

- 7 3 The Roman pottery includes a broad date range spanning the Roman period and was mostly regionally produced, for example copied Black Burnished Ware from context 105. As with the medieval assemblage, many of the sherds have undergone abrasion, suggesting re-working of some of the material. The small size of the assemblage suggests that the site was on the fringes of occupation at this period.
- 7 4 Two contexts (S10-123, S12-191) produced prehistoric pottery. These sherds are from hand-made jars and are likely to date to the Iron Age. The pottery from context 123 is of Iron Age Tradition, the production of which continues into the Roman period. The 'dolomite-tempered' sherds from context 191 are of a type with a long tradition of production spanning the Late Bronze Age (LBA) to Late Iron Age (LIA). Due to the small number of sherds recovered it may be that the pottery is of a LBA date, but it is more likely that they date from the LIA and that the site was on the fringes of settlement during this period.

Recommendation

- 7 5 The small size of the assemblage and the degraded nature of the material makes further study of the material of limited value. The assemblage is however an indicator of continuous occupation within the immediate vicinity over an extended period and should be retained in a local museum should further study be deemed necessary in the future.

Animal bone (Louisa Gidney)

- 7 6 The trial trenches produced few finds of animal bones. The details of the assemblage are summarized in Appendix 2 Table 2.

Trench S18

- 7 7 Context 83, a ditch fill, contained one unidentifiable fragment of bone.

Trench S9

- 7 8 Context 105, a pit fill, produced the majority of the faunal remains recovered. There is an interesting contrast in the state of preservation of the finds. One cattle calcaneum, with proximal end unfused, is from a very young calf and is in good condition. The remaining identifiable finds comprise at least ten horse teeth. These are in poor condition with the dentine decaying. There are also a few small unidentifiable fragments of bone. The teeth form a matching pair of maxillary tooth rows and it seems probable that these are all that remain of a complete skull. This was an immature animal as at least five of the teeth appear to be unempted and two have only very slight wear.

- 7 9 Context 115, a fill of another pit, produced one large animal long bone shaft fragment, which is in poor condition and disintegrating into several pieces.

Trench S10

- 7 10 Context 129, a ditch fill, produced a cattle-size thoracic vertebra, with both epiphysal ends fused, from an adult animal.

- 7 11 The paucity of faunal remains suggests that the areas investigated were peripheral to the disposal of household refuse. No further work is recommended on this assemblage.

Clay pipe (Daniel Stull)

- 7 12 The clay pipe assemblage consists of two stem fragments, both unstratified. There is therefore no further work recommended. The details of the assemblage are summarized in Appendix 2 Table 3.

Trench S2

- 7 13 One fragment of unstratified clay pipe stem.

Trench S16

- 7 14 One fragment of unstratified clay pipe stem.

Glass (Richard Annis)

- 7 15 The glass assemblage contains unstratified fragments from a single late 18th-early 19th century bottle. No further work is required. The details of the assemblage are summarized in Appendix 2 Table 4.

Trench S9

- 7 16 One green bottle neck, hand blown with an applied rim. Six bottle body sherds, probably from the same vessel as the neck. These were all unstratified and dating to the late 18th-early 19th century.

Lithics (Dr Mark White)

- 7 17 The lithics (flint) assemblage contains three pieces, two flakes of broadly prehistoric, but undiagnostic, date and a Neolithic blade. Due to the small size of the assemblage no further work is recommended. The details of the assemblage are summarized in Appendix 2 Table 5.

Trench N6

- 7 18 One possible blade fragment with plough damage. Orange/brown in colour and measuring a maximum 33mm in length by 25mm in width by 5mm thickness.

Trench N7

- 7 19 One broad flake from context 42. The flake is speckled dark orange/brown in colour, with plough damage evident to the edges of the flake. The flake exhibits a bulb of percussion and measures a maximum 67mm in length, 45mm in width and 9mm thickness.

Trench S7

- 7 20 One unstratified narrow blade with narrow parallel flaking scars. The blade is white in colour with grey interior. This piece represents a secondary stage in the core reduction process and is typical of flaking techniques dating to the Neolithic period. The blade measures a maximum of 36mm in length by 14mm in width by 4mm thickness.

Budding materials (David Schofield, John Senior & Daniel Still)

- 7 21 Some evidence for structural remains on the airfield was identified, but no buildings were located. Details of the building materials assemblage is summarized in Appendix 2 Table 6
- 7 22 Two worked blocks of masonry and a quantity of tufa were recovered from Trench S9, within the fill (105) of pit F106. The two stone blocks are coarse buff Upper or Lower Carboniferous Sandstone, sparsely micaceous
- 7 23 The larger of the blocks measured 600mm in length, by 280mm in width, by 300mm in depth. The stone had been squared off, but was broken prior to deposition. Rough tool marks were evident on two sides in the form of 'point dressing'. Due to the large size and weight of the block it was back-filled into the trench after being recorded
- 7 24 The second block measured 220mm in length, 212mm in width and 170mm in depth. Four sides of the block have been worked and squared off. Tool marks can be seen on three sides, including diagonal chisel marks. The fourth side has been worked smooth and would have been exposed as part of the inside face of building. This face is reddened and has a corner cracked off due to burning. The burning of the block had occurred prior to deposition, possibly while the block was part of a standing building
- 7 25 A quantity of calcareous tufa was recovered, weighing a total of 9003g. Some of the pieces have been shaped, with several pieces having flat faces. The largest piece (207mm in length) has white mortar with crushed tile inclusions still adhered to the flat face. The tufa is likely to have been brought to the site from areas of Magnesium Limestone outcrops to the west of Catterick
- 7 26 A quantity of sub-angular stones measuring up to 200mm in diameter and weighing a total of 3055g were kept as a sample of the stone identified from context 134, the fill of ditch F135. The stones are sandstone and all have white mortar attached with charcoal inclusions

Discussion

- 7 27 Tufa is a material used during the Roman period for construction purposes, being lightweight it is used in the vaulting of roofs, usually in bath-houses. This material and the worked sandstone masonry are likely to have come from substantial Roman buildings, possibly from buildings associated with the 'villa' complex just to the north of the airfield. The burning of the smaller sandstone block may indicate the destruction of Roman buildings due to fire. The stone is of local origin, locations to the north or west of the site are the most likely source. Although Roman quarries were often located next to Roman roads (such as Dere Street, immediately to the west of the site) their precise locations have yet to be identified in this area
- 7 28 It is not clear what the date of the mortared stones from F135 is, none of the stones have been worked and they may derive from buildings or boundary walls in the immediate vicinity

Industrial residues (Dr Jacqui Cotton)

- 7 29 Two of the samples assessed, from contexts 055 and 154, were un-diagnostic slag. This material would have been produced as part of metal-working processes. The small number of remains from context 134 were all clinker. As only small fragments of slag and clinker were present, the remains do not represent the direct deposition of industrial or fuel burning waste into the contexts. No further work is therefore required. The details of the assemblage are summarized in Appendix 2 Table 7.

Quern-stones (David Schofield, John Senior & Daniel Still)

- 7 30 Four broken fragments of quern-stones were recovered from Trench S9. Three of the fragments were recovered from pit F106 (fill 105), together with Romano-British pottery, building materials and bone. A fourth fragment was recovered during machining and is likely to have come from the same context. The details of the assemblage are summarized in Appendix 2 Table 8.
- 7 31 Two (joining) fragments are from the upper part of a rotary quern. The quern has a radius of 260mm and is up to 70mm in depth. The central spindle is 80mm in diameter and penetrates the full depth of the quern. Due to the size of the spindle it may be that a metal collar was inserted during use. In the centre of the quern a raised flange, 30mm in width, is present. This would have held the cereal grain as it fed into the central spindle. The quern is a coarse to very coarse pale buff Millstone/Redscar Grit with angular to sub-angular grains mostly 1-3mm, but up to *c* 1cm on the grinding surface. Many quartz grains appear to have well formed crystal faces, indicating silica overgrowths.
- 7 32 Two fragments (one unstratified) are from the lower part of a rotary quern. The fragment from context 105 measures a maximum of 134mm in width by 70 mm in depth and exhibits the same geological traits as the upper stones. The unstratified fragment measures a maximum of 235mm in width and 68 mm in depth. The quern is the same stone type as the rest with slightly larger grains, measuring 2-5mm, some *c* 1 cm.

Discussion

- 7 33 The quern-stones are Romano-British in appearance and indicate that the processing of cereals was undertaken here during this period. This would imply settlement in the immediate vicinity of the recovered querns and the domestic production of food. Millstone Grit is found locally, in Wenslydale, and it is likely that the stone was quarried from here. Further study on the quern-stones is recommended and possible publication, including comparison with other querns from the region.

8 Ecofactual evidence (Dr Jacqui Cotton)

Summary

- 8 1 53 bulk sediment samples were recovered from the fills of cut features during the trenching. Each sample was assessed for its potential to provide information regarding past environments and economies. Following the assessments it was recommended that further analysis and radiocarbon dating

be undertaken on three samples (contexts 26 & 30 from Trench N6, context 123 from S10) The analysis of remains from the Trench N6 samples has now been completed and is reported on below (para 8 21 – 8 28)

Method statement

- 8 2 Each was manually floated and sieved through 500µm mesh sieves The residues were retained and all finds recorded The residues were also scanned for evidence of metal-working debris using a magnet The flots were dried slowly, then scanned at x40 magnification for waterlogged and charred botanical remains Plant macrofossils were identified by comparison with modern reference material held in the Environmental Laboratory at Archaeological Services, University of Durham The abundance of each waterlogged species was noted and total counts of charred species were logged
- 8 3 As part of the analysis of contexts 26 and 30, the basal widths of all spelt wheat glume bases were measured in order to provide a comparison both with nearby sites and with data-sets from southern England

Assessment results (Appendix 2 Tables 9-18)

- 8 4 The processing of samples from Marne Barracks produced variable volumes and compositions of flots Seventeen of the contexts assessed contained charred plant remains, while twelve also contained low numbers of waterlogged seeds Only two contexts contained finds in the sample residues, although all contained limited quantities of tiny iron fragments These remains were present in very low quantities and consequently do not indicate on-site industrial activity

Discussion of assessment

Trench N5

- 8 5 The processing of three samples from Trench N5 produced relatively small volumes of flots, mainly comprising coarse sand and root material Occasional fragments of charcoal were found in the flots of contexts 13 and 15, while low numbers of cinder/clinker fragments were preserved in all three contexts Contexts 11 and 13 contained no plant macrofossils and context 15 contained only two degraded, unidentifiable charred grains The environmental evidence from this trench, therefore, is sparse

Trench N6

- 8 6 Contexts 32 and 39, located in Trench N6, contained mainly mineral material, with only small quantities of fuel waste (charcoal, coal and clinker/cinder) No plant macrofossils were preserved in these two contexts Contexts 26 and 30, also contained only low proportions of fuel waste, however, charred plant remains were preserved in both Context 26 contained two degraded wheat glume bases, a cereal grain and a heath grass seed, the latter commonly found in Iron Age and Romano-British contexts (ASUD 20011) Spelt glume bases and cereal grains were present in the flots of context 30 The higher proportion of chaff than cereal grain in the flots suggests that the remains may have

derived from cereal processing and/or cultivation. Further analysis of these remains is described below (para 8.21 – 8.28)

Trench S2

- 8.7 Samples from Trench S2 were extracted from contexts 47, 48, 49 and 51. The flots produced by the processing of these four samples were relatively small, and contained charcoal, root material and coarse sand. Only two charred plant macrofossils were preserved in the contexts, a spelt wheat glume base in context 48 and a degraded cereal grain in context 51. This limited quantity of remains indicates that domestic or agricultural waste was not deposited in the contexts and, consequently, the environmental evidence is limited.

Trench S4

- 8.8 The ditch fill context 76 from Trench S4 contained two unidentifiable charred cereal grains and a single charred weed seed. Little environmental or economic data can be derived from these remains. Occasional waterlogged seeds were present. However, as there are no flot matrix components that indicate the context to have been waterlogged, these seeds are probably not contemporary with context 76.

Trench S6

- 8.9 No charred plant macrofossils were preserved in contexts 160 or 162, both from Trench S6. An insignificant number of waterlogged seeds were preserved in context 160. The contexts' flots contained sand, root material and occasional charcoal fragments, but contained little environmental evidence.

Trench S7

- 8.10 The flot from context 167, extracted from Trench S7, was similar to those from Trench S6. Neither charred nor waterlogged seeds were present in the sample flot.

Trench S9

- 8.11 The posthole/small pit fill context 103, extracted from Trench S9, produced a large volume of flot containing a high proportion of charcoal, indicating that the context had been infilled with burnt fuel waste. The flot did not, however, contain charred or waterlogged plant macrofossils. Context 105 contained charcoal and two charred cereal grains, as well as bone, pot and other remains, indicating that the context received waste material. Only a small quantity of charcoal was contained within the sample from context 107, with a single degraded charred grain and a small number of legume fragments. Similar flot compositions were produced by the processing of material from contexts 109 and 115, which included charcoal and mineralogical material. The flots also contained charred barley, wheat and oat grains. The majority of the grain, however, was too degraded to be identified. This suggests that conditions prior to or following burial were not suitable for plant macrofossil preservation. Single oat grains were also present in the flots of contexts 117 and 119 from Trench S9, while contexts 125 and 127 contained only unidentifiable charred cereal grain.

Trench S10

- 8 12 Context 123, the fill of a palisade trench, contained a large number of charred plant macrofossils, including wheat grains, barley grains, oat grains and chaff, rye grains and chaff, legumes and weed seeds. The presence of cereal chaff suggests that the remains derived from cereal processing and/or cultivation (Hillman 1981). Some of the cereal species in the context, in particular rye and oat, are commonly found on sites dating from the Anglo-Saxon and medieval periods, although pottery of Iron Age Tradition was also found in this context. Radiocarbon dates would therefore be necessary to ascertain the date of this context. Small volumes of flots were produced by the processing of samples from contexts 134, 136, 139 and 141. All of these contexts, however, contained charred plant macrofossils including oat, barley and wheat grains. The remaining four environmental samples from Trench S10, from contexts 121, 129, 130 and 134 contained no charred plant macrofossils.

Trench S11

- 8 13 No charred plant macrofossils and only one waterlogged seed were preserved in the sample from context 156. The flots included only small quantities of charcoal and coal, and comprised mainly root material and sand. The context, therefore, produced little environmental data.

Trench S12

- 8 14 Occasional charcoal fragments were preserved in the samples from Trench S12, although no charred plant macrofossils were found in the flots. Two of the samples, from contexts 191 and 208, contained low numbers of waterlogged remains. None of the samples from Trench S12, therefore, produced significant environmental evidence.

Trench S13

- 8 15 Only small volumes of material were processed from contexts within Trench S13, all of which were post and stakeholes. None of the contexts, however, contained charred plant macrofossils, while three contained a small number of waterlogged seeds. Four of the contexts contained occasional charcoal, coal and clinker/cinder, although such low quantities suggest that fuel waste was not dumped directly into the contexts.

Trench S14

- 8 16 Context 87, a ditch fill, produced a moderate volume of flots containing a small quantity of charcoal, but no plant macrofossils. Two waterlogged seeds were present in the flots, however, the remains are not significant.

Trench S15

- 8 17 The moderate volume of flots from context 88, a ditch fill, comprised a diverse matrix, but with only low quantities of coal and charcoal. Neither charred nor waterlogged plant macrofossils were preserved in the flots, indicating that the context was not infilled with waste material.

Trench S18

- 8 18 Two samples were taken from Trench S18 for environmental assessment, from contexts 83 and 85. The former contained a small number of waterlogged

seeds, while the latter contained a single charred undentifiable cereal grain and a single charred legume. Low quantities of fuel waste were present in the samples.

Recommendations

- 8 19 Further analyses are not recommended for the contexts from Trenches N5, S2, S4, S6, S7, S9, S11, S12, S13, S14, S15 or S18, due to the absence or limited potential of botanical remains.
- 8 20 Full analysis and radiocarbon dating was recommended for contexts 26 and 30 from Trench N6 and for context 123 from Trench S10. This has been undertaken for contexts 26 and 30 (below).

Analysis and dating of contexts 26 and 30

- 8 21 The processing of these fine grained samples produced moderate volumes of flots, both of which predominantly comprised minerogenic material and occasional finds of hammer scale and charcoal (Appendix 2, Table 11). A single coal fragment was present in the flots of context 30. Charred plant macrofossils were preserved in both samples, although in higher quantities in context 30. Context 26 contained charred weed, grass and wetland seeds alongside cereal chaff and degraded cereal grain (Figure A). The charred plant macrofossils in context 30 included weed and grass seeds, cereal grain and chaff (Figure B). Overall, cereal grains and chaff dominated the finds (Figure C). No finds were present in the >10mm fractions of the samples' residues while insignificant quantities of ferrous metal were found in the <10mm fractions of the residues.
- 8 22 AMS dates were obtained for charred botanical remains from contexts 26 and 30 (para 5 29). Both dates were determined as late Iron Age. The closeness of the dates, considering the error margins associated with AMS dating, indicates that the deposition of contexts 26 and 30 was broadly synchronous.

Figure A

Context 26 Charred Plant Macrofossils

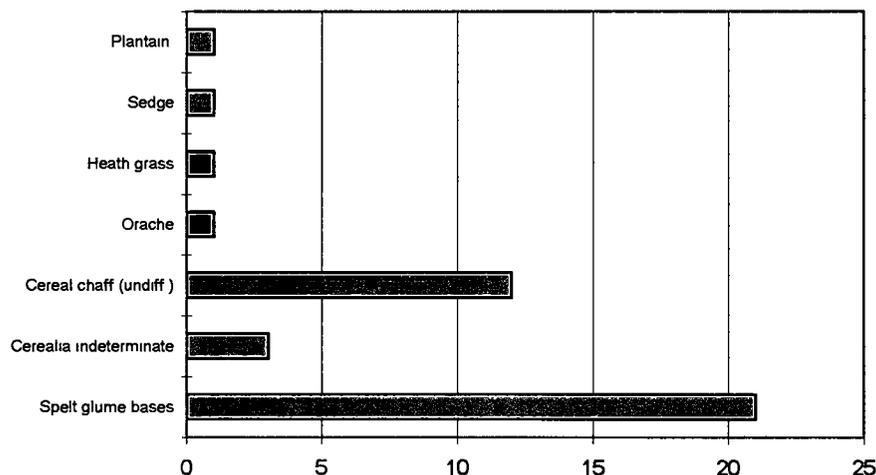


Figure B

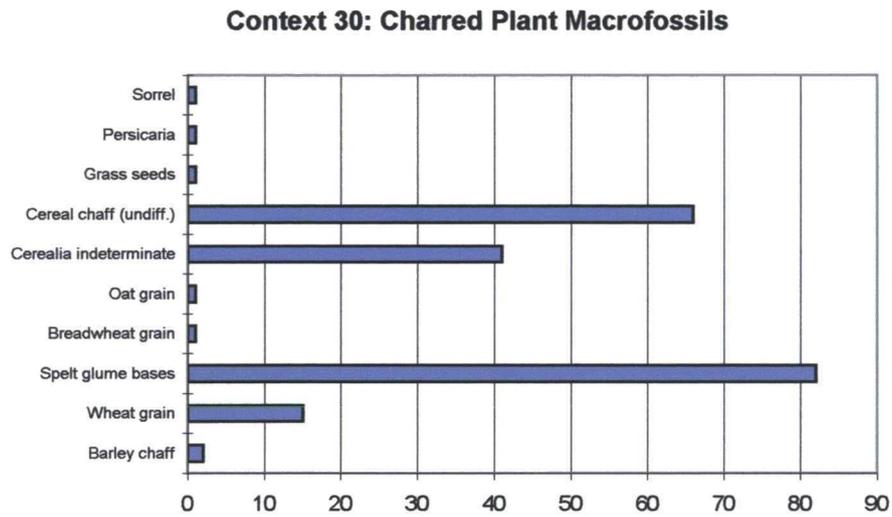


Figure C

Comparison of Charred Remains from Contexts 26 and 30

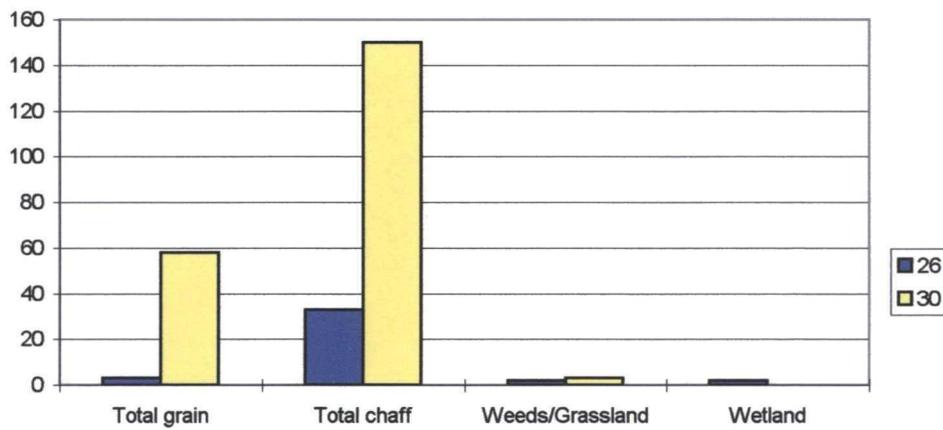


Figure D

Proportions of Charred Remains in Context 26

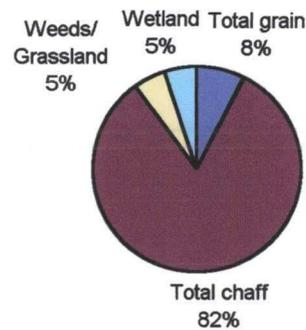


Figure E

Proportions of Charred Remains in Context 30

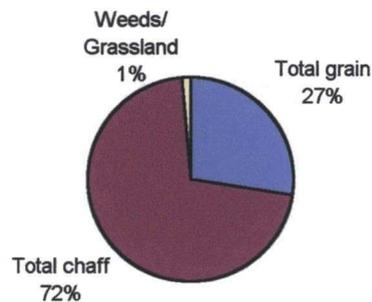
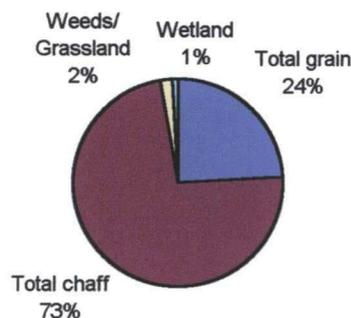


Figure F

Total Charred Remains From Contexts 26 & 30

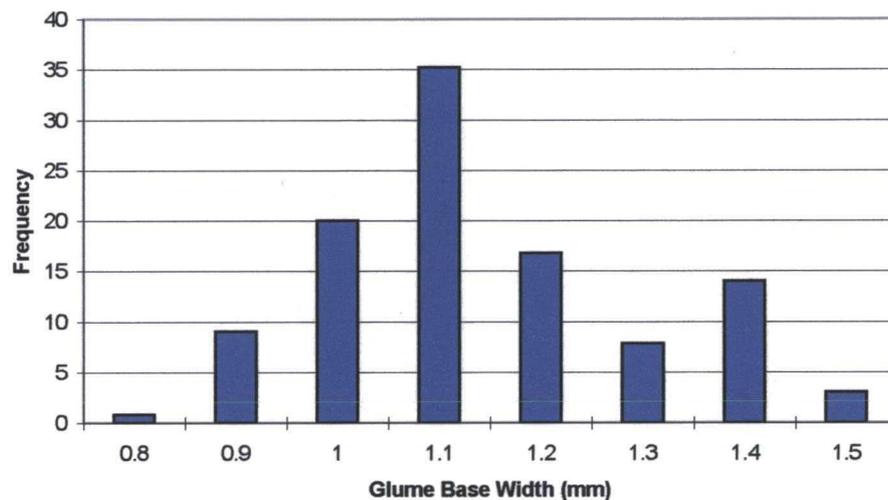


Discussion

- 8.23 The composition of cereal species within the two samples includes spelt wheat, barley and breadwheat. Both spelt wheat and barley are commonly found in Iron Age deposits from northern England, with both crops being cultivated during the Iron Age and through the Roman occupation (Heslop 1987, van der Veen 1992, ASUD 2000). Only one breadwheat grain was found in context 30. Breadwheat was increasingly grown as a crop from the late Romano-British period onwards, however occasional finds from Iron Age sites (e.g. van der Veen 1992; 1994, ASUD 2000) indicate small-scale consumption. An oat grain was also present in context 30, but this is likely to have originated from a wild oat species, as opposed to a cultivated species, as oat production is not believed to have commenced until the Anglo-Saxon period (Huntley & Stallibrass 1995).
- 8.24 As represented in Figures A, B and C few weeds or grassland species were present in either context. The species preserved are representative of an open landscape, with the presence of heath grass and sedge suggesting some areas of damp or waterlogged ground. Palaeoenvironmental data from the region are

sparse, although data from the North York Moors to the south, indicate an open landscape during the late prehistoric period (Atherton 1976). The low numbers of seeds from contexts 26 and 30 limit the extent to which the data can be used to augment the palaeoenvironmental record.

- 8.25 Analyses of the proportions of chaff, weeds and other seeds in contexts 26 and 30 (Figures D, E and F) indicate the dominance of chaff remains, comprising spelt wheat glume bases, barley rachis and degraded wheat glume bases. The presence of charred chaff in archaeological deposits can be interpreted as the result of crop processing, whereby the chaff represents a waste product from processes such as winnowing and sieving which is inadvertently burnt (Hillman 1981). According to Hillman's model, the presence of 'heavy' chaff, such as the glume bases and rachis present in contexts 26 and 30, represents the latter stages of crop processing. The waste from cereal processing is thought to be inadvertently charred as a consequence of being near to hearths, ovens or bonfires. In numerous archaeological deposits, charred material is found in association with fuel waste material such as charcoal or coal (e.g. ASUD 2001f/g/h). The minute quantities of charcoal in the Catterick samples may suggest that the waste did not come into contact with fire as proposed by the Hillman (1981) model. Recent research has acknowledged the utility of cereal chaff for numerous purposes, including fuel, fodder and thatch (Smith 2001, ASUD forthcoming). The presence of cereal waste, predominantly chaff, without charcoal may indicate therefore that the material could have been used as fuel or construction material prior to being charred. The use of spelt wheat chaff as a fuel has also been proposed by Huntley (in Busby *et al.* 1996), during the analysis of plant remains from the pottery kiln excavated at Marne Barracks in 1994.
- 8.26 Although the cereal chaff and grain in contexts 26 and 30 may not have been deposited in the ditches directly as waste from crop processing activities, the presence of agricultural waste products at the site does indicate some on-site arable production. AMS dating of charred material from the ditches provided a late Iron Age date. Pastoralism may have been more common-place during the early stages of the Iron Age, however, the latter stages saw increases in arable cultivation, as verified by other studies in north-east England (Heslop 1987, van der Veen 1992, Huntley 1995, ASUD 2001f/h). The site may, therefore, have formed part of a small native farmstead such as those described by Clack (1982), who proposed that many such farmsteads may have continued production into the Romano-British period, and may have been utilised by the Romans to supply nearby settlements such as *Cataractonium*.
- 8.27 The results of spelt glume base width measurements indicate that the widths lie within a range from 0.8mm to 1.5mm (Figure G). The distribution of sizes shows a slightly negative skew, although it is acknowledged that the data-set used is small. Helbaek (1952) measured spelt wheat glume base widths from Roman sites in southern Britain, which resulted in a size range from 0.89mm to 1.54 mm. Some studies of spelt size from northern sites have determined slightly smaller glume widths to southern counterparts.

Figure G Distribution of spelt glume base widths from contexts 26 and 30

These differences have been attributed to less favourable growing conditions, with respect to climate and soils (cf Huntley 1989). However, the distribution observed from contexts 26 and 30, and from the analysis of spelt from Catterick by Busby *et al.* (1996), indicates that the spelt glume base widths lie within the Helbaek range. This may suggest that there was less environmental influence over the size of spelt grains produced than previously believed, although it is accepted that factors such as seasonality and taphonomic processes will have affected the distribution. These analyses provide a data-set for further study into the differing characteristics of grain produced in southern and northern England.

Conclusions

- 8.28 Analysis of late Iron Age to early Romano-British charred plant remains from Marne Barracks has determined the similarity in cereal species produced to those at other sites in northern England. The limited number of seeds preserved has prevented extensive analyses of the former environmental conditions at the site. The proportions of chaff, grain and seeds present in the samples, alongside the matrix components of the flots, has indicated that although the remains derive from agricultural waste, they may have been used for another purpose such as fuel or fodder. Although limited, the data produced during the analyses can be added to the regional database, to ascertain trends in agricultural production during the Iron Age/Romano-British transition.

9. The archaeological resource

- 9.1 Subsequent to this evaluation, the known archaeological resource at Marne Barracks and its immediate environs is outlined below. Excellent reviews and discussions of both early Anglian and Roman Catterick, as well as notes on the historical background to research in the area, are provided by Wilson (1984, 2002 and Wilson *et al.* 1996) and interested parties are directed to those papers. Much of the following information regarding the historical background is based on Wilson's 1984 and 1996 papers.

- 9 2 In order to assist with future planning decisions for the airfield area to the north of the runway a schematic section through the deposits has been prepared (Figure 21), at the request of the Heritage Unit at North Yorkshire County Council. The drawing shows the depths of redeposited material, archaeological features and subsoils. The information is derived from Air Ministry drawings (see ASUD 2001a) and from the evaluation trenches in that area.
- Prehistory (to AD 43)
- 9 3 There is no evidence for the presence of people in the area during the Palaeolithic (Old Stone Age, up to c 8800 BC), during which time Catterick would have been right on the edge of the Devensian ice sheet. The first limited evidence for human activity around Catterick is during the Mesolithic (Middle Stone Age, c 8800-4000 BC), the early post-glacial period. People were hunter/gatherers, largely nomadic and leaving little trace of their activities with the exception of flint tools. A few such tools have been found during fieldwalking along the west side of the A1, north and south of Bamesse Farm (Wilson 1994), which would originally have been lost or discarded perhaps at a temporary camp or while following a herd of migrating animals such as red deer.
- 9 4 There is considerable evidence for the presence of people in the Catterick area later in prehistory. In the Neolithic period (New Stone Age, c 4000-1800 BC) people started to cultivate crops and practice stock husbandry, and so began to lead a more sedentary life with more permanent settlements and more tangible archaeological remains. Although there is currently no direct evidence for occupation sites in the area, substantial monuments built by Neolithic and Bronze Age (c 1800-750 BC) people have survived, to some extent, north of the barracks. While the precise function of some of the monuments remains unclear, the manpower and social organisation required for such constructions indicates the significant role that beliefs and ritual played in the lives of these people.
- 9 5 The presence of a cursus at Scorton has been known for some time. This is a huge earthwork comprising two parallel ditches running across the landscape for some 2 km, forming a ceremonial avenue. Just to the west of the cursus, ring-ditches and pit alignments of late Neolithic/early Bronze Age date, as well as Iron Age roundhouses, were discovered in 1997 during works for an extension to Scorton Quarry (NAA in prep). To the south of the River Swale, at Catterick Racecourse, a huge late Neolithic/early Bronze Age mound of stones was revealed by excavation in 1995 (Moloney 1996, Moloney *et al* forthcoming). The cairn was surrounded by a kerb of large boulders and contained eight small, empty chambers, also made of large river boulders. The chambers are believed to be the graves of important people, whose bones had decayed in the dry, aerobic burial conditions. Several nearby pits were found to contain Neolithic decorated pottery vessels, a stone axe and various flint tools, together with many burnt animal bones and evidence for other types of food including hazelnuts and apples, perhaps the remains of feasting. An Iron Age enclosure and roundhouses were also excavated at the racecourse.

- 9 6 With regard to this evaluation at Mame Barracks, lithic evidence for prehistoric activity was recovered in the form of three flints. None of the flints were from sealed archaeological contexts. Two undiagnostic flakes were recovered from trenches N6 and N7 in the north-eastern part of the airfield and a narrow Neolithic blade was found in S7, in the central southern part of the airfield.
- 9 7 Charcoal and charred cereal grain from the fill of ditch F16 (Trench N5) has been radiocarbon dated to cal BC 920 to 800 (Beta-166801), the late Bronze Age/very early Iron Age. Only the lower part of the ditch survived but measured 2.5m in width, it seems likely that this would have been a significant feature of the late Bronze Age landscape. The feature was not identified magnetically, probably due to its depth from the existing ground surface, the overburden from landscaping and the shallowness of its remaining fill.
- 9 8 Numerous pottery sherds and cut features were identified, broadly dated to the Iron Age. The majority of these features were found to the south of the runway, however, at least two (F27 & F31) were identified in the north-eastern part of the airfield (Trench N6). These ditch features, and three postholes, were stratigraphically lower than medieval ridge and furrow remains, and contained plant macrofossils typically found in Iron Age or Romano-British contexts. The macrofossils have been radiocarbon dated and the results confirm their late Iron Age (possibly early Roman) date.
- 9 9 A palisade trench (F124) with stakeholes was identified in trench S10, and contained two sherds from a handmade jar of Iron Age Tradition, the production of which continued into the Roman period. The fills of the trench and stakeholes, however, contained cereal remains typical of the Anglo-Saxon or medieval periods. The dating of this feature therefore remains uncertain, but it is possible that it continued in use over a long period.
- 9 10 A large, circular stone wall (F174/205) set within a ring-ditch (F176/239) in S12 has also been dated to the later prehistoric period. 19 sherds of Iron Age Tradition pottery were recovered from the soil matrix between the stones. The function of this substantial feature, measuring c 20m in diameter, is yet to be established, however, it is larger than would be expected of a domestic structure. Similar structures, though smaller, with stone elements in the walls have been excavated at Scorton and Roxby (Inman *et al* 1985) and found to contain evidence for metalworking. No such evidence was recovered during the trial excavation at Mame Barracks.
- 9 11 During the Iron Age (c 750 BC-AD 43) Catterick was part of the territory occupied by a tribe called the Brigantes, a main centre for whom lay c 15 km to the north at Stanwick. A settlement dating to this period was identified from the air in the 1970s at Catterick Racecourse and excavated in 1995 prior to mineral extraction (Moloney 1996). A similar early Iron Age site was identified in Pallett Hill Quarry, just to the south, in the 1980s. These sites typically comprise a rectilinear enclosure defined by ditches, within which were roundhouses, again enclosed by ditches, and areas for storage and stock. These are precisely the types of features that were identified in the geophysical

survey of the airfield, and which could even date to the Bronze Age. In contrast to earlier periods, for which we have burial and other ritual evidence but no occupation sites, the Iron Age in the Catterick area is characterised by small settlements but, as yet, no evidence for burials.

- 9 12 The archaeological resource for the prehistoric period at Marne Barracks therefore comprises
- Limited lithic evidence for Neolithic activity
 - Late Bronze Age/early Iron Age ditch north of the runway
 - Late Iron Age (or possibly very early Roman) ditches and postholes north of the runway
 - Possible Iron Age palisaded enclosure and occupation south of the runway
 - Substantial Iron Age circular stone building south of the runway
 - Various other features, of unknown date and extent
- 9 13 The potential for further prehistoric remains to survive beneath areas of overburden or ridge and furrow has been demonstrated by the presence of ditches F16, F27 and F31
- Roman (AD 43-410)
- 9 14 In AD 43 the Roman army invaded Britain. Within a few decades most of the local tribes had been subdued, a network of roads had been established and towns had started to develop. The native Brigantian stronghold at Stanwick, to the north of Catterick near Darlington, fell to the Romans in AD 72.
- 9 15 *Cataractonium*, the Roman town at Catterick Bridge, lies strategically at the point where the low ridge that carries the Dere Street Roman road crosses the River Swale. Dere Street was the main north-south highway connecting the legionary fortress at York with the forts of the Hadrianic frontier. The numerous excavations which have been carried out in this area have demonstrated the development of this major Roman site from an Agricolan fort, established in c AD 80, to a prosperous small 4th century town (Wacher 1971, Wilson 2002), making this one of the most important Roman sites in northern Britain.
- 9 16 With the construction of Hadrian's Wall in the 120s came the abandonment of many of the forts to the south. This appears to be the case at Catterick. The *vicus*, a civilian settlement outside the fort, however, grew and a timber *mansio* (posting station for official travellers) was soon built at the core of the developing settlement. The fort was re-occupied in c AD 160 and the civilian settlement flourished around a new, larger, stone-built *mansio*. A possible amphitheatre was also constructed to the south of the town at this time (Moloney 1996). Excavations on the north side of the Swale have demonstrated the presence of a possible temple and civilian settlement there in the later 2nd to 4th centuries. An extensive roadside settlement had also been developing to the south of the town, culminating in a Roman 'village' centred

on Bainesse Farm. The settlement had begun in the 1st century and flourished in the 2nd, when earlier timber buildings were replaced in stone (Wilson 1994)

- 9 17 By c 300 a major system of defences had been built around *Cataractonium*. At about this time, much of the Bainesse settlement had been abandoned and a possible villa appears to have been established within the Mame Barracks site. This would probably have been at the centre of a large agricultural holding. There is the potential, during extensive works at the site, for completing the plan of the possible villa buildings at Mame. The remains of parts of a 4th century Roman field system have been found on the former airfield at Mame (GeoQuest Associates 1994) and other Roman field systems have been identified to the west of the A1 (Wilson 1994). The geophysical survey for this project also identified tracks and ditched enclosures to the south of the runway, which could be contemporary. The extent and character of this site remain largely unknown. A later survival of the Bainesse village is a pottery kiln, discovered just within the Barracks site in 1994. This is the first kiln from Roman Catterick and pottery found within it dates to the late 3rd/early 4th centuries (Busby *et al* 1996). Roman burials have also been identified outside the main entrance to Mame Barracks (Wilson 1994).
- 9 18 The fort at *Cataractonium* was again occupied from c 370-400, after which it was abandoned for the last time. (Recent evidence indicates that there may not have been any discontinuity in the Roman military occupation of Catterick, with the exception of c AD 120-160 – pers comm Pete Wilson). Many of the civilian buildings are by now built in timber, perhaps indicative of a general decline in the town, which appears to be abandoned shortly after c 400. Occupation of the possible villa at Mame may have continued into the 5th century, but by the 6th century it was almost certainly in a ruinous condition, since Anglian burials cut through the walls.
- 9 19 A number of features dating to the Roman period were excavated during the course of this evaluation. These are exclusively to the south of the runway, with the possible exception of two ditches in Trench N6 (above, para 9 7). Material culture dating to the Roman period was recovered from five other trenches: S9, S10, S12, S15 and S18. In Trench S9 a large pit (F106) contained four fragments of broken quem-stone, two worked sandstone blocks, tuffa fragments (possibly roofing material), animal bone (including a horse skull) and a single sherd of Sandy Greyware (a regionally copied and produced version of Black Burnished Ware), dating to the 2nd-4th centuries. The building materials are almost certainly derived from a structure which was located near the trench, or possibly even from the 'villa' buildings beneath the existing Roman Catholic Chapel. One of the worked sandstone blocks is reddened and cracked from burning and so it may be that the building materials come from a structure which had been destroyed by fire. From a narrow gully (F126) within the same trench, more building material was recovered, in the form of two small fragments of Roman tile. Two boundary ditches, both aligned approximately north-south could also date from the Roman period. In Trench S10 a single sherd of a Roman flagon was recovered from a ditch (F122). In Trench S12 a rim sherd from a dish or bowl was recovered from another ditch (F209), dating to the 2nd-4th centuries.

- 9 20 The only other Roman finds from this evaluation comprised an unstratified fragment of *tegula* (tile) from Trench S15, and residual pottery sherds from within both a ditch fill and re-deposited layers in Trench S18. It is likely, however, that a number of other features, as yet undated, are indeed Roman.
- 9 21 The known archaeological resource for the Roman period at Marne Barracks therefore comprises
- late 3rd/early 4th century buildings, perhaps part of a large villa complex of unknown extent
 - remains of 4th century enclosures and field systems of uncertain extent
 - a late 3rd/early 4th century pottery kiln
 - miscellaneous Roman ditches and possible pits near the kiln, being part of the Baines Farm settlement
 - possible very early Roman (or late Iron Age) ditches and postholes north of the runway
 - several ditches, gullies and pits with occupation evidence south of the runway
- 9 22 The potential resource may also include
- at least a second pottery kiln, as these were usually built in pairs
 - Roman burials
 - further field systems, tracks, enclosures and possible roundhouses

Post-Roman/Anglian to Norman Conquest (AD 410-1066)

- 9 23 In recent years a convincing argument has been made for the existence of small British kingdoms in the north of England during the immediate post-Roman period. Although there is no definite evidence for such a kingdom being centred on Catterick, its status as an important estate centre in the early Anglian period would not be inconsistent with such an origin. A considerable body of evidence for Anglian presence in the Catterick area has been amassed over the years (see Wilson *et al* 1996).
- 9 24 Certainly there seem to have been strong British chiefs in the north who resisted the flow northwards of Anglo-Saxons for over a century. Historical references to *Catraeth* (probably Catterick) in the poem *Y Gododdin*, by Aneirin, may be the earliest post-Roman records relating to Catterick and the British resistance. The poem records that 300 British warriors, led by Urien of Rheged, were killed by Angles in a battle at *Catraeth* in c 600. It is possible that the 'ramparts of the stronghold' described by Aneirin are in fact the earthworks at Castle Hills. The topographic survey of these earthworks, undertaken as part of this study, identified the remains of other earthworks outside the Norman motte and bailey castle, which could indeed have an earlier, post-Roman origin (ASUD 2001a). Charcoal from within ditch F14 in Trench N6, just 150m from Castle Hills, has been dated to this period: cal AD 420 to 610 (2 σ , Beta-166800).

- 9 25 The attribution of an Anglian royal burgh or vill to Castle Hills remains largely conjectural, based on both historical accounts and the topographic factors. The site is believed to have been a high point in the landscape since the start of the post-glacial period and the central places in northern British estates typically used such high points. There is also evidence for the adoption and adaptation of such native British sites by the Angles, such as at Yeavering (Alcock 1987).
- 9 26 Several historical references also cite Catterick as an important centre in the early Anglian period, a place where royal weddings and baptisms took place. The location of the main centre of Anglian occupation remains largely conjectural, but is presumed to be under the present village of Catterick. Nevertheless, sunken-featured buildings, or *Grubenhauser*, have so far been identified at four locations in the Catterick area. These buildings of 6th century date have been excavated amongst the remains of 4th century Roman buildings on the north side of the River Swale, in the southern part of Pallett Hill Quarry, at the former coal depot in Catterick village, and on the former RAF airfield, now under the REME workshop (Wilson *et al* 1996). The function of these buildings is still not clear. In some cases the evidence indicates use as dwellings, but typically they appear to have been used for storage or as workshops, such as for weaving. Almost invariably, the last phase of use of these structures seems to be for rubbish disposal. The discovery of further sunken-featured buildings at Mame Barracks would potentially help to establish the function of these enigmatic features. No more of these features were identified during the present evaluation.
- 9 27 A number of other recorded features, as yet undated, could reflect Anglo-Saxon use or occupation of the area.
- 9 28 Despite the paucity of settlement remains, there have been numerous discoveries of Anglian burials throughout the Catterick area. Cemeteries, or parts thereof, have been identified during investigations at Scorton Quarry, immediately north of Catterick Bridge, at the southern end of the Racecourse, at two locations to the north of Baines Farm, outside the entrance to Mame Barracks, and cut into Roman buildings at two locations within Mame Barracks (*ibid*). The burials in and around Mame and Baines could all be part of an extensive cemetery extending over 1 km, however, it seems likely that two or more discrete cemeteries are represented. The remains of Anglo-Saxon burials are also indicated on the 1st edition OS map of 1857 immediately south of Mame next to the A1, although no evidence for this has been produced in recent times. The majority of these burials have been dated to the 6th century, however, some from the Racecourse cemetery and possibly from the CAS Site 46 excavation, may be 5th century in date. The orientation of most of the burials at Site 46 appears to be deliberately related to the alignment of the underlying Roman buildings, indicating that they were recognisable either as mounds or earthworks when the site was used for burial. Burials offer huge potential for the study and understanding of past societies. The study of discrete burial groups for this period is still in its infancy. Are different sections of society in life reflected in death by different burial practises, and does this vary from one region to another? The positions of

bodies in graves can differ, e.g. crouched/extended, as can the inclusion, variety or absence of grave goods. All of these factors can help to determine social identities.

- 9 29 The later Anglian (after the late 8th century) history of the area is undocumented. A few Viking artefacts have been found in the Catterick area. It seems likely that Catterick remained at the centre of an important estate, since at the time of the Domesday Survey it was one of the two largest manors in Richmondshire. It is possible the ridge and furrow farming system, evident over much of the airfield, may have pre-Conquest origins. No ridge and furrow remains were identified by a walkover survey of the grassed areas in the northern part of the barracks.
- 9 30 There is great potential in the Catterick area to investigate the late Roman-early medieval interface, a period for which little is currently known. The opportunity for such studies at Catterick was missed during the large excavations of the 1950s and 1960s, when much material was bull-dozed away in order to reveal the Roman buildings.
- 9 31 The known archaeological resource for the post-Roman/Anglian period at Mame Barracks comprises
- ditch F14 just south-west of Castle Hills
 - one or more cemeteries, of unknown extent
 - a sunken-featured building ('Grubenhaus')
- 9 32 The potential resource may also include
- British or Anglian earthworks at Castle Hills
 - re-use of palisaded enclosure F124
 - more burials
 - field systems, tracks, enclosures and further buildings
 - ridge and furrow cultivation

Post-Conquest (AD 1066-1485)

- 9 33 The evidence for post-Conquest archaeological remains at Mame currently comprises the Norman motte and bailey castle at Castle Hills, together with ridge and furrow remains, a pit (F116) and possibly ditch F84.
- 9 34 The castle is a Scheduled Ancient Monument (NY 299) and as such enjoys statutory protection. The location of the castle provides an easily defensible position, using natural high ground and the River Swale to the east. The Swale was closer to the castle in the medieval period, possibly at the base of the motte on its eastern side. A former course of the river can be identified here on aerial photographs (e.g. 1933 & 1998). The original purpose of the Norman earthworks may have been to overlook a river crossing or ford. Indeed, in earlier times the Swale may even have been navigable by shallow-draught vessels up to this point. Although the motte and bailey castle here is of Norman date, some of the earthworks may have earlier origins. As well as the

River Swale, the defended site here would also, at least in post-Roman times, have afforded good views of movements along the former Dere Street

- 9 35 The geophysical survey undertaken during Phase 1 of this project has already demonstrated that the majority of the airfield was in arable cultivation during the medieval period (ASUD 2001a) Although the ridge and furrow remains can only be seen on the surface in two locations, they have been detected geomagnetically across most of the area
- 9 36 The only other finds of medieval material culture include unstratified sherds, recovered from either the topsoil or from re-deposited layers Unstratified early medieval/medieval sherds were most common in Trenches S3 and S18, on the western side of the airfield
- 9 37 The known archaeological resource for the post-Conquest period at Mame Barracks comprises
- motte and bailey castle
 - ridge and furrow cultivation across most of the airfield
 - a single pit and ditch south of the main way

Post-medieval (AD 1485-1900)

- 9 38 The main north-south road through the area at this time did not follow the course of the present A1 road At the southern limit of the Mame Barracks site the 18th century road turned abruptly to the north east, to Oran hamlet, and then north-west and north through Catterick Village This road traversed what is now the airfield and is evident both in the geophysical survey image, old maps and on aerial photographs Leeming Lane, along the western limit of the study area, is first shown on the tithe map of 1842, and will have taken the vast majority of traffic that had previously used the Oran road
- 9 39 Ditch F10 in Trench N2 has not been dated artefactually but given that it is parallel and adjacent to the former Oran Road it is likely that it was a drainage ditch for the road and is therefore also post-medieval in date
- 9 40 Early maps indicate that the surrounding land had been enclosed by this time and that the study area comprised a series of north-east/south-west fields The field boundaries were progressively removed until about 1900 Ditch F18 in Trenches N4/5 contained post-medieval pottery The function of the ditch is not certain but it is likely that it served as a field boundary since it is on the same alignment as the known former field boundaries
- 9 41 A field drain in Trench N7, and possibly ditch F84 in Trench S18, together with unstratified artefacts, comprise the remaining evidence for post-medieval activity recovered during the evaluation
- 9 42 There are eight listed buildings in the study area, all dating to this period and all within the Oran House building group on the south side of the airfield The buildings are all Grade II listed and as such enjoy statutory protection The existing Oran House and all but one of the outbuildings date to c 1830 The

barn is believed to date to the 18th century and was presumably associated with an earlier house and outbuildings shown on maps as early as 1739

- 9 43 The known archaeological resource for the post-medieval period at Mame Barracks comprises
- Oran House and outbuildings
 - Former road north from Oran House, with at least one probable drainage ditch
 - Former field boundaries

Modern (AD 1900-present)

- 9 44 In the early part of the 20th century the study area became Catterick Aerodrome. This resource has been assessed in a companion report for this project on the history and development of RAF Catterick (Francis 2001). There are currently some 122 buildings not including the Oran group and 84 Service Family Quarters. Although a few buildings of WWI origin survive, the majority of the buildings date from 1925-1944. It is understood that the listing of Buildings 68, 54, 31, 46 and 124 will be recommended by English Heritage to the Secretary of State in a report to be submitted in 2001.

- 9 45 Many of the geophysical anomalies detected on the airfield relate to activities undertaken in this period, such as landscaping, runway lighting and other services and possible buildings or compounds. The nature of some of these anomalies has been confirmed by the evaluation trenching. For example, the building foundations in Trench N1, a former metal fence in N7 and two rows of 6" nails in S5 (It is thought these may have been used to peg down a target during bombing practice).

10 Conclusions and recommendations

- 10 1 The works comprised the excavation of 26 trenches on the airfield at Mame Barracks, together with appropriate post-excavation assessment and formulation of recommendations for further work, in accordance with an approved Project Design (ASUD 2001c). Limited post-excavation analyses of materials north of the runway have been undertaken, in accordance with the recommendations contained in the draft evaluation report (ASUD 2001e).
- 10 2 In so far as the evidence permits, the works have addressed the research objectives set out in Section 2 of this report. As well as answering specific questions, the evaluation has highlighted the significant archaeological potential of four areas on the airfield. One area lies to the north of the runway while the other three lie to the south. Areas of high and medium archaeological potential have also been identified elsewhere in the study area (Figure 22).
- 10 3 In the northern part of the airfield, a ditch of probable late Bronze Age date has been identified beneath a layer of infill from landscaping operations, and two probable late Iron Age ditches have been found to survive beneath the medieval ridge and furrow remains. Another ditch in this area has been dated

- to the post-Roman period and may be associated with the nearby motte and bailey castle at Castle Hills. If any future development requiring ground disturbance is proposed for this area, it is recommended that further archaeological excavation is carried out prior to such development.
- 10 4 Given the current development proposals, by completing the recommended post-excavation works and reporting for land north of the runway (ASUD 2001e), the MoD has completed their investigation of the archaeological resource in that area.
- 10 5 A number of late prehistoric and Roman features have been sampled south of the runway, including a palisade trench, a large stone-walled structure and numerous ditches, pits and post and stakeholes. Having identified the archaeological 'risk', in terms of development, for land to the south of the runway, it is understood that the MoD will dispose of the area as previously agreed to the National Army Museum (NAM North). It is also understood that any further requirement for archaeological work in this area will be the responsibility of NAM.
- 10 6 As before, with regard to the three highlighted areas south of the runway, further archaeological excavation is recommended prior to development. Each of these three areas has the potential to elucidate the late prehistoric/Romano-British history of the area. If, however, no further excavation is required, it is recommended that the more specific post-excavation works, as identified below, are undertaken as a minimum requirement.

Trench S1

- 10 7 Ridge and furrow remains only were identified in this trench. These are presumed to be medieval in date. No further work is recommended.

Trench S2

- 10 8 An undated double-ditched trackway and posthole were identified here. It would be possible to obtain radiocarbon dates from one of the ditches (F40). Given that the trackway appears to head towards the Roman roadside settlement at Bainsse Farm it is recommended that dates are commissioned for this feature.

Trench S3

- 10 9 One undated ditch (F57) was identified in the trench. No material suitable for radiocarbon dating was recovered from this feature. No further work is recommended.

Trench S4

- 10 10 One undated ditch (F77) was identified in the trench. It is recommended that a radiocarbon date is obtained for the fill of this feature.

Trench S5

- 10 11 Four irregular ditches were identified in this trench. None are dated and none contain organic remains suitable for dating. No further work is recommended.

Trench S6

- 10 12 One undated ditch (F161) and one undated pit (F163) were identified in the trench. Neither feature is dated and neither contained material suitable for radiocarbon dating. No further work is recommended.

Trench S7

- 10 13 One undated ditch (F168) was identified in the trench. No material suitable for radiocarbon dating was recovered from this feature. No further work is recommended.

Trench S8

- 10 14 No archaeological features were identified in this trench. No further work is recommended.

Trench S9

- 10 15 A variety of features including four pits, three gullies and postholes were encountered in this area, which is of considerable archaeological significance. One pit is provisionally dated to the Roman period, while another is provisionally dated to the medieval period. A further ditch may contain possible Roman tile fragments. The fills of some of these features have the potential to provide radiocarbon dates for the features. It is recommended that materials from the following contexts are submitted for dating: 103, 105, 107, 109, 105, 125 and 127.

Trench S10

- 10 16 This trench lies within the same area of archaeological significance as S9, and also contains many features including a palisade trench, six ditches and stakeholes. Based on a limited quantity of ceramics, and some stratigraphic relationships, some of the features (including the palisade trench) are broadly dated to either the late Iron Age or Roman periods. Plant macrofossil evidence from the palisade trench, however, is more typical of Anglo-Saxon or medieval deposits, rather than the Iron Age date indicated by the pottery evidence. It is therefore strongly recommended that further analysis of the pottery is undertaken, as well as full analysis of the plant remains, together with radiocarbon dating of materials from selected deposits: 121, 123, 130, 134 and 136.

Trench S11

- 10 17 One undated ditch (F157) was identified in the trench. No material suitable for radiocarbon dating was recovered from this feature. No further work is recommended.

Trench S12

- 10 18 A number of features including a ring-ditch, a wall and further ditches were encountered in this area, which is of considerable archaeological significance. The fabric of the wall, which was laid within the ring-ditch cut, contained pottery broadly dated to 950BC – 150AD. One ditch (F208) contained one sherd of Roman pottery. The other features contained no dating evidence, but

some could be dated by radiocarbon. It is recommended that this be undertaken for the following selected contexts: 175, 185, 191, 237 and 238.

Trench S13

- 10 19 Twenty-five probable stakeholes were identified in the trench, close to the ring-ditch and building in S12. Some of the stakeholes are in lines and are interpreted as former fences. None of these features are dated and none have the potential for dating. No further work is recommended.

Trench S14

- 10 20 One undated ditch (F86) was identified in the trench. No material suitable for radiocarbon dating was recovered from this feature. No further work is recommended.

Trench S15

- 10 21 One undated ditch (F89) was identified in the trench. Material recovered from the fill of the ditch could be dated by its radiocarbon content. Given the proximity of this feature to the ring-ditch and building in S12, it is recommended that radiocarbon dating is carried out on this material.

Trench S16

- 10 22 No archaeological features were identified in this trench. No further work is recommended.

Trench S17

- 10 23 No archaeological features were identified in this trench. No further work is recommended.

Trench S18

- 10 24 One ditch (F84) was identified in the trench, beneath layers of re-deposited material. The feature is not dated. The material within the ditch appears to be as disturbed as the layers above and beneath it and no further work is recommended.

Trench S19

- 10 25 No archaeological features were identified in this trench. No further work is recommended.

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