Hook Street Berkeley

Agricultural Land Classification

April 1998

Resource Planning Team
Bristol
FRCA Western Region

Job Number 27/98

HOOK STREET BERKELEY

AGRICULTURAL LAND CLASSIFICATION SURVEY

CONTENTS

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INTRODUCTION

1 This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 21 6 ha of land at Hook Street on the north west side of Berkeley Field survey was based on 23 auger borings and 2 soil profile pits and was completed in March 1998 During the survey 2 sample was analysed for particle size distribution (PSD)

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 the 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 Apart from the published regional ALC map (MAFF 1977) which shows the site at a reconnaissance scale as being Grade 3 with some Grade 4 to the south the site had not been surveyed previously However the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988) and supersedes any previous ALC survey Grade descriptions are summarised in Appendix I

4 Land on the eastern side of Berkeley was surveyed in 1997 (FRCA, 1997) and although most of the site consisted of disturbed land small undisturbed areas were mapped as Subgrade 3b with a moderate wetness limitation

5 At the time of survey land cover was dependant upon ownership with most of the site being permanent grassland for grazing with one field of maize stubble and one of oilseed rape Land which was not surveyed included an area of residential buildings and associated gardens agricultural buildings and a small copse

SUMMARY

6 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 Hook Street

Grade	Area (ha)	% Surveyed Area (20 6 ha)
2	3 9	19
3a	5 7	28
3b	1 2	6
4	9 8	47
Other land	1 0	
Total site area	21 6	

7 This shows that 47% of the site has been mapped as best and most versatile The Grade 2 land on the higher ground is well drained and has a minor workability limitation The Subgrade 3a land with a moderate wetness limitation has slowly permeable reddish lower subsoils while the upper subsoil of the Subgrade 3b land is slowly permeable The Grade 4 land has a severe wetness limitation

CLIMATE

8 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

9 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

10 Climatic variables also affect ALC grade through interactions with soil conditions The most important interactive variables are Field Capacity Days (FCD) which 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 Hook Street

Grid Reference		ST 679 995	ST 684 999	ST 681 000
Altitude (m)		8	23	10
Accumulated Temperature (day C)		1526	1509	1523
Average Annual Rainfall (mm)		798	795	793
Overall Climatic Grade		1	1	1
Field Capacity Days		178	178	177
Moisture deficit (mm)	Wheat	101	99	101
	Potatoes	93	91	93

RELIEF

11 Altitude ranges from 8 metres near Lynch Road to 23 metres on the B4066 Station Road The site is mainly gently sloping with some areas of level ground giving no agricultural limitation

GEOLOGY AND SOILS

12 The underlying geology of the site is shown on the published geology map (IGS 1970) as being mainly Lower Old Red Sandstone Thornbury Beds (red marl with thin beds of

sandstone) with alluvium through the middle of the site This was largely borne out by the soils found during the current survey

13 Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1 250 000 (SSEW 1983) This shows the site to be Hodnet Association with soils from the Fladbury 2 Association along the steam running north south through the middle of the site More detailed soils information is also available in the 1 25 000 scale survey (SSEW 1974) which shows soil series including Middleton Complex with the Fladbury Series along the stream

14 The Hodnet soils are described as being reddish fine and coarse loamy soils with slowly permeable subsoils and slight seasonal waterlogging Some similar soils are well drained reddish fine loamy soils The Fladbury 2 Association is described as stoneless clayey soils variably affected by groundwater some with sandy subsoils and some similar but fine loamy soils These descriptions were borne out by the current survey

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

Grade 2

16 The small areas of Grade 2 land have a minor workability limitation as illustrated by Pit 1 where a topsoil PSD sample was taken They have medium clay loam topsoils over heavy clay loam upper subsoils and clay lower subsoils which are well drained and the profiles were therefore assessed as Wetness Class I (see Appendix II) Some of the profiles were impenetrable with a soil auger due to a layer of stones in the upper subsoil but this does not cause a drought limitation as shown by Pit 1 A small transitional area of Subgrade 3a below Hook Street Farm marked as Lynch on the accompanying map has been included in this mapping unit

Subgrade 3a

17 The area of Subgrade 3a has a moderate wetness limitation The profiles typically have medium clay loam topsoils over heavy clay loam upper subsoils and clay lower subsoils The lower subsoils show evidence of wetness and may or may not be gleyed and are slowly permeable layers as illustrated by Pit 2 The profiles were therefore assessed as Wetness Classes II and III depending on the depth at which the profile becomes slowly permeable These are red profiles but because they become slowly permeable at 50 60 cm wether the slowly permeable layer extends below 100 cm is not critical to the assessment of the wetness class

Subgrade 3b

18 The small area of Subgrade 3b land has a moderate wetness limitation and is almost adjacent to a similar mapping unit from the 1997 survey (FRCA 1997) These profiles have

slowly permeable layers starting below the topsoil and were assessed as Wetness Class IV which with a medium clay loam topsoil implies a moderate wetness limitation

Grade 4

19 Along the stream in the centre of the site there is a severe wetness limitation These profiles have heavy clay loam and clay topsoils over clay subsoils and tend to be gleyed from the surface with slowly permeable layers beginning below the topsoil They were assessed as wetness Class IV

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April 1998

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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 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 (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 which 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 (In preparation) Soil Survey Field Handbook Revised Edition

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 1974)

1 Terms used on computer database in order of occurrence

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

USE 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		

ASPECT The aspect of the land

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

M REL	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 and 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	**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 /			

STRUCTURE Ped Development *

WA	Weakly adherent	**M**	Moderately developed
W	Weakly developed	**S**	Strongly developed

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 1974) for details

SITE NAME	PROFILE NO	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hook Street Berkeley	Pit 1 (Asp 14E)	Level	Permanent Grass	Av Rainfall 795 mm ATO 1509 day C	Lower Old Red Sandstone (Brownstones)
JOB NO	DATE	GRID REFERENCE	DESCRIBED BY	FC Days 172 Climatic Grade 1 Exposure Grade 1	SOIL SAMPLE REFERENCES
27/98	12/3/98	ST 6777 9967	HLJ		T/S 0 25 cm MCL (S23 Z57 C20 /)

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	28	MCL	7 5YR43	2 / HR (Vis)	None	None					MF & VF		Clear Smooth
2	44	HCL	0 5YR43 44	10 / HR (Vis) *[1]	None	Few	MDCSAB	Friable	Moderate	Good	CVF		Clear Smooth
3	100 +	C	2 5YR46 05G62	0 / (Vis)	None	None	MDMSAB	Firm	Good	Poor *[2]	FVF		

Profile Gleyed From Not gleyed

Depth to Slowly Permeable Horizon No Spl

Wetness Class I

Wetness Grade 2

Available Water	Wheat	190 mm
	Potatoes	127 mm
Moisture Deficit	Wheat	100 mm
	Potatoes	92 mm
Moisture Balance	Wheat	90 mm
	Potatoes	35 mm

Droughtiness Grade 1 (Calculated to 120 cm)

Final ALC Grade 2

Main Limiting Factor(s) Workability

Remarks *[1] hard rock is sandstone and is at the top of the horizon

*[2] within the peds

SITE NAME	PROFILE NO	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hook Street Berkeley	Pit 2 (Asp 7)	3 North West	Oil Seed Rape	Av Rainfall 795 mm ATO 1509 day C	Lower Old Red Sandstone (Brownstones)
JOB NO	DATE	GRID REFERENCE	DESCRIBED BY	FC Days 172 Climatic Grade 1 Exposure Grade 1	SOIL SAMPLE REFERENCES
27/98	13/3/98	SO 6820 0000	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	7 5YR43	2 / HR (Vis)	None	None					CF & VF		Clear Smooth
2	52	HCL	0 5YR43 44	0 / HR (Vis)	FFFO (10YR66)	None	MDCSAB	Friable	Moderate	Good	FF & VF		Abrupt Smooth
3	80 +	C	2 5YR46 2 5Y73	5 / MSST (Vis)	CFFO (10YR66)	Few	MDCAB	Firm *1	Moderate *2	Poor	FVF		

Profile Gleyed From Not gleyed

Depth to Slowly Permeable Horizon 52 cm

Wetness Class III

Wetness Grade 3a

Available Water	Wheat	139 mm
	Potatoes	115 mm
Moisture Deficit	Wheat	100 mm
	Potatoes	92 mm
Moisture Balance	Wheat	39 mm
	Potatoes	23 mm

Droughtiness Grade 1 (Calculated to 120 cm)

Final ALC Grade 3a

Main Limiting Factor(s) Wetness

Remarks *1 but plastic
*2 ochreous colours predominantly within peds therefore not poor