21/95

Gloucester Structure Plan
Colethrop Farm, Hardwicke
Agricultural Land Classification

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COLETHROP FARM, HARDWICKE

AGRICULTURAL LAND CLASSIFICATION

CONTENTS

COLETHROP FARM, HARDWICKE

AGRICULTURAL LAND CLASSIFICATION SURVEY

SUMMARY

The survey was carried out by ADAS on behalf of MAFF as part of its statutory role in the preparation of the Gloucester Structure Plan. The fieldwork was completed in May 1995 at a scale of 1:10,000. Data on climate, soils, geology and from previous Agricultural Land Classification (ALC) Surveys was used and is presented in the report. The distribution of grades is shown on the accompanying ALC map and summarised below. Information is correct at this scale but could be misleading if enlarged.

Distribution of ALC grades: Colethrop Farm

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (117.8 ha)
1	3.5	2.7	3.0
2	10.4	8.0	8.8
3a	12.6	9.7	10.7
3b	91.3	70.1	77.5
Urban	6.2	4.8	
Non Agricultural	4.8	3.7	
Agricultural Buildings	1.4	1.1	
TOTAL	130.2		

22% of the area was found to be best and most versatile, mainly at the west end of the site, in a block of land to the north of Haresfield Lane.

The area of Grade 1 and 2 was limited mainly by droughtiness while the areas of Subgrade 3a were found to have a moderate wetness limitation. The remaining area of Subgrade 3b was mainly found to have a more serious moderate limitation due to wetness and workability.

1. INTRODUCTION

An Agricultural Land Classification (ALC) Survey was carried out in May 1995 at Colethrop Farm, Hardwicke on behalf of MAFF as part of its statutory role in the preparation of the Gloucester Structure Plan. The fieldwork covering 130.2 ha of land was conducted at semi-detailed density with approximately one boring per 2 hectares of agricultural land for mapping at 1:10,000 scale. A total of 66 auger borings were examined and 4 soil profile pits were used to assess subsoil conditions.

The published provisional one inch to the mile ALC map of this area (MAFF 1972) shows the grades of the site at a reconnaissance scale as Grade 3.

The recent survey supersedes this map having been carried out at a more detailed level and using the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988). These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The grading takes account of the top 120 cm of the soil profile. A description of the grades used in the ALC system can be found in Appendix 2.

Although no previous survey had been carried out on this site, several neighbouring sites have been surveyed in recent years and these are referred to in Appendix 1.

2. CLIMATE

The grade of the land is determined by the most limiting factor present. The overall climate is considered first because it can have an overriding influence on restricting land to a lower grade despite other favourable conditions.

Estimates of climatic variables were interpolated from the published agricultural climate dataset (Meteorological Office 1989). The parameters used for assessing overall climate are accumulated temperature, a measure of the relative warmth of a locality, and average annual rainfall, a measure of overall wetness. The results shown in Table 1 indicate there is no overall climatic limitation.

Table 1: Climatic Interpolations: Colethrop Farm

Grid Reference		SO819120	SO805123
Altitude (m)		40	20
Accumulated Temperature (day °)		1481	1504
Average Annual Rainfall (mm)		715	710
Overall Climatic Grade		1	1
Field Capacity Days		156	156
Moisture deficit (mm):	Wheat	106	108
	Potatoes	98	101

Climatic data on Field Capacity Days (FCD) and Moisture Deficits for wheat and potatoes are also shown. These data are used in assessing the soil wetness and droughtiness limitations referred to in later sections.

3. RELIEF AND LANDCOVER

Altitude ranges from 20 to 40 m AOD. Slopes are mainly gentle and not limiting.

At the time of survey, landcover was mainly grass and cereals. The eastern end of the site, not part of Colethrop Farm itself, was largely given over to pony paddocks, owned or let to several occupiers, each with its own access and stable unit and frequently a caravan on site.

4. GEOLOGY AND SOILS

The geology of the site is shown on the published 1:50,000 scale Solid and Drift geology map, Sheet 234, Gloucester, British Geological Survey 1975. This shows mainly Lower Lias clay overlain at the west end of the site and in other patches by fan or river gravels. Where examined by soil auger during the course of this survey, this material appeared to be mainly stone-free.

The soils were mapped by the Soil Survey of England and Wales in 1983 at a reconnaissance scale of 1:250,000 and are shown as Badsey 2 and Evesham 2 Associations.

Badsey 2 Association is described as well drained calcareous fine loamy soils over limestone gravel. Some similar soils affected by groundwater.

The Evesham 2 Association is described as slowly permeable calcareous clayey soils. Some slowly permeable seasonally waterlogged non-calcareous clayey and fine loamy or fine silty over clayey soils.

This distribution was largely borne out by the recent ALC survey, although the area shown as Badsey 2 was seen to be developed on mainly quartz sandy deposits rather than limestone gravel and the area of Badsey 2 was found not to extend as far east of Colethrop Farm buildings as that shown on the Soil Survey map.

5. AGRICULTURAL LAND CLASSIFICATION

The distribution of ALC grades is shown in Table 2 and on the accompanying ALC map, which has been drawn to tie up, as far as possible, with adjoining surveys. This information could be misleading if shown at a larger scale, and the boundaries shown may be subject to revision after detailed survey.

Table 2: Distribution of ALC grades: Colethrop Farm

Grade	Area (ha)	% of Survey Area	% of Agricultural Land (117.8 ha)
1	3.5	2.7	3.0
2	10.4	8.0	8.8
3a	12.6	9.7	10.7
3b	91.3	70.1	77.5
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TOTAL	130.2		

Grade 1

A small area of Grade 1 was found around Colethrop Farm buildings, developed on sandy river terrace deposits and found to be borderline to Grade 2 on droughtiness. The mapping unit includes one auger boring which was Grade 2 on droughtiness.

The small area of Grade 1 near Four Mile Elm shown on a previous survey (Land at Hardwicke, 1992) was not found to extend east of the road at this point.

Grade 2

The area shown as Grade 2, with a minor limitation due to droughtiness, also developed on sandy river gravel deposits. Several profiles also show mottling below 40 cm, which in the absence of a slowly permeable layer indicates Wetness Class I and not a significant limitation.

Subgrade 3a

Two small areas are shown as Subgrade 3a, with moderate limitations mainly due to wetness. The area towards Naas Lane includes 2 auger borings found to be Grade 2 on droughtiness but included within the Subgrade 3a mapping unit to tie in with a previous survey to the north (Waterwells Farm, 1992).

Subgrade 3b

The extensive areas shown as Subgrade 3b are limited by more serious moderate limitations, *mainly of wetness and workability, with heavy clay loam topsoil textures at Wetness Class IV* or occasionally Wetness Class III.

Although not generally stony, this mapping unit includes two small convex hilltops in the south-east of the area where a moderate stone content may give rise to a significant droughtiness limitation.

Other Land

Land shown as urban includes railway, roads and dwellings.

Land shown as non-agricultural includes the woodland known as Hunt Grove and a small area of waste ground between RAF Quedgley and Shorn Brook to the south.

Resource Planning Team
Taunton Statutory Unit
May 1995

APPENDIX 1

REFERENCES

ADAS Resource Planning Team. ADAS Bristol. Reports of survey for the following areas:

Chambers Farm, Brookthorpe	1994	scale 1:10,000	reference 114.94
Land at Hardwicke	1992	scale 1:10,000	reference 26.92
Waterwells Farm	1992	scale 1:10,000	reference 8.192

BRITISH GEOLOGICAL SURVEY (1975) Solid and Drift Edition, Sheet 234, Gloucester, scale 1:50,000.

MAFF 1972 Agricultural Land Classification Map, Sheet 143, Provisional 1:63,360 scale.

MAFF (1988) Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick.

METEOROLOGICAL OFFICE (1989) Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES (1983) Sheet 5, Soils of South West England, 1:250,000 scale.

APPENDIX 2

DESCRIPTION OF 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 include 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 and horticultural crops can usually be grown but on some land in the 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.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where 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 level of yields. It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yields of which are variable. In most 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 very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Descriptions of other land categories used on ALC maps

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religious buildings, cemeteries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants.

Non-agricultural

'Soft' uses where most of the land could be returned relatively easily to agriculture, including: private park land, public open spaces, sports fields, allotments and soft-surfaced areas on airports/airfields. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

Agricultural buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses. Temporary structures (eg polythene tunnels erected for lambing) may be ignored.

Open water

Includes lakes, ponds and rivers as map scale permits.

Land not surveyed

Agricultural land which has not been surveyed.

Where the land use includes more than one of the above landcover types, eg buildings in large grounds, and where may be shown separately. Otherwise, the most extensive cover type will usually be shown.

Source: MAFF (1988) Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for Grading the Quality of Agricultural Land), Alnwick.

APPENDIX 3

DEFINITION OF SOIL WETNESS CLASSES

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years.

Wetness Class II

The soil profile is wet within 70 cm depth for 31-90 days in most years or, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but not wet within 40 cm depth for more than 30 days in most years.

Wetness Class III

The soil profile is wet within 70 cm depth for 91-180 days in most years or, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31 and 90 days in most years.

Wetness Class IV

The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years or, if there is no slowly permeable layer within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years.

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years.

Notes: The number of days specified is not necessarily a continuous period. 'In most years' is defined as more than 10 out of 20 years.

Source: Hodgson, J M (in preparation), Soil Survey Field Handbook (revised edition).

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Colethrop Farm, Hardwicke	Pit 1 (ASP 65)	0°	Permanent Grass	Av Rainfall: 712 mm ATO: 1490 day °C FC Days: 156 Climatic Grade: 1 Exposure Grade: 1	Lias clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
21/95	12/5/95	SO811117	PB		PB280

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	25	C	10YR42	1% HR	0	0	-	-	-	G	MF, VF	Y	Clear Smooth
2	55	C	25Y53	3% SLST	CDFOM (25Y56)	0	MCPr	Fm	P	P	FF	Y	Gradual Wavy
3	80	C	25Y51	3% SLST	MDMOM (25Y56)	0	WCPr	Fm	P	P*	FF	Y	

Profile Gleyed From: 25

Depth to Slowly Permeable Horizon: 25

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	123 mm
	Potatoes:	100 mm
Moisture Deficit	Wheat:	107 mm
	Potatoes:	99 mm
Moisture Balance	Wheat:	+16 mm
	Potatoes:	+1 mm
Droughtiness Grade:		2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

* H3 zero pores within ped, occasional worm channel between peds.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Colethrop Farm, Hardwicke	Pit 2 (ASP 58)	0°	PGR	Av Rainfall: 712 mm ATO: 1490 day °C FC Days: 156 Climatic Grade: 1 Exposure Grade: 1	River gravel
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
21.95	12.5.95	SO810118	PB		PB281

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	25	MSL	10YR4/2	None	Common rusty root channels	None	-	-	Moderate	Good	Many fine and v fine	None	Gradual Smooth
2	58	MSCL	10YR4/4	None	None	None	Weak coarse subangular blocky	Friable	Moderate	Good	Common fine and v fine	None	Gradual Smooth
3	90	SC	10YR5/4 (10YR5/3)	None	Many distinct fine ochreous 10YR5/8	None	Weak coarse angular blocky	Friable	Moderate	Good	Few fine and v fine	None	Gradual Smooth
4	105	MSL	10YR5/3	None	Many distinct fine ochreous 10YR5/8	None	Weak coarse subangular blocky	Friable	Good	Good	None	None	Gradual Smooth
5	120	LMS	10YR5/4	None	Many faint medium grey 10YR6/3	None	Weak coarse subangular blocky	Friable	Good	Good	None	None	-

Profile Gleyed From: 58 cm

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 1

Available Water	Wheat:	150 mm
	Potatoes:	110 mm
Moisture Deficit	Wheat:	107 mm
	Potatoes:	99 mm
Moisture Balance	Wheat:	+43 mm
	Potatoes:	+11 mm
Droughtiness Grade:		1 (Calculated to 120 cm)

Final ALC Grade: 1

Main Limiting Factor(s):

Remarks:

Borderline Grade 2 on droughtiness.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Colethrop Farm, Hardwicke	Pit 3	0°	Permanent Grass	Av Rainfall: 712 mm ATO: 1490 day °C FC Days: 156 Climatic Grade: 1 Exposure Grade: 1	River gravel
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
21/95	12/5/95	SO808120 (ASP 38-48)	PB		PB282

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	14	SCL	10YR4/2	None	Few rusty root channels	None	-	-	Moderate	Good	Many fine and v fine		Clear Smooth
2	45	HCL	10YR5/4	None	None	Few	Slightly compact weak coarse subangular blocky	Firm	Moderate	Good	Common fine and v fine		Gradual Smooth
3	66	C	10YR5/4 Ped faces 10YR6/3	5% HR Vis est	Common faint fine ochreous 10YR5/8	Few	Weak coarse subangular blocky	Friable	Moderate	Good	Few fine and v fine		Clear Smooth
4	76	C	As above	30% HR sieved	As above	Common	As above	Friable	Moderate	Good	Few v fine		Abrupt Smooth
5	115	LMS	10YR5/4	10% HR sieved - in bands	Common faint coarse ochreous 10YR5/8	None	Weak coarse subangular blocky	V friable	Moderate	good	None		-

Profile Gleyed From: 45

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 1

Available Water	Wheat:	119 mm
	Potatoes:	110 mm
Moisture Deficit	Wheat:	107 mm
	Potatoes:	99 mm
Moisture Balance	Wheat:	+12 mm
	Potatoes:	+11 mm
Droughtiness Grade:		2 (Calculated to 120 cm)

Final ALC Grade: 2

Main Limiting Factor(s): Droughtiness

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Colethrop Farm	Pit 4 (ASP 29)	2° W	PGR	Av Rainfall: 712 mm ATO: 1490 day °C FC Days: 156 Climatic Grade: 1 Exposure Grade: 1	Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
21.95	12.5.95	SO814122	PB		PB283

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size,Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	23	C	10YR42	0	0	0	-	-	-	G	MF, VF	Y	Abrupt Smooth
2	70	C	25Y53	0	CFFOM (25Y56)	0	MCPr	Fm	P	P	CF	Y	Gradual Smooth
3	95	C	25Y51	0	CFFOM (25Y56)	0	WCPr	Fm	P	P	FVF	Y	

Profile Gleyed From: 23

Depth to Slowly Permeable Horizon: 23

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	124 mm
	Potatoes:	101 mm
Moisture Deficit	Wheat:	107 mm
	Potatoes:	99 mm
Moisture Balance	Wheat:	+17 mm
	Potatoes:	+2 mm
Droughtiness Grade:		2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

SOIL PLASTICITY RECORDING SHEET

ANNEX 2

SITE DATA

Grid Ref	SO 81 SW		Site Name	Colethrop Farm			LPA	Gloucester CC	
AAR	712 mm	ATO	1490	FCD	156	MD (wheat)	107	MD (potatoes)	99

SOIL PIT DATA

	PIT TWO SOIL SERIES Badsey 2			PIT THREE SOIL SERIES Badsey 2			PIT FOUR SOIL SERIES Evesham 2		
DEPTH	TEXTURE	PLASTIC Y/N	COMMENTS	TEXTURE	PLASTIC Y/N	COMMENTS	TEXTURE	PLASTIC Y/N	COMMENTS
10 cm	MSL	N	No ball, no worm	SCL	N	No ball	C	N	No ball
20 cm	MSL	N	"	HCL	N	"	C	N	"
30 cm	MSCL	N	"	HCL	N	"	C	N	"
40 cm	"	N	"	HCL	N	Ball, no worm	C	N	Ball, no worm
50 cm	"	N	"	C	Y	Worm	C	Y	Worm
60 cm	"	N	"	C	Y	"	C	Y	"