

AGRICULTURAL LAND CLASSIFICATION AT CRINGLE HOUSE FARM, WOLLASTON, NORTHANTS

The 44.56 ha site was surveyed using a 1 m Dutch auger on January 5 and 12 1983 and 52 auger borings were made. The land is the subject of a planning application, for mineral working, by Hall Aggregates (Eastern Counties) Ltd and Grendon Farms Ltd.

The site is included on the provisional ALC map OS 133 at a scale of 1" : 1 mile published in 1974. This shows the western $\frac{1}{3}$ of OS 0026 included in grade 4 with the remainder of this field and OS 0004 in grade 3. The majority of OS 3700 and OS 6800 are mapped as grade 2 apart from a small area in the extreme west of OS 3700 which lies within grade 3. The current survey, at 1 : 2,500, has allowed a more detailed assessment. When visited OS 0026 was in winter wheat and the remainder were in stubble after spring cereals.

1. Physical Background

- 1.1 The land lies at around 45 m on the lower slopes of the River Nene Valley. OS 0026 is almost flat and is divided from the remainder of the site by the Grendon Brook, a tributary of the Nene which is slightly embanked. The remainder of the site slopes very gently westward, steepening slightly in the east.
- 1.2 The farm manager has confirmed that the majority of the site is subject to flooding approximately nine years out of ten. The duration is usually about a week in February/March which can kill autumn sown crops and hinders spring drilling or the application of fertilizers. The Welland and Nene River Division of the Anglian Water Authority has confirmed that "to the best of their knowledge" the area described as liable to annual flood risk is "probably correct". They state that "there is some doubt as to whether the flooding is caused by insufficient channel capacity in Grendon Brook itself or by flood water backing up from the River Nene".
- 1.3 OS 0004 and OS 0026 were underdrained, at one chain's width, 15 - 20 years ago and all the site is subsoiled every five years. Approximately once every three years each field receives around 100 tonnes per acre of pig manure from the adjacent pig unit.

2. Climate

- 2.1 The area is characteristic of central eastern England with a low average annual rainfall and relatively long hours of summer sunshine. The nearest meteorological station is Wollaston pumping station (889 641) which lies in the Nene Valley at 43 m. The average annual rainfall for 1941 - 70 is as follows:

												mm	
J	F	M	A	M	J	J	A	S	O	N	D	Total	
50	39	41	38	50	46	50	58	50	47	56	49	574	
												(22.6 in)	

2.2 Potential transpiration* is 471 mm (18.5 in) for ADAS agroclimatic area 22E which includes Cringle House. April to September is the period of greatest significance for crop growth and the average summer potential transpiration is 444 mm while the average rainfall for the same period at Wollaston pumping station is 292 mm. Consequently moisture retentive soils are at a premium in this area.

2.3 The average growing season in the area is 240 days (length of time soil at 30 cm depth remains above 6°C). The mean last frost occurs around late April but the bottom of the valley may be more frost prone because cold air tends to sink downslope.

3. Geology

3.1 The site is included on Geological Survey of England and Wales sheet 186 (Solid and Drift) at 1 inch : 1 mile (1958). This shows that the entire site is underlain by Upper Lias Clay although this is not revealed at the surface. The majority of OS 6800, OS 3700 and the central belt of OS 0004 are shown as first river terrace. They consist of sands and gravels laid down by the Nene after the melting of ice sheets in the Pleistocene age. OS 0026, the north western and southern tip of OS 0004 and the south western edge of OS 3700 are formed on alluvium deposited in the flood plain of the River Nene.

4. Land Classification

4.1 The site was classified according to MAFF Technical Reports 11 and 11/1.

4.2 The proportion of land in the different ALC grades is shown below:

5. Grade 3 - As described in Technical Report 11/1.

5.1 Land with moderate limitations due to the soil, relief or climate, or some combination of these factors which restricts the choice of crops, timing of cultivations, or levels of yield. Soil defects may be of structure, texture, depth, drainage, stoniness or water holding capacity. Other defects such as altitude, slope or rainfall, may also be limiting factors; for example, land over 122 m (400 ft) which has more than 1015 mm (40 in) annual rainfall, (1145 mm (45 in) in north-west England, western Wales and the West Country) or land with a high proportion of moderately steep slopes (1 in 8 to 1 in 5) will generally not be graded above 3.

Grade 3 is now subdivided on a nationally consistent basis.

6. Subgrade 3b

6.1 Most of this land is capable of average production - typically of cereals and grass - although areas where yields are slightly below average are also eligible provided there is an advantage such as greater flexibility of cropping. In the case of land which is primarily suitable for grass there must be the particular advantage of a long growing season.

*The amount of water transpired per unit area by a vigorously growing short green crop which completely covers the ground and is amply supplied with water.

6.2 In terms of actual or potential production land must satisfy one of the following "production standards" under satisfactory management:

- i) slightly below average yields of 3 "key" crops, grass, wheat or barley, potatoes, sugar beet;
- ii) consistently average yields of 2 of the "key" crops listed above;
- iii) high yields of "usable"* grass over a long growing season, together with below average yields of barley or oats.

*The concept "usable" grass implies:

- i) No physical limitation to the growth of grass over most of the year.
- ii) No physical limitation on the grazing (or harvesting) of grass for most of the year.

6.3 All the soils in OS 0004, OS 6800 and OS 3700 cannot be graded any higher than 3b because of the threat of flooding in 9 years out of 10 which restricts their flexibility of cropping.

6.4 The southern half of OS 0004 comprises red brown sandy loam and loamy sand topsoils developed on river terrace gravels. A small area of similar soils is found around boring 52 in the north west corner of OS 6800.

6.5 The lightest soils are found in the most southern part of OS 0004, adjacent to the alluvial area around boring 36. The loamy sands overlie orange coarse loamy sand at around 55 cm and sand at 85 cm. The soils are well drained due to the underlying gravel but suffer from annual flooding which restricts them to 3b. Although they have a moderate available water capacity (AWC)* they may suffer from slight droughtiness in summer which could cause crop stress.

6.6 Red brown sandy loams overlying coarse sand and gravel at 58 - 75 cm lie north of the loamy sands and may also suffer from summer droughtiness. The underlying gravel holds up the winter table and a few ochreous mottles, indicative of temporary water logging, are visible at 37 - 40 cm. A few of the well drained sandy loams overlie loamy sand at 40 - 45 cm and pass into gravel in a coarse sand matrix at 58 - 85 cm.

6.7 The remaining sandy loams, on the northern fringe of the lighter terrace soils and at boring 52, merge downwards into sandy clay loam at 50 - 85 cm. This subsoil has slight ochreous mottles due to the winter water table held up in the underlying gravel which lies at 68 - 90 cm.

6.8 The rest of the river terrace area, in the northern half of OS 0004 and on OS 6800 and OS 3700 has generally developed red brown sandy clay loam topsoils with 2 - 5% of the surface covered by stone. In general the sandy clay loams become coarser and more orange with depth and are underlain at 62 - 85 cm by gravel in a coarse sandy matrix. In a few places, as at borings 23, 37 and 40, a thin band of coarse sandy clay

*Amount of water held in pore spaces of a soil in a form available to plants.

separates the sandy clay loam from the gravel. Occasionally, as around borings 42 and 47, a shallow horizon of coarse orange sand lies between the topsoil and gravel.

- 6.9 Other variants include clay loam topsoil over sandy clay loam and gravel as borings 21 and 45, a thin capping of silty clay loam over the sandy clay loam at boring 25, which is probably due to alluvial deposition from the adjacent Grendon Brook. At boring 43 clay loam overlies loamy sand at 70 cm and merges downward into coarse sand and gravel.
- 6.10 It seems likely that the sandy clay loams and clay loams have developed on the river terrace partly due to downwash from the nearby Upper Lias Clay and Boulder Clay which lie upslope from the site.
- 6.11 The sandy clay loams of OS 3700 and OS 0004 in general are imperfectly drained with ochreous mottles, signifying temporary winter water logging, visible at 30 - 45 cm. Lower in the profile grey colouring and manganese concretions, indicating more long term saturation, are evident.
- 6.12 In areas free from flood these soils would be considered suitable for a wide range of crops and would give above average yields. However, almost annual flooding for up to a week in spring which can kill autumn sown crops, limits the flexibility of the land. The high proportion of sand reduces the structural stability of the soils and increases the danger of cultivation pans forming if the soils are worked when wet. Pans can restrict the movement of roots, water and air and consequently affect crop growth and yields. These soils have a tendency to surface capping under heavy rain and these can delay the emergence of seedlings. The presence of gravel at depths below 60 cm can also be a limitation as it will inhibit root development since winter cereals can root down to a depth of 1.2 m.

7. Subgrade 3c

- 7.1 Land in subgrade 3c has some physical characteristics which give a poorer production performance than that of other land in the grade. This poorer performance may be in the form of higher risks, high costs, lower flexibility or lower yield.
- 7.2 In terms of its actual or potential production such land is usually characterised by below average yields in a narrow range of crops.
- 7.3 The majority of the 3c land is mapped on the alluvial flood plain of the River Nene. The soils consist of very stiff grey brown silty clays which become increasingly orange red with depth to around 30 - 45 cm below which the grey colours, characteristic of impeded drainage, predominate. The drainage is poor due to the high local water table and the fine textured slowly permeable subsoil. This results in ochreous mottles, often accompanied by manganese concretions, at 15 - 30 cm and gleying below 30 cm.
- 7.4 The use of these soils is limited by regular winter flooding and the poor drainage. The risk of structural damage is high if these soils are worked when wet and plough pans form, restricting the development of roots and producing temporarily anaerobic conditions which reduce yields. Consequently these soils are only suitable for permanent grassland or crops sown after the period of greatest flood risk.

7.5 A small area, around boring 35, on the soils developed on the river terrace are confined to 3c because of the risk of droughtiness. The soils are orange brown loamy coarse sands overlying an orange coarse sand at 62 cm which has ochreous mottles and manganese concretions at 85 cm. The available water capacity is only small and consequently crops would suffer during dry periods.

8. Grade 4

8.1 Land with severe limitations due to adverse soil, relief or climate, or a combination of these. Adverse soil characteristics include unsuitable texture and structure, wetness, shallow depth, stoniness or low water holding capacity. Relief and climatic restrictions may include steep slopes, short growing season, high rainfall or exposure, for example land over 600 ft which has over 50 in annual rainfall or land with a high proportion of steep slopes (between 1 in 5 and 1 in 3) will generally not be graded above 4.

8.2 Land in this grade is generally only suitable for low output enterprises. A high proportion of it will be under grass, with occasional fields of oats, barley or forage crops.

8.3 A small strip of grade 4 land is mapped in the extreme west, adjacent to a dismantled railway line. The soils consist of stiff grey brown silty clays with ochreous mottles within 15 cm of the surface overlying a gleyed orange clay at 42 - 55 cm.

8.4 The soils are poorly drained and prone to annual flooding so that the choice of crops is severely limited. Spring cereals can be grown but the slow drainage and cultivation difficulties lead to late drilling and only moderate yields. The grazing and growing season are shortened by the poor drainage and consequent risk of poaching and slowness of the land to warm up in spring.

8.5 The soil structure is weak and the topsoil readily smeared and compacted. There is a narrow soil moisture range between the soil being too wet to work and too hard and dry to form a tilth.

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RPG LAWS
Cambridge RO
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REFERENCES

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ADAS (1974) Agricultural Land Classification OS Sheet 133 (Provisional) MAFF Pinner.

ADAS (1976) Agricultural Climate of England and Wales Technical Bulletin 35 (MAFF) Pinner.

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APPENDIX 1 AUGER BORINGS AT CRINGLE HOUSE FARM

Auger boring	cm	Boring description	Grade
1.	0-75 75-90+	dark grey brown ZC, red mottles at 10cm, grey mottles at 37cm and gleyed with manganese concretions below 60cm gleyed yellow C.	4
2.	0-65 65-90+	dark grey brown ZC, paler with depth, red mottles at 20cm, grey at 32cm Orange gleyed C, grey below 82cm	3c
3.	0-55 55-90+	dark grey brown ZC, red mottles at 15cm, grey at 22cm gleyed orange C.	4
4.	0-42 42-90+	dark grey brown ZC, red mottles at 12cm, grey at 25cm gleyed clay, more orange with depth	4
5.	0-40 40-90+	dark grey brown ZC, red mottles at 25cm gleyed orange C	3c
6.	0-90+	red brown ZC, red mottles at 30cm, gleyed at 40cm and very grey below 60cm	3c
7.	0-90+	red brown ZC, red mottles 15cm, grey 30cm, heavily gleyed below 40cm, very grey below 60cm.	3c
8.	0-90+	grey brown ZC, red mottles 20cm, increasingly orange red with depth, gleyed below 35cm.	3c
9.	0-90+	red brown ZC, red mottles 20cm, increasingly gleyed below 35cm.	3c
10.	0-90+	grey brown ZC, red mottles at 27cm, gleyed below 40cm	3c
11.		"	"
12.	0-90+	grey brown ZC, red mottles at 20cm, grey below 30cm, manganese concretions and gleying at 50cm.	3c
13.	0-85 85-90+	dark grey brown ZC, red mottles at 20cm, grey at 32cm, gleyed at 42cm orange sandy clay	3c
14.	"	"	"

Auger boring	cm	Boring description	Grade
15.	0-90+	dark grey brown ZC, red mottles at 28cm, grey mottles at 35cm and manganese concretions at 40cm. Gleyed below 65cm	3c
16.	0-60 60-90+	dark grey brown ZC, red mottles at 30cm, grey mottles at 40cm. Stiff grey C	3c
17.	0-90+	grey brown ZC, red mottles at 28cm, grey mottles at 35cm, increasingly grey with depth.	3c
18.	0-90+	grey brown ZC, red mottles at 22cm, grey mottles at 35cm, increasingly orange coloured with depth	3c
19.	0-90+	grey brown ZC, red mottles at 33cm, gleyed below 60cm	3c
20.	"	" " "	"
21.	0-45 45-62 62+	brown CL orange SCL, increasingly coarse with depth, gravel in coarse sand matrix regularly flooded	3b
22.	0-37 37-90+	red brown FSCL orange SCL, coarser with depth, red mottles at 40cm, regularly flooded	3b
23.	0-37 37-65 65+	red brown FSCL orange SC, increasingly orange and coarse with depth very wet coarse sand and gravel regularly flooded	3b
24.	0-43 43-70 70-80 80-90+	red brown SL orange loamy sand loamy coarse sand and 15% gravel gravel in coarse sand matrix regularly flooded	3b
25.	0-37 37-85 85-90 90+	grey brown ZCL orange SCL, increasingly orange and sandy with depth, few red mottles below 65cm wet loamy coarse sand gravel regularly flooded	3b

Auger boring	cm	Boring description	Grade
26.	0-37 37-72 72+	red brown SCL coarse SCL, increasingly orange with depth. Red mottles at 37cm but not visible at greater depth (possible pan). gravel in coarse sand matrix regularly flooded	3b
27.	0-50 50-68 68+	red brown SL orange SCL, red mottles below 50cm gravel with coarse sand, water standing at 68cm, regularly flooded	3b
28.	0-75 75+	red brown SL, coarser with depth, 2% stone throughout profile gravel in coarse sand matrix, v.wet regularly flooded	3b
29.	0-55 55-85 85-90+	LS, increasingly coarse with depth orange loamy coarse sand orange S regularly flooded	3b
30.	0-40 40-62 62-90+	red brown SL orange LS coarse S and gravel regularly flooded	3b
31.	0-65 65-90+	red brown SL, more orange below 40 SCL, strongly mottled red and grey regularly flooded	3b
32.	0-58 58+	red brown SL, more orange below 35cm red mottles at 37cm gravel in coarse sand matrix regularly flooded	3b
33.	0-55 55-72 72-90 90+	red brown SL, increasingly orange with depth, red mottles at 40cm, grey mottles and manganese below 50cm loamy coarse sand coarse SC gravel regularly flooded	3b
34.	0-60 60+	red brown SL, coarser and more orange with depth, few red mottles below 40cm gravel in coarse sand matrix regularly flooded	3b

Auger boring	cm	Boring description	Grade
35.	0-62 62-90+	orange brown loamy coarse sand orange coarse sand with few red mottles and manganese concretions at 85cm. regularly flooded.	3c
36.	0-33 33-90+	dark grey brown CL gleyed yellow grey C, grey below 65cm and containing small amounts of orange sand below 80cm. regularly flooded.	3b
37.	0-40 40-65 65+	red brown SCL, red mottles at 33cm SC and 15% small stones, grey mottles at 47cm gravel in coarse S matrix regularly flooded	3b
38.	0-75 75-90+	red brown SCL, red mottles at 40cm, manganese concretions at 48cm, increasingly orange with depth gravel in coarse sand matrix regularly flooded	3b
39.	0-65 65-90+	red brown SCL, red mottles below 45cm gravel in orange SC matrix, very wet, grey mottles at 65cm. regularly flooded.	3b
40.	0-70 70-85 85-90+	red brown SCL, red mottles at 40cm, grey below 55cm orange SC gravel in coarse sand matrix, very wet regularly flooded	3b
41.	0-58 58-72 72-90+	red brown SCL SCL and 20% small gravel gravel in coarse sand matrix 5% surface stone regularly flooded	3b
42.	0-42 42-63 63-90+	red brown SCL, increasingly orange with depth orange coarse S with 20% small stones gravel in coarse sand matrix regularly flooded	3b
43.	0-45 45-70 70-82 82-85 85-90+	CL/SCL, increasingly sandy with depth orange SCL, red mottles below 50cm orange loamy coarse sand, v.wet orange coarse sand gravel in coarse sand matrix regularly flooded.	3b

Auger boring	cm	Boring description	Grade
44.	0-85 85-90+	red brown SCL, with red mottles 35cm, increasingly clayey with depth, grey mottles at 62cm gravel in coarse S matrix, very wet. regularly flooded	3b
45.	0-30 30-62 62-90+	brown CL SCL gravel in coarse sand matrix, very wet	3b
46.	0-65 65-90+	red brown SCL gravel in coarse orange sand matrix, some gleying regularly flooded	3b
47.	0-72 72-75 75-90+	red brown SCL, red mottles below 62cm orange coarse S gravel in coarse S matrix regularly flooded	3b
48.	0-75 75-90+	red brown SCL gravel in coarse S matrix regularly flooded	3b
49.	0-40 40-62 62-65 65-90+	red brown SCL, increasingly coarse with depth orange SCL coarse orange S and 20% gravel gravel in coarse S matrix regularly flooded	3b
50.	0-72 72-90+	red brown SCL, increasingly orange with depth gravel in coarse S matrix 5% surface stones regularly flooded	3b 3b
51.	0-62 62-90+	red brown SCL, increasingly orange with depth gravel in coarse sand matrix regularly flooded	3b
52.	0-85 85-90+	red brown SL SCL regularly flooded	3b