CTRL Carbon Dating

Westenhanger Castle, Kent

Small quantities of charcoal retrieved from excavated samples could be used for radiocarbon dating but there are few contexts for which this is thought to be necessary. It could be used as confirmation for the dating framework applied to the early medieval ceramics, for example, but it is unlikely to be sufficiently accurate. No samples were taken specifically for radiocarbon dating during the evaluation, excavation or watching brief. No material was suitable for any other forms of scientific dating, with the exception of archaeomagnetic dating.

Archaeomagnetic Dating

The Clark Laboratory took fourteen archaeomagnetic samples taken from the pit near to Structure 3 (sub-group 21). Only five could be used to provide the following two date ranges:

AD 450-480 at 68% confidence level and AD 430-500 at 95% confidence level;
AD 1470-1500 at 68% confidence level and AD 1450-1520 at 95% confidence level.

The discrepancy between the above dates and those provided by the pottery (AD 1050-1250), may be due to post depositional disturbance or subsidence of the burnt material into the underlying pit. The archaeomagnetic dates lie at either end of the medieval spectrum and cannot be treated as reliable. Both the ceramics and the location of the pit within its enclosure suggest that it belongs to the early medieval phase of occupation in this landscape, but this is not reflected, unfortunately, in the archaeomagnetic dating. The discrepancy can be accounted for on the basis that the burnt material did not, after all, represent in-situ burning, but was merely a waste deposit.

Whitehill Road Barrow

Radiocarbon

No radiocarbon samples were taken. Insufficient amounts of charcoal were recovered from the 100% excavation of the Whitehill Road barrow to allow for any subsequent radiocarbon dating.

Luminescence

Five samples were taken through a section of the outer barrow ditch at Whitehill Road (ARC WHR 99) of which three were analysed. The dates obtained were 15000 BC for the basal fill while the upper two samples were given a weighted mean date of 5940 BC ± 340 ± 660 for the infilling of the ring ditch. It appears that the sediments had been bleached prior to filling the ditch as these dates appear to be too early. Another factor may have been the contamination of the fills with the bleached natural substrate, which would account for the early date.

Northumberland Bottom

It may be possible to obtain Accelerator Mass Spectrometry (AMS) radiocarbon dates on the snails obtained from the bulk samples from the evaluation ARC TGW 97, if required. As a sequence of samples for snail analysis was taken adjacent to the monolith sequence, AMS dating of the snails would probably be the best way of dating the sediment sequence. Unfortunately there were no snails preserved in the lowest redeposited soil material and it will not be possible to date the charcoal from the unit as there is an insufficient amount and the monoliths will be set in resin.

Archaeo-magnetic dating

Several features were subject to archaeo-magnetic dating by the Clark Laboratory at MoLAS. These were:

- Roman oven in ARC WNB 98 Area C,
- Roman malting oven in ARC HRD 99,
- medieval oven in ARC WNB 98 Area A/B,
- medieval oven in ARC HRD 99,
- post-medieval brick clamp at Hazells Farm ARC 330 98.

It is not considered necessary to use such dating on any of the other material recovered.

Zone 4

Radiocarbon

Several of the LBA/EIA pots retained carbonised organic residues, that could be sampled for radiocarbon dating.

Luminescence

Six samples were taken, three from sediments beneath sarsen stones and three from colluvium in an 'artesian well', located adjacent to the Sarsen stones, to the east of Church Road, Singlewell. The feature appears to have filled gradually with waterlain sediments. The OSL date was 120BC± 200 for the start of infilling. Results from the sediments below the sarsen stones were incompletely bleached and no dates were determined; it is likely that these were Late Glacial fills of a solution feature.

Cobham Golf Course

No specialist dating techniques were used during the fieldwork in this Zone. Where features occurred there was adequate ceramic evidence to establish a date. A number of burnt firepits/charcoal clamps were recorded in the vicinity of Knights Place Farm, but the reddening of the interiors of these features was insufficient to enable archaeo-magnetic dating to be undertaken. No wood was recovered that would have allowed for dendrochronological dating.

Radiocarbon

No radiocarbon samples were taken during fieldwork. However, it appears that adequate amounts of charcoal survive in samples from fills [227] and [229] of ring ditch [234], ARC CGC 98 to establish a radiocarbon date for these basal fills. It is

considered that a sample should be sent for dating as the positive result would be extremely useful as the date established from the ceramic vessel fragments have a broad date range of around 600 years.

Cuxton

No samples were taken on the site for specific dating purposes and no radiocarbon, dendrochronological, luminescence or archaeomagnetic dating has taken place for this assessment. However, it is recommended that radiocarbon (AMS) dating be carried out on the snail shells (Appendix 14: Geo-archaeology).

There is an adequate amount of charcoal for radiocarbon dating certain prehistoric, and otherwise undated features (such as the pits full of charcoal and burnt flint). However, the lack of directly associated features, and the probability of modern root and other organic contamination (due to the very thin topsoil) means that it is unlikely to be of great benefit to the project.

As a 200g bone sample (a femur) is necessary for radiocarbon dating, there are sufficient quantities of human bone for this technique, and it may be possible to use such dating to corroborate ideas about phases of burial. It is envisaged that around six samples would be needed to clarify the phasing. However, the first stage of this research must rest with a detail analysis of the finds material based on the three broad grave alignment groups, as there are no stratigraphic relationships with which to augment the basic ^{14}C results.

Parsonage Farm

There is potential for dating the changing nature of the local environment and the impact of human activity by the radiocarbon dating of organic deposits recovered from the monolith samples.

There is potential for radiocarbon dating for the peat deposits, but these are all well dated by pottery.

Waterloo Connection

Radiocarbon

The chronology of the material culture of the Romano-British period is generally well understood, although sometimes within rather broad limits. The pottery, ceramic building material, coins and small finds assemblages from the cemetery offer a good range of well-dated types across the entire period of use of the cemetery.

However, some aspects of dating are problematic, for example the age of pottery groups when they were deposited is likely to very variable, particularly in a funerary context, where potentially quite a high proportion of ‘antique’ vessels might be expected. Some key burial groups, including the in situ cremations, and many individual burials, lack good artefactual dating evidence. In many instances the date range obtainable from the pottery and other artefacts is too broad to assist in phasing

the burials. Dating would be particularly useful for the large number of cremation burials, which are currently assigned to the general phase 3 (Figure 7 and 8). In addition, key questions, such as the date at which the cemetery fell out of use, remain very uncertain due to the much smaller quantity of late Roman material recovered.

It is therefore proposed that a programme of radiocarbon dating is undertaken to improve the chronology of the site. Advice has been sought from the Scientific Dating Co-ordinator at English Heritage (A Bayliss). The programme would require both high precision dating and the AMS measurement of cremated bone and involves the application of newly developed statistical techniques (Bayesian modelling) to the results to substantially reduce the probable date range (Lanting and Brindley 1998).

It should be possible to establish the date of individual cremation burials to within a century or so by using high-precision measurements which would require 10-50 g of identified short-lived charcoal per burial.

It is likely that by submitting approximately 20 samples it will be possible to confirm both the start date and the end date of the period of use of the cemetery. If AMS measurements (on either bone or charcoal) are applied, this scale of programme would be required to counteract the effects of statistical scatter on the measurements. A similar number of further dates could be required to address specific questions, such as the chronological range of bustum burials within the cemetery, although samples will wherever possible be selected to address multiple aims. Dating might be desirable for discrete groups of graves, or to assess the chronology of identified ritual practices; dating may also be useful to date human bone from the well/shaft, and to confirm the date of suspected Iron Age features.

White Horse Stone

Radiocarbon

Introduction

Seven radiocarbon determinations were obtained for the assessment stage from the Rafter Laboratory, New Zealand (AMS) and from the Scottish Universities Research And Reactor Centre, Scotland (Conventional). The aims of the dating programme were to confirm the expected date of contexts key to the overall site interpretation and to provide a date for significant features that had no artefactual dating evidence (e.g. unaccompanied burials). The results were all calibrated using the OxCal program and are presented in Table 4. The potential for further dating is discussed in Section 4.4 (Dating Potential), below.

Selected samples

Samples were selected from the post fills of the Neolithic long house and from a series of human and animal burial deposits at White Horse Stone and West of Boarley Farm.

Results (see Table 4)

Neolithic

Two AMS dates (NZA-11463-4) were obtained on material recovered from a single posthole fill of the Neolithic long house. The two dates are consistent and fall within the first half of the 4th millennium cal BC. They confirm the date of the building as early Neolithic. One of the dates was on cereal grain and this also provides a date for early Neolithic cereal cultivation.

Iron Age

Two dates were obtained for features associated with the early Iron Age settlement. One date (GU-9088) was obtained on charred cereal that had been placed within a pottery vessel. This vessel formed part of an assemblage of objects that had been placed with a cremation deposit within the pit. The pottery vessels were thought to be of transitional E-MIA date, one of which was associated with an important group of ironwork. The single determination confirms the suggestion that the date of this deposit falls towards the end of the early Iron Age and perhaps within the start of the middle Iron Age.

The second determination (GU-9089) on a human burial has a similar result, again indicating a date within the start of the middle Iron Age.

Saxon

Three determinations were obtained on bone from otherwise undated burials. One date (GU-9013) was obtained on a female inhumation burial adjacent to the Pilgrim's Way track. The result indicates a mid-late Saxon date for the burial and also provides a terminus post quem for this section of the Pilgrim's Way and a key date for the upper part of the dry valley colluvial sequence.

Two dates (GU-9086-7) were obtained on bone from two of a series of animal burials from West of Boarley Farm. One burial had been dated by association with late Iron Age pottery and others were considered to be of this date. However, the calibrated results demonstrate both burials to be of mid-late Saxon date.

Table 4: Radiocarbon results obtained during the assessment (calibrated using OxCal program)

Lab ref	Context	Sample	Date	1σ	2σ	Comment
NZA-11463	ARC WHS98 ctx 4818/1 (early Neolithic house posthole)	Charred cereal	4911 ±60	3780-3640 cal BC	3940-3530 cal BC	From post fill of early Neolithic structure. Confirms date of structure.
NZA-11464	ARC WHS98 ctx 4818/2 (early Neolithic house posthole)	Charred plant, alnus/corylus	4974 ±60	3910-3700 cal BC	3950-3640 cal BC	From post fill of early Neolithic structure. Confirms date of structure.
GU-9013	ARC WHS99 ctx 9025 (Inhumation adjacent to Pilgrims way)	Human bone, femur	1190± 60	Cal AD 720-940	Cal AD 680-970	Indicates burial to be mid-late Saxon
GU-9086	ARC BFW98 ctx 1034 (Cattle burial)	Cattle bone	1150± 50bp	Cal AD 810-960	Cal AD 770-1000	Indicates burial to be mid-late Saxon
GU-9087	ARC BFW98 ctx 1060 (Horse burial)	Horse bone	1210 ±50bp	Cal AD 720-890	Cal AD 670-950	Indicates burial to be mid-late Saxon
GU-9088	ARC WHS98 ctx 6130 (Pit with cremation deposit)	Charred grain from cremation deposit within pit	2270± 60bp	400-210 cal BC	490-160 cal BC	Supports the suggestion that the deposit is transitional EMIA
GU-9089	ARC WHS98 ctx 2291 (Inhumation burial)	Human bone	2250 ±70bp	400-200 cal BC	420-100 cal BC	Supports the suggestion that the burial could be EMIA or MIA

Optically stimulated luminescence

A series of four dates were obtained on a sequence of late Glacial deposits in the White Horse Stone dry valley section. Two were on solifluction deposits and two were on samples taken from the Allerød soil (See Appendix 16 for a discussion of the results).

Dating Potential

Radiocarbon

Seven dates were obtained during the assessment stage (see section 3.4, above) and these results highlight the potential of undertaking further dating to clarify existing date ranges provided by artefactual and ecofactual evidence, to bracket stratigraphic sequences and phases and to determinate the age of those features of uncertain date (e.g. burials).

The following features have the potential for radiocarbon dating:

- The Allerød soil and possible undisturbed Neolithic soil within the dry valley sequence, although this would involve identifying suitable charcoal samples that might not provide very precise dates.
- Further dates on the Neolithic structure and those associated features considered to be contemporary within the White Horse Stone Dry Valley. Ideally further dates should be obtained on samples recovered from those features directly associated with the main structure and on features that are known to pre and post date the structure. If sufficient suitable samples can be found then it might be possible to firmly establish and refine the dating using the OxCal program, although this is likely to be limited by the paucity of sample material (see Appendix 10-11). There is also the possibility of dating a number of features within the dry valley that are thought to be contemporary with the building or of early Neolithic date (samples 289, 634, 739, 691 and 742; also animal bone from context 4904).
- To date the possible second Neolithic structure at Pilgrim's Way. The only finds from this structure were of Neolithic date. There is limited scope to obtain a date for this structure as only wood charcoal was recorded from the fill of one of the postholes (806).
- Dates for the Peterborough Ware and Grooved Ware associated pits at White Horse Stone and Pilgrim's Way (White Horse Stone samples 676, 673, 637 and 639; also animal bone from contexts 4967, 4969, 4997 and 4996; Pilgrim's Way context 965 and 967).
- Dates for the middle Bronze Age structures and ditch (animal bone contexts 4016, 4044, 4100, 4203 and 7070).
- Dates for the late Bronze Age pit deposits (e.g. 5426 sample 921 or 926).
- Further dates could be obtained on deposits associated with the Iron Age settlement. This could include the remaining burials to demonstrate whether they are contemporary or later than the main phase of use of the site.
- Dates could be obtained to confirm the age and date range of the ironworking activity. The remains of charcoal, interpreted as fuel, would provide suitable sample material. It should be possible to demonstrate whether this activity pre- or post-dates 400 cal BC. If it can be demonstrated that iron objects (e.g. the

cremation group) from the site were possibly made on the site (see Assessments 5.1 and 7.1), then it will also be important to prove that these deposits were broadly contemporary (i.e. that the metalworking is also transitional early-middle Iron Age).
- The unaccompanied cremation deposits at Pilgrim's Way (Charred plant remains).
- The remaining animal burials at West of Boarley Farm to demonstrate whether they are contemporary with the middle Saxon ones or indeed belong to the late Iron Age (horse and neo-natal pig).
- To confirm the date of selected settlement features at West of Boarley Farm as middle Saxon.
- Dates obtained on burnt residues adhering to vessel surfaces could resolve the date of the problematic vessel (?Saxon or LIA) forms and shell-tempered fabrics at West of Boarley Farm.

OSL dating

Four dates were obtained on samples taken from Profile G at White Horse Stone. The objective was to provide a date for the Allerød soil (see section 3.4 and Appendix 18) and date the lower part of the dry valley sequence. The results broadly fit with the expected date range and provide an absolute chronology for this part of the sequence.

Church Lane

Radiocarbon Dating (Appendix 11)

A sample of sapwood from a large piece of an oak branch which was found preserved in deposits at the base of the palaeochannel in trench 17 (ARC STR99) was submitted for radiocarbon dating. The sample was intended to provide a terminus post quem for the sequences of environmental samples taken from stratigraphically later contexts.
The sample consisted of a large sample of wood, c. 20 pieces from the sapwood of an oak branch, which ranged from deep brown to light brown in colour. Microscopic examination of one piece revealed a fragile, crumbly structure with an orange-brown coating which appeared to be powdered wood with Crystalline spikules visible. There were soil residues present and a white powdery substance. Samples were prepared by removing all outer surfaces with a scalpel blade and grinding the wood in a mortar and pestle, then subject to cellulose extraction process and dried in a vacuum oven.

Table 4: Radiocarbon results obtained during the assessment

Lab ref	Context	Sample	Date	1σ	2σ
NZA-12234	ARC STR99 ctx 1730 (base of waterlogged palaeochannel sequence	Oak branch (sapwood)	7968 ±60	95.4% confidence 7050cal BC - 6690 cal BC	68.2% confidence 7040cal BC - 6780 cal BC

The date is considerably earlier than anticipated. Late Iron Age pottery was recovered from the upper part of the sequence and assessment of the pollen cores suggested that the whole sequence was most likely to be of later prehistoric date. The taphonomy of the channel sequence is complex and not particularly well-defined. Initial interpretation of the stratigraphy suggested that the branch might not be contemporary

with the deposits in which it was embedded. The preliminary radiocarbon date suggests that the branch does indeed belong with the earliest deposits in the sequence.

Dating Potential

Radiocarbon Dating (Appendix 11)

The preliminary radiocarbon date obtained to date from a waterlogged oak branch at the base of the East of Station Road palaeochannel sequence has produced a late Mesolithic result. This is much earlier than initially suspected on the basis of the pottery and pollen evidence.

If the potential of the palaeoenvironmental sequence is to be realised, further radiometric dating of samples taken at intervals throughout the sequence would be desirable to establish more precisely the date of the sequence. There are samples of waterlogged remains from contexts 1726 and 1725 which would allow further radiocarbon dates to be obtained for these contexts. The most significant change in the pollen evidence, between grassland and woodland recolonisation occurs between these two contexts. Whilst the individual dates themselves may not provide very precise dates, statistical methods are now available which will allow a more precise estimate of the chronological boundary between the two contexts to be made (eg Bronk Ramsey 1995), although a relatively large number of dates (at least six) may be required to obtain a usefully precise estimate of the date of the transition. High resolution dating of the environmental sequence is important for addressing Fieldwork Event Aims 2, 4, 5 and 6 and Landscape Zone Priority 1.

It is recommended that at least one additional date should be obtained for the oak tree branch at the base of the sequence to confirm the suggested late Mesolithic date. Although the branch is slow-grown it is unlikely to produce a reliable dendrochronological date since the centre of the branch has rotted away leaving only approximately 50 rings (some sapwood survives). However, as the sample has been radiocarbon dated it is potentially of value for improving the dendrochronological sequence and radiocarbon calibration for the region. Although such work does not explicitly fall within the CTRL research strategy it is recommended that the material be made available for assessment by a dendrochronology specialist.

APPENDIX 7 - DATING

7.1 Assessment of the Radiocarbon Date

by Chris Hayden

Introduction

7.1.1 A sample of sapwood from a large piece of an oak branch which had been preserved in deposits at the base of the palaeochannel in trench 17 was submitted for radiocarbon dating. The sample was intended to provide a *terminus post quem* for the sequences of environmental samples taken from stratigraphically later contexts.

Method

7.1.2 The sample was analysed using an accelarator mass spectrometer to determine its conventional radiocarbon age, percent modern and $\Delta^{14}C$ based on the NBS-I oxalic acid standard, and the $\delta^{13}C$ was measured using a stable isotope mass spectrometer.

Material and Context

7.1.3 The sample was taken from the sapwood of the branch, this being the youngest part closest in age to the date of the tree's death. The date of death of the tree is assumed to be roughly contemporary with the date of its deposition. It is likely that the branch became deposited in the palaeochannel deposits as a result of a tree falling. Only the portion of the branch embedded in the deposits was preserved, the rest rotting away. The date of death of the tree thus probably post-dates the deposition of context 1731 into which it is embedded (Figure 5). Its relationship with context 1730 is less certain, but its seems likely that its deposition was roughly contemporary with the deposition of this context. Whatever the case, it provides a clear *terminus post quem* for the environmental samples which begin in context 1727 above.

Results

7.1.4 The sample results are tabulated below. A copy of the certificate, issued by the Rafter Radiocarbon Laboratory, and the OxCal calibration graph, is attached.

Lab ref	Context	Sample	Date	1σ	2σ
NZA-12234	ARC STR99 ctx 1730 (base of waterlogged palaeochannel sequence	Oak branch (sapwood)	7968 ±60	95.4% confidence 7050cal BC - 6690 cal BC	68.2% confidence 7040cal BC - 6780 cal BC

7.1.5 The date is considerably earlier than anticipated. Late Iron Age pottery was recovered from the upper part of the sequence and assessment of the pollen cores suggested that the whole sequence was most likely to be of later prehistoric date. The taphonomy of the channel sequence is complex and not particularly well-defined. Initial interpretation of the stratigraphy suggested that the branch might not be contemporary with the deposits in which it was embedded. The preliminary radiocarbon date suggests that the branch does indeed belong with the earliest deposits in the sequence.

7.1.6 If the environmental sequence is to be of any value for environmental reconstruction in fulfilment of the fieldwork event aims and landscape zone priorities, further radiocarbon dating will be required to confirm the mesolithic date suggested for the early part of the sequence, the late Iron Age date suggested by the artefactual evidence for the upper part, and the chronology of the intervening deposits.

Potential for Further Work

7.1.7 The environmental sequence has produced clear results of direct relevance to achieving Landscape Zone Priority 1 and Fieldwork Event Aims 2, 4 and 5 for the site, which are set out in section 2 of the main report, above. It would be desirable to establish more precisely the date of this sequence, in particular to date the major changes observed in the pollen record by radiometric means. There are samples of waterlogged remains from contexts 1726 and 1725 which may allow further radiocarbon dates to be obtained for these contexts. The most significant change in the pollen and insect evidence, between grassland and woodland recolonisation, occurs between these two contexts, which at present are thought most likely to be of late Iron Age or Roman date. Further dates may allow a more precise estimate of the date at which the field system appears to have fallen into disuse to be obtained. Statistical methods are now available which will allow an estimate of the date range chronological boundary between the two contexts to be made (eg Bronk Ramsey 1995).

7.1.8 Unfortunately, the period of time in which the transition is likely to have occurred (the 2nd century AD) corresponds to a very flat area in the calibration curve followed by a marked wiggle which means that material dating in calendar years from *c* AD 125 to 250 and perhaps later will produce very similar radiocarbon dates. The OxCal calibration package will simulate the kinds of radiocarbon dates one could expect for material of a given calendar age and a given error (here taken as ±60 years). It is possible to use these simulated dates to see how accurate an estimate of the date of the transition it may be possible to obtain. Simulations have been run assuming that one, two or three samples of similar or differing dates have been taken from each context (ie two, four and six determinations in total). The results, shown in

7.1.9

7.1.10 Table 1-Table 7, suggest that even if two samples were taken from each context the date range would still be likely to be nearly three hundred years. If only two samples are taken the range may be much greater, possibly over 400 years. This level of accuracy is insufficient to address the question at issue which is whether the change in the landscape occurs roughly at the same as the field system goes out of use (in the 2nd century AD), or whether the change occurs nearer the end of the Roman period. Larger numbers of samples could reduce the range: six samples, for example, typically reduce the range more usefully to less than 200 years, and further increases in the number of samples produce smaller ranges.

Bibliography

Bronk Ramsey, C, 1995, Radiocarbon calibration and analysis of stratigraphy, *Radiocarbon* **38**, 425–30

Table 1: simulation of two close dates

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 120	200 BC	AD 90
DATE OF TRANSITION	**130 BC**	**AD 290**
AD 130	AD 70	AD 350

Table 2: simulation of two more distant dates

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 70	0	AD 240
DATE OF TRANSITION	**AD 50**	**AD 330**
AD 160	AD 110	AD 390

Table 3: simulation of four close dates

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 110	40 BC	AD 210
AD 120	40 BC	AD 210
DATE OF TRANSITION	**AD 50**	**AD 290**
AD 130	AD 110	AD 390
AD 140	AD 110	AD 390

Table 4: simulation of four more distant dates

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 80	210 BC	AD 90
AD 120	0	AD 260
DATE OF TRANSITION	**AD 80**	**AD 350**
AD 140	AD 200	AD 440
AD 180	AD 180	AD 440

Table 5: simulation with six dates

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 70	170 BC	AD 120
AD 100	110 BC	AD 130
AD 120	90 BC	AD 140
DATE OF TRANSITION	**0**	**AD 190**
AD 140	AD 50	AD 320
AD 160	AD 80	AD 380
AD 190	AD 50	AD 320

Table 7: simulation with eight samples

Calendar date for which C14 date estimated	**Calibrated date range (95%) incorporating stratigraphic data**	
AD 70	60 BC	AD 150
AD 90	40 BC	AD 180
AD 100	110 BC	AD 140
AD 120	50 BC	AD 170
DATE OF TRANSITION	**AD 60**	**AD 220**
AD 140	AD 120	AD 390
AD 160	AD 90	AD 320
AD 170	AD 130	AD 400
AD 190	AD 120	AD 390

Thurnham

Dating

Radiocarbon dating - Appendix 17

A small hazel stake (Corylus avellana) was sent for radiometric measurement. The sample originated in the upper part of well 11010, close to the later Roman corn-drier in the south-east of the Roman villa complex. The result given, with 95.4% confidence, is cal AD 259-539.

A second radiocarbon determination on red deer bone from the possible Bronze Age waterhole at Thurnham Villa has been dated to cal AD 978-1155 (95% confidence level).

Dating Potential

Radiocarbon

The chronology of the material culture of the Romano-British period is generally well understood, although sometimes within rather broad limits. The pottery, ceramic building material, coin and small finds assemblages from Thurnham Villa and from Hockers Lane offer a good range of well-dated types across the entire period of occupation. It is therefore considered that further radiocarbon dating would have little potential to refine the dating information available from these sources.

APPENDIX 7- DATING

7.1 Radiometric Measurements

Introduction

7.1.1 Two samples for radiometric measurements were sent to the Scottish Universities Research and Reactor Centre, East Kilbride. The first was a coppiced hazel (*Corylus avellana*) stake that had been recovered from a stratigraphically late silt fill of well 11010 at Thurnham Roman Villa (sample GU-9077). The second was a 34g fragment of red deer metatarsal from the probable Middle Bronze Age waterhole 10288 (sample AA-39808; GU-9083).

7.1.2 The red deer metatarsal was found to contain insufficient collagen for radiometric dating. It was therefore submitted to the University of Arizona AMS facility for Accelerator Mass Spectrometer dating.

7.1.3 The samples were selected in order to confirm the dating of the late well silts and the waterhole. This was undertaken in accordance with the Fieldwork Event Aims for the site, which included the recovery of a dated occupation sequence for all phases of the site's development.

Results

7.1.4 Copies of the radiocarbon dating certificates are appended to this report.

7.1.5 Sample GU-9077, the hazel stake, has been dated to cal AD 259-539 at the 95% confidence level.

7.1.6 Sample AA-39808 (GU-9083), the red deer metatarsal, has been dated to cal AD 978-1155 at the 95% confidence level.

Potential for further work

7.1.7 The date from the hazel stake broadly confirms the interpretation reached from the stratigraphic data and spot dating, that the well was one of the latest features to remain in use on the site, and was silting up during the 4th century. This dating can be used to inform further analysis of the feature.

7.1.8 It is highly unlikely that further radiocarbon dating will reduce the range of this date. In general, for the Romano-British period, artefacts such as pottery and coins can give a far more precise indication of date than radiocarbon.

7.1.9 The date from the red deer metatarsal is unexpected and suggests that this piece of bone was intrusive; there is little doubt about the general dating and affinities of the Middle Bronze Age metalwork. Further analysis of the stratigraphy will be required to clarify the extent and significance of later disturbance to this feature.

7.1.10 It is considered that there is no potential for further radiocarbon dating.

Hurst Wood

Radiocarbon (Appendix 7)

Single samples from two burnt pits at the Hurst Wood detailed excavation were submitted for dating with the intention of estimating the date, and the date range of the burnt pits. The samples were therefore selected, as far as was possible, from two pits of contrasting shape, pit 140 being a flat-based, rectangular pit and pit 104 a circular, concave-based pit.

Table 1: Radiocarbon results obtained during the assessment

Lab ref	Context	Sample	Date	1σ	2σ	Comment
NZA-12274	ARC HWD98 ctx 107 (sample 9)	Burnt plant material (clematis vitalba)	1076±60	895-1017 cal AD	820-843 cal AD plus 862-1035 cal AD	From charcoal-rich fill of burnt, circular, concave pit 104
NZA-12284	ARC HWD98 ctx 143 (sample 14)	Burnt plant material (maloidiae)	2742 ±45	922-828 cal BC	993-810 cal BC	From charcoal-rich fill of burnt, rectangular, flat-based pit 140

Dating Potential

Radiocarbon date (Appendix 7)

Widely divergent (Bronze Age and Late Saxon) radiocarbon dates have been obtained for two of the burnt pits at Hurst Wood, indicating either that similar activities were carried out on the site over a very long period of time, or more likely, that the pits contain residual organic material as well as artefacts. If the former is true, all of the burnt features would need to be radiocarbon dated in order to examine their chronology. If the latter is true, further radiocarbon results would not resolve the dating problem at all. Since in either case the function of the pits will remain uncertain, no further dating is recommended.

There would be some intrinsic value in confirming the Saxon date of the clematis vitalba or Vitis vinifera charcoal from pit 104 and/ or the grape pips from the pit 143, with another radiocarbon date, to establish the date of possible vine cultivation on the site. This would be of value for wider CTRL research aims relating to changing agricultural practice over time.

No radiocarbon dating is recommended for other contexts in this group of sites as the features are either sufficiently dated by artefactual evidence or show evidence for a high level of residual material.

APPENDIX 7- DATING

7.1 Assessment of the Radiocarbon Dates

Introduction

7.1.1 Single samples from two burnt pits at Hurst Wood were submitted for radiocarbon dating. The samples were taken from pits which contrasted in size, form and location as far as was possible given the need to obtain datable sample. They were intended to provide an indication of the date, and hopefully the range of dates of the burnt pits on this site.

Method

7.1.2 The sample was analysed using an accelarator mass spectrometer to determine its conventional radiocarbon age, percent modern and $\Delta^{14}C$ based

on the NBS-I oxalic acid standard, and the $\delta^{13}C$ was measured using a stable isotope mass spectrometer.

Material and Context

The two samples consisted of fragments of burnt plant material. From amongst the fragments of wood charcoal, two samples from small twigs or stems were selected, one probably Maloideae (hawthorn, apple, pear etc.) and the other probably Clematis vitalba (clematis) or Vitis vinifera (vine). The selection of twigs and stems ensures that the date obtained should be close to the date of death of the plant. The need to select material of this kind rather than unidentified wood charcoal, severely restricted the range of contexts which could be dated, and the original intention to date pits which differed in size, shape and location, and which thus might be of differing date, could not all be fulfilled. One sample was eventually taken from context 143, the upper fill of pit 140, a flat-based, rectangular burnt pit. The other was from context 107, the primary fill of pit 104, a concave-based circular pit. Although contrasting in shape, both are amongst the larger pits on the site, and both lie at the northern end of the site. The upper fill of pit 104 contained a few fragments of fired clay, whilst pit 143 also contained a few sherds of middle-late Iron Age pottery, two pieces of flint and what may be a grape pip. The dates may thus provide a test of the extent to which these finds are likely to be residual.

Results

The sample results are tabulated below.

Table 2: Radiocarbon results obtained during the assessment

Lab ref	Context	Sample	Date	1σ	2σ	Comment
NZA-12274	ARC HWD98 ctx 107 (sample 9)	Burnt plant material (clematis vitalba)	1076±60	895-1017 cal AD	820-843 cal AD plus 862-1035 cal AD	From charcoal-rich fill of burnt, circular, concave pit 104
NZA-12284	ARC HWD98 ctx 143 (sample 14)	Burnt plant material (maloidiae)	2742 ±45	922-828 cal BC	993-810 cal BC	From charcoal-rich fill of burnt, rectangular, flat-based pit 140

7.1.3 Widely divergent (Bronze Age and Late Saxon) radiocarbon dates have been obtained, indicating either that similar activities were carried out on the site over a very long period of time, or more likely, that the pits contain residual organic material as well as artefacts. If the former is true, all of the burnt features would need to be radiocarbon dated in order to examine their chronology. If the latter is true, further radiocarbon results would not resolve the dating problem at all. Since in either case the function of the pits will remain uncertain, no further dating is recommended.

7.1.4 There would be some intrinsic value in confirming the Saxon date of the *clematis vitalba* or *Vitis vinifera* charcoal from pit 104 and/ or the grape pips

from the pit 143, with another radiocarbon date, to establish the date of the possible vine cultivation.

7.1.5 No radiocarbon dating is recommended for other contexts in this group of sites as the features are either sufficiently dated by artefactual evidence or show evidence for a high level of residual material.

Eyhorne Street

Radiocarbon

A sample consisting of charred cereal grains was submitted for radiocarbon dating. The sample was taken from the primary fill (71) of posthole 70, which formed the packing around the post-pipe. This posthole was thought to form part of a group of four features, mostly pits, (Group 66) two of which contained Grooved Ware amongst other artefacts and charred plant remains. The sample was intended to test the association of these four features by showing whether or not one of the features which did not contain Grooved Ware was similar in date to those that did. It was also intended to provide a date for the charred plant remains in the posthole, such remains having often been noted in association with Grooved Ware.

The date obtained calibrates to 2402-2022 BC (2 sigma NZA-12233 3773±60 BP). This result indicates that the posthole is of late Neolithic date and that it probably belongs to the same phase as the adjacent pits that contained Grooved Ware.

Dating Potential

There is limited potential to use radiocarbon dating to improve the phasing of the site. The undated features produced little suitable sample material, the most significant exception being ditch 116/136. However, only unidentified charcoal was recovered from this feature, which would produce a date of uncertain validity, although it would probably be sufficient to distinguish whether the feature was of Neolithic-early Bronze Age or Iron Age date. Similar material was recovered from pit 91.

More reliable dates could be obtained from hazel nut shells from gully 141/143 and pit 112, but this would be unlikely to greatly improve understanding of the site.

Consideration could be given to obtaining good quality dates for the pit contexts containing Grooved Ware and Beaker, where charred plant material such as grain or hazelnut are available. In addition, dates could be obtained on charred residues that adhere to sherd surfaces (noted for Grooved Ware). This would provide direct and high quality dates for this type of ceramic.

Consideration could also be given to obtaining high quality radiocarbon dates for selected Iron Age features, including the partial horse burial within pit 170 and the adjacent pit 175 which contained the sword fragments.

Beechbrook Wood

Dating

No scientific dates were commissioned for this assessment due to the following:

- in most cases, ceramic (and to some extent, worked flint) inclusions and stratigraphic relationships were deemed sufficient for preliminary phasing
- where uncertainties regarding date remained (such as for all ring ditches with the exception of 1682), material with absolute dating potential was either recovered in insufficient quantities or not from sufficiently secure deposits to meet objectives relevant to this assessment

Dating Potential

The collection of radiocarbon dates for the underpinning of the site chronology is essential due to the limited number of stratigraphic relationships between phases, and the identification of at least two pottery sequences with considerable regional significance. The latter include either transitional or new types, which makes a chronological placement of the artefacts a key process for their interpretation.

For most of the ceramics, sufficient carbonised remains have been recovered from associated deposits to achieve this aim. Given the wide spread of material and the long chronological range of the site, a meaningful result can, however, only be obtained by a comparatively large number of dates.

Radiocarbon dating of wood charcoal has a number of inherent drawbacks (potential intrusiveness, uncertain association with the event to be dated), therefore wherever possible single entity dates should be obtained from organic material with some relevance to the activity in question. To be favoured are annual species, preferrably cultivated ones, such as cereal grain, or those representing common foraging food, such as hazelnut shells. At Beechbrook Wood, a considerable number of either heavily truncated or token deposits of cremated human remains were identified (see Appendix 6.1). The material shows little further potential for analysis in its own right, but could present an ideal material for AMS dates, where the amount of material present proves sufficiently large for this purpose.

Suggestions for a programme of radiocarbon dates have been made in detail throughout this section, and can be summarized as follows:

- On grains or nutshells from Beaker pit 1377 in order to refine the regional chronology for the period
- On the nutshells from ring ditches 851 and 3003 in order to establish the date of their infilling/broader date range
- On suitable organic deposits from features in Bronze Age activity area 1952 to date the potentially transitional Middle/Late Bronze Age ceramics
- From any organic material found adhering to the daub from structure 3037 to confirm a Late Bronze Age date
- On fragments of bone from all cremation deposits in order to establish their date and associations. Cremation group 2441 and Roman cremation 1344 could be excluded if chronological issues can be sufficiently addressed by pottery dates
- On single grains and/or human cremated bone from placed deposits in the ditch fills of Middle Iron Age enclosure 3072, for a chronological placement of the new pottery series

Tutt Hill

Because features of all phases were distributed over similar areas, spatial associations cannot be used to assign dates, and there were also few significant stratigraphic relationships. Since pottery was relatively scarce, many of the features thus remain undated. This is particularly unfortunate in the case of the cremations, five out of eight of which are undated, but also affects other features, some of which, such as the late Bronze Age field system, can only be tentatively reconstructed.

Only an extensive programme of radiocarbon dating could remedy the difficulties in dating many of the features on the site. Samples of charred plant remains and charcoal were taken from many features, but much of the charcoal, in particular from the cremations, consists of wood charcoal which is unsuitable for radiocarbon dating. With careful selection, however, it may be possible to obtain dates for all of the cremations and a few pits, but for only a very restricted part of the possible late Bronze Age field system. Such a programme would require the submission of a large number of samples, which would be unjustifiable in terms of the interpretation of the site. However, radiometric dating may be justifiable in the case of the cremations, as part of a wider study of prehistoric burial practises in the region. Such a programme would be an addition to the original fieldwork aims.

Holm Hill

Dating

Many of the samples processed have produced relatively large quantities of charred material, including large pieces of charcoal. There is therefore considerable scope to consider obtaining radiocarbon dates from a range of feature types. Dates obtained from burnt-out tree stumps, hearths, cremation pyre debris and specific dumps of material (i.e. large grain concentrations in pits) may provide good chronological dates for these events, particularly where artefactual or stratigraphic evidence for relative chronology is absent.

Dating Potential

Landscape Zone Priority: Reconstruction of the changing palaeo-environment
The presence of a group of probable burnt-out tree stumps, a feature type recorded at other sites in the general locale, may point to prehistoric tree clearance. Radiocarbon dating of such features could confirm or deny the potential prehistoric date for this activity, and potentially ally these to the dated archaeological remains recorded. This will also contribute to establishing the local environment of the site (*Fieldwork Event Aim*) for specific periods.

Landscape Zone Priority: The ritual and ceremonial use of the landscape
The three pits that contain cremation-related deposits are as yet undated, although it is considered probable that they are Romano-British in date. Secure radiocarbon dating will allow these features to contribute more fully to a wider discussion/ consideration of the funerary rite as a whole for the region during this period, as little attention to these deposits, other than as ‘burials’ *per se*, has been given in the past.

Fieldwork Event Aim: Economic Basis of Agricultural Communities
The charred grain recovered from pit **2003** in particular was a notable find, and radiocarbon dating would be considered an appropriate next-step to place this feature into a chronological framework. Identification of the grain, and associated charred weed seeds, may also enable some indication of the agricultural farming regimes and economy for the period to which it belongs.

Littlestock

Dating

Many of the samples processed have produced relatively large quantities of charred material, including large pieces of charcoal. There is therefore considerable scope to consider obtaining radiocarbon dates from a range of feature types. Dates obtained from features such as hearths, grave-pits etc. may provide good chronological dates for these events, particularly where artefactual or stratigraphic evidence is ambiguous or absent.

Dating Potential

Research Objective: Early agriculturalists (4500 – 2000 BC)
Given the relative paucity of excavated remains from this period in the general area, or even Kent as a whole, the opportunity to obtain reliable absolute dating for the features at Little Stock Farm must be considered. The presence of intrusive material within the pit/ hollow considered to be Early/ Mid Bronze Age, however, may exclude this feature from being considered for radiocarbon dating.

Landscape Zone Priority: Ritual and ceremonial use of the landscape
Although the Late Bronze Age/ Early Iron Age 'placed' vessels and Middle/ Late Iron Age burials are broadly dated through ceramic identification, these features appear to be part of much wider traditions that encompass sites through Southern England. As such, it is considered imperative that secure absolute dates are obtained for the remains at Little Stock Farm, to place them within these broader sequences.

Saltwood

Dating

Absolute spot dates

1.1.1 Many of the phases of activity at Saltwood would benefit from absolute spot dates, aiming to provide fixed chronological markers rather than identifying sub-phases. In particular, the Early Neolithic pits, Bronze Age barrows and settlement(s) and Early/ Middle Iron Age burials provide the opportunity to give absolute dates for prehistoric activity. In addition, the Romano-British settlement remains and burials

(both cremation and inhumation) would benefit from absolute dates, as would the limited early medieval evidence.

1.1.2 Although the Anglo-Saxon cemeteries would not repay detailed sub-phase definition (see below) through radiocarbon dating, absolute dates for specific graves, to both identify marker events within each cemetery and confirm/ deny artefactual dating, would be considered viable.

Sub-phase definition

1.1.3 Few periods of activity at Saltwood would repay detailed radiocarbon analysis, either due to insufficient spatial/ stratigraphic data, insufficient potential dating resource, or the restricted radiocarbon plateau prohibiting statistical differentiation. Groups that would perhaps repay detailed sub-phase definition would be the group of cremation and cremation-related deposits/ features to the east of the Romano-British settlement C15 and the largely undated group of possible Bronze Age cremations associated with barrows C3766 and W33.

1.1.4 With particular reference to the Anglo-Saxon burials within the eastern, western and central cemeteries, the presence of human bone provides the opportunity for radiocarbon dating. However, the condition of the bone may not yield high collagen levels, and although it would be possible to take some samples for high precision dating (HPD), the scope of this is limited by the extremely poor bone survival. Even where a higher proportion of the skeleton survives, this may only comprise the mineral component, and there may not be sufficient collagen for dating purposes. Realistically a fairly wide suite of samples would need to be taken to make sub-phase definition worthwhile, and this is unlikely to be feasible for the Saxon burials.

1.1.5 Recent work using Baysian statistics and high-precision determination (The Queen's University of Belfast) has demonstrated the ability of radiocarbon dating for defining a series of chronological and developmental parameters of Anglo-Saxon cemeteries (e.g. Scull and Bayliss 1999). The definition of artefactual and attribute chronology can also be tested (*op cit.*).

1.1.6 There is potential to separate physical development (how did the cemeteries physically develop), longevity of a cemetery, where there any hiatuses (50-100 years +) in the use of the cemetery. There is also the potential to pinpoint with more accuracy the date of establishment of the cemetery and consider refinement of the artefacts dating of key graves (Scull and Bayliss 1999, 43). One such project was undertaken at Buttermarket, Suffolk, but to do so required 16 high precision determinations (±19 – 23).

1.1.7 High-precision radiocarbon dating, allied with explicit mathematical modelling of chronological problems, now has the potential to deliver calibrated ranges of about 50 years at the 95% confidence level for the first half of the 5th century, for example (Scull and Bayliss 1999, 39). Unfortunately the calibration curve does not allow such precise calendrical date ranges to be obtained from the intervening period between the middle of the 5th century and late 6th century. During this period the best expected date range is about a century or more at the 95% confidence level (Scull and Bayliss 1999, 39).

1.1.8 Normally this high-precision method has required a large sample size (see for example, Pearson 1984; McCormac and Housely 1995). The poor preservation of bone and likely low survival of collagen at Saltwood is therefore very likely to prohibit the use of this method. However, more recently techniques have been refined where processing using the small-sample high-precision process has recently become available at Belfast (Wilson *et al.* 1996).

1.1.9 In view of the condition of the bone, it seems unlikely that even small-sample high-precision of the available material will be productive (P. Marshall pers. comm.). There is the potential, however, to date key burials within each cemetery using AMS with a precision of ±50 years to aid in defining some basic chronological issues. In addition it is important to date charcoal relating to pyre materials from the cremation cemetery and compare these events chronologically with the inhumations.

Dating Potential

The presence of discontinuous activity from the Early Neolithic through to the early medieval period provides a useful sequence against which a suite of radiocarbon determinations could be applied. On the basis of recovered material, radiocarbon dating would significantly enhance the potential of the following features/ phases;

- The Early Neolithic features – to complement the diagnostic artefacts and place them within a secure chronological framework in relation to similarly dated remains elsewhere in Kent,

- The Bronze Age barrows – to place these into a secure chronological framework and to assist in the determination of the cemetery development (i.e. phased vs single event),

- The non-Saxon (Iron Age ?) inhumations – to confirm their phasing and therefore confidently identify ritual activity associated with this phase, and

- The Early Anglo-Saxon occupation on a Late Roman site – evidence for continuity between these periods is rare (although abandonment and reuse less so) and it may therefore be possible to confirm through radiocarbon determinations that activity between the periods is continuous.

Although radiocarbon dating for the Anglo-Saxon burials would assist in refining the relative and absolute chronologies for Early Anglo-Saxon burial based on artefact analysis, the amount of available bone for such determinations is poor at best. It would therefore only be considered viable to obtain radiocarbon determinations from the cemeteries to date individual burials. Statistically it is very unlikely that significant differentiation could be obtained to confidently identify burial phases, either within individual cemeteries, or even between cemeteries.

The selection of appropriate contexts for such analysis will be determined through a combination of criteria, not least of which would be detailed stratigraphic analysis and a consideration of associated diagnostic artefacts.

Specific needs can also be identified, including;

The inhumation burial lying over metalworking debris beside trackway C2. This burial is thought to be of Late Roman date on stratigraphic grounds.

Although other dating techniques have been considered, such as nuclear magnetic resonance dating and OSL dating, none are considered viable given the nature of the archaeological resource from Saltwood Tunnel.

Sandway

Dating

Three samples were submitted to the Rafter Laboratory, New Zealand, for AMS dating. The samples were all obtained from the Mesolithic pit **72** (**Figure 11**), their details are tabulated below (**Table 2**). The radiocarbon dates from Sandway Road fall outside the normal datasets, and are therefore calibrated with the 20 year atmospheric calibration curve, using the OXCAL 2.10 and data from Stuiver *et al* (1993.). They are expressed at the 95% confidence level with the end points rounded outwards to 10 years following the form recommended by Mook (1986).

Table 2: AMS dating sample details from Pit 72

Sample ID	Context	Sample	Depth	Material	Calibrated date
R26175/1	375051	49	0.10 – 0.15 m	Hazelnut	8590-8090 BC
R26175/2	375051	49	0.10 – 0.15 m	Cereal grain (*Triticum/ Hordeum* sp.)	5930-5660 BC
R26175/3	345031	44	0 – 0.05 m	Cereal grain (possible *Triticum* sp.)	1950-1690 BC

It is of note that the samples belong to three chronologically very distinct periods spanning *c*. 7,000 years, suggesting that residual and/or intrusive material is present in pit **72**. However, the artefactual evidence overwhelmingly indicates that the feature originates in the Later Mesolithic period (i.e. *c*. 6750-3500 BC), and it is therefore assumed provisionally that the radiocarbon date obtained from charred cereal grain R26175/2 indicates the approximate age of the feature. Clearly, if this assumption were valid, the worked flint evidence would assume tremendous importance within this period of prehistory.

This would therefore also assume that the hazelnut fragment is residual, possibly indicating earlier low-level transient hunter/gatherer activity in the area that is not preserved in any other way in the archaeological record. It is as yet unclear whether the remaining charred hazelnut fragments are also residual finds of a similar date, and whilst the possibility that the hazelnuts are the result of bioturbation cannot be ruled out, their charring would suggest not. The later cereal grain (which is attributable to the Early Bronze Age) recovered from the upper surface of the pit is likely to be intrusive, with Early/Middle Bronze Age pottery also recovered from nearby features.

Dating Potential

Introduction
Axiomatic to the degree of archaeological potential that Sandway Road possesses is the need for secure dating. Therefore, the contribution that radiocarbon dating *et al.* may give to the site archive is almost inestimable, particularly with regard to the earlier (i.e. Mesolithic) prehistoric remains. As such, dating potential is considered against the Mesolithic remains below, but is applicable to all Research Objectives (with the exception of *Towns and their rural landscapes* and *The recent landscape*), Landscape Zone Priorities (with the exception of *Ritual and ceremonial use of the landscape*) and Fieldwork Event Aims. This is particularly valid where other means of obtaining secure dating (i.e. diagnostic artefacts) are absent.

Research Objective: Hunter-foragers (400,000 – 4500 BC), and
Fieldwork Event Aim: Bronze Age and earlier use of the site
The radiocarbon determinations obtained to date from Sandway Road demonstrate the enormous potential the site has for contributing to the study of Mesolithic remains at a national level. The importance of not only providing secure absolute dates to go with the well-recorded worked flint assemblage, but also that such dates are being obtained from charred cereal grains cannot be overstated. It is recommended that a further suite of radiocarbon determinations are obtained from similar charred remains, both from within the central pit **72**, but also the outlying artefact scatters and features considered to be contemporaneous.

Because of the demonstrated potential for intrusive material indicated by the differing radiocarbon determinations already obtained, it would be unsafe to consider the smaller (<2mm) charred weed seeds as securely Mesolithic, and thus there is little or limited potential for further analysis from these elements where recovered. This contrasts slightly from the larger (>2mm) charred grains and charcoal fragments (and hazelnuts) which are less likely to be so mobile.

Although, as discussed above, great caution must be taken when obtaining radiocarbon dates from the very small organic remains recovered from Sandway Road, the Mesolithic radiocarbon dating record for south-east England and Kent in particular is extremely poor. Therefore such dating of an *in situ* lithic assemblage of this period would be of great importance, and it would therefore be considered paramount that such analysis occurs.

The Mesolithic radiocarbon record for south-east England, and for Kent in particular is extremely poor. There are currently no reliable Later Mesolithic radiocarbon dates associated with diagnostic lithic material from within Kent with the possible exception of the Stonewall Rock shelters in Chiddingstone (Jacobi 1982). Outside the county there are only a handful of reliable Later Mesolithic dates from Sussex, Surrey and the London area and very few of these are associated with diagnostic lithic assemblages. Arguably the most useful evidence in respect of the Sandway Road assemblage is the Hampshire site of Broom Hill, Braishfield, where parts of a Later Mesolithic assemblage (albeit contaminated by Neolithic material) were recovered from a pit from which five partly stratified conventional radiocarbon dates were also obtained (O'Malley and Jacobi 1978). At present this meagre data is amongst the best typochronological evidence for the Later Mesolithic in south-east England.

The presence of a group of possible burnt-out tree-stump remains may point to prehistoric tree clearance. The radiocarbon dating of a carefully selected group, possibly in association with similar features from other sites in the area, may provide an indication as to whether they are isolated events or part of a wider episode, as well as providing an absolute date for the features in question.

As such, the aim of any additional dating would be to ascertain:

- when did the Mesolithic activity occur
- how long did it last
- when did the Neolithic activity occur and what is the time span between this and the end of the Mesolithic activity
- do the burnt trees represent a single burning and clearance episode, and if so is this associated with the Mesolithic or Neolithic activity