Channel Tunnel Rail Link

London and Continental Railways

Oxford Wessex Archaeology Joint Venture

Animal bone from Saltwood Tunnel, Kent

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CTRL Specialist Report Series

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1 INTRODUCTION

Mammal and bird identifications by Jennifer Kitch and Fay Worley. Fish bone identifications by Rebecca Nicholson. Report by Fay Worley and Rebecca Nicholson.

1.1 The site

As part of an extensive scheme of archaeological mitigation undertaken prior to construction of the Channel Tunnel Rail Link, Canterbury Archaeological Trust and Wessex Archaeology were commissioned by Rail Link Engineering Limited to carry out a programme of archaeological excavation at Saltwood Tunnel, north of Saltwood, Kent (NGR TR 615345 136940 to TR 616157 136925). A complex multi-period site was revealed, with evidence for ceremonial and funerary land use as well as for settlement and agriculture.

Activity earlier than the Bronze Age was mainly restricted to unstratified or residual flint and pottery, but a group of eight Mesolithic Horsham-type retouched points from a small pit-like feature may date to the 7th millennium BC, and three early Neolithic pits attest to activity, perhaps domestic, in the mid-late 4th millennium BC. In the early Bronze Age a barrow cemetery developed. Five barrows and a flat grave dated to the late 3rd-early 2nd millennium BC.

Limited middle Bronze Age evidence, comprising a cremation burial, a small pit and other occasional finds of Deverel-Rimbury pottery, suggest the cemetery was respected until the late 2nd millennium BC but, in the late Bronze Age, a settlement and field-system were established. Early to middle Iron Age agriculture is also attested by ditches and at least one track or droveway. No contemporary settlement remains were discovered, but an early-middle Iron Age inhumation cemetery and a square enclosure, perhaps a mortuary enclosure, were established at some time between the 8th – 4th centuries BC. A middle Iron Age inhumation grave of 2nd to 4th century BC date also lay near the western end of the site.

Early Romano-British domestic finds abounded at the western end of the excavation, mainly near a sunken trackway and in pits and field enclosures to either side of it. The quantity and range of finds, and the presence of two small cremation cemeteries, strongly suggest that a small rural settlement lay close-by. That this settlement waned after the mid-late 3rd century is inferred from a greatly reduced suite of remains, and from progressive infilling of the sunken trackway. Limited occupation, or at least occasional use of the site, is likely to have continued into the later 4th century.

Early Anglo–Saxon evidence from Saltwood Tunnel is dominated by three separate inhumation cemeteries, each located in the vicinity of a Bronze Age barrow. Seventeen graves were excavated within the eastern cemetery, 59 in the western cemetery and 141 in the

central cemetery. Both the eastern and western cemeteries appear to have begun in the early 6th century. The eastern cemetery lasted only for one or two generations, whilst the western cemetery continued well into the 7th century. The central cemetery was established during the late 6th century and continued throughout the 7th century. From the early 6th century onwards there were always two cemeteries in use at the same time.

The central cemetery may have begun as a replacement for the eastern cemetery, but its plan subsequently changed with the deposition of four auspicious graves, each set in a north-south line at roughly 40m spacings. Three graves were large weapon burials and the fourth was an inhumation of female gender buried with gold and silver jewellery. The earliest of these graves, at the north of the cemetery, was probably deposited in the early years of the 7th century whilst the latest, at the south, may have been placed there around AD 625. Each burial attracted a range of satellite graves, arranged around it but not encroaching into its burial mound. Later graves spread to the south and the east, with a number of graves placed on the opposite side of the trackway 226. The latest graves within the central and western cemeteries were arranged in neat rows. Three early Anglo–Saxon grubenhäuser were also identified, all of which lay in the vicinity of the cemeteries and a little to the north of them.

Several early medieval ditches and pits towards the eastern end of the excavation mark the location of a small rural site, probably 10th or 11th century in date. Other medieval and post-medieval pottery was recovered from features and topsoil in the north-western corner of the excavation, where elements of the ancient Romano-British landscape may have been exploited as rectilinear fields, or possibly stock-pens. Remains associated with construction of the Saltwood railway tunnel in the early 1840s and relating to the presence of a military barracks in the earlier 20th century were recorded but not considered in detail.

Saltwood Tunnel comprises a series of contiguous excavation areas. Fieldwork event codes included in this analysis are ARC SLT98, ARC SLT98C, ARC SLT99, ARC SFB99 and ARC SFB01.

1.2 Method

Details of the animal bone recording method can be found in the CTRL Section 1 Post-excavation Project Design, Volume 2, Contractor's Method Statements (ADS 2006).

2 RESULTS

2.1 The animal bone

A total of 3537 fragments (9805 g) of animal bone was recovered from archaeological excavations at Saltwood Tunnel. A further 3178 fragments (714 g) were retrieved from environmental samples, sieved through 10mm and 4mm mesh. During analysis a number of fresh breaks were refitted, all fragment counts in this report are refitted fragment counts. The mammal, bird and amphibian bone assemblage was analysed by J Kitch and F Worley and the fish bone assemblage by R Nicholson, all of Oxford Archaeology.

Tables 1 and 2 summarise fragment numbers by phase for hand-collected and sieved material. The assemblage contains domestic and wild mammals and birds, fish and amphibian bones. Of the domestic mammals cattle dominate the overall assemblage with sheep/goat and pig bones found less frequently, however when the assemblage is divided by phase, sheep/goat are sometimes more frequent than cattle. One Anglo-Saxon specimen was positively identified as goat and one Roman and two undated fragments (one of which was part of an articulated skeleton) were positively identified as sheep. Horse, dog and cat are also represented. The number of fragments for cattle, sheep/goat, horse and dog are inflated by a series of articulated skeleton burials.

Wild mammals include a single late Bronze Age deer antler fragment, an undated rabbit bone, small mammal, small carnivore and micro mammals including vole, field vole and mouse.

Bird bones include corvid, small passerine, pigeon size and medium bird sized fragments, and, from the Roman period, galliform and domestic fowl.

Amphibian bones were only recovered from Roman, medieval to post-medieval and undated sieved residues. Most amphibian bones were identified as frog/toad but one specimen was identified as toad and one as frog.

Fish bones were recovered from Roman period contexts onwards, with the most numerous groups deriving from the medieval and post-medieval features. Table 7 lists the identifiable fragments by taxon; 426 bones were identified to taxon, while there were over 500 additional fragments considered non-identifiable. The latter included spines, ribs, rays and branchial bones as well as small and tiny bone flakes. Identified taxa were almost all marine, including: herring or sprat, fish of the cod family (Gadidae), flatfishes, conger eel, mackerel, gurnard(s), ray(s) and scad. Smelt and eel were also identified, albeit in low numbers; both are anadromous fishes, spending time in brackish and freshwater.

2.2 Preservation and alteration

Condition

The condition of the hand collected animal bone was generally fair to poor while the bone from the sieved residues was in slightly better condition (see Table 3). Very little animal bone was recorded as in very good or very poor condition. The poorest condition animal bone (grade 5) comprised 17 fragments recovered from the sieved residues and 80 hand collected fragments. Of these, 66 comprise horse bone from an Anglo-Saxon grave with the remainder coming from a late Bronze age pits and a ditch, a Roman pit and layer, a medieval ditch and an undated ditch. Most of the fish bones were fair to well preserved, but in general good bone preservation was limited to isolated pit and ditch fills, where remains must have been buried rapidly.

Butchery

Very few butchery marks were identified in the assemblage, they were found on only nine fragments from four contexts. Medieval pit fill 1310 contained a large mammal rib which had been chopped and snapped transversely. 11th to 13th century pit fill 791 contained two medium mammal ribs which had been cut transversely towards their ventral end and a medium mammal vertebra with a saggital cut on its ventral surface. Undated pit fill 1065 included a large mammal rib and medium mammal thoracic vertebra which had been chopped through transversely and longitudinally. Undated pit fill 5082 contained a cattle rib and sacrum fragment and sheep skull which had been butchered. The cattle rib had a series of seven transverse cuts on its lateral face and the sacrum fragment had been chopped on either side of the centrum of the first sacral vertebra. The sheep cranium had been split longitudinally with several further chops at the base of its horn core.

Bone working

No evidence for bone working was identified in the assemblage.

Burning

749 fragments were burnt. These fragments were predominantly recovered from pit fills (see Table 4). The burnt bones are considered by phase below.

Gnawing

Possible carnivore gnawing was identified on five fragments of bone, from Roman ditch fill 6095, Anglo-Saxon pit fill 1337, medieval pit fills 1342 and 5065 and medieval ditch fill 1563.

2.3 Early Neolithic

The early Neolithic faunal assemblage contained only three fragments of calcined unidentified bone from pit subgroup 136.

2.4 Early Bronze Age

Two fragmented cattle teeth were recovered from early Bronze Age barrow subgroup 46022, one from the ditch fill 3765 and one from the grave pit fill 3896. The teeth may be intrusive but it is likely that any associated bone has decayed.

2.5 Late Bronze Age

98 fragments of hand collected bone and 101 fragments of bone from the sieved residues can be dated to the late Bronze Age. Taxa identified comprise cattle, equid, deer, sheep/goat, large, medium and small mammals in addition to 138 unidentified fragments. The hand collected bone was retrieved from a ditch (group 46024) and five pits in pit group 46025, two of which (subgroup 206 and 369) also contained animal bone recovered through sieving. A further pit in this group contained only sieved animal bone. Four of the five pits contained both burnt and unburnt animal bone. Ditch group 46024 contained a large mammal humerus fragment and 26 unidentified fragments.

Pit subgroup 206 contained a fragmented cattle skull and a charred large mammal long bone, calcined medium mammal second phalanx and 12 calcined unidentified fragments. Pit subgroup 208 contained a right cattle humerus and left horse humerus. Pit subgroup 211 contained a sheep goat tooth. Pit subgroup 369 contained charred and unburnt animal bone. The unburnt bone comprised a fragment of deer antler, right sheep/goat mandible, left cattle mandible, eight large mammal rib fragments and 15 medium mammal rib fragments. The charred bone comprised a cattle maxillary molar, large mammal metapodial fragment, medium mammal tibia fragment and two medium mammal long bone fragments. Pit subgroup 2805 contained 16 burnt unidentifiable fragments, recovered through sieving. Pit subgroups 206, 208, 211 and 2805 also contained occasional unburnt unidentified fragments, and two small unidentified fish vertebrae.

Pit group 10166 contained both burnt and unburnt bone. The majority of the burnt bone was calcined to a grey or white colour. Unburnt bone in the pit comprised sheep/goat left and right mandible fragments and a right maxillary premolar, a fragmented cattle molar and further 26 unidentified fragments. Burnt bone comprised calcined medium mammal vertebra and mandible fragments, 10 calcined large mammal long bone fragments and a calcined large mammal calcaneum fragment, and five unidentified burnt fragments, all but

one calcined. Ditch subgroup 143 and pit subgroup 2805 only contained unidentifiable animal bone. The majority of the bone in the pit was burnt.

2.6 Early/middle Iron Age

26 fragments of bone dated to the early or middle Iron Age two of which were identifiable. A sheep or goat right radius diaphysis was recovered from ditch subgroup 80 and a cattle molar fragment was recovered from ditch subgroup 170. The remaining unidentifiable fragments were all recovered from pit group 67, ditch subgroup 62 and hollow subgroup 10061.

2.7 Roman

Roman period contexts contained the second highest frequency of animal bone including an articulated dog burial. Excluding the dog bones the Roman mammal assemblage is dominated by sheep/goat (including sheep) and cattle bones with only one equid bone and two pig bones. A small carnivore and bones from micro-mammals including field vole were also recovered. There were five bird bones including two identified as domestic fowl, and two frog or toad bones. There were twenty three identified fish bones, which considering the general scarcity of fish remains at Roman sites comprises a significant assemblage. Over a hundred fragments of fish bone, mostly small and tiny, were considered unidentifiable.

Hand collected animal bone from the Roman period was found in features from group 46027 including the fills of six pits (305, 312, 313, 314, 316 and 408), two boundary ditches (310 and 340), two ditches (132 and 162), a hollow way (34), a posthole (336), a human burial (1577) and layer 46. Sieved animal bone was also recovered from the hollow way, boundary ditch 310 and pits 305, 312 and 408 in addition to further subgroups comprising boundary ditches (10022, 10036 and 10116), drainage ditch (10157), pit (612), road (10156), oven 10165 and subgroup 42. Roman period animal bone is further discussed by taxa below.

Cattle and large mammal

A layer, three ditch and three pit subgroups contained cattle bone. Very few fragments were found in each subgroup. Layer subgroup 46 contained a right mandible and further tooth fragment. Ditch subgroup 132 contained a right calcaneum fragment and ditch subgroup 162 contained a left radius fragment. Boundary ditch subgroup 340 contained four fragments from a cattle skull with nine further vertebra fragments (five thoracic) and 17 rib fragments from the same context identified as large mammal. Pit subgroup 312 contained left radius and right innominate fragments and a large mammal sized skull fragment. Pit subgroups 313 and 314 each contained a cattle tooth. Pit subgroups 42 and 408, ditch subgroups 310, 10157, hollow way subgroup 34 and road subgroup 10156 contained large mammal bone fragments, but no bones identified as cattle.

Sheep/goat and medium mammal

Five sheep/goat fragments were hand collected from Roman contexts and a further 10 fragments, including one identified as sheep, were retrieved from sieved residues. All sheep/goat bone was recovered from feature group 46027. The majority of sheep/goat fragments were teeth.

Hand collected sheep/goat bone included a left scapula fragment and left mandibular first and second molar from pit subgroup 305, a fragmented molar from posthole subgroup 336 and a right metatarsal fragment from boundary ditch subgroup 310. Sheep/goat bone recovered through sieving comprised a molar fragment from pit subgroup 312, a calcined second phalanx from pit subgroup 408, a right maxillary molar from hollow way subgroup 34, a mandibular deciduous third premolar (identified as sheep), further tooth fragment and mandible fragment from drainage ditch subgroup 10157, and a maxillary molar, unworn molar fragment, tooth enamel fragment and metapodial fragment from road subgroup 10156.

In addition to sheep/goat bone pit subgroups 312 and 408, ditch subgroups 310 and 10157 and road subgroup 10156 also contained fragments identified as medium mammal which may also be sheep/goat. 312 contained one and 408 contained five rib fragments, 310 contained a second phalanx and 10157 contained five indeterminate fragments, two of which were burnt. 10156 contained a long bone fragment, mandible fragment and tooth fragment together with 76 unidentifiable fragments, two of which were burnt.

Ditches 3102 and 10022, and pits 42 and 612 contained medium mammal fragments but no positively identified medium mammal species.

Pig

Only two fragments of pig bone dated to the Roman period: a fragmented molar in context 6091 and a mandibular incisor in context 611, both pit group 46027.

Equid

A recently fragmented horse molar was recovered from context 1676 a roman layer in feature group 46027

Dog

Dog remains were recovered from a roman pit and ditch fill.

Roman ditch subgroup 310, fill 6169 contained the complete skeleton of a male dog (os penis present), aged at over 18 months at death, which stood at a withers height of 565mm (see Table 5). Eburnation on the distal articulation of a left and right third metacarpal and the proximal articulation of a proximal first phalanx was noted indicating joint disease in the front feet. The dog had also suffered a broken right tibia which had healed with the fragments

misaligned probably resulting a limp. Roman pit subgroup 312 contained a left ulna of a dog less than 9-10 months old at death.

Small mammal

Ditch subgroup 10036 contained a tooth from a small carnivore.

Micro-mammal

Roman hollow way fill (subgroup 10156) contained a field vole left mandible, vole tooth and calcanuem and further micro mammal long bone.

Bird

Five bird bones were recovered from pit subgroup 312 and hollow way subgroup 10156. The pit contained a bird long bone and fragments from two galliform tibio-tarsals. The hollow way contained a medium sized bird long bone and furcula.

Amphibian

Roman pit (subgroup 612) and boundary ditch (subgroup10116) each contained a single frog or toad long bone.

Fish

Twenty three fish bones were identified, including cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), herring or sprat (Clupeidae), eel (*Anguilla anguilla*) and flatfish (including Pleuronectidae - plaice, flounder or dab). A single small vertebra from a sunken trackway (subgroup 10156, context 352) was tentatively identified as pike (*Esox lucius*), the only exclusively freshwater fish identified in this assemblage. Samples from this feature also included bones from herring/sprat and eel. Four of the flatfish bones, from more than one individual, derived from context 6060 (sample 200, pit subgroup 312). Also in this context was a dentary from a large (about 0.8m) cod which had broken into three pieces, two of which were found in context 6079. With the exception of this cod bone, all the other gadid bones were found in sample 204 (pit context 6155, subgroup 408).

Unidentifiable

Boundary ditch subgroup 307, pit subgroup 316, oven subgroup 10165 and burial subgroup 1577 contained only unidentifiable, unburnt animal bone.

2.8 Anglo-Saxon

The Anglo-Saxon animal bone assemblage contained 59 hand collected fragments and 102 fragments retrieved from sieved residues including the badly degraded remains of a horse skeleton from a human burial. Excluding the horse burial, only 12 fragments could be

identified to mammalian taxon including cattle, sheep/goat (including one fragment identified as goat), pig, cat. No birds, amphibians or micro mammals were recorded. fish bones were present but were less common than in the Roman or medieval periods. Hand collected animal bone from the Anglo-Saxon period was found in features from group 46028 including the fills of two pits (sub groups 74 and 4550), a boundary ditch (subgroup 10045) and two human burials (subgroups 3998 and 4550). Sieved animal bone was recovered from three pits (subgroups 74, 10167 and 10172), two ditches (subgroups 7 and 10045), a human burial (subgroup 1291) and two sunken featured buildings, subgroups 61 and 10113). Anglo-Saxon period animal bone is discussed by taxa below.

Cattle and large mammal

Teeth and a carpal were the only identified cattle elements in the Anglo-Saxon assemblage. Three teeth, including a left maxillary third molar, right mandibular third molar and further tooth, were recovered from pit subgroup 4550 along with a large mammal mandible fragment, probably also cattle. The magnum carpal was recovered from sunken featured building subgroup 61.

Sheep/goat and medium mammal

Possible corn-dryer (subgroup 10167) contained a burnt sheep/goat left metatarsal and metapodial fragment. Pit subgroup 74 contained a sheep/goat right maxillary molar and pit subgroup 4550 contained a left mandible fragment identified as goat. In addition to sheep/goat bone subgroup 10167 and 4559 contained medium mammal bone. 10167 contained seven long bone fragments (one burnt) and two unidentifiable fragments. 4550 contained a burnt medium mammal vertebra. Pit subgroup 74 contained a burnt medium mammal long bone fragment and the fill of a grubenhaus (subgroup 10113 contained a burnt medium mammal tooth and long bone fragment.

Pig

Pit subgroup 4550 contained a fragment of pig molar and human burial subgroup 1238 contained an unerupted molar fragment (from an individual less than 22months old at death).

Equid

Anglo-Saxon grave 27 (subgroup1244) contained the degraded remains of a horse skeleton. Detrimental preservation conditions resulted in only the teeth and some long bone fragments surviving in very poor condition. Of the long bones, only a fragment of right tibia and left and right humeri were identifiable at analysis but the excavator noted that the left radius and possibly ulna and femur were also present. The height of the cheek teeth suggests an approximate age at death of 5-6years (following Levine 1982) while attrition of a lateral

incisor suggests age of 5 years (following Silver 1970: 293). It is not possible to estimate the size of the horse from the surviving fragments. The remains cannot be sexed but there was no evidence of canine teeth. No harness furniture was identified in the grave and no evidence of bit wear was present on the teeth. 37 fragments of large mammal humerus, long bone and skull from the grave are probably all remains of the horse skeleton.

Cat

A single cat right distal scapula was recovered from Anglo-Saxon secondary pit subgroup 74. Epiphyseal fusion suggests that the cat was over 8.5 months old at death.

Fish

No identifiable fish bones were recovered from the Anglo-Saxon features. Twelve unidentifiable fragments derived from sample 49, context 1337 (pit subgroup 74).

Unidentified animal bone

Only unidentified animal bone was recovered from burial subgroups 1291, 1762 and 3998, and pit 10172 and boundary ditch 10045. Some of the animal bone from the ditch and pit was calcined. Burial 1762 contained only one fragment of unidentifiable bone which was also calcined.

2.9 Medieval period

The medieval animal bone assemblage contains the largest quantity of fragments of any period represented in the Saltwood tunnel excavations. As with the Roman period assemblage, this is largely due to presence of an articulated dog skeleton in pit subgroup 47. Excluding the dog bones the medieval mammal assemblage is dominated by sheep/goat and cattle bones with one equid bone and seven pig bones. Three small mammal bones were also recovered but no micro mammals, amphibian or bird bones were found in the assemblage. Fish bones were more frequent than in any other period, although the number of bones identified from features dated with certainty to the medieval period was considerably lower than the numbers from deposits dated only to 1066-1800, ie. medieval or post-medieval. Hand collected and sieved animal bone from the medieval period was found in features from group 46029 including the fills of four ditches (subgroups 44, 66, 150 and 153) and five pits (sub groups 47, 48, 75, 112 and 203). Hand collected animal bone was also recovered ditch subgroup 153 and pit subgroup 156. Medieval period animal bone is discussed by taxa below.

Cattle and large mammal

Cattle bone was hand collected from the fills of two ditches (subgroup 1562 and 3541) and three pits (subgroups 47, 112 and 203). 44 contained a left metatarsal together with large

mammal long bone and mandible fragments. 153 contained a tooth. 47 contained a left innominate, left radius and right tooth fragments together with a large mammal rib. 112 contained the right zygomatic region of a cattle skull and pit 203 contained a right innominate, left and right radius and left mandible fragments together with large mammal mandible and rib fragments. Pit subgroups 48, 75 and 156, and ditch subgroups 66 and 150 contained large mammal fragments but no cattle bone. Large mammal fragments included vertebra, rib, long bone and mandible fragments. those long bone fragments in pit subgroup 75 were burnt.

Sheep/goat and medium mammal

Nineteen sheep/goat elements were recovered from medieval contexts, none could be positively identified as either sheep or goat. contexts containing sheep/goat bone comprised five pit subgroups (47, 48, 112, 156 and 203) and two ditch subgroups (66 and 150).

Pit 47 contained a right maxillary premolar, left maxillary molar and fragments of right metacarpal and tibia. Pit 48 contained a right maxillary molar and fragment of right radius. Pit 112 contained a right innominate fragment. Pit 156 contained fragments of left mandible (aged 9-12months old at death), a fragment of left femur and right tibia and a complete right radius from an individual aged over 3 years old at death. Pit 203 contained a permanent mandibular third premolar and two mandibular molar fragments. ditch 66 contained a left maxillary molar and right maxillary third molar and ditch 150 contained a left maxillary molar and left mandibular first molar.

In addition to the sheep/goat bone pits 47, 48 and 156 and ditches 66 and 150 also contained fragments of medium mammal bone, possibly sheep/goat. 47 contained three caudal vertebrae and two charred long bone fragments, 48 contained five long bone fragments, one of which was burnt, 156 contained a rib and eight long bone fragments, 66 contained a long bone and a rib fragment and 150 contained two long bone fragments. Ditch 44 contained two medium mammal long bone fragments but no other medium mammal taxa.

Pig

Pig bones were recovered from two pits and a ditch. Pit subgroup 203 contained a left mandible fragment, from a juvenile individual, a right canine from a boar and a right maxilla from an individual of approximately 17-22months old. Pit subgroup 156 contained a left temporal bone. Ditch subgroup 150 contained a calcined left second metatarsal and carpal or tarsal bone and an unburnt right mandibular premolar.

Equid

A complete left metatarsal, recovered from the secondary pit fill associated with the dog skeleton (below), was the only equid element dating to the medieval period.

Dog

Medieval primary pit fill 1344 (subgroup 47) contained the remains of a complete dog of indeterminate sex, aged at over 18months old at death which stood at a withers height of 580mm (see Table 5). As with the Roman dog, joint disease was noted on the dog's left hind foot; one left fourth metatarsal had eburnation on the anterior surface of the distal articulation, similar eburnation was noted on the proximal ends of two first phalanges. In addition, the dog had broken the tip of a spinous process of one thoracic vertebra which had healed but was misaligned. Two later fills of the pit (1342 and 1310) contained three fragments of dog bone which probably came from the same skeleton.

Small mammal

Three small mammal vertebra were recovered from pit group 47.

Fish

Forty nine bones were identified to taxon, while over an estimated three hundred small and tiny fragments were considered unidentifiable. Cod was the most commonly represented fish, with 30 identified bones. Other identified species include conger eel (*Conger conger*), ling (*Molva molva)*, whiting (*Merlangius merlangus*) mackerel (*Scomber scombrus*) and gurnard(s) (Triglidae, including tub gurnard *Trigla lucerna*), as well as right-eyed flatfish (Pleuronectidae -plaice, flounder or dab). A single vertebra was identified as possibly from three-bearded rockling (*Gaidropsarus vulgaris*). The majority of the fish remains came from pit group 47.

2.10 Medieval to post-medieval

Only four fragments of hand collected bone were dated to this phase with 1159 fragments of sieved bone, the greatest frequency for any sampled period. The hand collected bone included a sheep/goat fragment, two medium mammal fragments and one unidentified fragment. The sieved material included cattle, large mammal, sheep/goat, pig, dog, medium mammal, cat, small mammal, field vole and vole, micro mammal, corvid, pigeon size bird, medium bird, small bird, small passerine, bird, frog, frog/toad and unidentified animal bone. Of the fragments identified to species, the domestic mammal assemblage is dominated by sheep/goat and pig with only a few cattle bones and one dog and one cat bone. Three hundred and fifty fish bones were identified from this period, the majority from pit group 792. All animal bone from this period was recovered in features from group 46030. Hand collected animal bone from the medieval/post medieval period was recovered from boundary ditches 10000 and 10003. Animal bone was recovered from sieved residues from five pits (subgroup 281, 518, 603, 614 and 792) and four ditches (subgroups 10021, 10024, 10090 and 10109). These

features date from the 11th to 13th centuries. Medieval to post-medieval period animal bone is discussed by taxa below.

Cattle and large mammal

Only three cattle bones were identified, a first phalanx and tooth fragment from pit subgroup 792 and a second phalanx from pit subgroup 281. Large mammal sized fragments were identified from both of these contexts, 20 fragments including skull, mandible, tooth, vertebra, long bone and second phalanx from 792 and a long bone and indeterminate fragment from 281. 16 further large mammal fragments were recovered from pit subgroups 518, 603 and 614 and ditch subgroups 10021, 10024 and 10090.

Sheep/goat and medium mammal

15 sheep/goat fragments were recovered, none could be positively identified as either sheep or goat. Sheep/goat fragments were recovered from four pits (subgroups 281, 603, 614 and 792) and three ditches (subgroups 10003, 10021 and 10109). Pit subgroup 281 contained a sheep/goat tooth, left middle cuneiform and first phalanx fragment. Pit subgroup 603 contained a right tibia fragment. Pit subgroup 614 contained two tooth fragments and pit subgroup 792 contained a left innominate, left mandible, right radius, two metapodials and a horn core fragment. Ditch subgroups 10021 and 10109 each contained a tooth fragment and ditch subgroup 10003 contained a tibia fragment.

In addition to sheep/goat bone, medium mammal size fragments were recovered from pit subgroups 281, 603, 164, and 792 and from ditch subgroups 10021 and 10109. 281 contained a skull fragment, four tooth fragments, a vertebra and 44 indeterminate fragments. 603 contained a tooth fragment, three long bone fragments and 10 indeterminate fragments. 614 contained a pisiform, three tooth fragments, a first phalanx and 21 indeterminate fragments. 792 contained five vertebrae, three rib fragments, two teeth, one long bone fragment, one skull fragment and 161 indeterminate fragments. 10021 contained three long bone, one rib and 15 indeterminate fragments. 10109 contained an innominate fragment and eleven indeterminate fragments. Pit subgroup 518 and ditch subgroups 1000 and 10024 contained medium mammal size bone but no sheep/goat.

Pig

Six pig bone fragments were recovered from the fills of pit subgroups 281, 614 and 792. 281 contained a left maxilla and tooth and a burnt second phalanx. 614 contained a tooth and 782 contained a second phalanx and metapodial fragment.

Dog

A single dog tooth was recovered from pit subgroup 792.

Cat and other small mammal

A single cat left mandible was recovered from pit subgroup 792. A small mammal rib and skull fragment were recovered from the same context. An unidentified small mammal bone was recovered from pit subgroup 603 and a small mammal rib from ditch subgroup 10024.

Micro-mammal

29 micro mammal bones were recovered from pit subgroups 281 (four fragments), 614 (one fragment) and 792 (12 fragments) and from ditch subgroups 10024 (10 fragments) and 10109 (two fragments). Field vole was identified amongst the micro-faunal remains from 281 and 792.

Bird

Bird bones were identified in pit subgroups 281 and 792 and in ditch subgroups 10024 and 10109. 281 contained a corvid carpo-metacarpus fragment, pigeon size right humerus, unsided radius, right tibio-tarsus, right femur and right tibio-tarsus fragments (all juvenile), small passerine scapula, coracoid, left humerus and left tibio-tarsus fragments, small bird carpo-metacarpus, nine vertebrae, a phalanx, two flat bone and 16 unidentified fragments and an unidentified bird fragment. 792 contained a small passerine right ulna and humerus fragment, a medium bird long bone fragment, a small bird long bone fragment and unidentified bird fragment. 10024 contained a medium bird long bone fragment and a phalanx. 10109 contained small bird tarso-metatarsus and long bone fragments

Amphibian

Frog/toad bones were recovered from pit groups 281 (12 fragments including one identified as frog) and 782 (one fragment) and from ditch subgroup 10109 (one fragment).

Fish

Of the 348 identified bones, most (303 bones) were from (mainly) juvenile herring or sprat (Clupeidae) and smelt (*Osmerus eperlanus*) from sample 77 (context 796, pit group 792). Herring or sprat scales were also present. This sample seemed to represent a dumped deposit of these tiny fishes along with the remains of at least one eel (*Anguilla anguilla*), and occasional bones from gurnards (Triglidae) including a large pre-frontal and spine from tub gurnard (*Trigla lucerna*), mackerel (*Scomber scombrus*), ray (Rajidae), small and tiny flatfish, a cod of <15cm and three bones possibly from stickleback (probably *Gasterosteus aculeatus*, the 3-spined stickleback). Of the remaining bones, samples from pit group 281 contained bones from small gadids (including whiting, *Merlangius merlangius*), eel, herring/sprat, ray and flatfishes. Samples from pit group 10024 included bones from thornback ray (*Raja clavata*), conger eel (*Conger conger*) and herring/sprat.

2.11 Modern

The majority of bone from modern contexts was unidentifiable. Only 32 fragments of sheep/goat and 83 fragments of medium mammal sized bone were recovered. All were found in an animal burial (subgroup 394) and can therefore be assumed to be sheep/goat. This individual was only represented by axial elements including skull with both mandibles, vertebrae, rib and right innominate fragments. The sheep/goat was between 20 and 34 months old at death but could not be sexed.

2.12 Undated notable features

Pit subgroup 204 (context 5082) contained the remains of a sheep skeleton aged between five and eight years old at death which stood at a withers height of 598mm (see Table 6). It also contained a fragments of a possible articulated cattle axial skeleton (including skull, ribs, vertebra, innominate and sacrum) and a domestic fowl (including the synsacrum, left coracoid, scapula and ulna, right femur and radius). Further fragments of bird long bones and small bird furcula and rib were also recovered. The cattle and sheep bone had been butchered (see above). The pit included 23 unidentifiable fish bone fragments. Ditch subgroup 129 contained the remains of a near complete adult cattle skeleton aged over 3 to 3.5 years old at death.

Table 1: Number of fragments of each taxon from the hand collected material, summarised by phase

Taxon	Phase										
	ENE	**EBA**	**LBA**	**E/MIA**	**RO**	**AS**	**MD**	**MD/ PMED**	**MOD**	**UN**	**Total**
Cattle		2	5	1	12	4	10			195*	229
Equid			1		1	28*	1				31
Large Mammal			20		32	38	14			54	158
Goat						1					1
Sheep										2	2
Sheep/Goat			5	1	5	1	18	1	29*	52*	112
Pig					1	2	4			3	10
Dog					149*		207*				356
Medium Mammal			2		7	1	18	2	83	40	153
Cat						1					1
Rabbit										1	1
Small Mammal							3				3
Domestic fowl										9	9
Bird					1					6	7
Fish					37						37
Unidentified	3		65	9	525	59	682	1	274	809	2427
Total	**3**	**2**	**98**	**11**	**770**	**135**	**957**	**4**	**386**	**1171**	**3537**

* All/mostly from skeleton

Table 2: Number of fragments of each taxon from the sieved residues, summarised by phase

Taxon	Phase										
	ENE	**EBA**	**LBA**	**E/MIA**	**RO**	**AS**	**MD**	**MD/ PMED**	**MOD**	**UN**	**Total**
Cattle						1		3		2	6
Deer			1								1
Large Mammal			2		26		1	38		11	78
Sheep					1						1
Sheep/Goat			5		9	2	1	14	3	5	39
Pig					1		3	6		4	14
Dog					1			1			2
Medium Mammal			19		107	12	7	341		90	576
Cat								1			1
Small carnivore					1						1
Small Mammal			1					4			5
Field Vole					1			2		1	4
Vole					2			3			5
Mouse										3	3
Micro Mammal					1			24		9	34
Corvid								1			1
Pigeon size								5			5
Domestic fowl										1	1
Galliform					2					1	3
Medium bird					2			3		8	13
Small passerine								39		4	43
Bird								2		25	27
Fish					88	13	277	2		36	416
Frog								1			1
Toad										1	1
Frog/toad					2			13		9	24
Unidentified			73	15	435	74	242	656	68	310	1873
Total	**0**	**0**	**101**	**15**	**679**	**102**	**531**	**1159**	**71**	**520**	**3178**

Table 3: Condition of the animal bone (based on criteria suggested by Lyman 1996, 355)

Condition	Hand collected	Sieved residue
1 (very good)	4%	2%
2 (good)	19%	56%
3 (fair)	42%	37%
4 (poor)	33%	5%
5 (very poor)	2%	1%
Total	100%	100%

Table 4: Provenance of burnt bone

Sub-group interpretation	ENE	LBA	E/MIA	RO	AS	MD	MD/PMD	Unknown	Total
Burial human					1				1
Burial animal								7	7
Ditch boundary					13		10		23
Pit	3	144	9	95	21	148			420
Ditch			11			88			99
Ditch drainage				2					2
Negative structural					2				2
Road				3					3
Unknown				16	10		28	138	190
Total	**3**	**144**	**20**	**116**	**47**	**236**	**38**	**145**	**749**

Table 5: Calculation of dog withers heights following Harcourt (1974)

Context	Element	Side	GL (mm)	Factor	GL x factor	Correction	Withers height (mm)
1344	Femur	L	191	3.14	599.74	-12.96	587
1344	Tibia	L	195	2.92	569.4	+9.41	579
1344	Tibia	R	196	2.92	572.32	+9.41	582
1344 dog average withers height = 580mm							
6169	Humerus	L	171	3.43	586.53	-26.54	560
6169	Humerus	R	172	3.43	589.96	-26.54	563
6169	Radius	L	175	3.18	556.5	+19.51	576
6169	Radius	R	174	3.18	553.32	+19.51	573
6169	Ulna	L	199	2.78	553.22	+6.21	559
6169	Tibia	L	187	2.92	546.04	+9.41	555
6169 dog average withers height = 565mm							

Table 6: Calculation of sheep/goat withers heights following Teichert (1975)

Context	Element	Side	GL (mm)	Factor	Withers height (mm)
3595	Radius	R	140	4	560
3595 sheep average withers height = 560mm					
5082	Metacarpal	R	122	4.84	590
5082	Metatarsal	R	134	4.51	604
5082	Radius	R	145	4	580
5082	Radius	L	145	4	580
5082 sheep/goat average withers height = 589mm					

Table 7: Numbers of Identifiable fish bones

Taxon	Phase					
	LBA	RO	MD	MD/ PMED	UN	Total
Shark or ray (Elasmobranch)				1		1
Ray (Rajidae)						
Thornback Ray				1		1
Eel		2		10	1	13
Conger eel			2	1		3
Herring/sprat		5		234		239
Smelt				69		69
Cod		2	30	2		34
Whiting			1	4		5
Haddock		2				2
Ling			1			1
Cod family (Gadidae)		5	6	6	1	18
Cf. 3-bearded rockling			1			1
Cf. Stickleback				3		3
Cf. Pike		1				1
Tub gurnard				2		2
Gurnard (Trigidae)				2		2
Scad				1		1
Mackerel			1	2	4	7
Plaice				3		3
Plaice/Flounder/Dab (Pleuronectidae)		3	5			8
Flatfish nfi		3	2	7	1	12
Unidentified		4	5	4		14
Total identifiable	**0**	**27**	**54**	**352**	**7**	**440**

3 DISCUSSION

Excavations at Saltwood Tunnel produced animal bone dating from the early Neolithic to modern periods with Roman, medieval and medieval/post-medieval phases dominating the assemblage. The specimen counts for different taxa are skewed by a surprising number of animal burials. The site includes an Anglo-Saxon horse burial, Roman and Medieval dog burials, modern and undated sheep/goat burials and an undated cattle burial and partial burial.

Very little age-at-death data is available from the assemblage precluding interpretation of mortality profiles and husbandry strategy. Occasional neonatal/foetal medium mammal and sheep/goat elements were present in the medieval/post-medieval assemblage indicating breeding in the vicinity. The assemblage is also unsuitable for much metric analysis beyond the withers heights presented for dog and sheep/goat skeletons.

Very little can be concluded from the early Neolithic, early Bronze Age and early/mid Iron Age assemblages. The early Neolithic assemblage indicates the disposal of burnt animal bone in a pit for an unknown reason. The early Bronze age assemblage of cattle teeth may be intrusive but probably indicates the husbandry of cattle during this period. The early/mid Iron Age assemblage indicates utilisation of sheep/goats and cattle during this period.

The late Bronze Age assemblage indicates the utilisation of cattle, horse, sheep/goat and deer antler. A proportion of the assemblage was burnt before deposition possibly during domestic activities.

The Roman assemblage indicates the utilisation of cattle, sheep/goat, pig, dog, horse, fish and bird including domestic fowl. Cattle and sheep/goat are the most frequent mammalian taxa represented. Amphibian bones found in a Roman pit and boundary ditch indicate proximity to standing water and field vole remains from the Roman hollow way suggest a grassland environment. The Roman assemblage included a complete male dog skeleton which had suffered from joint disease and a broken right hind leg buried in a ditch. The healed leg fracture suggests that the animal was cared for. The presence of bones from large cod is rather unusual from a British Roman site; cod fishing developed as an industry in the medieval period, and where fish remains are found on Roman sites they tend to be few and often comprise salmonids, flatfish, herring, eel, freshwater fish and occasional other marine taxa.

The Anglo-Saxon period is less well represented than the Roman or later periods but does indicate the utilisation of cattle, sheep/goat, goat, pig, horse, cat and fish. The most interesting feature of the Anglo-Saxon assemblage is a possibly complete horse skeleton from an individual of 5 to 6 years old found in grave 27. At this age, the horse may have been trained for riding. A recent study suggests that in 2001, less than 20 other Anglo-Saxon burials with entire horses were known from Britain (Pestell 2001, 256). When compared with the other entire horse burials included in Pestell's report, the burial at Saltwood Tunnel is the most southerly, with only three other burials containing horses' heads found in south east England (see Pestell 2001, 257). Pestell's study also suggests that inhumed horses are found almost exclusively with male inhumations and may have been a high status offering (Pestell 2001, 256. No human bone survived in the Saltwood Tunnel horse burial.

The medieval is the best represented period in the faunal assemblage from Saltwood Tunnel. It indicates the utilisation of cattle, sheep/goat, pig, horse, dog and fish with sheep/goat dominating the domestic mammals. The medieval assemblage includes a second dog burial in a pit. The animal was adult and had also suffered joint disease and broken bones which had healed indicating a degree of care. The fish assemblage is typical for this date, being dominated by cod, with flatfish and other marine taxa of secondary importance; a

reflection of the major expansion in offshore fishing which occurred in the first part of the second millennium AD.

The medieval/post-medieval animal bone assemblage was nearly exclusively collected from sieved residues. Sheep/goat dominated the domestic mammalian assemblage but cattle, pig, dog and cat were also identified. Tiny and small fish bones were numerous in samples from pit fill 792, which possibly included a dump of rejected "whitebait", although the appearance of a mineralised deposit around some of the herring bones may indicate a cess component in this pit fill. Bird bones were frequent in the assemblage and included corvid, pigeon size and small passerines. No domestic fowl were identified. The presence of vole bones indicates a grassland environment and frog/toad bones indicate proximity to water. The modern faunal assemblage comprises a single sheep/goat burial.

The undated animal bone assemblage includes a further two cattle partial burials, one of which also contained a complete sheep and significant portion of a domestic fowl suggesting that it may be non-economic.

4 BIBLIOGRAPHY

ADS, 2006 CTRL Digital Archive, Archaeology Data Service, http://ads.ahds.ac.uk/catalogue/projArch/ctrl

Harcourt, 1974 'The dog in prehistoric and early historic Britain', *Journal of Archaeological Sciences*, i, 151.

Levine, M A, 1982 The use of crown height measurements and eruption-wear sequences to age horse teeth, in *Ageing and Sexing Animal Bones from Archaeological Sites* (eds B Wilson, C Grigson & S Payne), BAR Brit. Ser. **109**, 223-50

Lyman, R L, 1996 *Vertebrate taphonomy*, Cambridge: Cambridge University Press

Pestell, T, 2001 Animal burials in *Snape Anglo-Saxon Cemetery; Excavations and Surveys 8124-1992* (W. Filmer-Sankey and T. Pestell), Ipswich: East Anglian Archaeology Report **95**, 255-259

Silver, I, 1969 The ageing of domestic animals, in *Science and archaeology*, (eds D Brothwell and E Higgs), London: Thames and Hudson, 283-302

Tiechert, M, 1975 Osteometrische Untersuchungen zur Berechnung der Widerristhöhe bei Schafen, in *Archaeological Studies*, (A T Clason), Amsterdam