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GLOUCESTERSHIRE STRUCTURE PLAN: BROCKWORTH

AGRICULTURAL LAND CLASSIFICATION

CONTENTS

GLOUCESTERSHIRE STRUCTURE PLAN: BROCKWORTH

AGRICULTURAL LAND CLASSIFICATION SURVEY

SUMMARY

The reconnaissance scale survey was carried out by ADAS on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Structure Plan. The fieldwork at Brockworth was completed in December 1994 at a scale of 1:25,000. 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: Brockworth

Grade	Area (ha)	% of Survey Area	% of Agricultural Land	
3a	69	37	53	
3b	61	33	47	
Urban	32	17		
Non Agricultural	16	9		
Agricultural Buildings	7	4		
TOTAL	185	100	100	(130 ha)

Just over half of the agricultural land is best and most versatile, being graded 3a. This land is generally well drained with a high stone content in the subsoil. Most of the 3a land is limited due to workability. The rest of the agricultural land is deep, stone free, clayey soil, and is graded as 3b due to a wetness limitation.

1. INTRODUCTION

A reconnaissance scale Agricultural Land Classification (ALC) Survey was carried out in December 1994 at Brockworth, Gloucestershire on behalf of MAFF as part of its statutory role in the preparation of the Gloucestershire Plan. The fieldwork covering 185 ha of land was conducted by ADAS at a scale of 1:25,000 with approximately one boring per 6 hectares of agricultural land. A total of 29 auger borings were examined and 3 soil profile pits used to assess subsoil conditions.

The published provisional one inch to the mile ALC map of this area (MAFF 1968) shows the grades of the site at a reconnaissance scale to be Grade 3, except for a small area of urban land south of Henley.

Part of the area was also surveyed in 1982 at a scale of 1:25,000. That survey showed a mixture of Subgrades 3a and 3b.

The recent survey supersedes this map having been carried out 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.

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: Brockworth

Grid Reference		SO 902 163	SO 881 175
Altitude (m)		65	40
Accumulated Temperature (day °)		1449	1447
Average Annual Rainfall (mm)		719	671
Overall Climatic Grade		1	1
Field Capacity Days		160	149
Moisture deficit (mm):	Wheat	103	109
	Potatoes	95	103

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

The elevation of the site ranges from 40 m AOD to 94 m AOD. Slopes are gentle and are not limiting. At the time of the survey much of the agricultural land was under arable cropping, with the remainder under permanent grass.

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, Institute of Geological Sciences 1972.

Most of the survey area is underlain by Lower Lias Clay deposits. However, patches of fan gravel associated with river terraces occur around Brockworth Court and north of Little Witcombe.

The soils were mapped by the Soil Survey of England and Wales in 1983 at a reconnaissance scale of 1:250,000.

The area west of Mill Lane is mapped as Badsey 2 Association. These are described as generally well drained, calcareous fine loamy soils over limestone gravel. The rest of the site, with the exception of a small area north of Little Witcombe, has soils of the Evesham 2 Association. These are slowly permeable calcareous clayey soils. The area north of Little Witcombe are mapped as the Badsea 1 association which are similar to Badsey 2.

The soils found during the recent survey agree with this distribution, although the slowly permeable clayey soils extend further to the west past Brockworth Court.

5. AGRICULTURAL LAND CLASSIFICATION

The distribution of ALC grades is shown in Table 2 and on the accompanying ALC map. This information could be misleading if shown at a larger scale.

Table 2: Distribution of ALC grades: Brockworth

Grade	Area (ha)	% of Survey Area	% of Agricultural Land	
3a	69	37	53	
3b	61	33	47	
Urban	32	17		
Non Agricultural	16	9		
Agricultural Buildings	7	4		
TOTAL	185	100	100	(130 ha)

Subgrade 3a

The 3a land is variable, generally being well drained, calcareous, with a heavy clay loam or clay topsoil. Stone content is <5% in the topsoil, increasing to 55% in the subsoil. These profiles are graded as 3a due to topsoil workability limitations. Some profiles to the west of Brockworth Court have a medium clay loam or medium sandy loam topsoil and are graded as 3a due to a droughtiness limitation imposed by the high subsoil stone content.

Pockets of soils having a gleyed slowly permeable layer occurring below 50 cm occur. These soils are calcareous and have a Wetness Class of III (see Appendix 3). Due to the lower altitude, the western end of the site has a Field Capacity Day value below 151 FCD, and where these soils occur within this lower FCD zone they are graded as 3a.

Subgrade 3b

The 3b land is clayey throughout, with a low stone content, and a gleyed slowly permeable layer occurring above 40 cm. Is Wetness Class 4 which, in conjunction with 160 Field Capacity Days and a heavy clay loam or clay topsoil, leads to a grade of 3b due to a wetness limitation.

Resource Planning Team
Taunton Statutory Unit
January 1994

APPENDIX 1

REFERENCES

INSTITUTE OF GEOLOGICAL SCIENCES (1972) Solid and Drift Edition, Sheet 234

MAFF (1968) 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), 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
Brockworth	1 P	0°	Ploughed	Av Rainfall: 1449 mm ATO: 719 day °C FC Days: 160 Climatic Grade: 1 Exposure Grade: N/A	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
122/94	1/12/94	Near ASP 15; SO 905 162	PRW		PRW/127

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	30	C	10YR4/3	<1%	None	None	-	Friable	Moderate	Many	Few Fine	Strongly Calcareous	Abrupt smooth
2	64	C	10YR5/3	<1%	Common Fine Distinct 10YR5/8	None	Moderate coarse Prismatic	Friable	Poor	<0.5% Biopores	Few Fine Ex Ped	Strongly Calcareous	Abrupt smooth
3	100+	C	2.5Y5/3	<1%	Common Medium Distinct 10YR5/8	None	Moderate Coarse Angular Blocky	Firm	Poor	<0.5% Biopores	Few Fine Ex Ped	Strongly Calcareous	-

Profile Gleyed From: 30 cm

Depth to Slowly Permeable Horizon: 30 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 126 mm

Potatoes: 103 mm

Moisture Deficit Wheat: 103 mm

Potatoes: 95 mm

Moisture Balance Wheat: 23 mm

Potatoes: 8 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

Worm to 60

NL336k

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Brockworth	2 P	Flat	Winter Barley	Av Rainfall: 1449 mm ATO: 719 day °C	River Terrace Fan Gravel
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: N/A	SOIL SAMPLE REFERENCES
122/94	1/12/94	Near ASP 18; SO 910 162	PRW		

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	34	HCL	10YR4/3	5% Visual Estimate HR	None	None	-	Friable	Moderate	Many	Common Fine	Strongly Calcareous	Abrupt Smooth
2	61	HCL	2.5Y5/6	55% Sieved HR	None	None	Moderate Medium Subangular Blocky	Friable	Moderate	Many	Few Fine	Strongly Calcareous	Clear Smooth
3	120 dug to 80	C	2.5Y5/6	65% Sieved HR	None	none	-	-	Moderate	Many	None Observed	Strongly Calcareous	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: 1

Wetness Grade: 2

Available Water	Wheat:	94 mm
	Potatoes:	85 mm
Moisture Deficit	Wheat:	103 mm
	Potatoes:	95 mm
Moisture Balance	Wheat:	-9 mm
	Potatoes:	-10 mm
Droughtiness Grade:		3a (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Droughtiness

Remarks:

NL336k

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Brockworth	3P	Flat	Winter Barley	Av Rainfall: 719 mm ATO: 1449 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1	SOIL SAMPLE REFERENCES
122/94	1/12/94	Between ASP 7+8; SO 895 170	PRW	Exposure Grade: N/A	PRW/128

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	35	C	10YR4/2	None	None	None	-	Friable	Moderate	Many	Common Fine	Not Calcareous	Abrupt Smooth
2	80	C	2.5Y5/2	None	Common Distinct 10YR5/6	None	Coarse Moderate Angular Blocky	Firm	Poor	<0.5% Biopores	Few Fine	Not Calcareous	-

Profile Gleyed From: 35

Depth to Slowly Permeable Horizon: 35

Wetness Class: IV

Wetness Grade: 3b

Available Water	Wheat:	100 mm
	Potatoes:	105 mm
Moisture Deficit	Wheat:	103 mm
	Potatoes:	95 mm
Moisture Balance	Wheat:	-3 mm
	Potatoes:	10 mm

Droughtiness Grade: 3a (Calculated to 80 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

NL336k

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Brockworth	1 P	0°	Ploughed	Av Rainfall: 1449 mm ATO: 719 day °C FC Days: 160 Climatic Grade: 1 Exposure Grade: N/A	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
122/94	1/12/94	Near ASP 15; SO 905 162	PRW		PRW/127

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	30	C	10YR4/3	<1%	None	None	-	Friable	Moderate	Many	Few Fine	Strongly Calcareous	Abrupt smooth
2	64	C	10YR5/3	<1%	Common Fine Distinct 10YR5/8	None	Moderate coarse Prismatic	Friable	Poor	<0.5% Biopores	Few Fine Ex Ped	Strongly Calcareous	Abrupt smooth
3	100+	C	2.5Y5/3	<1%	Common Medium Distinct 10YR5/8	None	Moderate Coarse Angular Blocky	Firm	Poor	<0.5% Biopores	Few Fine Ex Ped	Strongly Calcareous	-

Profile Gleyed From: 30 cm

Depth to Slowly Permeable Horizon: 30 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 126 mm

Potatoes: 103 mm

Moisture Deficit Wheat: 103 mm

Potatoes: 95 mm

Moisture Balance Wheat: 23 mm

Potatoes: 8 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

Worm to 60

NL336k

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Brockworth	2 P	Flat	Winter Barley	Av Rainfall: 1449 mm ATO: 719 day °C FC Days: 160 Climatic Grade: 1 Exposure Grade: N/A	River Terrace Fan Gravel
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY		SOIL SAMPLE REFERENCES
122/94	1/12/94	Near ASP 18; SO 910 162	PRW		

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
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2	61	HCL	2.5Y5/6	55% Sieved HR	None	None	Moderate Medium Subangular Blocky	Friable	Moderate	Many	Few Fine	Strongly Calcareous	Clear Smooth
3	120 dug to 80	C	2.5Y5/6	65% Sieved HR	None	none	-	-	Moderate	Many	None Observed	Strongly Calcareous	-

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: 1

Wetness Grade: 2

Available Water	Wheat:	94 mm
	Potatoes:	85 mm
Moisture Deficit	Wheat:	103 mm
	Potatoes:	95 mm
Moisture Balance	Wheat:	-9 mm
	Potatoes:	-10 mm
Droughtiness Grade:		3a (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Droughtiness

Remarks:

NL336k

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Brockworth	3P	Flat	Winter Barley	Av Rainfall: 719 mm ATO: 1449 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1	SOIL SAMPLE REFERENCES
122/94	1/12/94	Between ASP 7+8; SO 895 170	PRW	Exposure Grade: N/A	PRW/128

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	35	C	10YR4/2	None	None	None	-	Friable	Moderate	Many	Common Fine	Not Calcareous	Abrupt Smooth
2	80	C	2.5Y5/2	None	Common Distinct 10YR5/6	None	Coarse Moderate Angular Blocky	Firm	Poor	<0.5% Biopores	Few Fine	Not Calcareous	-

Profile Gleyed From: 35

Depth to Slowly Permeable Horizon: 35

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 100 mm

Potatoes: 105 mm

Moisture Deficit Wheat: 103 mm

Potatoes: 95 mm

Moisture Balance Wheat: -3 mm

Potatoes: 10 mm

Droughtiness Grade: 3a (Calculated to 80 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

NL336k