East of Berkeley

Agricultural Land Classification

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Resource Planning Team
Bristol
FRCA Western Region

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EAST OF BEREKLEY

AGRICULTURAL LAND CLASSIFICATION SURVEY

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INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 12.5 ha of land on the eastern edge of Berkeley. Field survey was based on 11 auger borings and one soil profile pit, and was completed in September 1997.

2. The survey was conducted by the Resource Planning Team of FRCA Western Region, on behalf of MAFF in its statutory role in the preparation of Stroud District Local Plan.

3. Information on climate, geology and soils, and from previous ALC surveys was considered and is presented in the relevant section. The published regional ALC map (MAFF, 1977) shows the site at a reconnaissance scale as being Grade 3 on the western side of the site and Grade 4 in the East. Apart from this the site had not previously been surveyed. The current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF, 1988) and therefore supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.

4. At the time of survey land cover was mostly permanent pasture. The field in the north-western corner of the site is an abandoned orchard.

SUMMARY

5. The distribution of ALC grades is shown on the accompanying 1:10 000 scale ALC map. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas. Areas are summarised in the Table 1.

Table 1: Distribution of ALC grades: Berkeley, East

Grade	Area (ha)	% Surveyed Area (12.5 ha)
3b	12.5	100
Total site area	12.5	100

6. None of the site is "best and most versatile". All of the site was graded as Subgrade 3b (moderate quality) land with either a moderate wetness and or gradient limitation. The survey site is partly on an old landfill site. A cap of red clay subsoil with a topsoil layer of stony clay loam has been used in the restoration. The clay subsoil is slowly permeable. The central area of the site also has strongly sloping gradients which will restrict the agricultural versatility of the land.

CLIMATE

7. Estimates of climatic variables for this site were derived from the published agricultural climate dataset "Climatological Data for Agricultural Land Classification" (Meteorological Office, 1989) using standard interpolation procedures. Data for key points around the site are given in Table 2 below.

8. Since the ALC grade of land is determined by the most limiting factor present, overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions. Parameters used for assessing overall climate are accumulated temperature, a measure of relative warmth and average annual rainfall, a measure of overall wetness. The results shown in Table 2 indicate that there is no overall climatic limitation.

9. Climatic variables also affect ALC grade through interactions with soil conditions. The most important interactive variables are Field Capacity (FC) Days that are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes, which are compared with the moisture available in each profile in assessing soil droughtiness limitations. These are described in later sections.

Table 2: ***Climatic Interpolations: Berkeley, East***

Grid Reference		ST 687 996	ST 688 996
Altitude (m)		25	10
Accumulated Temperature (day °C)		1506	1523
Average Annual Rainfall (mm)		792	785
Overall Climatic Grade		1	1
Field Capacity Days		177	176
Moisture deficit (mm):	Wheat	99	101
	Potatoes	91	93

RELIEF

10. Altitude ranges from 8 metres near Long Bridge, to 26 metres at Berrycroft. The site is on the East facing side of a hill. Gradients at the top and bottom of the hill are gently sloping with no limitation to its agricultural usage. The centre of the site is strongly sloping and these areas will have a moderate limitation to their agricultural versatility due to the steep gradient.

GEOLOGY AND SOILS

11. The underlying geology of the site is shown on the published geology map (IGS, 1970) as being predominantly Thornbury Beds. These are red marl with thin beds of sandstone. There is a small area of alluvium adjacent to the stream in the eastern part of the site. The soils found during the recent survey could not give an indication of the underlying geology as the site has been restored after it was used as a landfill.

12. Soil across the whole site was mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983). It is shown as belonging to the Hodnet Association in the West and Fladbury 1 Association in the East.

13. The Hodnet soils are described as being reddish fine and coarse loamy soils with slowly permeable subsoils and slight seasonal waterlogging. Some similar soils may be well drained reddish fine loams. Soils from the Fladbury 1 Association are described as being stoneless, clayey soils variably affected by groundwater.

14. The soils found during the recent survey were stony clay loam topsoils over clay slowly permeable subsoils. Some of the profiles were impenetrable immediately below the topsoil. The site had previously been used as a landfill and these profiles have been restored.

AGRICULTURAL LAND CLASSIFICATION

15. The distribution of ALC grades found by the current survey is shown on the accompanying 1:10 000 scale map and areas are summarised in Table 1. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas.

Subgrade 3b

16. The whole site has been graded as Subgrade 3b. The profiles consist of medium clay loam topsoils over clayey subsoils. They are gleyed from below the topsoil and have a slowly permeable layer in the subsoil. The profiles were assessed as Wetness Class IV (see Appendix II). With a medium clay loam topsoil this is a moderate wetness limitation. The poor drainage means that the soil water regime will adversely affect plant growth and impose restrictions on cultivations and grazing by livestock. Some of the profiles were impenetrable below the topsoil due to stones. Soil profile pit 1 is representative of these profiles that also have a moderate wetness limitation.

17. Areas of land in the centre of the site have a moderate limitation to their agricultural use due to gradient. The gradients found during the survey of 8-11° will restrict the safe and accurate use of some agricultural machinery, thus restricting cropping practises. The top of the southern most field may also have a limitation due to micro-relief, although it is not likely to be worse than Subgrade 3b.

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October 1997

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APPENDIX I

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 that 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 that 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 that can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations that significantly restrict the range of crops and/or 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 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 that restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

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

APPENDIX II

DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile.

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 (Ed) (1997) Soil Survey Field Handbook. Soil Survey Technical Monograph No 5, SSLRC, Cranfield University.

APPENDIX III

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1997).

1. Terms used on computer database, in order of occurrence.

GRID REF: National 100 km grid square and 8 figure grid reference.

LAND USE: At the time of survey

WHT:	Wheat	**SBT:**	Sugar Beet	**HTH:**	Heathland
BAR:	Barley	**BRA:**	Brassicas	**BOG:**	Bog or Marsh
OAT:	Oats	**FCD:**	Fodder Crops	**DCW:**	Deciduous Wood
CER:	Cereals	**FRT:**	Soft and Top Fruit	**CFW:**	Coniferous Woodland
MZE:	Maize	**HRT:**	Horticultural Crops	**PLO:**	Ploughed
OSR:	Oilseed Rape	**LEY:**	Ley Grass	**FLW:**	Fallow (inc. Set aside)
POT:	Potatoes	**PGR:**	Permanent Pasture	**SAS:**	Set Aside (where known)
LIN:	Linseed	**RGR:**	Rough Grazing	**OTH:**	Other
BEN:	Field Beans	**SCR:**	Scrub		

GRDNT: Gradient as estimated or measured by hand-held optical clinometer.

GLEY, SPL: Depth in centimetres to gleying or slowly permeable layer.

AP (WHEAT/POTS): Crop-adjusted available water capacity.

MB (WHEAT/POTS): Moisture Balance. (Crop adjusted AP - crop potential MD)

DRT: Best grade according to soil droughtiness.

If any of the following factors are considered significant, 'Y' will be entered in the relevant column.

MREL:	Microrelief limitation	**FLOOD:**	Flood risk	**EROSN:**	Soil erosion risk
EXP:	Exposure limitation	**FROST:**	Frost prone	**DIST:**	Disturbed land
CHEM:	Chemical limitation				

LIMIT: The main limitation to land quality: The following abbreviations are used.

OC:	Overall Climate	**AE:**	Aspect	**EX:**	Exposure
FR:	Frost Risk	**GR:**	Gradient	**MR:**	Microrelief
FL:	Flood Risk	**TX:**	Topsoil Texture	**DP:**	Soil Depth

CH:	Chemical	**WE:**	Wetness	**WK:**	Workability
DR:	Drought	**ER:**	Erosion Risk	**WD:**	Soil Wetness/Droughtiness
ST:	Topsoil Stoniness				

TEXTURE: Soil texture classes are denoted by the following abbreviations:-

S:	Sand	**LS:**	Loamy Sand	**SL:**	Sandy Loam
SZL:	Sandy Silt Loam	**CL:**	Clay Loam	**ZCL**	Silty Clay Loam
ZL:	Silt Loam	**SCL:**	Sandy Clay Loam	**C:**	Clay
SC:	Sandy clay	**ZC:**	Silty clay	**OL:**	Organic Loam
P:	Peat	**SP:**	Sandy Peat	**LP:**	Loamy Peat
PL:	Peaty Loam	**PS:**	Peaty Sand	**MZ:**	Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes:-

F: Fine (more than 66% of the sand less than 0.2mm)
M: Medium (less than 66% fine sand and less than 33% coarse sand)
C: Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content: **M:** Medium (< 27% clay) **H:** heavy (27 - 35% clay)

MOTTLE COL: Mottle colour using Munsell notation.

MOTTLE ABUN: Mottle abundance, expressed as a percentage of the matrix or surface described.

F: few <2% **C:** common 2 - 20% **M:** many 20 - 40% **VM:** very many 40%+

MOTTLE CONT: Mottle contrast

F: faint - indistinct mottles, evident only on close inspection
D: distinct - mottles are readily seen
P: Prominent - mottling is conspicuous and one of the outstanding features of the horizon.

PED. COL: Ped face colour using Munsell notation.

GLEY: If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

STONE LITH: Stone Lithology - One of the following is used.

HR:	All hard rocks and stones	**SLST:**	Soft oolitic or dolimitic limestone
CH:	Chalk	**FSST:**	Soft, fine grained sandstone
ZR:	Soft, argillaceous, or silty rocks	**GH:**	Gravel with non-porous (hard) stones
MSST:	Soft, medium grained sandstone	**GS:**	Gravel with porous (soft) stones

SI: Soft weathered igneous or metamorphic rock

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm.

STRUCT: The degree of development, size and shape of soil peds are described using the following notation

Degree of development	**WA:** Weakly developed Adherent		**WK:**	Weakly developed
	MD: Moderately developed		**ST:**	Strongly developed
Ped size	**F:**	Fine	**M:**	Medium
	C:	Coarse	**VC:**	Very coarse
Ped Shape	**S:**	Single grain	**M:**	Massive
	GR:	Granular	**AB:**	Angular blocky
	SAB:	Sub-angular blocky	**PR:**	Prismatic
	PL:	Platy		

CONSIST: Soil consistence is described using the following notation:

L:	Loose	**VF:**	Very Friable	**FR:**	Friable	**FM:**	Firm
VM:	Very firm	**EM:**	Extremely firm	**EH:**	Extremely Hard		

SUBS STR: Subsoil structural condition recorded for the purpose of calculating profile droughtiness: **G:** Good **M:** Moderate **P:** Poor

POR: Soil porosity. If a soil horizon has poor porosity with less than 0.5% biopores >0.5mm, a 'Y' will appear in this column.

IMP: If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

SPL: Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

CALC: If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a 'Y' will appear this column.

2. Additional terms and abbreviations used mainly in soil pit descriptions.

STONE ASSESSMENT:

VIS:	Visual	**S:**	Sieve	**D:**	Displacement

MOTTLE SIZE:

EF:	Extremely fine <1mm	**M:**	Medium 5-15mm
VF:	Very fine 1-2mm>	**C:**	Coarse >15mm
F:	Fine 2-5mm		

MOTTLE COLOUR: May be described by Munsell notation or as ochreous (OM) or grey (GM).

ROOT CHANNELS: In topsoil the presence of 'rusty root channels' should also be noted.

MANGANESE CONCRETIONS: Assessed by volume

N:	None		**M:**	Many	20-40%
F:	Few	<2%	**VM:**	Very Many	>40%
C:	Common	2-20%			

POROSITY:

P: Poor - less than 0.5% biopores at least 0.5mm in diameter
G: Good - more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE:

The *number of roots* per $100cm^2$:		Very Fine and Fine	Medium and Coarse
F:	Few	1-10	1 or 2
C:	Common	10.25	2 - 5
M:	Many	25-200	>5
A:	Abundant	>200	

ROOT SIZE

VF:	Very fine	<1mm	**M:**	Medium	2 - 5mm
F:	Fine	1-2mm	**C:**	Coarse	>5mm

HORIZON BOUNDARY DISTINCTNESS:

Sharp:	<0.5cm	**Gradual:**	6 - 13cm
Abrupt:	0.5 - 2.5cm	**Diffuse:**	>13cm
Clear:	2.5 - 6cm		

HORIZON BOUNDARY FORM: Smooth, wavy, irregular or broken.*
* See Soil Survey Field Handbook (Hodgson, 1997) for details.

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Berkeley, East	Pit 1 (ASP 11)	2° East	Permanent Grass	Av Rainfall: 792 mm ATO: 1506 day °C	Thornbury Beds - disturbed
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 77 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
67/97	9/9/97	ST 686 994	HLJ		None

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	27	MCL	75YR42	5% HR (VIS)	FDFO (10YR66)	None	-	-	-	-	MF + VF	-	Clear smooth
2	43	HCL	75YR53	15% HR (VIS)	CDFO (10YR66)	Few	MCSAB	Firm	Moderate	Good*[1]	CF + VF	-	Abrupt smooth
3	75+	C	25YR44 10Y51	< 1% HR (VIS)	CDFO (75YR56)	None	MCAB	Firm	Moderate	Poor	FF + VF	-	-

Profile Gleyed From: 27 cm

Slowly Permeable Horizon From: 43 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 126 mm

Potatoes: 103 mm

Moisture Deficit Wheat: 99 mm

Potatoes: 91 mm

Moisture Balance Wheat: 27 mm

Potatoes: 12 mm

Droughtiness Grade: 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: Disturbed ground (an old landfill site)
*[1] borderline. One side of pit only had H1 and H3 from 27 cm.