

FRCA



FARMING AND RURAL CONSERVATION AGENCY
An Executive Agency of the Ministry of Agriculture, Fisheries and Food and the Welsh Office

**LAND BETWEEN PITSFORD,
BOUGHTON AND MOULTON,
NORTHAMPTONSHIRE**

**Agricultural Land Classification
& Statement of Soil Physical
Characteristics
Maps and Report**

February 1998

**Resource Planning Team
Eastern Region
FRCA Cambridge**

**RPT Job Number: 10/98
MAFF Reference:EL29/2621
FRCA Job No.:ME3WWD8**

AGRICULTURAL LAND CLASSIFICATION REPORT & STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

LAND BETWEEN PITSFORD, BOUGHTON AND MOULTON, NORTHAMPTONSHIRE

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 117.0 ha of land between the villages of Pitsford, Boughton and Moulton, Northamptonshire. The survey was carried out during February 1998.
2. The survey was carried out by the Farming and Rural Conservation Agency (FRCA) for the Ministry of Agriculture, Fisheries and Food (MAFF), in connection with an application for determination of modern conditions for a mineral site pursuant to the Environmental Act 1995. This survey supersedes previous ALC information for this land.
3. The work was conducted by members of the Resource Planning Team in the Eastern Region of FRCA. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.
4. At the time of survey the agricultural land use on the site was mainly maize stubble, winter cereals and ploughed land, with some permanent pasture around Bunkers Hill Farm and two fields of grass ley at the eastern end of the site. The areas mapped as 'Other land' comprise an area of farm buildings at Bunkers Hill Farm, an old quarry at the western end of the site and an unsurfaced lane and woodland strip in the middle of the site.

SUMMARY

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10 000; it is accurate at this scale but any enlargement would be misleading.
6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1 overleaf.
7. The fieldwork was conducted at an average density of one boring per hectare. A total of 114 borings and 5 soil pits was described.

8. Three areas of land at the site have been graded 2 (very good quality agricultural land) due to either slight droughtiness limitations, or minor wetness and workability restrictions. Four areas have been identified as Subgrade 3a (good quality agricultural land) principally due to moderate droughtiness limitations, although some land along the southern edge of the site has a moderate wetness and workability limitation. Subgrade 3b (moderate quality agricultural land) has been mapped on the higher land to the north of the site where significant droughtiness or topsoil stone content form the overriding limitations. Along part of the southern edge of the site, heavy textured soils with a wetness and workability limitation have been mapped with the area being restricted to Subgrade 3b.

Table 1: Area of grades and other land

Grade/Other land	Area (hectares)	% surveyed area	% site area
2	23.1	21	20
3a	44.9	40	38
3b	42.9	39	37
Other land	6.1	N/A	5
Total surveyed area	110.9	100	95
Total site area	117.0	-	100

FACTORS INFLUENCING ALC GRADE

Climate

9. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

10. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5 km grid datasets using the standard interpolation procedures (Met. Office, 1989).

Table 2: Climatic and altitude data

Factor	Units	Values	Values	Values
Grid reference	N/A	SP 766 667	SP 757 668	SP 774 668
Altitude	m, AOD	95	90	100
Accumulated Temperature	day°C (Jan-June)	1372	1378	1366
Average Annual Rainfall	mm	619	618	619
Field Capacity Days	days	129	128	129
Moisture Deficit, Wheat	mm	107	107	106
Moisture Deficit, Potatoes	mm	98	99	97
Overall climatic grade	N/A	Grade 1	Grade 1	Grade 1

11. The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

12. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (AT0, January to June), as a measure of the relative warmth of a locality.

13. The combination of rainfall and temperature at this site mean it is relatively warm and dry. Therefore, the climatic grade for this site has been assessed as 1.

Site

14. The site occupies the south facing slope of an east/west orientated valley, with two tributary valleys dissecting the site. The land falls gently along the northern part of the site but more steeply on the side slopes of the tributary valleys and on the lower slopes of the main valley on the southern edge of the site. The altitude of the site ranges from 105 m AOD along the northern boundary to 85 m AOD in the main valley. Gradients are typically 1-3° over the northern part of the site and 4-7° on the lower slopes and in the tributary valleys. Gradient is not limiting except for very small localised areas on the eastern side of the tributary valley at the eastern end of the site where slopes of 7½° were measured. Gradient and altitude do not constitute a limitation to the ALC grade apart from the very small area mentioned above, where land quality is restricted to subgrade 3b.

Geology and soils

15. The published 1:50 000 scale solid and drift geology map, sheet 185, Northampton, (Geological Survey of Great Britain, 1980) shows the site to mainly comprise Northampton Sand (Ironstone ferruginous and sandy limestones). On the lower slopes at the southern edge of the site, Upper Lias (mainly mudstone with thin limestones and shales) has been mapped.

16. On the 1:250 000 reconnaissance scale published soils map, sheet 4, Soils of Eastern England (Soil Survey of England and Wales, 1983) the majority of the site is shown as the Banbury Association which is briefly described as well drained brashy fine and coarse loamy ferruginous soils over ironstone, with some deep fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging. A narrow band of Denchworth Association has been mapped on the lower slopes at the southern edge of the site. These soils are described as slowly permeable seasonally waterlogged clayey soils with similar fine loamy over clayey soils.

17. During this survey a more detailed inspection of the soils was carried out and five soil types were identified, the distribution of these is shown on the accompanying soil resources map. It should be noted that Soil Types I and II are similar being coarse loamy and sandy and Soil Types IV and V are broadly similar comprising heavy textured fine loamy and clayey soils. Soil Type III comprises shallow very stony limestone soils. In terms of soil stripping, Soil Types I and II may be handled together, and Soil Type IV can be moved with Soil Type V. The soil resources of Soil Type III are limited due to shallow depth and high stone content and should therefore be considered as a separate unit.

Soil Type I (47.7 hectares)

18. This Soil Type occurs extensively on the most gently sloping land on the eastern half of the site and also on the gently sloping upper slopes at the western end. These soils are typically coarse loamy over sandy and variably stony in the subsoil. This soil type typically has a medium sandy loam or loamy medium sand topsoil approximately 30 cm thick over a loamy medium sand upper subsoil, becoming medium sand below 50/60 cm depth. Stone content of the topsoil is typically 2-5% small sandstone/ironstone fragments, whilst the subsoil horizons range from 0-30% in the upper subsoil and 0-60% in the lower subsoil. Roots penetrate throughout the profile despite the high stone content. These soils are typically free draining throughout.

Soil Type II (29.6 hectares)

19. Soil Type II is broadly similar to Soil Type I, but is slightly heavier textured throughout. These soils typically have a medium sandy loam or occasionally sandy clay loam topsoil approximately 30 cm thick overlying a medium sandy loam or sandy clay loam upper subsoil to 60/80 cm depth, becoming loamy medium sand at depth. Stone contents are broadly similar to Soil Type I becoming stonier with depth and the soils are typically free draining throughout.

Soil Type III (11.6 hectares)

20. Soil Type III occupies a small area in the central part of the site where very stony soils overlie sandy limestone at varying depths. These soils have a moderately stony sandy clay loam, medium sandy loam or occasionally medium clay loam topsoil. The topsoil stone content is typically 5-25%, and is partly related to the depth to the underlying bedrock. Where the sandy limestone lies immediately below the topsoil then large flat slabs of limestone have been ploughed up which subsequently become broken up with successive cultivations giving rise to the stoniest profiles. In other areas the soils are deeper and these profiles have a very stony medium sandy loam or sandy clay loam subsoil with 50-60% small to large sandy limestone fragments. Despite the very high stone content, roots can penetrate to depth. These soils are typically free draining throughout.

Soil Type IV (15.6 ha)

21. These soils typically comprise the colluvial and alluvial soils occupying the lower slopes of the two tributary valleys that dissect the site. Soil Type IV typically has a medium clay loam topsoil approximately 30 cm deep overlying a yellowish brown medium or heavy clay loam upper subsoil with faint ochreous mottles at depth. Below 70 cm depth the slowly permeable, greyish Lias Clay is typically encountered, which has a coarse angular blocky structure. These soils are generally slightly stony throughout.

Soil Type V (6.3 ha)

22. Two small areas of Soil Type V have been mapped on the lowest slopes at the southern edge of the site and comprise slowly permeable clayey soils. A typical profile has a heavy clay loam topsoil 25/30 cm thick, overlying the slowly permeable, greyish Lias Clay. These soils are non calcareous and stoneless to very slightly stony throughout.

AGRICULTURAL LAND CLASSIFICATION

23. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 2.

24. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix II.

Grade 2

25. Three areas of Grade 2 land have been mapped which correspond to the deep moderately well drained (Wetness Class II), fine loamy colluvial soils of Soil Type IV and the deeper, free draining, heavier textured variants of Soil Type II. The former are restricted to Grade 2 due to a minor wetness and workability limitation caused by the presence of the slowly permeable clay at depth giving rise to periodic waterlogging in the lower subsoils. The land occupied by the heavier variants of Soil Type II has been restricted to Grade 2 due to a minor droughtiness limitation.

Subgrade 3a

26. Subgrade 3a has been mapped mainly on the middle slopes of the site and correlates with the lighter stonier variants of Soil Type II and the coarse loamy variants of Soil Type I. The major limitation associated with these soils is droughtiness. Profile textures and stoniness result in these soils having moderate reserves of available water for plant growth and under the prevailing climatic conditions such soils will have a moderate droughtiness limitation restricting the land quality to Subgrade 3a.

Subgrade 3b

27. The majority of the higher flatter land at the north and east of the site which correlates with Soil Type I has been classified as Subgrade 3b due to a moderately severe droughtiness limitation. These sandy soils have moderately low reserves of available water for plant growth and under the prevailing climatic conditions moisture balance calculations indicate that such soils are very droughty restricting the land quality to Subgrade 3b.

28. Included within this mapping unit are the stony soils of Soil Type III. These soils have moderately stony topsoil horizons (15-25% limestone fragments > 2 cm diameter). The presence of high quantities of stone in the topsoil not only reduces the amount of plant available water, but more seriously impedes cultivations and crop quality and increases wear and tear to farm equipment. The amount of topsoil stones in these soils is sufficient to limit the land quality to Subgrade 3b. Also the combination of profile stone content, textures and

structures combine to limit in some instances the amount of available water for crop growth. This limits the land also to this subgrade due to droughtiness.

29. Subgrade 3b has also been mapped on the lower slopes of the site where the heavy textured soils overlying the Lias Clay (Soil Type V) were identified. These heavy textured soils are slowly permeable immediately below the topsoil. The soils have been assessed as Wetness Class III, which in combination with the heavy clay loam topsoil texture results in a significant wetness and workability constraint.

N A Duncan
for the Resource Planning Team
Eastern Region
FRCA Cambridge

SOURCES OF REFERENCE

Geological Survey of Great Britain (England and Wales) (1978) *Sheet No.185, Northampton, solid and drift edition, scale 1:50 000.*
BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.*
MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification.*
Met. Office: Bracknell.

Soil Survey of England and Wales (1983) *Sheet 4, Soils of Eastern England, scale 1:250 000.*
SSEW: Harpenden.

Soil Survey of England and Wales (1984) *Soils and their Use in Eastern England.*
SSEW: Harpenden

APPENDIX I

DESCRIPTIONS OF THE GRADES AND SUBGRADES

Grade 1: Excellent Quality Agricultural Land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2: Very Good Quality Agricultural Land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural or horticultural crops can usually be grown but on some land of this grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When more demanding crops are grown, yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a: Good Quality Agricultural Land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b: Moderate Quality Agricultural Land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass, or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4: Poor Quality Agricultural Land

Land with severe limitations which significantly restrict the range of crops and/or the level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5: Very Poor Quality Agricultural Land

Land with severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE I (47.7 ha)

Topsoil	Texture	: Medium sandy loam or loamy medium sand
	Colour	: 7.5YR4/4 brown
	Depth	: Typically 30 cm, range 25 to 40 cm
	Stoniness	: Typically 2-3%, very slightly stony (1-5%)*
	Roots	: Common, fine and very fine
	Calcium carbonate	: Non calcareous
	Boundary form	: Clear, smooth
	Upper subsoil	Texture
Colour		: 7.5YR4/6 and 5/6 strong brown
Depth		: Typically 50/60 cm, range 45 to 80 cm,
Stoniness		: Variable. Typically 5-10%, range stoneless to moderately stony (0-30%)*
Structure		: Weakly developed medium and coarse subangular blocky
Consistence		: Very friable
Structural condition		: Moderate
Porosity		: >0.5%
Roots		: Common, very fine
Calcium carbonate		: Non calcareous
Boundary form		: Clear smooth
Lower subsoil	Texture	: Medium sand
	Colour	: 10 YR 6/6, yellowish brown, 10 YR 7/8 brownish yellow
	Depth	: >120 cm
	Stoniness	: Typically 50-60%, range stoneless to very stony (0-60%)*
	Structure	: Single grain
	Consistence	: Loose
	Structural condition	: Moderate
	Porosity	: >0.5%
	Roots	: Few, very fine.
	Calcium carbonate	: Non calcareous.

Wetness Class: I

*All stones within the profile are ferruginous sandstone and ironstone.

SOIL TYPE II (29.6 hectares)

Topsoil	Texture	: Medium sandy loam or sandy clay loam
	Colour	: 7.5YR 4/3 and 4/4 brown
	Depth	: Typically 30 cm, range 27 to 30 cm
	Stoniness	: Typically 3-5%, range very slightly to slightly stony (2-10%)*
	Roots	: Many or common, fine and very fine
	Calcium carbonate	: Non calcareous
	Boundary form	: Clear smooth
Upper subsoil	Texture	: Medium sandy loam or sandy clay loam
	Colour	: 7.5YR 4/6 and 5/6 strong brown
	Depth	: Typically 60/80 cm, range 60 to 100 cm
	Stoniness	: Typically 5-10%, range very slightly to moderately stony (5-20%)*
	Structure	: Weak coarse subangular blocky
	Consistence	: Friable
	Structural condition	: Moderate
	Porosity	: >0.5%
	Roots	: Common, range few to common, fine and very fine
	Calcium carbonate	: Non calcareous,
	Boundary form	: clear, irregular
Lower subsoil	Texture	: Loamy medium sand
	Colour	: 10YR 5/6 yellowish brown,
	Depth	: >120 cm
	Stoniness	: Typically 30-40%*, occasionally >60%
	Structure	: Too stony to assess
	Consistence	: Very friable
	Structural condition	: Too stony to assess
	Porosity	: >0.5%
	Roots	: Few, very fine.
	Calcium carbonate	: Non calcareous

Wetness Class: I

* All stones within the profile are ferruginous sandstone and ironstone and occasionally sandy limestone

SOIL TYPE III (11.6 hectares)

Topsoil Texture : Medium sandy loam, sandy clay loam or medium clay loam
 Colour : 7.5YR 4/4 brown
 Depth : Typically 30 cm, range 30 to 33 cm
 Stoniness : Typically 20%*, range slightly to moderately stony (5-25% sandy limestones of which majority >2 cm)
 Roots : Many, fine and very fine
 Calcium carbonate : Calcareous
 Boundary form : Clear, smooth

Upper Subsoil** Texture : Medium sandy loam, sandy clay loam or medium clay loam
 Colour : 7.5YR 5/6 strong brown
 Depth** : Variable, typically 45/50 cm, range not present to 80 cm
 Stoniness : Typically 50 %*, range slightly to very stony (10-55% sandy limestone)
 Structure : Weak medium subangular blocky
 Consistence : Very friable
 Structural condition : Good
 Porosity : >0.5%
 Roots : Common, fine and very fine
 Calcium carbonate : Calcareous

Lower subsoil** Texture Loamy medium sand
 Colour 10YR 6/6 yellowish brown
 Depth** >120 cm
 Stoniness 60% sandy limestone, shattered bedrock
 Structure Too stony
 Consistence Very friable
 Structural condition Moderate
 Roots Common fine and very fine
 Calcium carbonate Very calcareous

Wetness Class I

* All stones are sandy limestone

** In some profiles there is no subsoil with the topsoil overlying weathered sandy limestone. In other profiles there is an upper subsoil overlying the shattered bedrock.

SOIL TYPE IV (15.6 hectares)

Topsoil	Texture	: Medium clay loam
	Colour	: 7.5YR 4/3 and 4/4 brown and 10YR 4/4 dark yellowish brown
	Depth	: Typically 30 cm, range 25 to 30 cm
	Stoniness	: Typically 3-5%, range very slightly to slightly stony (3-12%)*
	Roots	: Common, fine and very fine
	Calcium carbonate	: Non calcareous
	Boundary form	: Clear smooth
Upper subsoil	Texture	: Medium or heavy clay loam
	Colour	: 7.5YR 4/6 and 5/6 strong brown and 10YR 5/5 and 6/6 yellowish brown
	Depth	: Typically 70 cm, range 50 - 80 cm
	Stoniness	: Typically 3-5%, range stoneless to slightly stony (0-10%)*
	Structure	: Moderate coarse subangular blocky
	Consistence	: Firm
	Structural condition	: Moderate
	Porosity	: >0.5%
	Roots	: Few fine and very fine
	Calcium carbonate	: Non calcareous,
	Boundary form	: Gradual smooth
Lower subsoil	Texture	: Clay
	Colour	: 2.5Y5/3 and 6/3 light olive brown and 5Y6/2 light olive grey,
	Depth	: >120 cm
	Stoniness	: Stoneless
	Structure	: Strong coarse angular blocky
	Consistence	: Firm to very firm
	Structural condition	: Poor
	Porosity	: <0.5%
	Roots	: Few, very fine.
Calcium carbonate	: Non calcareous	

Wetness Class: II

SOIL TYPE V (6.3 hectares)

Topsoil	Texture	: Heavy clay loam
	Colour	: 10YR 4/4 dark yellowish brown
	Depth	: Typically 25 cm, range 25 to 30 cm
	Stoniness	: Typically 1-2% flint or sandstone
	Roots	: Common, fine and very fine
	Calcium carbonate	: Non calcareous
	Boundary form	: Abrupt smooth
Subsoil	Texture	: Clay
	Colour	: 2.5Y5/3 and 6/3 light olive brown and 5Y6/2 light olive grey,
	Depth	: >120 cm
	Stoniness	: Stoneless
	Structure	: Strong coarse angular blocky
	Consistence	: Firm to very firm
	Structural condition	: Poor
	Porosity	: <0.5%
	Roots	: Few, very fine.
	Calcium carbonate	: Non calcareous

Wetness Class: III