Hardwicke Court

Agricultural Land Classification

July 1998

Resource Planning Team
Bristol
FRCA Western Region

RPT Job Number: 1/98

FRCA File No: EL14/170

HARDWICKE COURT

AGRICULTURAL LAND CLASSIFICATION SURVEY

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INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 456.9 ha of land at Hardwicke. Field survey was based on 194 auger borings and 7 soil profile pits, and was completed in July 1998.

2. The survey was conducted by the Resource Planning Team of FRCA Western Region on behalf of MAFF in its statutory role.

3. Information on climate, geology and soils, and from previous ALC surveys was considered and is presented in the relevant sections. Apart from the published regional ALC map (MAFF 1977), which shows the entire site at a reconnaissance scale as ALC Grade 3 the site had not been surveyed previously. 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. Adjacent ALC surveys were carried out at Crosskeys, Hardwicke (ADAS 1994a) and Summerhouse Farm, Hardwicke (ADAS 1994b). The Crosskeys survey showed Subgrade 3a to the west of the site and Subgrade 3b to the east. The main limitation to the 3a land was considered to be wetness. The topsoil texture was a medium sandy loam overlying slowly permeable subsoils. The 3b land also had wetness limitation, but with heavier topsoils. Similar heavy soils were found at Summerhouse Farm.

5. At the time of survey land cover was permanent pasture, cereals, field beans and oilseed rape. Access was not available to 6.7 ha of agricultural land in the south of the site. Other land which was not surveyed included old airfield land, now used for industrial units, a caravan park and areas of woodland.

SUMMARY

6. The distribution of ALC grades is shown on the accompanying 1: 20 000 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: Hardwicke Court

Grade	Area (ha)	% Surveyed Area (399.1 ha)
2	12.4	3
3a	11.9	3
3b	368.1	92
Agricultural land not surveyed	6.9	2
Other land	57.8	
Total site area	456.9	

7. The majority of the land has been graded as Subgrade 3b. These soils experience a moderate wetness limitation with heavy clay loam topsoils overlying slowly permeable clays. 6% of the agricultural land surveyed is best and most versatile. The small area of Grade 2 in the north of the site has light textured well drained soils, whilst two areas of good quality land, Subgrade 3a experience a moderate wetness limitation with slowly permeable layers deeper in the profile than in the Subgrade 3b land.

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.

Table 2: Climatic Interpolations: Hardwicke Court

Grid Reference		S0790 110	S0783092	S0 791126
Altitude (m)		15	16	11
Accumulated Temperature (day °C)		1511	1511	1514
Average Annual Rainfall (mm)		734	746	716
Overall Climatic Grade		1	1	1
Field Capacity Days		160	163	158
Moisture deficit (mm):	Wheat	107	106	108
	Potatoes	100	99	102

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.

RELIEF

11. Altitude ranges from 18 metres in the south east of the site to 9 metres along the Gloucester and Sharpness canal with little variation across the site. No limiting slopes were found during the survey.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS 1972). This shows the geology largely consists of Lower Lias, mainly clay overlain with small areas of gravels from the third main terrace of the River Severn along the motorway to the south and east of the site and to the north east of Hardwicke Court. A thin band of Esturine Alluvium is mapped along the brook just south of Hardwicke Court running from the A38 to the canal, and alongside the canal south of the brook.

13. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1: 250 000 (SSEW 1983). The Evesham 2 Association covers the majority of the site, although a small area of Badsey 1 intrudes to the south east of the site along the motorway and a larger band of Badsey 2 soils is mapped to the north west running eastwards from Hardwicke Court. Also a band of Newchurch 2 soils runs along the canal south of Hardwicke Court.

14. The Evesham 2 Association soils are over clay geology. They are described as slowly permeable calcareous clayey soils, with some slowly permeable seasonally waterlogged non-calcareous clayey and fine loamy or fine silty over clayey soils. The two Badsey soil associations are similar with Badsey 1 being well drained calcareous and non-calcareous fine loamy soils over limestone gravel. Badsey 2 soils are generally calcareous. The Newchurch 2 soils are deep stoneless mainly calcareous clayey soils. The majority of the soils found at the site were similar to Evesham 2 association with evidence of the Newchurch 2 association in the west identified by heavier textured profiles with slowly permeable layers generally higher in the profile than the Evesham soils. The extent of Badsey soils was not as great as suggested by the soils map and lighter textured sandier soils were restricted to a small area to the east of Hardwicke Court similar in extent to the area of third terrace gravels shown on the published geology map.

AGRICULTURAL LAND CLASSIFICATION

15. The distribution of ALC grades found by the current survey is shown on the accompanying 1: 20 000 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 area of Grade 2, very good quality land has been mapped to the east of Hardwicke Court. These soils are well drained and are Wetness Class I (See Appendix II). Medium clay loam topsoils overlie sandier subsoils and these soils experience a minor droughtiness limitation. Parts of the profile are also stony and in a soil pit dug in this mapping unit it was found that stony horizons had between 23 and 40% hard rock by volume. Stone contents were assessed by sieving and displacement. Some slightly heavier topsoils, heavy clay loam were also found within this unit and these experience a minor workability limitation.

Subgrade 3a

17. Two small areas of Subgrade 3a, good quality land are mapped within the survey area. The southern block has heavy clay loam topsoils and is assessed as Wetness Class II. Similar soils are found in the east of the Grade 2 block at Hardwicke Court.

18. The adjacent survey at Crosskeys showed Subgrade 3a land adjacent to the A38. The current survey has shown that this soil type does not extend across to the west of the A38, nor to the south. Within the current survey area heavier textured soils were found than in the adjacent Crosskeys survey.

19. Along the brook in the south and through the centre of the site running east-west there are a scattering of Subgrade 3a borings, but these only represent a narrow strip and are not mapped as a separate mapping unit since they would not form a management unit and are included in the Subgrade 3b Unit. These borings are assessed as Wetness Class II with gleying and slowly permeable layer much deeper in the profile similar to those areas which are mapped as Subgrade 3a described above.

Subgrade 3b

20. The majority of the survey area has been mapped as Subgrade 3b, moderate quality land. Heavy clay loam and clay topsoils overlie heavier subsoils. There is evidence of wetness in the form of gleying often high in the profile with slowly permeable layers either in the upper subsoils or the lower subsoil. The majority of these soils are assessed as Wetness Class IV with some Wetness Class III occurring where gleying and/or slowly permeable layers are deeper in the profile. Six soil profile pits were dug within the Subgrade 3b to confirm the presence of slowly permeable layers. The variation between the Evesham 2 and Newchurch 2 associations shown on the soil survey map do not affect the final ALC grade.

21. The boring density had to be slightly reduced in parts of the survey site where mature crops did permit access to the surveyors. It is expected that the area of agricultural land not surveyed in the south of the site will be Subgrade 3b as indicated by published soils information.

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29 July 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 (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.

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, Silsoe.

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
Hardwicke Court	Pit 1	0°	PGR	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1.98	8.7.98	SO 786097	GMN/GMS		-

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	17	HCL	10YR33	None	7.5YR46 Top half CDFO	-	-	-	-	-	MVF	-	Clear Smooth
2	44	C	2.5Y52	None	10YR56 CDFO	C	MDMPR some SAB	Firm	Poor	Low	CVF	-	Clear Smooth
3	70+	C	5Y42 Top 5Y51 Bottom	None	10YR56 CDFO	F	MDCAB	Firm	Poor	Low	FVF	-	-

Profile Gleyed From: 17

Slowly Permeable Horizon From: 17

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 88 mm

Potatoes: 100 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: -19 mm

Potatoes: 0 mm

Droughtiness Grade: 3a (Calculated to 70 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hardwicke Court	Pit 2	0°	Fallow	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1.98	9.7.98	SO 796115	GMN/GMS		-

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	20	HCL	10YR42	None	None	None	-	-	-	-	FVF	-	Clear Smooth
2	44	C	25Y53	None	CDFO 10YR56	Few	WKCSAB	Friable	Mod	Low	FVF		Clear Smooth
3	55	C	25Y53	None	CDFO 10YR56	Few	MDCAB	Firm	Poor	Low	FVF		
4	70+	C	25Y51	None	CDFO 10YR56	None	MDCAB	Firm	Poor	Low	FVF		

Profile Gleyed From: 20 cm

Slowly Permeable Horizon From: 20 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 96 mm

Potatoes: 108 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: -11mm

Potatoes: 8 mm

Droughtiness Grade: 3a (Calculated to 70 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hardwicke Court	Pit 3	0°	Forage Beet	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 100 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1/98	14/7/98	SO 791123	GMS/GMN		-

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	22	HCL	10YR41	None	CDVFO 7.5YR46	None	-	-	-	-	CVF	-	Clear Smooth
2	55	C	2.5Y51,52	None	CDFO 10YR56	None	Patchy MDCSAB with some WKCSAB	Friable	Moderate	Borderline Poor	FVF	-	Clear Smooth
3	80+	C	2.5Y61,51	5% calcareous soft material	CDMO 10YR68	None	WKCSAB	Firm	Poor	Poor	FVF	-	

Profile Gleyed From: Surface

Slowly Permeable Horizon From: 55cm

Wetness Class: III

Wetness Grade: 3b

Available Water Wheat: 105 mm

Potatoes: 111 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: -2 mm

Potatoes: 11 mm

Droughtiness Grade: 3a (Calculated to 80 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: Matrix colour of H2 greyer than in borings because smearing and mixing of mottles make it appear browner

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hardwicke Court	Pit 4	0°	PGR	Av Rainfall: 734 mm ATO: 1511day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1.98	16.7.98	SO 799109	GMS/GMN		-

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	18	C	10YR41	None	CDFO 7.5YR46	None	-	-	-	-	MF+VF	-	Clear Smooth
2	34	C	2.5Y54,53 (10YR52)	None	F/CDFO 10YR56	Common	MDCSAB	Firm	Mod	Poor	CVF	-	Clear Smooth
3	65+	C	2.5Y52	None	CDFO 10YR56	Few	STM+CPr	V Firm	Poor	Poor	FVF		

Profile Gleyed From: Surface

Slowly Permeable Horizon From: 34 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 88 mm

Potatoes: 97 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100mm

Moisture Balance Wheat: -19 mm

Potatoes: -3 mm

Droughtiness Grade: 3a (Calculated to 65 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Hardwicke Court	Pit 5	0°	PGR	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay/Terrace Gravels
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1.98	16.7.98	SO 791 118	GMS/GMN		-

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	MCL	10YR42	None	None	None	-	-	-	-	MVF&F	-	Gradual Smooth
2	60	SC (SCL?)	10YR54	None	CDFO (patchy) 10YR56	None	WKCSAB	Friable	Moderate	Poor	CF&VF	-	Gradual Smooth
3	68	MSL	10YR56	None	CDFO 10YR56	Few	MDCSAB	Friable	Moderate	Poor	FVF	-	Clear Broken
4	94	LMS	10YR54	23%HR(s+d)	None	None	WKCSAB	V Friable	Moderate	Poor	None	-	Clear Wavy
5	110	MS	10YR64	40%HR(s+d)	None	None	WKCSAB	V Friable	Moderate	Poor	None	-	Clear Smooth
6	120	MSL	7.5YR54	None	None	None	No sample	No sample	No sample assume Moderate	Poor	None	-	

Profile Gleyed From: Not gleyed

Slowly Permeable Horizon From: No SPL

Wetness Class: I

Wetness Grade: 1

Available Water Wheat: 129 mm

Potatoes: 114 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: +22 mm

Potatoes: +14mm

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
Hardwicke Court	Pit 6	0 °	PGR	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1	PSD SAMPLES TAKEN
1.98	16.7.98	SO 788111	GMS/GMN	Exposure Grade: 1	-

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	10YR41	None	CDFO 10YR56	None	-	-	-	-	MVF to 15cm CVF to 30cm	-	Clear Smooth
2	51	C	(25Y61) 25Y52	None	CDMO 10YR58	Common	WKCAB	Firm	Poor	Poor	FVF on ped faces	-	

Profile Gleyed From: Surface

Slowly Permeable Horizon From: 30 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 78 mm

Potatoes: 78 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: -29 mm

Potatoes: -22 mm

Droughtiness Grade: 3b (Calculated to 51 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks:

SITE NAME	PROFILE NO.	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
HarDwicke Court	Pit 7	0°	Field Beans	Av Rainfall: 734 mm ATO: 1511 day °C	Lower Lias Clay
JOB NO.	DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 160 Climatic Grade: 1 Exposure Grade: 1	PSD SAMPLES TAKEN
1.98	16.7.98	SO 779109	GMS/GMN		-

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	22	C	2.5Y53	None	CDFO 10YR56	None	-	-	-	-	FVF	-	Clear Smooth
2	65	C	25Y52 (05Y51)	None	MDFO 75YR58	F	MDCAB with patches of WCSAB	Firm	Poor	Poor	FVF	-	

Profile Gleyed From: Surface

Slowly Permeable Horizon From: 22 cm

Wetness Class: IV

Wetness Grade: 3b

Available Water Wheat: 84 mm

Potatoes: 93 mm

Moisture Deficit Wheat: 107 mm

Potatoes: 100 mm

Moisture Balance Wheat: *-23 mm*

Potatoes: -7 mm

Droughtiness Grade: 3b (Calculated to 65 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: