## APPENDIX 10: ASSESSMENT OF GEO-ARCHAEOLOGY

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### 1. Introduction

1.1 Monolith samples were recovered from two sections (26 and 23) during excavation works at ARC STP 99 (Figure 5). The sections cut through a sequence of sediments that were provisionally interpreted as soliflucted and colluvial slope deposits, eroded from the higher land to the north and south and accumulated in the northern dry valley floor. The aim of the geo-archaeological assessment is to determine the potential of the samples to provide information with which the changing landscape and geomorphological processes operating on the site might be reconstructed. This would provide a better understanding of the environment of the Late Neolithic, Bronze Age, Iron Age and Roman settlement found in the environs of the site (Area 330 Zone 3).

1.2 The monolith samples form 3 profiles. For each profile, overlapping monolith tins (0.50m x 0.05m x 0.05m) were hammered into the cleaned section face. The sediments and stratigraphy visible in section were described and drawn by the excavators on site. The monolith locations were marked on the section drawing and a level related to ordnance Datum was taken on the top of each tin. Each tin was wrapped in cling film and plastic bags, labelled and stored in the MoLAS fridge prior to assessment.

### 2. Methodology

2.1 The sediments sampled in each tin were cleaned and described using standard sedimentary criteria. This attempts to characterise the visible properties of each deposit, in particular relating to its colour, compaction, texture, structure, bedding, inclusions clast-size and dip.

2.2 For each profile, every distinct unit was given a separate number and the nature of the contacts between each unit noted. Where several units appear to be part of the same depositional phase or event they have been grouped into a larger unit [indicated by a letter]. The units identified during description are related to the contexts described on site in the profile description tables (Table 28, Table 29 and Table 3) and where possible the profiles are discussed in terms of the contexts as opposed to the units identified in the monolith tins.

2.3 In order to characterise the contexts sampled, in terms of composition and texture, a small measured sub-sample from various locations down each profile was washed over a 63um and 500um mesh and the residues air dried and re-weighed. Rapid scanning of the dried residues under a binocular microscope (at x16-x64) magnification attempted to assess the component characteristics of each sample. The object of this part of the assessment was to determine the potential for more sophisticated particle size or mineral grain analysis to identify different sediment sources, transport mechanisms, depositional and post-depositional processes operating during the time the sediments accumulated.

## 3. Quantifications

3.1 This section gives the results of the monolith assessment. In Table 28, Table 29 and Table 3 the sequences sampled are described. Table 31 sets out the results of wet sieving in terms of texture and composition.

**Sample <24>: section 26**

3.2 This sample consisted of 4 overlapping monolith tins taken from the south-west part of section 26, through contexts ([87], [85] and [86]). This sample was at a slightly higher elevation than sample <25>, which was also taken from section <26>, but closer to the valley axis.

*Table 28: Assessment of Geo-Archaeology: Sample <24> section 26*

| **Context** | **Zone & unit** | **elevation of contact (m OD)** | **description and contacts** | **tin** | **sub-samples (see** Table 31**)** |
|---|---|---|---|---|---|
| | | 14.79 | Top of sequence sampled | | |
| 87 | A | [0.16m thick] | Dark yellowish brown 10YR4/6 slightly sandy silt, with possibly some clay. Moderately abundant chalk and flint inclusion of granular to 10mm diameter. Massive (the chalk and gravel clasts are distributed throughout the unit with no apparent orientation or structure). Compact. | A | 24A |
| | | 14.63 | Distinct | | |
| 85 | B | [0.48m thick] | Dark yellowish brown 10YR4/6 slightly sandy silt, with possibly some clay. No chalk or flint clasts within the matrix, but very occasional grit-sized chalk within root channels. Occasional root channels are visible as humic stained voids c.5mm thick and as carbonate precipitated veins (1mm thick) that occur towards the base of the unit and extend across the contact with unit C. Compact | A B | 24B |
| | | 14.15 | Distinct sub-horizontal | | |
| 86 | C1 | [0.35m thick] | Yellowish brown 10YR5/8. Soft and compact slightly sandy silt. Holey porous structure. Very occasional granular flint. Frequent carbonate precipitations as threads and flecks, especially towards top of unit. | B C | 24C1 |
| | C2 | [0.40m thick] | As above but slight decrease in carbonate precipitations | C D | 24C2 |
| | C3 | [0.20m thick] | As above but faint bedding structures visible as slightly clayey lenses and a sand lens or bed about 20mm thick occurs at about 13.4m OD. | D | 24C3 |
| | | 13.20 | Base of profile sampled | | |

**Sample <25> Section 26**

3.3 This sample consisted of 3 overlapping monolith tins taken from the north-east part of section 26, through contexts ([87] and [84]). Sample <25> was at a lower elevation and closer to the axis of the dry valley than <24>, which was taken at the south-western end of the same section face.

*Table 29: Assessment of Geo-Archaeology: Sample <25> section 26*

| **Context** | **Zone & unit** | **elevation of contact (m OD)** | **description and contacts** | **tin** | **sub-samples (see** Table 31**)** |
|---|---|---|---|---|---|
| | | 13.56 | Top of sequence sampled | | |
| 87 | A | [0.25m thick] | Dark yellowish brown 10YR4/4 slightly sandy silt, with possibly some clay. Compact & smooth. Chalk granules associated with root channels. Occasional flint inclusions of granular to 10mm diameter. | A | 25A |
| | | 13.31 | Possible contact | | |
| 84 | B | [0.65m thick] | Dark yellowish brown 10YR4/4 slightly sandy silt, with possibly some clay. Softer and slightly darker than unit A. This unit is also possibly slightly more humic, slightly more clayey and has a rougher & looser structure. Occasional faint carbonate precipitations, which decrease with depth, picking out root channels. Occasional gravel and chalk inclusions within matrix as opposed to within root channels. Very occasional manganese flecks. | A B C | 25B |
| | | 12.66 | Distinct sub-horizontal | | |
| 84 | C | [0.35m thick] | Dark yellowish brown 10YR4/4 slightly sandy silt, with possibly some clay. Compact and smooth. Manganese flecks and some iron-staining occurs throughout unit. Very infrequent carbonate precipitations. Very occasional root channels, containing chalk and (a single) brick granules. | C | 25C |
| | | 12.41 | Base of profile sampled | | |

**Sample <26>: section 23**

3.4 This sample consisted of 6 overlapping monolith tins taken from the north-east part of section 23, through contexts ([1], [2] and [3]).

*Table 30: Assessment of Geo-Archaeology: Sample <26> section 23*

| Context | Zone & unit | elevation of contact (m OD) | description and contacts | tin | sub-samples (see Table 31) |
|---|---|---|---|---|---|
| | | 18.19 | Top of sequence sampled | | |
| 1 | A | [0.87m thick] | Strong brown 7.5YR5/6 slightly sandy silt. Very compact & hard. Decalcified (does not fizz with HCL). Angular blocky structure. Occasional flint grit and granules. Very occasional chalk granules. Occasional greenish grey 'soily' clasts / disrupted root tubules. Humic stained roots, some followed by fine white modern rooting. Occasional manganese flecks. | A<br>B | 26A |
| | | 17.32 | Sharp irregular contact | | |
| 2 | B | [0.94m thick] | Yellowish brown 10YR5/6 slightly sandy silt. Compact but moderately soft. Occasional large tufa-like clasts. Frequent carbonate concretions as flecks, threads and lumps. Very occasional faint root channels visible as slightly darker (more clayey or humic) stains. Holey porous structure. Possible increase in sand and decrease in carbonate concretions downwards. | B<br>C<br>D<br>E | 26B1<br>26B2<br>26B3 |
| | | 16.39 | Gradual / indistinct | | |
| 3 | C1 | [0.40m thick] | Yellowish brown 10YR5/6. Compact sandy silt. Occasional carbonate precipitations. Occasional more clayey lenses and traces of sub-horizontal bedding. | E<br>F | 26C1 |
| | C2 | [0.30m thick] | Yellowish brown 10YR5/6. Wavy, intermittent beds / laminae of sand, silty sand and very fine chalk & flint grit. | F | 26C2 |
| | | 15.71 | Base of profile sampled | | |

3.5 Results of wet sieving:

*Table 31: Assessment of Geo-archaeology: Texture and Composition - Sample 24*

| Context | Sub-sample | Weight (g) | >500um (%) coarse sand and grit | 63-500um (%) fine-medium sand | <63um (%) silt + clay | Composition characteristics |
|---|---|---|---|---|---|---|
| **Sample** | **24** | | | | | |
| 87 | 24A | 34.00 | 2.0 | 10.3 | 87.7 | Mostly quartz + mod. chalk (in fine gravel + sand fractions); iron-stained quartz + iron concreted sand grains, but fewer than <24B>; occ. charcoal |
| 85 | 24B | 17.33 | 0.6 | 10.9 | 88.5 | Increase in iron stained quartz, otherwise similar to <24A> but with less chalk. Occ.shell; occ. Iron + manganese concretions; occ. Iron concreted carbonate precipitations. |
| 86 | 24C1 | 24.28 | 0.8 | 14.3 | 84.9 | Mostly quartz., less iron stained than <24B> but more iron stained carbonate concretions / agglomerations than the samples above. Very occasional shell and chalk. |
| 86 | 24C2 | 20.28 | 0.5 | 23.6 | 75.9 | Similar to <24C1> |
| 86 | 24C3 | 16.86 | 0.6 | 17.8 | 81.6 | Mostly quartz. Frequent carbonate concretions / precipitations and many are white ie: (not iron-stained) |

*Table 32: Assessment of Geo-archaeology: Texture and Composition - Sample 25*

| **Context** | **Sub-sample** | **Weight (g)** | **>500um (%) coarse sand and grit** | **63-500um (%) fine-medium sand** | **<63um (%) silt + clay** | **Composition characteristics** |
|---|---|---|---|---|---|---|
| **Sample** | **25** | | | | | |
| 87 | 25A | 20.66 | 1.7 | 10.7 | 87.6 | Mostly quartz: occasionally iron-stained. Occasional shell frags. Occ. chalk + flint gravel clasts - slightly iron stained. More iron-staining than <24A>. Occ. Iron concreted carbonate concretions. |
| 84 | 25B | 20.58 | 3.5 | 9.5 | 87.0 | Mostly quartz, frequently iron-stained. Moderate carbonate concretions / precipitations, mostly iron-stained. Moderate manganese and iron concretions. |
| 84 | 25C | 12.92 | 0.5 | 7.9 | 91.6 | Mostly quartz, frequently iron-stained. Occasional carbonate concretions / precipitations, mostly iron-stained. Frequent manganese and iron concretions. |

*Table 33: Assessment of Geo-archaeology: Texture and Composition - Sample 26*

| **Context** | **Sub-sample** | **Weight (g)** | **>500um (%) coarse sand and grit** | **63-500um (%) fine-medium sand** | **<63um (%) silt + clay** | **Composition characteristics** |
|---|---|---|---|---|---|---|
| **Sample** | **26** | | | | | |
| 1 | 26A | 16.99 | 0.1 | 15.5 | 84.4 | Mostly quartz, occasionally iron-stained. Very occ. chalk fine gravel and sand. No carbonate concretions. |
| 2 | 26B1 | 22.77 | 1.0 | 7.9 | 91.1 | Mostly quartz and occ sand sized chalk. V. occ. Shell frags. Abundant white carbonate concretions. |
| 2 | 26B2 | 18.40 | 1.7 | 12.9 | 85.4 | Mostly quartz low iron-staining. Moderate chalk grains and carbonate concretions |
| 2 | 26B3 | 31.49 | 2.1 | 24.5 | 73.4 | Mostly quartz low iron-staining. Occasional chalk. Fewer carbonate concretions than above + some manganese |
| 3 | 26C1 | 20.48 | 6.0 | 27.6 | 66.4 | Very few carbonate concretions in fine fraction. Occasional manganese grains. Possibly wider mineral diversity than other samples. |
| 3 | 26C2 | 17.07 | 3.6 | 34.3 | 62.1 | As <26C1> |
| loess | (Dines *et al* 1954) | | 0.5 | 9.5 | 90.0 | 10% carbonate, 15% clay minerals, 75% quartz (Langhor, pers. comm.) other minerals include glauconite |

## 4. Provenance

4.1 The samples will be discussed together, as the sequence of sediments observed in each profile have lateral relationships to one another. The deposits have also been related to the sediment sequence described in the ARC STP 97 evaluation report (URL 1997).

4.2 Both sections 23 and 26 were located on the north-north-east facing slope of the dry valley.

- Section 23, from which sample <26> was taken, was located further up the slope and close to the depression of a tributary channel, joining the dry valley from the south-east.
- Section 26 was located about 40m north-west (ie: both down-valley and down-slope) of section 23.
- Sample <24> taken from the south-west end of section 26
- Sample <25> was taken from the north-east end of the section (at a lower elevation and about 30m closer to the valley axis).

4.3 The sediments sampled correspond to those observed in the ARC STP 97 evaluation trenches. The lowest parts of sample <26> (context 002 and 003) and <24> (context [86]) appear to cut through the 'loessic sand'. This was shown (URL 1997, fig.4) to form a wedge of sediment mantling the south-west dry valley side. It thickened into the valley from the higher land to the south-east, thinning towards the foot of the slope where it interfingered between the overlying colluvium and underlying 'head gravels'. Although these gravels were observed at the very base of both sections they were not sampled owing to their coarse nature.

4.4 The overlying colluvium was recorded in the 1997 evaluation report as comprising 3 contexts, infilling the valley floor and lower valley side. Each colluvial deposit became thicker downslope, towards the foot of the valley side and across the valley floor. These colluvial deposits have also been identified in ARC STP 99 as contexts [85] (and possibly [1]), [84] and [87]. Although all 3 colluvial contexts were yellowish brown clay silts and difficult to differentiate, the differences recorded during the 1997 evaluation were on the whole representative of the sequence of colluvial sediments observed in section 26. The lowest ('primary colluvium') had occasional gravel and may correspond with ARC STP 99 context [85], and also possibly [1], in sample <26>. The middle ('secondary colluvium') was more clayey with very few inclusions and probably corresponds to context [84]. The upper ('chalk flecked colluvium') was characterised by frequent chalk fragments and is likely to correspond to context [87].

4.5 Assessment of the monolith samples taken through these deposits has allowed some refinements to be made of the original interpretations and has provided material with potential for more detailed analysis.

4.6 Although contexts [2]=[86] and [3] are likely to have a loessic component, the evidence for bedding seen in [3] (sample <26> unit C2) is more indicative of a waterlain deposit. However gravel stringers do occur locally in loess, such as can be observed in the exposures at Pegwell Bay (Murton *et al* 1998, 36-37). The high sand content (Table 31) of context [3] also suggests it is derived from sandy beds within the Thanet sands, or from reworking of the underlying sandy valley gravels. This latter is more likely, owing to the more diverse mineral assemblage in the sand grains of context [3] than in any other samples. Loess is essentially windblown silt (Lowe & Walker 1999, 121).

4.7 Recent micromorphological examination of inter-laminated silt and sand in part of a loess / brickearth profile at Heathrow airport, has shown that wind blown sedimentation was likely to have occurred in winter and surface wash during the summer months (Rose *et al* 2000) in some episodes of loess deposition. Similar laminations are common in loess profiles within the Belgium Loess.

4.8 The gradual transition from context [3] to context [2] in section 23 was represented in the monolith sample <26> (Table 3) by unit C1, which had occasional faint laminations. The transition between the two contexts was also seen in the gradual increase in silt and clay and decrease in sand from [3] to [2] indicated by the wet sieving results (Table 31). This might suggest that a loessic input was increasingly being incorporated into the accumulating sediment, perhaps as a result of increasingly cold and dry conditions.

4.9 The Thanet Beds in this area were described as silt (URL 1997) and may have contributed to contexts [2] and [86]. However, the calcareous nature of these contexts suggest that their silt content was more likely to be derived from loess. Loess is typically 10% carbonate, 15% clay minerals and 75% quartz (R. Langhor, pers. comm.). Although the 'loessic sand' was described as mostly decalcified in the evaluation report, contexts [2] and [86] had a calcareous matrix and were enriched with carbonate precipitations, particularly as root pseudomorphs. The calcareous matrix suggests that these contexts have been at sufficient depth since they were deposited, to not become decalcified. This is echoed by the carbonate precipitations, which also imply that carbonate has been leached from the formerly calcareous upper horizons of the deposit and percolated down the profile. The precipitation around root channels suggests that plants were growing in the deposit, implying that it formed the lower horizons of a soil. It is therefore likely that contexts [2] and [86] represent the lower part of a former loess derived deposit in which weathering and soil formation has taken place.

4.10 The non-calcareous upper parts of sections 23 and 26 (contexts [1], [85] and [87] may therefore be the *in situ* decalcified upper horizons of the originally calcareous 'loessic sand'. However, when decalcified, loess becomes highly erodible. It is thus likely that the upper contexts are colluvial and represent decalcified soil material derived from loess and Thanet Sands, transported downslope by water and gravity-aided slope processes during the Holocene. Other evidence for downslope movement of these deposits, such as their morphology (thickening towards the slope foot and valley floor) and the inclusion of apparently rolled and compacted soil clasts in context [1] would support this interpretation. If samples for soil micromorphology were taken, which has potential to identify characteristics such as rolled soil clasts, small scale structure and matrix composition may be seen (Macphail 1992; Allen 1992; Rose *et al* 2000).

4.11 The iron stained quartz grains that were common in <24B> might support the suggestion (URL 1997) that evidence for pedogenesis (soil formation) may exist at the surface of the 'primary colluvium' (context [85]). This was tentatively interpreted as a possible Bronze Age landsurface. Although this was not seen in ARC STP 99 due to contractors works, further micro-morphological analysis would be the best way for its identification.

4.12 Context [84] in ARC STP 99 was described as secondary colluvium in the 1997 evaluation. It is more clay-rich, with manganese flecks and occasional iron staining, and it is possible that it has resulted from the damper and possibly episodically wet or flooded conditions in the lowest parts of the valley floor. Past hillwash events are likely to have deposited coarser sandy sediment at the valley edge but carried finer particles into the axis of the valley. The identification of possible channel features in both the present investigation and during the 1997 evaluation (URL 1997) within the valley axis suggests that seasonal bournes were likely to have existed in the valley in the past. However, the lack of coarser material implies that during these episodes the valley floor may have been flooded or soggy as opposed to containing flowing water.

4.13 The name and location of 'Springhead' Roman settlement, down-valley from the site indicates that springs are likely to have existed in the valley in the past. The water table oscillates rapidly in chalk in response to winter rains and summer drought (Sumbler 1996, 148). As a result, spring heads of seasonal streams move up and down the valley depending on the water level in the chalk aquifer. Thus springs may have seeped from a number of places at the contact of the alluvium / colluvium and chalk after heavy rains.

4.14 It has been suggested that the many shallow sub-rounded features excavated below the colluvium (generally cut into [2]/[86] and sealed by [1]/[85] were springs. The features in ARC STP 99 appear to be located on the valley floor and some are certainly archaeological. It is likely that springs would have emerged where chalk exists close to the surface and the group of bowl-shaped features recorded in ARC 330 98 to the south-west of ARC STP 99 appear to conform to this view. The ARC 330 98 features were all very similar, were associated with a possible stream area, and contained no finds. In addition they cut through the lower colluvium and appear to represent a spring line during the colluviation.

4.15 It is possible that all the features have been truncated by downslope soil movement. The 'cuts' in ARC STP 99 are only visible in the carbonate concreted parts of the profile [2] and [86]. These contexts are more cohesive and less susceptible to erosion than the overlying sandier decalcified sediments. Valley side sediments are only 'in transit'. The valley sides are likely to have been both a source and a zone of accumulation of sediment (Allen 1992). Therefore it is very likely that features originally cut through decalcified soil material mantling the slope and into the *in situ* loess-derived calcareous subsoil, will eventually be reworked and eroded, leaving only the lower part, cut into the less erodible subsoil, surviving.

4.16 The generally well-sorted fine texture and lack of flint and chalk gravel within the colluvial deposits differs from the poorly sorted calcareous valley sediments seen in many downland dry valleys (eg: ARC CXT 97 Area 330 Zone 6). This is probably due to the finer grained source material available, but may also be caused by different types of colluvial processes operating. It would appear that on the present site a continuous process of surface wash has operated, together with soil creep, as there is no evidence for the coarser sediments that accumulate at the foot of rills or gulleys.

4.17 A distinct change in colluviation is indicated by the inclusions of chalk fragments in the uppermost deposit [87]. This might suggest that at this time activity was focused on the chalk slope to the sides of the valley, as opposed to the south-west slope, which is capped with Thanet Sand and mantled in loessic material and which was probably the source of the earlier erosion events (and activity). It is possible that this later erosion may have been associated with the use of the Roman land surrounding Springhead Roman Town. Although marling (chalk added to the soil to increase its fertility) and deeper ploughing in the medieval and later periods is another possibility.

4.18 Assessment of the monolith samples has suggested that the bedded sand, silt and chalk-flint granules (context [3]), immediately overlying valley gravels, probably accumulated as a result of seasonal meltwater in the Devensian period. On the south-west slopes of the dry valley, loess or locally redeposited loess then accumulated, probably in dry periglacial conditions. It would seem that the earliest loess deposition was contemporary with the same processes that deposited the underlying waterlain deposit, as the transition between contexts [3] and [2] appears to be gradual. Loess deposition has been dated from about 10ka to 25ka BP in this area (Bateman 1998).

4.19 Subsequently, probably during the early Holocene, weathering and soil formation took place, which decalcified the surface of the loess. The decalcified loess will have been susceptible to soil erosion. Human activity, especially deforestation and clearance on the plateau and slopes of the dry valley may have triggered hillwash processes, which have eroded the upper decalcified loess and soil from the valley sides and redeposited it further downslope (as contexts [1] and [85]). This seems to have been a continual and gradual process for no evidence for more catastrophic erosion was found (such as the flint and chalk gravel typically found at the foot of rills and gulleys). Material found during the 1997 evaluation dated this colluvial episode to the Bronze Age. Wetter conditions seem to have existed on the floor of the dry valley (as seen by context [84]), perhaps as a result of the seepage of springs from the valley side (as seen in the ARC 330 98 features).

4.20 Evidence for a watercourses (though probably temporary) was found directly cutting the valley gravels in 1997, cut into the Late Devensian deposits in ARC STP 99 and cut into the lower colluvium during ARC 330 98. However the more clayey [84], which may correspond to the (undated) secondary colluvium observed in the evaluation ARC STP 97, may represent increasingly wet climatic conditions. During this period a higher water table may have led springs to seep more regularly across a wetter valley floor (as seen in ARC 330 98). The upper ‘chalk flecked’ colluvium described in the ARC STP 97 evaluation report corresponds with context [87]. This may be derived from more intensive activity on the valley sides, which cut into the chalk, or it may result from marling to improve the fertility of the soil at any time from the Iron Age onwards, but probably during the medieval and post-medieval periods.

4.21 The monoliths have sampled all the colluvial contexts identified during fieldwork. However in order to reconstruct the sequence of events and provide information regarding the evolving landscape, environment and soils available to be exploited by the prehistoric and historic communities who occupied the environs of the site, further work on these samples is required. The most useful technique would be to examine the sediments in thin section. As no blocks for soil micromorphology were taken during the excavation, it would be necessary to make thin sections from the monolith samples, if possible. In addition, the fine waterlogged sediment in sample <25> is likely to preserve pollen, which could provide information on the changing ecology and possible human activities within the catchment of the valley. If these colluvial sediments remain undated, pollen might also be able to provide a rough age estimate for their accumulation (in terms of established Holocene pollen zones for the Kent area).

## 5. Conservation

5.1 If thin sections are made of the monolith blocks they will take up less storage space, stand a better chance of long term preservation and be amenable to a similar method of archiving to that for finds and environmental samples. As monoliths the samples are not easily stored, need to be kept in a cool to cold and dark environment and will be likely to deteriorate with time. In addition thin sections are easily available for further research and can be examined frequently without loss of information. Stored monoliths are less accessible and will gradually loose their potential for preserving information, especially as each time they are examined, further cleaning will wear away the surface.

5.2 In the same way, processed sub-samples taken from the monoliths will be easier to store and less likely to deteriorate than the original soil material.

5.3 Long term storage as monolith samples is likely to be costly and is not an efficient use of space or archive material.

## 6. Comparative material

6.1 Much geo-archaeological research has been undertaken on the slope deposits in the dry valleys of south-east England. This has focussed on identifying periods of instability (sediment accumulation) and stability (soil formation) and attempting to correlate these events with evidence for human activity (Burleigh & Kerney 1982; Bell 1983, Allen 1992).

6.2 The colluvial and soliflucted sediments infilling dry valleys have also been investigated by Quaternary Scientists, with the aim of reconstructing Late Glacial environments. Evidence for buried interstadial soils have sometimes been found within these deposits (Preece 1994). Recent work on brickearth, with similar characteristics to the 'loessic sand' (contexts [2] and [86]) on the present site has shown that periods of Late Glacial and early Holocene soil formation can also be detected by soil micromorphology (Rose *et al* 2000).

6.3 Examination of deeply stratified colluvial profiles have shown that, as a result of accelerated soil erosion, the deep brown earth soils that developed in the early Holocene below woodland have been removed (Bell and Boardman 1992). Where the colluvial deposits have been well dated (mostly by pottery inclusions or the burial of dated features) the periods of accelerated erosion and stability have been directly correlated with episodes of human occupation and activity upslope (Macphail *et al* 1990; Bell & Walker 1992, 193, Allen 1992).

6.4 Valley sediments have been recorded and sampled from several of the CTRL sites (for example Area 330 Zones 3, 4 and 6). As such they record sequences and chronologies for periods of landscape stability and instability that might be compared with each other and to other evidence for human settlement and activity across the North Downs landscape.

6.5 In addition, CTRL work being to the north of the A2 and A2-M2 widening scheme works should provide further comparative material.

## 7. Potential for further work

7.1 The data from the monolith samples has potential to address the following landscape zone and fieldwork aims:

- *To study the natural landscape, its geomorphology, vegetation and climate, as the context within which the archaeological evidence can be interpreted.*
- *Farming communities (2000 BC-100 BC): to consider environmental change resulting from landscape organisation and re-organisation.*

7.2 In addition, sample <26> has potential to provide information about the Late Glacial environment.

7.3 The achievement of these aims requires a well-dated framework within which to place the geo-archaeological data. The main sequence of colluviation in ARC STP 99 appears to be cut by Late Bronze Age features (and a Bronze Age horizon was identified in the evaluation ARC STP 97) and material seals Neolithic occupation deposits. It is therefore considered that sufficient dating evidence for deposits exist for soil micromorphological examination of thin sections made from the monoliths. This work might enable the sequence of events that record the changing landscape and environment of the valley to be reconstructed. Combined with pollen analysis of the finer sediment towards the valley floor (sample <25>) this could provide information about past ecology and landuse and human–landscape interactions.

7.4 In order to extract the most reliable information from the thin sections, it is recommended that prior to resin impregnation for thin section manufacture the monolith inserts should first be x-rayed and subject to loop-sensor magnetic susceptibility determination. In addition, closer-spaced sub-samples than those taken for assessment should also be taken from the tins in case background particle size, loss-on-ignition and phosphate analysis is also needed to provide a suite of data with which trends through the profiles can be reconstructed. Such information is very important when interpreting thin section characteristics.

7.5 This data should be examined in conjunction with the archaeological and dating evidence from the site. As a result of these new data the monolith assessment presented here should be refined in order to make the most reliable interpretations about past landuse and environmental change for the environs of the site.

7.6 In order to achieve this potential it is suggested that the following further works are attempted:

*Table 34: Recommendations for further work on the monolith samples*

| | Task | staff / technology |
|---|---|---|
| 1 | **<br>a) X-ray and b) magnetic susceptibility determination of 12 monolith inserts.<br>c) Loss on ignition and d) particle size analysis at 30mm intervals through the profiles (30 sub-samples) | Geoarchaeologist<br>(no report at this stage) |
| 2 | *<br>Preparation and analysis of 12 pollen samples | Pollen specialist |
| 3 | *<br>a) Impregnation of the monolith samples, manufacture of 6 thin sections of c.110 x 70mm and<br>b) analysis / interpretation of the depositional and post-depositional characteristics recorded in these samples | Likely to take 3 months to prepare the thin sections. |
| 4 | Comparison of the sequence and chronology of events at ARC STP 99 with the archaeological evidence on-site and with valley sediment profiles from other CTRL sites and from the published literature for the area. | Geoarchaeologist |
| | NOTES; | |
| | * It is suggested that the thin sections / pollen slides should initially be scanned to assess their potential and, if suitable the analysis should be undertaken. | |
| | **The results of task 1 analysis will need to be made available to whoever does task 3b. The task 1 analysis will in turn need task 3 information to enable the task 1 data to be interpreted.<br>It is suggested that the task 1 data are sent as uninterpreted data to the task 3 specialist, who will prepare his / her report. The results of task 1 and 3 will then be available, together with the task 2 report for geoarchaeological interpretation. This will form task 4, in which the results of the various geoarchaeological analysis will be integrated. | |

## 5. Bibliography


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