ro	IA/Ro
IA/Ro	
IA/Ro?	
ERo	1-2C
1C	
ML1	
L1E2	
L1E2?	
1-2C	
1-2C?	
EM2	
M2?	
M3	3-4C
M3?	
M3-?4	
L3-4	
3-4?	
4C	
M4	
	not used
ML1 onwards	
ML2 onwards	
3C onwards	
M4 onwards	
Ro	
undatable/no date	

Table 2. Terrestrial mollusc taxa by context, from excavations along the Lutton to Huntingdon pipeline. (indicates that species level identification would be possible but was not undertaken because the context was 'undatable').*

Taxa\Context	1170	1023
Carychium sp.*		70+
Succinea sp.	2	4
Cochlicopa lubrica (M ller)		4
Vertigo sp.*		30+
Pupilla muscorum (L.)		5
Vallonia sp.*	8	30+
Acanthinula aculeata (M ller)		6
?*Oxychilus* sp.	2	12
Clausilidae sp. indet.		5
?*Trichia* sp.	3	8
Helicigona lapicida (L.)		1
Cepaea/*Arianta* sp.	2	5

Table 3. Freshwater mollusc taxa by context, from excavations along the Lutton to Huntingdon pipeline.

Taxa\Context	1170	1023
Hydrobiidae sp. indet.		8
Planorbidae sp. indet.	very many	15
Freshwater bivalve (*Sphaerium*/*Pisidium*)		4

Table 4. Fragment count and frequency of species from all sites, from excavations along the Lutton to Huntingdon pipeline, by date group.

Species		**IA**	**%**	**MIA/ ERo**	**%**	**IA/Ro**	**%**	**1-2C**	**%**	**3-4C**	**%**	**Total**
Canis f. domestic	dog	10	8	1	2	0	0	1	2	4	4	16
Equus f. domestic	horse	12	10	14	30	29	32	7	15	22	21	84
Sus f. domestic	pig	2	2	7	15	4	4	4	9	5	5	22
Bos f. domestic	cattle	47	39	13	28	41	45	24	51	45	43	170
Caprovid	sheep/goat	39	33	10	21	16	18	10	21	16	15	91
cf. *Capra* f. domestic	?goat	0	0	1	2	0	0	0	0	0	0	1
Ovis f. domestic	sheep	7	6	1	2	0	0	1	2	7	7	16
Gallus f. domestic	chicken	0	0	0	0	0	0	0	0	4	4	4
Homo sapiens	human	3	3	0	0	1	1	0	0	1	1	5
Total		**120**		**47**		**91**		**47**		**104**		**409**

Table 5. Fragment count and frequency of unidentified categories from all sites, from excavations along the Lutton to Huntingdon pipeline, by date group.

Category	**IA**	**%**	**MIA/ ERo**	**%**	**IA/Ro**	**%**	**1-2C**	**%**	**3-4C**	**%**	**Total**
large mammal	194	56	40	52	198	65	102	63	154	66	688
medium mammal	125	36	36	47	74	24	55	34	49	21	339
unidentifiable	25	7	1	1	34	11	6	4	29	12	95
Total	**344**		**77**		**306**		**163**		**232**		**1122**

Table 6. Reconstructed horse withers heights from excavations along the Lutton to Huntingdon pipeline.

date	**species**	**element**	**measurement**	**withers (mm)**	**hands**
MIA/ERo	Equus f. domestic	metatarsal	246.4	1313.31	12.3
IA/Ro	Equus f. domestic	metatarsal	249.9	1331.97	13.1
3-4C	Equus f. domestic	metatarsal	268.3	1430.04	14
3-4C	Equus f. domestic	metatarsal	277.2	1477.48	14.2

Tables 7-14 relate to text in the appendix.

Table 7. Total numbers of identified and unidentified fragments by date group from Field 8, Lutton to Huntingdon pipeline.

Species		**IA**	**MIA/ERo**	**IA/Ro**	**1-2C**	**Total**
Canis f. domestic	dog	0	1	0	0	1
Equus f. domestic	horse	0	14	4	0	18
Sus f. domestic	pig	1	0	3	0	4
Bos f. domestic	cattle	8	4	23	0	35
Caprovid	sheep/goat	5	1	8	0	14
Ovis f. domestic	sheep	1	1	0	0	2
Sub-total		*15*	*21*	*38*	*0*	*74*
large mammal		15	21	54	3	93
medium mammal		9	4	22	0	35
unidentifiable		1	0	1	0	2
Sub-total		*25*	*25*	*77*	*3*	*130*
Total		**40**	**46**	**115**	**3**	**204**

Table 8. Total numbers of identified and unidentified fragments by date group from Field 13, Lutton to Huntingdon pipeline.

Species		**IA**	**Total**
Equus f. domestic	horse	1	1
Bos f. domestic	cattle	2	2
Sub-total		*3*	*3*
large mammal		13	13
medium mammal		10	10
Sub-total		*23*	*23*
Total		**26**	**26**

Table 9. Total numbers of identified and unidentified fragments by date group from Field 28, Lutton to Huntingdon pipeline.

species		**IA**	**MIA/Ero**	**IA/Ro**	**1-2C**	**Total**
Canis f. domestic	dog	7	0	0	0	7
Equus f. domestic	horse	6	0	5	7	18
Sus f. domestic	pig	0	0	0	4	4
Bos f. domestic	cattle	17	4	12	16	49
Caprovid	sheep/goat	14	1	2	10	27
cf. *Capra* f. domestic	?goat	0	1	0	0	1
Ovis f. domestic	sheep	5	0	0	1	6
Sub-total		*49*	*6*	*19*	*38*	*112*
large mammal		68	10	54	68	200
medium mammal		52	6	24	50	132
unidentifiable		4	1	0	0	5
Sub-total		*124*	*17*	*78*	*118*	*337*
Total		**173**	**23**	**97**	**156**	**449**

Table 10. Total numbers of identified and unidentified fragments by date group from Field 36, Lutton to Huntingdon pipeline.

species		**3-4C**	**Total**
Canis f. domestic	dog	2	2
Equus f. domestic	horse	1	1
Sus f. domestic	pig	2	2
Bos f. domestic	cattle	17	17
Caprovid	sheep/goat	4	4
Ovis f. domestic	sheep	4	4
Sub-total		*30*	*30*
large mammal		49	49
medium mammal		22	22
unidentifiable		2	2
Sub-total		*73*	*73*
Total		**103**	**103**

Table 11. Total numbers of identified and unidentified fragments by date group from Field 59, Lutton to Huntingdon pipeline.

species		**IA**	**IA/Ro**	**Total**
Equus f. domestic	horse	2	19	21
Sus f. domestic	pig	1	0	1
Bos f. domestic	cattle	8	4	12
Caprovid	sheep/goat	14	5	19
Homo sapiens	human	0	1	1
Sub-total		*25*	*29*	*54*
large mammal		60	83	143
medium mammal		36	24	60
unidentifiable		20	33	53
Sub-total		*116*	*140*	*256*
Total		**141**	**169**	**310**

Table 12. Total numbers of identified and unidentified fragments by date group from Field 62, Lutton to Huntingdon pipeline.

species		**IA**	**1-2C**	**3-4C**	**Total**
Canis f. domestic	dog	3	0	2	5
Equus f. domestic	horse	3	0	21	24
Sus f. domestic	pig	0	0	3	3
Bos f. domestic	cattle	9	2	28	39
Caprovid	sheep/goat	4	0	12	16
Ovis f. domestic	sheep	1	0	3	4
Gallus f. domestic	chicken	0	0	4	4
Homo sapiens	human	3	0	1	4
Sub-total		*23*	*2*	*74*	*99*
large mammal		35	16	105	156
medium mammal		12	0	27	39
unidentifiable		0	4	28	32
Sub-total		*47*	*20*	*160*	*227*
Total		**70**	**22**	**234**	**326**

Table 13. Total numbers of identified and unidentified fragments by date group from Field 64, from Lutton to Huntingdon pipeline.

species		**IA**	**MIA/ERo**	**IA/Ro**	**1-2C**	**Total**
Canis f. domestic	dog	0	0	0	1	1
Equus f. domestic	horse	0	0	1	0	1
Sus f. domestic	pig	0	7	1	0	8
Bos f. domestic	cattle	3	5	2	6	16
Caprovid	sheep/goat	2	8	1	0	11
Sub-total		*5*	*20*	*5*	*7*	*37*
large mammal		3	9	7	15	34
medium mammal		6	26	4	5	41
unidentifiable		0	0	0	2	2
Sub-total		*9*	*35*	*11*	*22*	*77*
Total		**14**	**55**	**16**	**29**	**114**

Table 14. Number of contexts containing bone by field (site) and by date group, Lutton to Huntingdon pipeline.

Site/Field	**IA**	**MIA/ERo**	**IA/Ro**	**1-2C**	**3-4C**
8	5	3	8	1	
13	3				
28	7	1	2	11	
36					7
59	8		4		
62	7			1	7
64	1	1	2	3	

Appendix

Vertebrate remains from individual sites

Table 14 shows the number of contexts by site and by date group.

Field 8

The small bone assemblage recorded from this site was recovered mainly from ditch and gully fills. Pottery evidence from these features suggests a late Iron Age and early Roman date for the occupation in this area. Material from 17 contexts was recorded from four of the five date groups.

Preservation of the bone assemblage was generally fair, the broken surfaces of most fragments appearing 'spiky'. Colour ranged from brown to fawn, with some variation within contexts. Material from five contexts was fairly fragmented (20-50% or 50%+ fragments being <5 cm in length), although in the case of contexts 1054, 1057 and 1060 this coincided with similar percentages of fragments with fresh breakage. Butchery and dog gnawing marks were noted but only on a few bones.

Total numbers of fragments can be found in Table 7. These show that cattle, horse and caprovid remains are the most numerous, whilst a few pig and dog bones were also present. Although the assemblage is rather small for providing any useful interpretative information it can be seen that cattle remains outnumber those of caprovid. Similarly, the large and medium mammal fraction (assuming that they represent mainly cattle and caprovid remains respectively) show high proportions of cattle in comparison with caprovid remains.

The quantity of horse remains appears particularly high but is in fact augmented by thirteen bones from a single deposit (1049), representing the hind leg of a single individual. These bones were found articulated *in situ* and the excavators tentatively suggest that they may represent a ritual deposit. [See discussion in main text].

The main domesticates (i.e. cattle and caprovids) are mainly represented by non-meat bearing elements such as mandibles, isolated teeth and distal limb elements, but the large and medium mammal categories include large numbers of shaft fragments.

Field 13

A very small assemblage of animal bone was recovered from only three contexts, all of which were tentatively dated by the pottery to the Iron Age. The three deposits formed the fills of a single feature.

Preservation was recorded as fair, whilst the colour was brown. Dog gnawing and fresh breakage were noted on fragments from all three contexts.

The assemblage consisted of only 3 identified and 23 unidentified fragments. The species present included horse and cattle, although caprovid remains are almost certainly represented in the medium mammal fraction (Table 8).

Field 28

The small bone assemblage consisted of material from twenty-one contexts dated by pottery to the Iron Age and early Roman period.
One hundred and twelve identified and 337 unidentified bone fragments (Table 9) were

recorded from the fills of fifteen of the excavated features. All the features which yielded bone were ditches.

Overall, the bones were of fair preservation, with material from a single context (1094) being battered in appearance. Fragments from three other deposits (1041, 1093 and 1095) had rounded edges. Colour was noted as being mainly brown or light brown, although a few contexts contained fawn or ginger fragments. Dog gnawing, butchery and fresh breakage were all noted but were not extensive.

Cattle and caprovid remains formed the bulk of the assemblage and this was also the case in the large and medium mammal categories in the unidentified fraction. A single pelvis was tentatively identified as goat (Context 1013).

Horse and pig bones were present in lower frequencies, whilst dog remains were only noted from Iron Age deposits.

Whilst the identified cattle and caprovid fraction was composed of primary butchery waste (i.e. non-meat bearing bones such as mandibles, isolated teeth and distal limb elements), the unidentified categories were largely made up of shaft and rib fragments (meat-bearing elements), possibly representing waste from meals.

There are a higher proportion of cattle remains in comparison to those of caprovid (based on total fragments counts and including the large and medium mammal categories) throughout all the periods represented at the site. A very slight increase in the importance of cattle is apparent over time, although the small numbers mean that no reliable conclusions can be drawn.

Field 36

Pottery evidence suggests that the seven contexts from which the very small bone assemblage was recovered were all of 3rd to 4th century date.

This very small assemblage was reasonably well preserved, although more than half of the contexts contained some fragments with rounded edges, suggesting the presence of redeposited material. Most of the fragments were brown, light brown or fawn in colour, with some variation within contexts noted. As at other sites, evidence of butchery, dog gnawing and fresh breakage was present but only on a few fragments. One context (1086) showed a high degree of fragmentation compared with material from other deposits from the site.

Species represented included cattle, caprovid, horse, pig and dog remains, cattle and large mammal fragments being the most numerous (Table 10).

Field 59

Iron Age and early Roman occupation is indicated by the small pottery assemblage recovered from this site. Features excavated included ditches and gullies associated with a round house. Twelve deposits produced a small assemblage of bone.

The vertebrate material from this site was moderately well preserved, with most fragments being fawn in colour. The nature of the broken surfaces of the fragments was rather variable throughout, with some fragments being rounded and battered in appearance. This, together with the marked degree of fragmentation noted (20-50% of fragments <5 cm in length), suggest that

material was gradually incorporated into the deposits after lying on the ground surface for some time, possibly being trampled. Some of the fragmentation however, particularly of material from Contexts 1101 and 1026, is more recent.

A limited range of species was present, including cattle, caprovid, horse and pig (Table 11). A single human tibia was also recorded. Total fragment counts for the identified species show that horse remains were the most numerous, but the numbers were augmented by the presence of a large number of isolated teeth. Similarly caprovid remains are represented by many isolated teeth and shaft fragments.

Over the site as a whole, the identified fragments of cattle and caprovids indicate butchers' waste (non-meat bearing bones such as mandibles and isolated teeth), although many shaft fragments were recorded in the large and medium mammal categories and it is clear that there is no obvious prepoderance of particular elements in any specific context.

Field 62

Bone was recovered from a number of features, the deposits mainly being fills of a complex system of gullies and ditches for drainage, and parts of enclosures.

Fifteen contexts in all produced a small quantity of bone, mostly of Iron Age and 3rd to 4th century date.

Bones from all the periods represented at the site were reasonably well preserved. Most of the Roman material was brown in colour, whilst that from the Iron Age was fawn. Within many of the deposits there were some fragments that were rounded and battered in appearance. Hardly any evidence for butchery or dog gnawing was noted. Fresh breakage was particularly evident on material from Contexts 1149, 1152 and 1170.

The small Iron Age assemblage included cattle, caprovid, horse and dog remains (Table 12). In addition, three fragments of human skull were identified from Context 1120 (Feature 85). The later 3rd-4th century material had a similar range of species with the addition of pig and chicken remains, albeit in very small quantities. A single fragment of a human femur (Context 1102, Feature 69) and three human skull fragments (Context 1120, Feature 85) were also identified.

Skeletal representation of the main domesticates again was dominated by maxillae, mandibles, isolated teeth, and metapodials. However, the large and medium mammal categories were again characterised by numerous shaft fragments and, additionally, there were also high frequencies of cow-sized mandible, cranial and rib fragments, especially from the later Roman material.

It is apparent that the assemblages represent a mixture of primary butchery and domestic waste, with none of the deposits reflecting one specific activity. Changes through time are difficult to perceive because of the small size of the assemblages, particularly that from the Iron Age.

Field 64

Gully and ditch fills were the main features producing the small amount of animal bone from this site. Occupation, dated by pottery, occurred from mid to late Iron Age to the

early Roman period.

Preservation overall was recorded as 'fair' for all chronological groups. Colour and angularity (nature of the broken surfaces) was rather variable for the Iron Age and broader category material, with colour ranging from brown to light brown and fawn. Differences of colour were also recorded within contexts. This same material was noted as being battered and rounded in appearance, whilst fragments from 1st-2nd century contexts were fawn and 'spiky'. With the exception of material from Context 1155, the assemblage was not particularly fragmented and very little evidence of dog gnawing and butchery was noted.

As at previous sites the remains of cattle and caprovid, pig, horse and dog remains were present (Table 13), but numbers of fragments were insufficient to draw any conclusions regarding the relative importance of different species.

Appendix

Biometrical archive

All measurements follow those outlined by von den Dreisch (1976), Davis (1992) and Dobney *et al.* (forthcoming).

Cattle

Field	Pottery date	Date group	Species	Element	Bone id	41	42	BC	43
36	M4	3-4C	cattle	horncore	244	51.6	37.6	147.0	160.0
62	M4 onwards	not used	cattle	horncore	360	30.7	-	-	105.0
62	Ro	not used	cattle	horncore	298	46.8	36.7	141.0	163.0

Field	Pottery date	Date group	Species	Element	Bone id	M3 length	M3 breadth
28	IA	IA	cattle	M3	99	33.1	14.7
28	MLIA	IA	cattle	mandible	57	33.7	12.2
62	IA	IA	cattle	M3	317	33.3	14.9
62	LIA	IA	cattle	mandible	335	32.0	12.0
28	IA/Ro	IA/Ro	cattle	mandible	122	30.0	13.5
59	IA/Ro	IA/Ro	cattle	mandible	10	35.1	15.6
64	LIA/Ro	IA/Ro	cattle	mandible	399	33.9	12.6
62	1-2C?	1-2C	cattle	mandible	402	35.6	16.6
36	M4	3-4C	cattle	mandible	246	37.6	15.6
62	M4	3-4C	cattle	mandible	350	34.0	15.3
62	ML2 onwards	not used	cattle	mandible	314	42.9	16.4
64	ML1 onwards	not used	cattle	mandible	362	35.7	12.2

Field	Pottery date	Date group	Species	Element	Bone id	BT	HT	HTC	SD
8	IA?	IA	cattle	humerus	158	68.6	41.5	31.3	-
28	IA	IA	cattle	humerus	101	65.0	39.3	29.4	-
59	IA?	IA	cattle	humerus	262	63.8	36.9	29.5	29.1
62	LIA	IA	cattle	humerus	330	65.6	39.8	30.7	-
8	LIA/Ro	IA/Ro	cattle	humerus	145	69.0	42.9	31.8	-
28	EM2	1-2C	cattle	humerus	221	62.3	37.9	29.4	28.6
62	M4	3-4C	cattle	humerus	342	-	44.1	33.9	-

Field	Pottery date	Date group	Species	Element	Bone id	Bp	SD	BFp
28	IA	IA	cattle	radius	102	-	-	64.5
28	EM2	1-2C	cattle	radius	214	-	-	75.0
28	EM2	1-2C	cattle	radius	216	70.6	34.5	65.1
62	M4	3-4C	cattle	radius	265	84.0	40.3	76.4

Field	Pottery date	Date group	Species	Element	Bone id	SD	Bd	Dd
59	IA/Ro	IA/Ro	cattle	tibia	26	21.7	51.6	34.0

Field	Pottery date	Date group	Species	Element	Bone id	GL	SD	Bp	Dp	BFd	Dd	Dem	Dvm	Dim
8	LIA/ERo	MIA/ERo	cattle	metacarpal	155	179.0	31.7	57.7	32.4	60.2	31.3	23.6	31.9	28.4
8	IA/Ro	IA/Ro	cattle	metacarpal	185	176.8	28.2	49.4	30.1	-	-	-	-	-
8	IA?	IA/Ro	cattle	metacarpal	159	-	-	47.9	28.7	-	-	-	-	-

28	EM2	1-2C	cattle	metacarpal	217	181.7	28.7	50.2	28.5	52.8	28.8	22.7	29.2	26.6
28	ERo	1-2C	cattle	metacarpal	40	-	33.1	57.8	35.0	-	-	-	-	-

Field	**Pottery date**	**Date group**	**Species**	**Element**	**Bone id**	**GL**	**SD**	**Bp**	**Dp**	**BFd**	**Dd**	**Dem**	**Dvm**	**Dim**
8	IA/Ro	IA/Ro	cattle	metatarsal	189	-	-	42.0	38.5	-	-	-	-	-
64	MLIA	IA/Ro	cattle	metatarsal	393	-	22.3	42.5	41.9	-	-	-	-	-
36	M3?	3-4C	cattle	metatarsal	231	-	-	-	-	59.4	30.8	23.4	31.2	28.1
36	M3?	3-4C	cattle	metatarsal	232	-	-	-	-	57.2	31.9	24.6	31.5	28.2
36	M4	3-4C	cattle	metatarsal	247	216.2	29.5	50.2	46.7	58.1	31.9	23.7	32.4	27.5
62	3C onwards	not used	cattle	metatarsal	278	217.7	26.9	52.9	49.5	60.9	32.8	24.6	33.0	29.4

Field	**Pottery date**	**Date group**	**Species**	**Element**	**Bone id**	**Bd**	**Dl**	**GLl**
28	IA	IA	cattle	astragalus	97	37.3	32.8	60.8
59	IA/Ro	IA/Ro	cattle	astragalus	25	36.7	32.3	59.0
36	4C	3-4C	cattle	astragalus	233	48.2	41.0	74.0

Field	**Pottery date**	**Date group**	**Species**	**Element**	**Bone id**	**C**	**C+D**	**DS**
8	LIA	IA	cattle	calcaneum	166	24.9	42.7	35.4

Caprovid

Field	Pottery date	Date group	Species	Element	Bone id	41	42	BC
62	Ro	not used	goat	horncore	302	33.3	19.0	93.0

Field	Pottery date	Date group	Species	Element	Bone id	M3 length	M3 breadth
8	LIA	IA	sheep/goat	M3	153	21.1	7.3
28	IA	IA	sheep/goat	mandible	92	20.3	7.1
28	IA	IA	sheep/goat	mandible	93	19.3	7.6
59	MLIA	IA	sheep/goat	mandible	34	19.0	6.5
62	MLIA	IA	sheep/goat	M3	321	18.7	7.1
28	IA/>L1	MIA/ERo	sheep/goat	M3	63	20.5	7.2
64	MLIA/ERo	MIA/ERo	sheep/goat	M3	387	22.0	7.9
64	MLIA/ERo	MIA/ERo	sheep/goat	mandible	386	23.0	7.7
8	LIA/Ro	IA/Ro	sheep/goat	M3	148	20.2	7.7
28	L1E2	1-2C	sheep/goat	M3	76	20.4	7.1

Field	Pottery date	Date group	Species	Element	Bone id	BT	HT	HTC
28	MLIA	IA	sheep/goat	humerus	52	25.9	15.4	12.2
28	IA	IA	sheep	humerus	94	24.5	15.3	12.2
28	IA	IA	sheep	humerus	123	22.8	14.5	10.6
8	LIA/ERo	MIA/ERo	sheep	humerus	198	25.4	15.6	12.0
62	M4	3-4C	sheep	humerus	291	28.0	17.7	13.6

Field	Pottery date	Date group	Species	Element	Bone id	SD	Bd	Dd

62	LIA	IA	sheep	tibia	327	9.1	20.9	16.0
28	EM2	1-2C	sheep	tibia	133	-	22.9	19.8
36	M4	3-4C	sheep	tibia	249	12.4	-	21.2
62	M4	3-4C	sheep/goat	tibia	340	11.8	28.3	22.1

Field	Pottery date	Date group	Species	Element	Bone id	GL	SD	Bp	Dp	BFd	Dd	Dem	Dvm	Dim
28	MLIA	IA	sheep/goat	metacarpal	210	-	12.7	19.6	14.4	-	-	-	-	-
64	MLIA	IA	sheep/goat	metacarpal	394	-	12.3	20.8	15.3	-	-	-	-	-
62	M4	3-4C	sheep/goat	metacarpal	339	-	12.3	21.2	15.7	-	-	-	-	-
36	3-4?	3-4C	sheep	metacarpal	256	117.8	11.8	19.8	14.3	22.7	15.0	9.9	14.8	12.9

Field	Pottery date	Date group	Species	Element	Bone id	SD	Bp	Dp	BFd	Dd	Dem	Dim
8	LIA/Ro	IA/Ro	sheep/goat	metatarsal	171	11.0	18.1	19.0	-	-	-	-
36	M3	3-4C	sheep	metatarsal	242	12.7	-	-	25.0	15.7	10.7	13.7

Horse

Field	Pottery date	Date group	Species	Element	Bone id	GLP
13	IA?	IA	horse	scapula	73	79.6
59	MLIA	IA	horse	scapula	33	73.7
59	IA/Ro	IA/Ro	horse	scapula	24	75.5

Field	Pottery date	Date group	Species	Element	Bone id	BT	HT	HTC
28	IA	IA	horse	humerus	107	72.2	48.1	35.1

Field	Pottery date	Date group	Species	Element	Bone id	GL	SD	Bd	Dd	Ll
8	LIA/ERo	MIA/ERo	horse	tibia	136	340.0	34.7	66.5	41.5	304.0
28	EM2	1-2C	horse	tibia	222	-	34.5	59	38.9	-

Field	Pottery date	Date group	Species	Element	Bone id	Bd	Dd
28	IA/Ro	IA/Ro	horse	metacarpal	83	44.1	31.9
36	3-4?	3-4C	horse	metacarpal	259	44.3	33.3

Field	Pottery date	Date group	Species	Element	Bone id	GL	SD	Bp	Dp	BFd	Dd	Ll	GLl
8	LIA/ERo	MIA/Ero	horse	metatarsal	140	254.0	28.3	47.0	41.7	47.1	35.7	246	251.0
28	IA/Ro	IA/Ro	horse	metatarsal	84	259.0	29.2	-	-	45.5	36.9	250	256.0
28	EM2	1-2C	horse	metatarsal	225	-	26.4	41.0	34.4	-	-	-	-
62	M4	3-4C	horse	metatarsal	264	272.0	30.9	49.0	44	50.0	37.6	268	271.0
62	M4	3-4C	horse	metatarsal	287	286.0	35.3	52.0	45.4	54.1	40.9	277	282.0

Pig

Field	Pottery date	Date group	Species	Element	Bone id	GLl	GLm
64	IA/Ro	IA/Ro	pig	astragalus	397	38.3	35.5

Chicken

Field	Pottery date	Date group	Species	Element	Bone id	Bd
62	M4	3-4C	chicken	humerus	296	13.2

Field	Pottery date	Date group	Species	Element	Bone id	Did
62	M4	3-4C	chicken	ulna	297	8.6

Field	Pottery date	Date group	Species	Element	Bone id	GL	Bd	Dip	Dd	La
62	M4	3-4C	chicken	tibiotarsus	270		9.8		9.8	
62	M4	3-4C	chicken	tibiotarsus	295	99.7	10.0	17.5	10.3	95.5