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Maidenford, Barnstaple
Agricultural Land Classification
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Resource Planning Team
Bristol
FRCA Western Region

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MAIDENFORD, BARNSTAPLE
AGRICULTURAL LAND CLASSIFICATION SURVEY

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MAIDENFORD, BARNSTAPLE

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 65.6 ha of land at Maidenford, Barnstaple. Field survey was based on 36 auger borings and 1 soil profile pit, and was completed in July 1998. During the survey 2 samples were 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 North Devon 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 mainly Grade 3, the site was previously surveyed in 1981 at a scale of 1: 25 000 (ADAS 1981). 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. A recent ALC survey at Portmore Farm which is close to the current survey area, (ADAS 1994) found mainly Subgrade 3a limited by workability with heavy clay loam topsoils. Another recent survey at Barnstaple, which included a site at Waytown, adjacent to the current survey area (ADAS 1993), also found Subgrade 3a limited by restricted workability with heavy clay loam topsoils, with a small area of Subgrade 3b limited by gradient. These other surveys are entirely consistent with the findings of the current survey.

5. At the time of survey land cover was mainly grass and field beans. Other land which was not surveyed included mainly residential land and a small area of recently planted amenity woodland.

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: Maidenford

Grade	Area (ha)	% Surveyed Area (52.3 ha)
3a	18.6	36
3b	27.6	53
4	5.3	10
5	0.8	1
Other land	13.3	
Total site area	65.6	

7. This shows that 36% of the area surveyed was found to be best and most versatile. This was Subgrade 3a with heavy clay loam topsoil and therefore limited by restricted workability. However, much of the rest of the site was found to be Subgrade 3b, limited by gradient.

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: Maidenford

Grid Reference	SS 577 331	SS 581 330
Altitude (m)	85	50
Accumulated Temperature (day °C)	1493	1533
Average Annual Rainfall (mm)	1077	1025
Overall Climatic Grade	1	1
Field Capacity Days	220	212
Moisture deficit (mm):		
Wheat	85	93
Potatoes	73	83

RELIEF

11. Altitude ranges from 40 metres in the south east corner to 94 metres at the radio mast with mainly strong slopes which limit the land to Subgrade 3b and smaller areas of steeper slopes limited to Grade 4. The remaining areas of gentle and moderate slopes, including one isolated area at the top of the hill east of the radio mast have no significant gradient limitation.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1982) as mainly Pilton shales. The current survey found the parent material to be closer to the surface on the higher slopes of the main hill and on the steeper slopes on the east side of the site.

13. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1: 250 000 (SSEW, 1983) as Denbigh 1 Association which is described as well drained fine loamy and fine silty soils over rock, some similar soils having slowly permeable subsoils and slight seasonal waterlogging, with some shallow soils locally. This was entirely borne out by the current survey.

AGRICULTURAL LAND CLASSIFICATION

14. 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 3a

15. The areas shown as Subgrade 3a were found to be mainly heavy clay loam topsoil at Wetness Class I, limited by workability. This is illustrated by Pit 1.

Subgrade 3b

16. The areas shown as Subgrade 3b were found to have similar soils to those described above, if somewhat more shallow, but limited by gradient with slopes of between 8 and 11°. In the north of the current survey area, the road follows the effective limit of the Subgrade 3b, so that it appears to lie adjacent to the Subgrade 3a shown in the 1993 survey.

Grade 4

17. Several small areas were found to have steeper slopes and are shown as Grade 4 limited by gradient.

18. The single field east of Waytown House is also shown as Grade 4 but limited by wetness. Two borings in this field were found to be Wetness Class IV with a slowly permeable layer starting in the upper subsoil and with heavy clay loam topsoil.

Grade 5

19. The small area shown as Grade 5 was found to have steep slopes of around 20°. The south end of this steep slope was found to be relatively dense woodland which appears to be rarely grazed and has been shown as non-agricultural.

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27 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.

GLEYS: 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
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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

<u>Degree of development</u>	WA: Weakly developed Adherent	WK: Weakly developed
	MD: Moderately developed	ST: Strongly developed
<u>Ped size</u>	F: Fine	M: Medium
	C: Coarse	VC: Very coarse
<u>Ped Shape</u>	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
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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
F: Few <2% M: Many 20-40%
C: Common 2-20% VM: Very Many >40%

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 Maidenford		PROFILE NO. Pit 1 (Asp 5-6)	SLOPE AND ASPECT 7° N		LAND USE Beans		Av Rainfall: 1077 mm ATO: 1493 day °C		PARENT MATERIAL Pilton shale			
JOB NO. 33.98		DATE 6.7.98	GRID REFERENCE SS 5747 3319		DESCRIBED BY PB		FC Days: 216 Climatic Grade: 1 Exposure Grade: 1		PSD SAMPLES TAKEN TS 0-25 cm: HCL(S32:Z39:C29%)			

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	HCL	10YR43	5% HR (vis)	0	0	-	-	-	-	CF	-	Clear smooth
2	40	HCL	10YR44	30% ZR (vis)	0	0	MDFSAB	FR	G	G	CVF	-	Clear Smooth
3	67	HCL	2.5Y63	65% ZR (vis)	0	0	Too stony	FR	(M)	G	FVF	-	Clear Wavy
4	70+	Shale	-	-	-	-	-	-	-	-	-	-	

Profile Gleyed From: -
 Slowly Permeable Horizon From: -
 Wetness Class: I
 Wetness Grade: 3a

Available Water Wheat: 97 mm
 Potatoes: 100 mm
 Moisture Deficit Wheat: 90 mm
 Potatoes: 78 mm
 Moisture Balance Wheat: +7 mm
 Potatoes: +22 mm

Droughtiness Grade: 2 (Calculated to 80 cm)

Final ALC Grade: 3a
 Main Limiting Factor(s): We

Remarks: