Camb 34/93

LAND AT BRITTONS HALL FARM,
CHIGNALL ST. JAMES
NR. CHELMSFORD, ESSEX

SOILS AND
AGRICULTURAL LAND CLASSIFICATION

FEBRUARY 1987

RURAL PLANNING SERVICES,
BROADWAY HOUSE,
130C BROADWAY,
DIDCOT,
OXON OX11 8UB

1. INTRODUCTION

1.1. This report describes the soils and Agricultural Land Classification (ALC) of about 70ha (173 acres) of land at Brittons Hall Farm, Chignall St. James, near Chelmsford, Essex.

1.2. It is based on a study of published information and on the results of a site inspection carried out on 25 January and 2 February 1987.

1.3. The published information consulted included:

(a) Geological Survey Sheet 240 (Epping) at 1:50,000;

(b) Soil Survey of England and Wales Sheet 161 (Saffron Walden) a reconnaissance map at 1:63,630 and accompanying report;

(c) Soil Survey of England and Wales, National Soil Map Sheet 4 (Eastern England) at 1:250,000 and accompanying *Regional Bulletin*;

(d) ALC Sheets 148 (Saffron Walden) and 161 (London N.E.) at 1:63,360 accompanying Regional Bulletin;

(e) Meteorological Office map of mean annual rainfall (1941-70) 1:625,000.

1.4. Section 2 of this report describes the physical characteristics of the site as they affect land quality, based on the published information and observations made during the site inspection.

1.5. The main purpose of the site inspection was to provide fuller information about the soils from which a detailed ALC of the site could be produced.

1.6. 111 borings were made by 1.2m dutch hand auger at the locations shown on RPS 1. Descriptions of the borings are given in Appendix 1 and the types of soils found are discussed in Section 3. A soil map is attached as RPS 2.

1.7. Section 4 discusses the detailed Agricultural Land Classification of the site, with detailed ALC maps presented as RPS 3/1 and 3/2.

2. PHYSICAL CHARACTERISTICS OF THE SITE

Location and Land Use

2.1. The site consists of a block of land, of about 63ha (156 acres) lying south of the hamlet of Chignall St James, and a smaller block of about 7ha (17 acres) between Chignall St James and Chignal Hall to the North East.

2.2. All the land is in arable use except for three small fields east of Pengymill which are used for horse grazing and a strip of the permanent grass on the valley floor of the River Can at the north-west corner of the site.

2.3. The south-west corner of the smaller northern block is not in agricultural use having had assorted materials tipped and/or stored on it and with bushes and small waste heaps dotted over it.

Topography

2.4. The land is part of the central Essex Boulder Clay Plateau, falling away to the valley of the River Cam which forms the western boundary of both blocks.

2.5. The height varies from about 37m to 44m (115 to 135ft), and there is a general absence of steep slopes. Much of the eastern half of the site is basically flat while the western half has gentle slopes down to the River Cam.

2.6. Thus there are no agricultural limitations imposed either by altitude or gradient.

Climate

2.7. The site has the typical, somewhat continental climate of south Essex, with relatively high summer and low winter temperatures.

2.8. The main annual rainfall is about 600mm (23.6 inches), a relatively low figure for south-east England.

Geology

2.9. The geological map shows virtually the entire land as part of the extensive spread of Chalky Boulder clay in Central Essex.

2.10. A narrow strip of alluvium is shown along the floor of the Can valley but only the extreme south-west corner of the smaller northern block extends onto this. The map also shows a narrow strip of glacial gravels and a superficial drift called Head at the south-west corner of the main block, overlooking Pengymill.

Soils

2.11. The northern block is covered by the Soil Survey map sheet 141 which shows Chalky Boulder Clay soils (Hanslope and related series) on the highest ground nearest the road, soils on glacial gravels (Chelmer and related series) in a broad band across the centre of the block, and poorly drained clayey soils (Fladbury series) on the alluvium in the extreme south-west corner. This is, however, only a reconnaissance map, and so the soil types and soil boundaries should not be taken too literally.

2.12. Both blocks are now covered by Sheet 4 of the 1:250,000 National Soil Map but this gives only a very simplified picture of the soils. Both blocks are shown mostly as Assocation 511j (Stretham) with Association 571x (Ludford) along the Can Valley.

2.13. This is simply another way of making the basic distinction between clayey soils on the Chalky Boulder Clay and gravelly soils along the valley sides, the common soil pattern in Central and South Essex.

2.14. It may be noted, however, that in this vicinity the Chalky Boulder Clay soils have been assigned to the Stretham Association found on particularly chalky clay and which are regarded as better drained than the more common Hanslope Association on the Chalky Boulder Clay.

2.15. Investigations elsewhere where this Stretham Assocation has been shown, however, have failed to demonstrate that the soils were any more chalky or better drained than normal.

ALC

2.16. The site is on the overlap between Sheets 148 and 161, which follow the convention in the area of classifying virtually all the Boulder Clay as Grade 2, the Gravels, Head and Alluvium on the valley sides and floors as Grade 3.

2.17. Thus most of the site is shown as Grade 2 with Grade 3 where the ground falls away towards the River Can.

2.18. More detailed investigations have, however, shown that the Boulder Clay can give gradings ranging generally from Grade 2 to 3b depending on drainage. The gravel head and clay soils also give a range of land qualities which can only be determined following detailed site inspections.

3. SITE INSPECTION - SOILS

3.1. The site inspection revealed that virtually all the undisturbed soils on the arable land had Chalky Boulder Clay. Only 11 of the 105 borings concerned failed to reach Chalky Boulder Clay, and most of these are thought to have Chalky Boulder Clay below auger depth.

3.2. The horse grazing paddocks in the extreme south-west did have gravelly soils, however, but much disturbed by former small gravel digging operations. On the arable land only two borings (no 53 and 111) both in low lying positions had stony layers at depth indicating the presence of gravels nearby. Otherwise these soils resembled the others on the site.

3.3. Thus the distinction on the reconnaissance maps, and by implication on the ALC map, that the higher ground was Chalky Boulder Clay, the lower ground was over gravels, is not correct. Instead, the whole site should be regarded as having soils on Chalky Boulder Clay (or their decalcified equivalents).

3.4. The characteristic soil of the Chalky Boulder Clay is a calcareous clay or clay loam over calcareous clay, passing down into yellowish brown Chalky Boulder Clay (Soil Type A). These soils, which would be classed as the Hanslope series by the Soil Survey of England and Wales were found at 78 of the 112 boring locations.

3.5. Similar soils ie. clay loams over clay, but non-calcareous, at least in the surface were also found (Soil type B). These would be classed as the Faulkbourne series (or one or two with redder subsoils as the Bengeo series). 19 examples of such soils were found, about half overlying Chalky Boulder Clay within auger depth.

3.6. Site investigations of similar terrain elsewhere in South and Central Essex have shown that such non calcareous clayey soils can be quite common and substantial areas of them can

be picked out on a soil map. At Chignal Hall, however, they appear to occur as isolated small patches scattered throughout the broad zone of calcareous Hanslope soils. The only discrete areas of such non-calcareous soils considered worth separating out on the soil map, RPS 2, are near the north-east corner of the main block and in one of the most easterly fields adjacent to the River Can.

3.7. All these calcareous (Soil Type A, Hanslope) and non-calcareous (Soil Type B, Faulkbourne/Bengeo soils) show signs of drainage impedance caused by the slow permeability of the underlying clay. This feature has an important bearing on the ALC gradings and will be discussed further in section 4. There is, however, little evidence for the belief of the Soil Survey (see para 2.14 above) that this site is part of an area where the soils are either more chalky or better drained than soils elsewhere on the Chalky Boulder Clay.

3.8. One patch of particularly badly drained soils was found near the south-west corner of the main site. These soils (Soil Type C) were also of heavier textures with non-calcareous clay topsoils and were overall heavier and stiffer than the other clayey soils on the site. These soils would probably be classed as the Ragdale or Oak Series (borings 51 - 56 inclusive). Similar soils were also found as isolated borings at locations 92 and 99.

3.9. The horse grazing paddocks in the extreme south-west had an assortment of soils all showing signs of disturbance and the whole area has a broken, hummocky topography with small pits, obviously having formerly been dug for gravel (or marl). This assortment of soils is shown as soil type O on the soil map.

3.10. One auger boring (no 102) was in the calcareous loamy alluvium of the River Can and would probably be classed as the Rib series. For convenience it too, is included as one of the 'assorted soils' on the map and in the appendix.

3.11. Thus the soil pattern of the Brittons Farm site can be summarised as:

Almost all the soils are developed in Chalky Boulder Clay with the commonest being calcareous clays or clay loams over clays (Soil Type A, Hanslope series). There are two patches and occasional isolated borings of similar but non calcareous soils (Soil Type B, Faulkbourne/Bengeo series), but these are relatively rare. Heavier, stiffer soils (Soil type C, Ragdale/Oak series) are also rare but occur in a small patch near the south-west corner and as occasional isolated borings elsewhere. The only examples of soils overlying gravels (Soil Type D) are in the horse grazing paddocks in the extreme south-west corner, but these have been disturbed by former gravel or marl digging operations. One boring is located on the alluvium of the River Can.

4. AGRICULTURAL LAND CLASSIFICATION

4.1. The main limitations of most of the soils on the site are their heavy textures and impeded drainage, caused mainly by the impermeable clay subsoils. The heavy textures preclude any of the soils from Grade 1, and so gradings in the Grade 2 - Grade 3 range are indicated.

4.2. By convention, ALC Grades have been applied in Eastern England for soils over boulder clay according to the depth from the surface at which colour mottling indicative of impeded drainage is first encountered. The criteria also take account of whether the mean annual rainfall is above or below 25 inches. Since at Brittons Hall Farm it is about 600m (23.6 inches) the relevant criteria become:

Grade 2 - Not mottled within 40cm of the surface

Sub-grade 3a - Mottled within 40cm but not within 30cm of the surface

Sub-grade 3b - Mottled within 30cm of the surface

4.3. In all cases, it is assumed that the soil textures are acceptable for these gradings, and in the majority of the Brittons Hall Farm soils this is the case, with the topsoil textures being clay loams or calcareous clays. However, if the topsoil is a non-calcareous clay as in Soil Type C then the ALC criteria require a grading no higher than Subgrade 3c.

4.4. The disturbed gravelly soils in the horse grazing paddocks are graded 4 because of the poor soils, the broken topography and the disturbed character of the area, though perhaps even Grade 5 might be a more realistic grading.

4.5. When the gradings for each of the auger borings are plotted on a map (RPS 3/1) a very complicated patchwork of gradings appears.

4.6. With the exception of the discrete areas of 3c and 4 associated with Soil Types C and D respectively, the majority of the site exhibits almost a random distribution of grades varying from 2 to 3b on Soil Types A and B.

4.7. The map indicated some boundaries between these grades, but they are regarded as somewhat speculative. Given the same individual auger boring locations it would be possible to draw alternative boundaries, and it is thought probable that alternative borings near those which are recorded could give different gradings and so a completely different ALC map.

4.8. Furthermore, it should be noted that the 'depth to mottling' criterion is somewhat arbitary and covers a narrow depth band within the soil profile so perhaps it is not surprising that such a complex pattern of gradings results.

4.9. Also it is debatable if the farmer would really notice the so-called differences in land quality, although there might be yield variations. Certainly, however, the complex pattern is such that the areas of better Grade 2 could not be separately exploited, nor the poorer 3b areas avoided.

4.10. Of the 87 individual roughly equally spaced borings on Soil Types A and B, 28 are Grade 2, 38 and Subgrade 3a and 31 are Subgrade 3c. It therefore seems that it would be reasonable the 'average out' these gradings. Assuming then that the 28 Grade 2 'balance out' the 31 of Subgrade 3b an overall grading of 3a for most of the site would be indicated.

4.11. Thus, the final ALC map for the site becomes RPS 3/2 showing virtually the whole site as Subgrade 3a (but with individual borings in the 2 to 3b range), with small areas of Subgrade 3c and Grade 4 at the south-west corner, each occupying about 5% of the site.

APPENDIX 1 - AUGER BORING DETAILS

Soil Type A - Calcareous clays and clay loams over clay developed in Chalky Boulder Clay (Hanslope series).

(a) Typical Profile (No 44)

0 - 24cm Dark brown calcareous clay

24 - 36cm Brown calcareous clay

36 - 51cm Brown calcareous clay with ochreous mottles

51+cm Pale brown chalky clay with ochreous and grey mottles (Chalky Boulder Clay)

(b) summary of horizon depths etc. of similar profiles

Notes 'e' - estimated depth (irregularity ploughed surface)

c - clay

cl - clay loam

No	Calcareous Topsoil		Calcareous Subsoil		Chalky Boulder Clay	Depth to mottles (cm)	ALC
	Depth	Texture	Clay loam	Clay			
2	0 - 24	cl	24 - 32	-	32+	24	3b
3	0 - 26	cl	26 - 39	-	39+	46	2
4	0 - 26	c	-	-	26+	26	3b
5	0 - 24	c	-	-	24+	24	3b
6	0 - 24	cl	24 - 32	32 - 42	42+	24	3b
7	0 - 25	c	-	25 - 45	45+	54	2
8	0 - 23	cl	-	23 - 34	34+	34	3a
10	0 - 25	c	-	25 - 60	60+	35	3a
11	0 - 24	c	-	24 - 28	28+	38	3a
15	0 - 25	c	-	25 - 42	42+	34	3a
16	0 - 24	cl	24 - 49	-	49+	31	3a
17	0 - 22	c	-	22 - 44	44+	22	3b
18	0 - 22	c	-	22+	-	26	3b
20	0 - 24	c	-	-	24+	33	3a
23	0 - 23	c	-	-	23+	34	3a
24	0 - 24	c	-	24 - 40	40+	46	2
25	0 - 23	cl	-	23 - 43	43+	23	3b
26	0 - 22	c	-	22 - 44	44+	33	3a
27	0 - 26	c	-	26 - 55	55+	55	2
28	0 - 25	c	-	25 - 35	35+	48	2
29	0 - 23	c	-	23 - 38	38+	31	3a
30	0 - 24	c	-	24 - 43	43+	33	3a
31	0 - 28	cl	-	28 - 50	50+	42	2
32	0 - 26	c	-	26 - 40	40+	32	3a
33	0 - 24	c	-	24 - 43	43+	38	3a
34	0 - 25	c	-	25 - 44	44+	44	2

No	Topsoil (Dark brown clay loam)	Texture	Calcareous Subsoil Clay loam	Clay	Chalky Boulder Clay	Depth to mottles (cm)	ALC
35	0 - 29	c	-	29 - 95	95+	80	2
36	0 - 27	c	-	27 - 85	85+	27	3b
37	0 - 26	c	-	-	26+	32	3a
38	0 - 25	c	-	25 - 95	95+	25	3b
39	0 - 24	c	-	-	24+	24	3b
40	0 - 25	c	-	-	25+	25	3b
41	0 - 26	c	-	-	26+	38	3a
42	0 - 26	c	-	26 - 40	40+	26	3b
43	0 - 24	c	-	24 - 29	29+	24	3b
44	0 - 24	c	-	24 - 51	51+	36	3a
46	0 - 26	c	-	26 - 65	65+	60	2
47	0 - 28	cl	28 - 60	60+	-	43	2
49	0 - 25	c	-	-	25+	53	2
57	0 - 25e	c	-	25 - 30	30	25	3b
58	0 - 25e	c	-	25 - 35	35	25	3b
59	0 - 25e	c	-	25 - 50	50	75	2
60	0 - 25e	c	-	25 - 60	60	25	3b
61	0 - 25e	c	-	25 - 50	50	25	3b
62	0 - 25e	c	-	25 - 35	35	35	3a
63	0 - 25e	c	-	25 - 60	60	45	2
64	0 - 25e	c	-	25 - 35	35	35	3a
65	0 - 25e	c	-	25 - 35	35	35	3a
66	0 - 25e	c	-	25 - 50	50	25	3b
67	0 - 25e	c	-	25 - 60	60	35	3a
68	0 - 25e	c	-	25 - 45	45	35	3a
69	0 - 25e	c	-	25 - 40	40	35	3a
70	0 - 25e	c	-	25 - 45	45	45	2
71	0 - 25e	c	-	25 - 35	35	35	3a
72	0 - 25e	c	-	-	25	45	2
73	0 - 25e	cl	-	25 - 40	40	25	3b
74	0 - 28	c	-	28 - 80	80	48	2
75	0 - 25	c	-	25 - 43	43	33	3a
76	0 - 27	c	-	27 - 38	38	52	2
77	0 - 27	c	-	27 - 33	33	48	2
78	0 - 25	c	-	25 - 53	53	25	3b
79	0 - 24	c	-	24 - 60	60+	24	3b
80	0 - 26	cl	-	26 - 38	38+	26	3b
81	0 - 23	cl	-	23 - 46	46+	36	3a
88	0 - 28	cl	-	28 - 43	43+	28	3b
89	0 - 24	c	-	24 - 44	44+	75	2
90	0 - 28	c	-	-	28+	37	3a
91	0 - 27	c	-	27 - 53	53+	34	3a
95	0 - 24	c	-	24 - 42	42+	42	2
96	0 - 28	cl	-	28 - 54	54+	38	3a
100	0 - 26	c	-	26 - 41	41+	48	2
103	0 - 23	c	-	-	23+	36	3a
104	0 - 29	c	-	29 - 55	55+	37	3a
105	0 - 25	c	-	25 - 54	54+	32	3a
106	0 - 25	cl	25 - 53	53+	-	44	2
107	0 - 24	cl	24 - 36	36 - 43	43+	36	3a
109	0 - 23	c	-	23 - 51	51+	23	3a
110	0 - 23	cl	23 - 50	50 - 72	72+	55	2

Soil Type B - Non calcareous clay loams over clay, usually with Chalky Boulder Clay at depth (Faulkbourne or Bengeo series)

(a) Typical profile (No 13)

0 - 23cm Dark brown clay loam

23 - 37cm Brown clay loam

37 - 100cm Brown clay with ochreous mottles

100+cm Pale brown chalky clay with ochreous and grey mottles (Chalky Boulder Clay).

(b) Summary of horizon depths etc. of similar profiles.

No	Topsoil (Dark brown clay loam)	Subsoil Non-calcareous		Chalky Boulder Clay	Depth to ochreous mottles (cm)	ALC
		Clay loam	Clay			
1	0 - 25	25+	-		48	2
9	0 - 22	22 - 37	37 - 95	95+	37	3a
12	0 - 23	-	23+	-	28	3b
13	0 - 23	23 - 37	37 - 100	100+	37	3a
14	0 - 24	24 - 32	32 - 75	75+	32	3a
19	0 - 26	26 - 42	42 - 58	59+	32	3a
21	0 - 25	-	25 - 48	48+	25	3b
22	0 - 22	-	22 - 62	62+	22	3b
45	0 - 25	-	25 - 70	70+	25	3b
48	0 - 25	25 - 80	80+	-	37	3a
50	0 - 28	28+	-	-	44	2
87	0 - 27	27 - 50	50+	-	80	2
93	0 - 28	28 - 52	52+	-	28	3b
94	0 - 25	-	25 - 58	58+	25	3b
97	0 - 27	-	27 - 95	95+	36	3a
98	0 - 24	-	24+	-	28	3b
101	0 - 23	-	23 - 57	57+	28	3b
108	0 - 28	28 - 95	95+	-	95	2
111	0 - 27	27 - 45	45 - 65	-	45	2

Note : Stoniness prevented augering beyond 65cm in boring 111

Soil Type C - Poorly Drained clays (Ragdale or Oak series)

(a) Typical profile (No 56)

0 - 25(e)cm	Dark greyish brown non-calcareous clay
25 - 45cm	Greyish brown non-calcareous clay with ochreous mottles
45 - 50cm	Greyish brown non-calcareous clay with ochreous and grey mottles
50+cm	Greyish brown non-calcareous chalky clay (Chalky Boulder Clay).

(b) Summary of horizon depths etc. of similar profiles.

Notes 'e' - estimated depth (irregularly ploughed surface)

No	Topsoil (Non calcareous clay)	Subsoil (Clay)	Chalky Boulder Clay	Depth to mottles (cm)	ALC
51	0 - 25e	25 - 32	32 +	25	3c
52	0 - 25e	25 - 33	33 +	25	3c
53	0 - 25e	25 - 50	-	25	3c
54	0 - 25e	25 - 30	30	25	3c
55	0 - 25e	25 - 30	30	25	3c
56	0 - 25e	25 - 50	50	25	3c
92	0 - 26	26+	-	26	3c
99	0 - 26	26 - 67	67 +	26	3c

Note : Stoniness prevented augering beyond 55cm in boring 53

Soil Type D - Assorted Soils

82	0 - 23 DB cl	4
	23 - 35 B c with ochreous mottles, stony	
	35+ Too stony to auger	
83	0 - 40 B cl, stony (Not Topsoil)	4
	40+ Too stony to auger	
84	0 - 20 DB humous cl with ochreous mottles calc	4
	20 - 38 G & B mottled cl calc.	
	38 - 50 LG & YB mottled cl calc.	
	50+ Too stony to auger	
85	As 84	
86	0 - 15 DB humouse csl	4
	15+ DB gravel	
	Disturbed profile	
102	0 - 15 slightly humouse c, calc	3c?
	15 - 37 GB c	
	37+ GB c with ochreous & grey mottles	

BRITTONS HALL FARM, CHIGNALL ST JAMES

SOILS AND ALC

Summary

Almost all the soils are developed in Chalky Boulder Clay with the commonest being calcareous clays or clay loams over clays (Soil Type A, Hanslope series) as shown on RPS 2. There are two patches and occasional isolated borings of similar but non-calcareous soils (Soil Type B, Faulkbourne/Bengeo series), but these are relatively rare. Heavier stiffer soils (Soil Type C, Ragdale/Oak series) are also rare but occur in a small patch near the south-west corner and as occasional isolated borings elsewhere. The only examples of soils overlying gravels (Soil Type D) are in the horsegrazing paddocks in the extreme south-west corner, but these have been disturbed by former gravel or marl digging operations. One boring is located on the alluvium of the River Can.

The main agricultural limitations of the soils are their heavy textures and consequent impeded drainage. Using the criterion of depth to mottling conventionally applied to such soils in Eastern England, a complex pattern appears of almost equal proportions of Grades 2, 3a and 3b. (see RPS 3/1). It is suggested that, realistically the average or overall grading for this land (about 90% of the site) is Subgrade 3a (See RPS 3/2). Near the south-west corner the heavy, poorly drained clays (Soil Type C) and the disturbed gravelly soils (Soil Type D) give land of Subgrade 3c and Grade 4 respectively, each about 5% of the site.