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Ancient Monuments Laboratory
Report 71/89

A BURIED SOIL FROM CASTLE RISING, NORFOLK.

Matthew Canti

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Summary

A buried soil from Castle Rising Ticket Office site has been examined with a view to elucidating its origin, genetic relationships and environmental history. From particle size and micromorphological evidence, the soil appears to have developed in-situ by acidification and leaching but without the onset of podsolisation. It was clearly disturbed and probably artificially deepened prior to burial with local subsoil materials.

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A BURIED SOIL FROM CASTLE RISING, NORFOLK

1. INTRODUCTION

Excavations at the Castle Rising Ticket Office site were carried out in the summer of 1987 by the Norfolk Archaeological Unit and directed by David Gurney. Samples of a thick, dark buried soil were sent to the Ancient Monuments Laboratory for description and analysis.

2. SAMPLES

CR87A - A Kubiena tin from the interface between top of buried soil and overlying redeposited chalky boulder clay. (See Figure 1)

CR87B - A Kubiena tin from interface between bottom of buried soil and underlying Dark Yellowish Brown sand. (See Figure 1)

CR87C - A large monolith spanning the whole of the buried soil, with both underlying and overlying deposits.(See Figure 2)

3.METHODS

KUBIENA TINS - were impregnated, sectioned and examined microscopically.

MONOLITH - was described and sampled for particle size analysis, to provide information on likely horizon relationships.

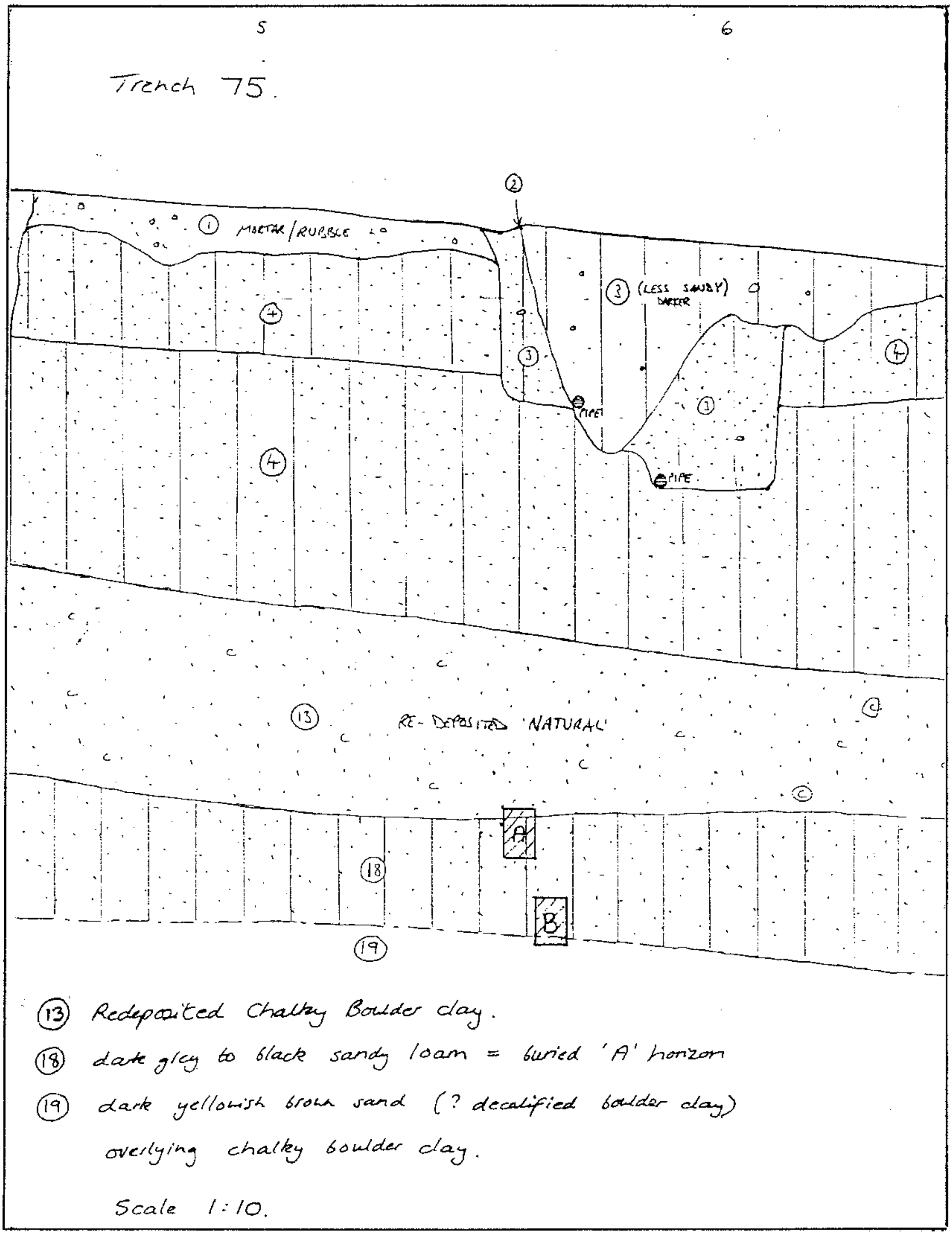


Figure 1
Part of section drawing showing positions of Kubiena tins CR87A and CR87B.

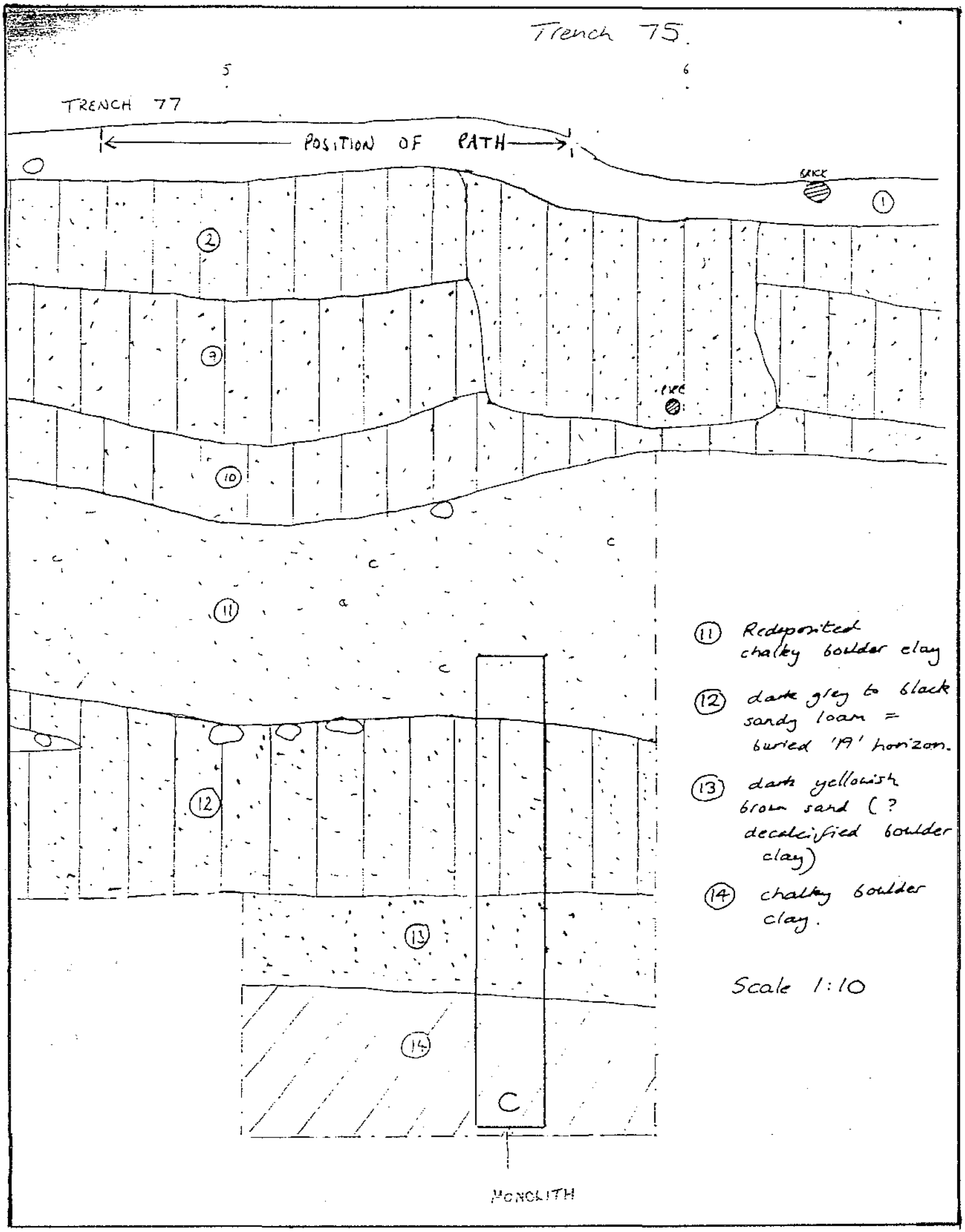


Figure 2
Part of section drawing showing positions of monolith tin CR87C.

4.1 RESULTS- Monolith

0-15/17cm — SAMPLE 1

Yellowish Brown (10yr 5/6) Loamy Sand. Common, very small to medium, rounded (chalk) or angular (flint) stones. Structureless, single grain. Abrupt, smooth boundary to:-

15/17-40/50cm — SAMPLE 2

Very Dark Greyish Brown (10yr 3/2), Loamy Sand. Few, angular small and medium flints. Structureless, single grain Clear, smooth boundary to:-

40/50-65/69cm — SAMPLE 3

Brown (7.5yr 4/4) Sand. Few, small, angular,flints. Structureless, single grain. Abrupt wavy boundary to:-

SAMPLE 4

65/95-85/95cm — SAMPLE 5

Strong Brown (7.5yr 5/8) Sandy Loam. Abundant small and medium, rounded (chalk) and angular (flint). Structureless, single grain. Clear, wavy boundary to:-

85/95-base — SAMPLE 6

Brownish Yellow (10yr 6/8) Sandy Loam. Abundant very small to medium, rounded (chalk) and angular (flint) stones. Structureless, single grain.

Plate 1
The soil monolith

The buried soil appears to be in-situ with its underlying subsoil, rather than a purely dumped deposit. If the parent sands of layer 13 were calcareous, then a gradual process of decalcification would have slowly reduced the pH and altered the biological activity to a point where podsolisation ensued. Since there is no bleached layer or relic Bs horizon, it can be assumed that this point had not been reached at the time of burial. However, evidence of grain bleaching and the dark colour of the humus in layer 12 suggests that this soil was "on the turn" from a Brown Sand to a Brown Podzolic Soil (Avery 1980). Such soils do not usually have the depth of dark A horizon that was found here, so the possibility of artificial deepening and disturbance must be borne in mind.

4.2 RESULTS - Particle size analyses

All the samples were dried, disaggregated and sieved to determine size distribution in the sand and stones fraction. Fine material was analysed with a Sedigraph 5000ET, which produces results comparable with traditional sedimentation methods.

Large stone percentages cannot be treated as statistically reliable unless very large amounts of soil are sieved. Since, only a monolith was available, the sample size used here is accurate up to 4mm (Mace 1964). The data for whole soil percentages (Fig. 3) must, therefore, be viewed within this constraint. A second set of data is also provided (Fig.4) which represents analyses of the sub-4mm fraction. This second set of curves can be regarded as repeatable.

It is apparent from Figure 3 that four of the deposits (solid lines) are related in terms of particle size. These are the immediate overburden, the dark buried soil and the two samples of subsoil. Their essential similarity is in the degree of sorting (steep slope) in the central (600-100um) part of the curve. Despite the statistical problem outlined above, even the >4mm fractions are reasonably well matched. This result vindicates the suggestion that the dark soil is in-situ, but also shows that its overburden is likely to be natural subsoil transported from very nearby (see page 8, para.3).

The remaining two samples on Figure 3 (dotted lines), from the base of the monolith, are somewhat different. Their stone content is clearly higher, but they still show a degree of sorting in the medium sand fraction. Taking Figure 3 on its own, it would seem that 5 is a mixed material, showing properties of both the 1-4 group and also the poorly sorted basal material 6 (see Page 4 for sample points).

Figure 4 sheds light on this issue by effectively removing the stones, to see how the sub-4mm materials relate. As before, the 1-4 group shows up well, but the distinction from 5 and 6 is far less clear. An apparent trend in these materials is that higher

FIG 3

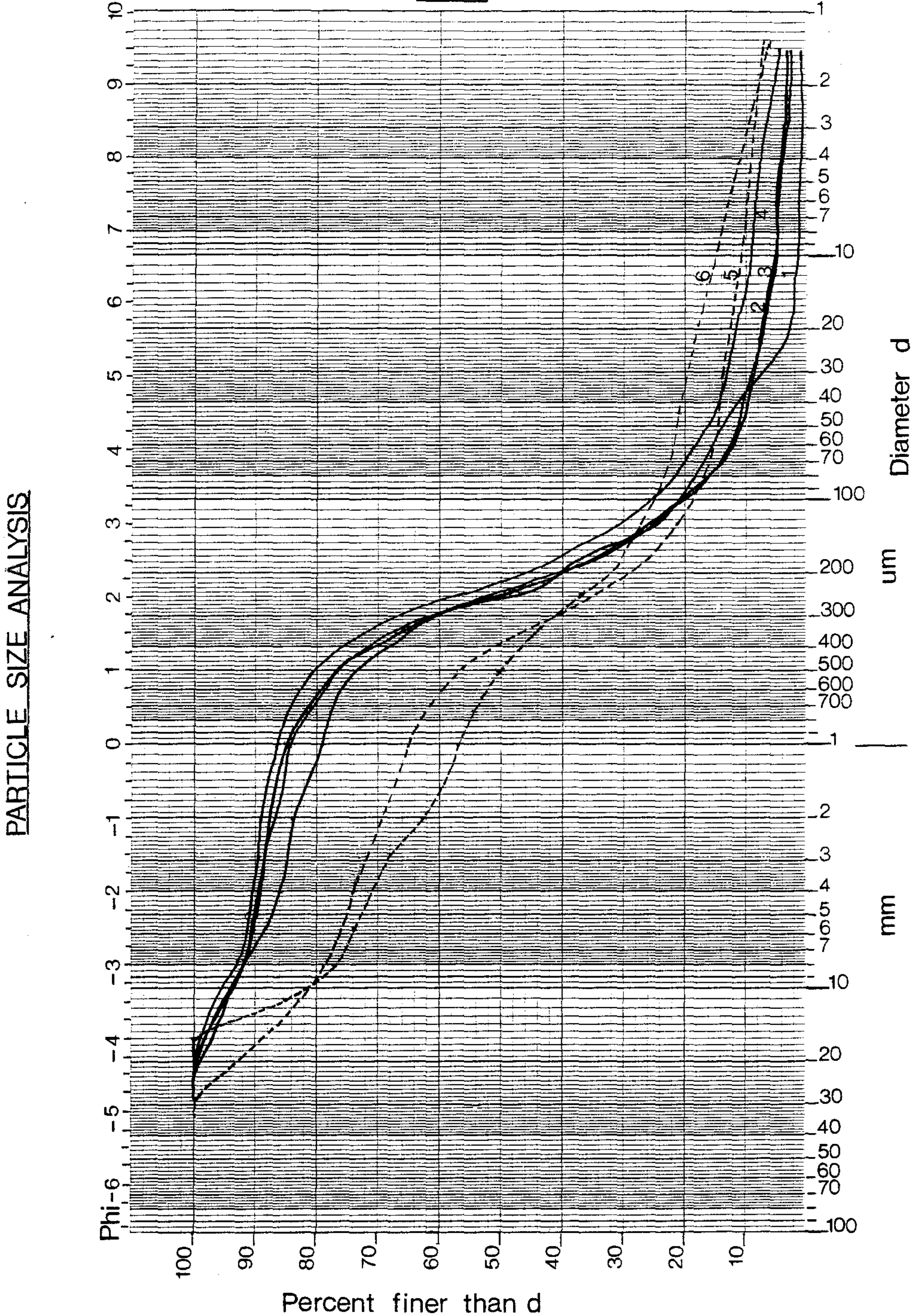
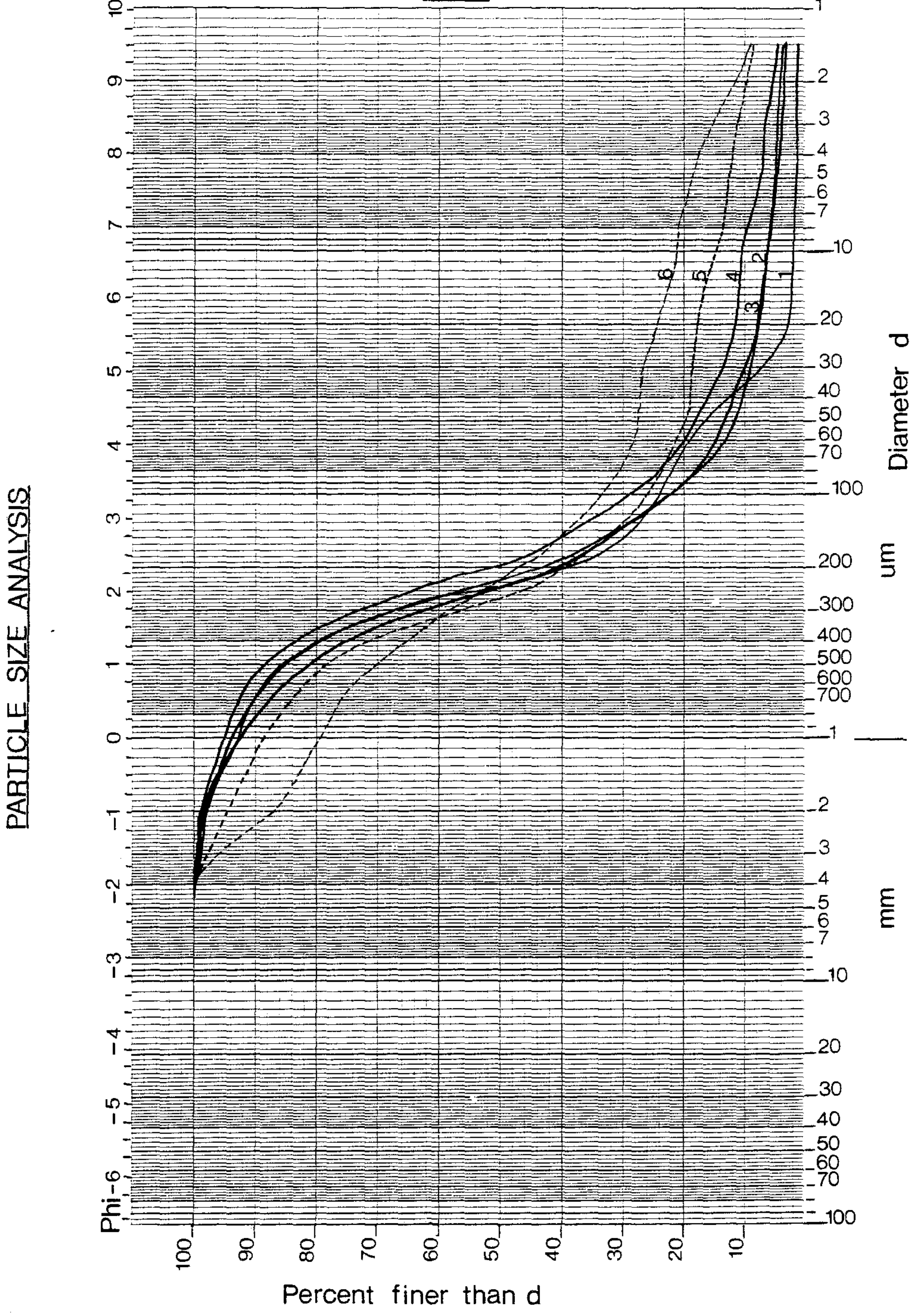

PARTICLE SIZE ANALYSIS
Phi
Percent finer than d
Diameter d
um
mm
1
2
3
4
5
6

FIG 4


PARTICLE SIZE ANALYSIS
Phi
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
Diameter d
um
mm
1
2
3
4
5
6
7
10
20
30
40
50
60
70
100
200
300
400
500
600
700
100
90
80
70
60
50
40
30
20
10
Percent finer than d

coarse sand percentages relate to higher clay percentages, with 1-4 at the bottom of the scale (low coarse sand/ low clay) and 6 at the top of the scale (high coarse sand/high clay). In essence, this scale is an inverse measure of sorting, since a hypothetical continuation would trend towards a sample whose distribution curve would be a straight line (i.e perfectly unsorted).

In practical terms then, the implication of Figs. 3 and 4 is that a well sorted sand has been mixed with an unsorted material in varying proportions. Castle Rising is mapped as lying on the border of Sandringham sands (Cretaceous) and Boulder clay (B.G.S. Sheet 145). These would seem to be likely candidates for the two materials, the former providing well sorted sand and the latter providing unsorted materials up to boulder size. There may, however, be influences from unmapped fluvioglacial deposits as well.

Material from the base of the monolith is largely boulder clay influenced, while the middle and upper parts, including the buried soil and its overburden, are composed more of the well-sorted sand. In this context, it should be noted that a separate sandy layer is visible in the section photograph (not reproduced), at the base of layer 11. This sandy layer, being roughly one third of layer 11, was clearly the material in the monolith, and therefore the sample that was tested. Thus, the <u>immediate</u> overburden (but not the whole of layer 11) can be said to be of near-identical origin to the subsoil (layer 13) and the buried soil (layer 12).

4.3 Micromorphology

The fabric of the buried soil consists largely of bleached quartz grains, pellety humus and dense angular fragments of mor-type humus (see Plate 2). These features are all compatible with the type of acid conditions in coarse textured soils that were discussed in Section 4.1. However, throughout the soil there are scattered grains of chalk (see Plate 3), which are anomalous within such a soil regime. Further evidence of exotic inputs can be found at both the top and bottom of the buried soil. Examples shown here are a fragment of chalky mortar, (Plate 4) and piece of pot (Plate 5).

Many hypotheses could be formulated to cover the features in these slides. In general terms, the juxtaposition of mor type humus with occasional chalk grains and anthropogenic inputs would suggest a degree of disturbance to the natural acid soil, which may or may not be associated with the actual burial. The unusual depth of the A horizon, mentioned earlier, would therefore seem to be artificial.

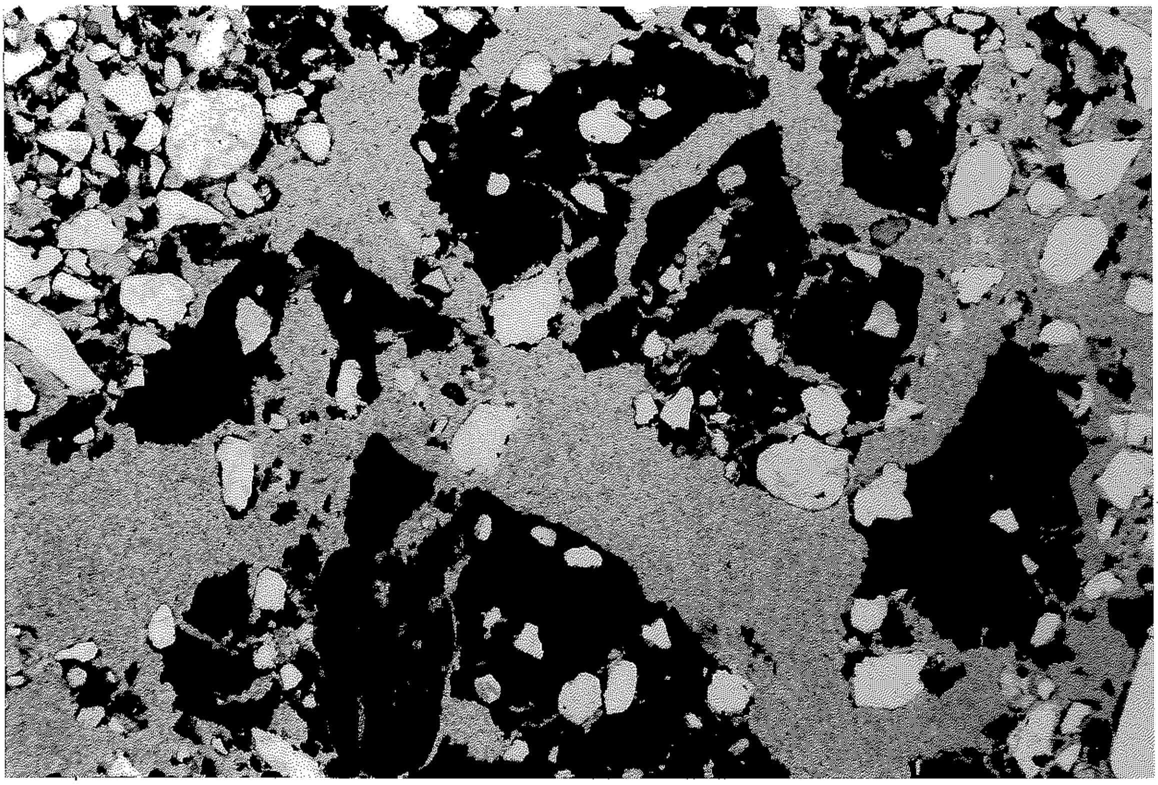


Plate 2
Dark masses of mor-type humus and bleached quartz grains from CR87B. Plane polarised light.

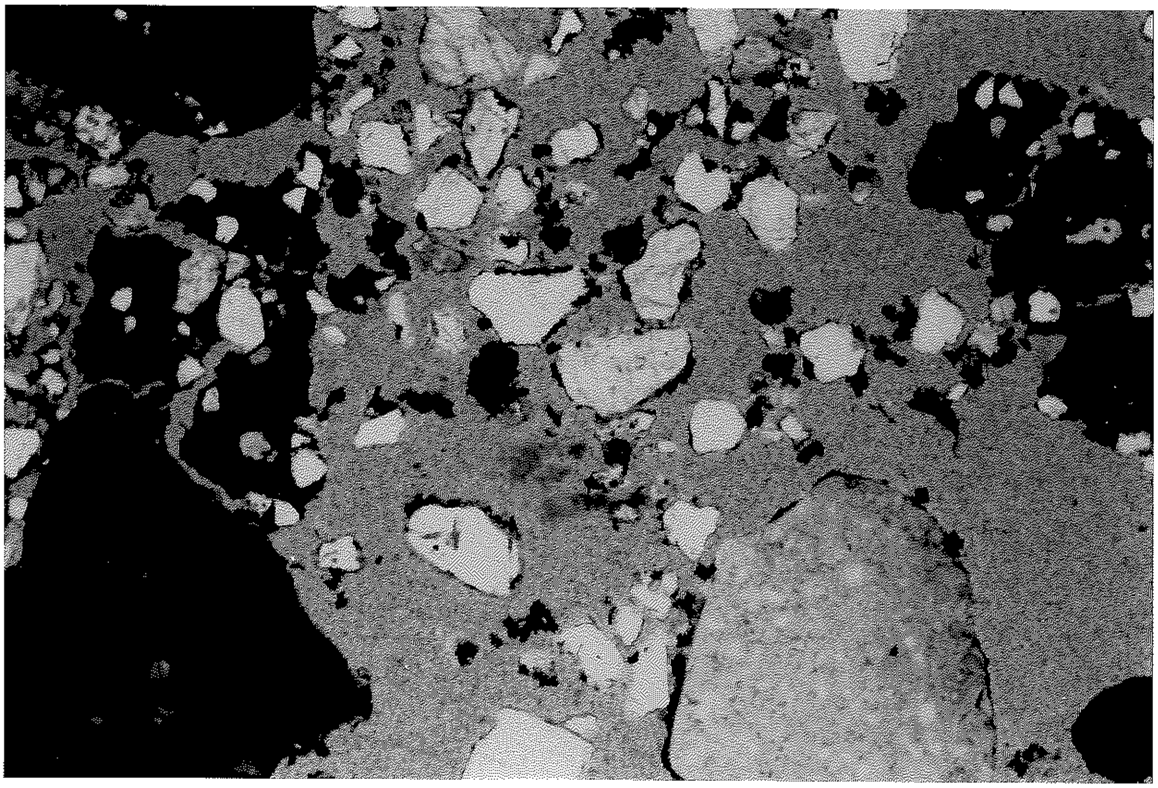


Plate 3
Chalk (dark grains on left) and flint (light grain on right) from CR87B. Plane polarised light.

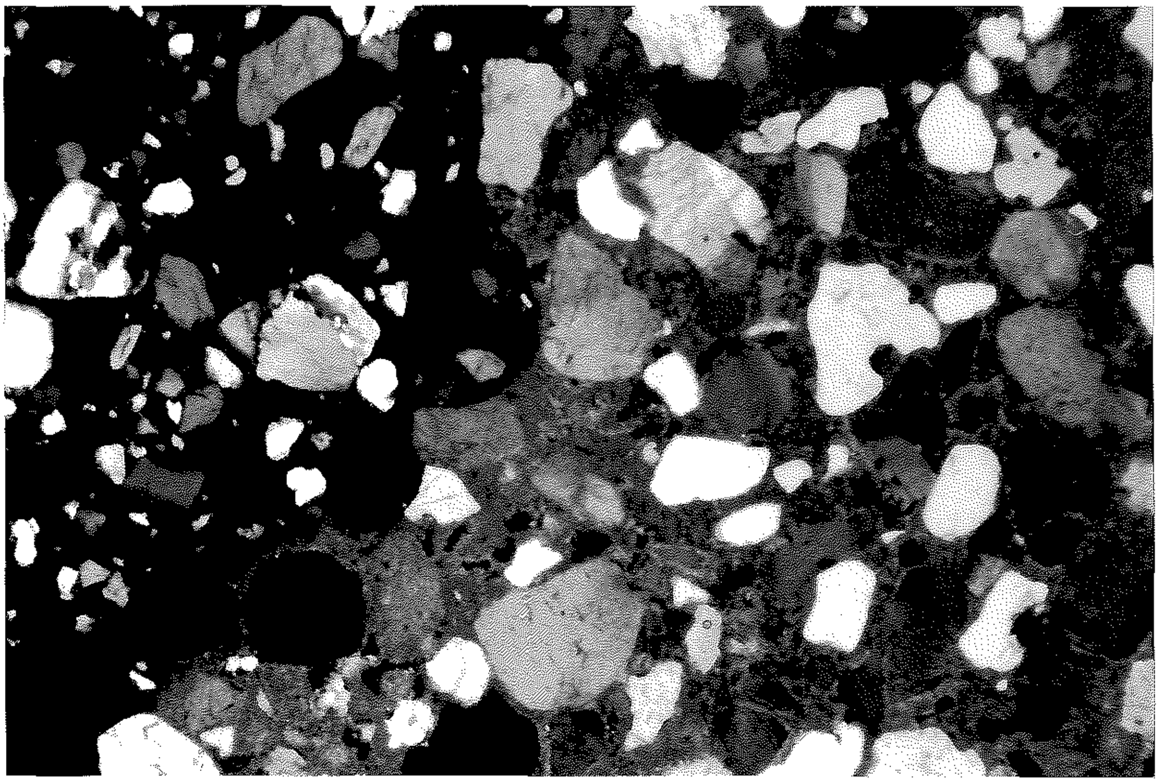


Plate 4
Chalky mortar fragment (right hand side of photograph) from CR87A. Cross polarised light.

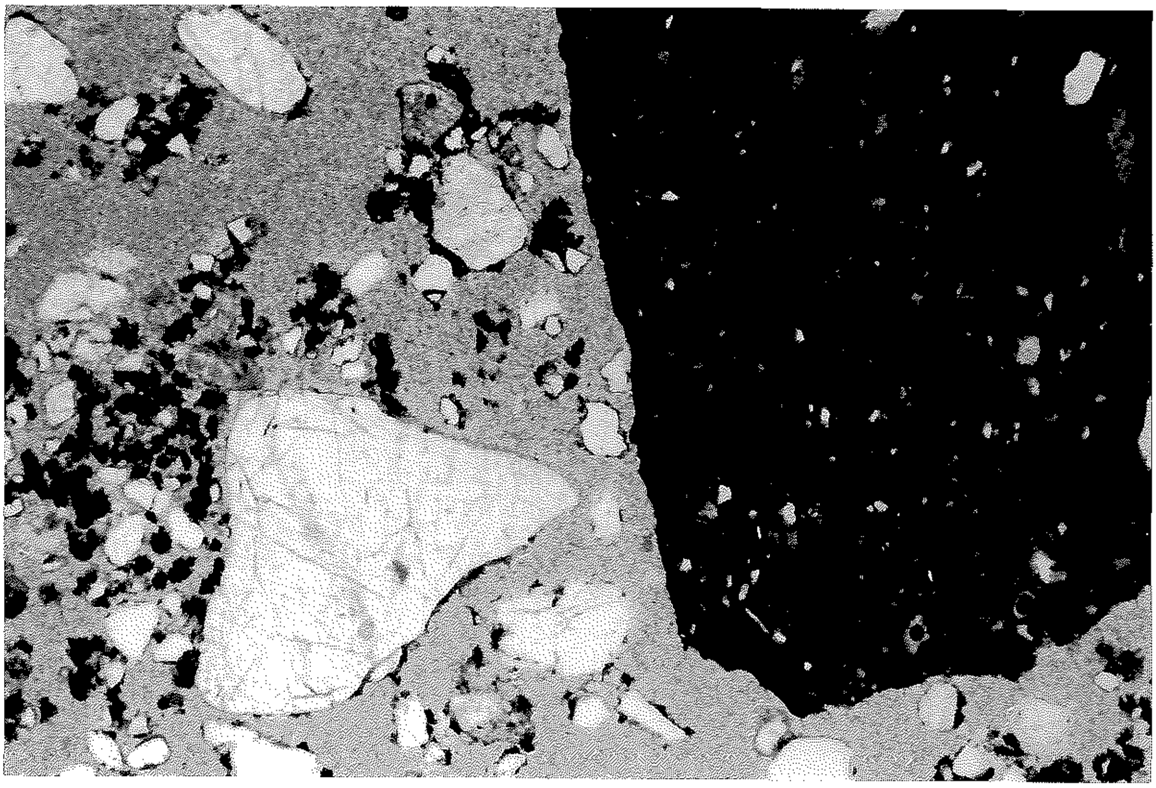


Plate 5
Pot fragment (right hand side) from CR87B. Plane polarised light.

5. Conclusion

1. From particle size evidence, the monolith was a whole, in-situ buried profile formed in a parent material consisting largely of well-sorted sand, but weakly influenced by local boulder clay. Underlying the profile, the layers increasingly resembled a boulder clay, but the immediate overburden of the profile was the same sand as the soil itself.

2. From macro- and micromorphological evidence, the buried soil was acid and had some development of mor humus, but had not yet reached the point of true podsolisation. At some time between this juncture and the moment of burial, the A horizon was artificially deepened, but only from very local sources. Amounts of exotic contamination are insufficient to indicate dumping, but their depth in the profile suggests considerable topsoil upheaval, for example raking. The burial proper was initiated with a layer of very local subsoil material.

REFERENCES

Avery B.W. (1980) "Soil Classification for England and Wales." Soil Survey Tech. Mon. 14 Harpenden.

Mace A.E. (1964) quoted from Shackley M.L. (1975) "Archaeological sediments: A survey of analytical methods." John Wiley and Sons. New York

Acknowledgement

Many thanks to Dr Richard Macphail for micromorphological identifications.

APPENDIX 1

Particle Size Analyses

Phi	um	CRC1	CRC2	CRC3	CRC4	CRC5	CRC6
-5.0	32000	100	100	100	100	100	100
-4.5	22600	100	100	100	100	95.81	100
-4.0	16000	98.09	98.74	98.67	97.23	89.21	100
-3.5	11300	95.65	95.38	95.14	94.06	82.69	84.25
-3.0	8000	92.18	93.19	92.61	92.29	78.5	77.01
-2.5	5700	88.14	91.82	90.92	91.2	75.61	74.36
-2.0	4000	86.04	90.71	89.72	90.18	73.37	71.35
-1.5	2800	84.86	89.94	88.76	89.06	71.26	68.39
-1.0	2000	84.44	89.25	87.84	87.78	68.96	62.16
-0.5	1400	81.72	87.9	85.93	86.2	66.93	59.36
0.0	1000	79.78	86.55	84.08	84.03	65.02	57.02
0.5	707.1	78	84.64	81.63	81.44	62.25	54.32
1.0	500	74.08	80.68	76.47	76.36	57.37	50.17
1.5	353.6	64.32	71.88	66.67	64.75	47.46	44.62
2.0	250	44.96	56.43	51.52	48.07	34.87	37.82
2.5	176.8	29.8	42.19	34.94	34.76	26.68	31.56
3.0	125	23.9	31.94	24.5	25.3	21.45	26.95
3.5	88.4	20.15	23.27	16.37	17.73	17.26	23.12
4.0	62.5	17.35	18.15	13.19	12.39	15.21	21.31
4.5	44.2	12.43	15.74	11	10.4	14.26	20.27
5.0	31.3	6.64	13.9	9.12	8.96	13.55	19.44
5.5	22.1	2.72	12.35	7.59	7.79	12.83	18.52
6.0	15.6	2.1	10.96	6.47	6.73	11.87	17.2
6.5	11.0	1.99	9.82	5.67	5.89	10.82	15.59
7.0	7.8	1.86	8.89	5.14	5.29	10.13	14.38
7.5	5.5	1.72	8.03	4.69	4.82	9.48	13.13
8.0	3.9	1.53	7.13	4.15	4.38	8.62	11.44
8.5	2.8	1.32	6.21	3.64	3.95	7.82	9.68
9.0	2.0	1.05	4.97	3.03	3.38	6.94	7.38
9.5	1.4	.88	4.22	2.68	3.04	6.45	6

Textural Details

These values are the normal weight percent in each of the class groups. See Appendix 2 for class details.

	CRC1	CRC2	CRC3	CRC4	CRC5	CRC6
Coarse Sand	9.4	6.9	9.4	9.5	12.6	15.5
Medium Sand	50.5	40.7	44.8	46.1	45.2	30.5
Fine Sand	20.1	32.5	31.1	30.6	20.4	20
Total Sand (S)	80	80	85.3	86.2	78.1	65.9
Coarse Silt	17.2	6.6	6.5	5.3	3.6	4.8
Medium Silt	.7	4.1	2.7	2.9	4.2	7.6
Fine Silt	.8	3.7	2.0	1.8	4.0	9.8
Total Silt (Z)	18.8	14.4	11.3	10.0	11.8	22.2
Total Clay (C)	1.2	5.6	3.5	3.9	10.1	11.9
Texture	LS	LS	S	S	SL	SL

APPENDIX 2.

Particle size classes and textural assessment.

Size Classes :-

SAND (S) 2mm-60um
  Coarse (CS) 2mm-600um
  Medium (MS) 600um-200um
  Fine (FS) 200um-60um

SILT (Z) 60um-2um
  Coarse (CZ) 60um-20um
  Medium (MZ) 20um-6um
  Fine (FZ) 6um-2um

CLAY (C) <2um

Textural assessment:-

Values for Sand, Silt and Clay are entered into the triangular diagram below.