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CHUDLEIGH .99
Agricultural Land Classification

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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 112 ha of land at Chudleigh. Field survey was based on 50 auger borings and 4 soil profile pits, and was completed in March 1999. During the survey 6 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 Teignbridge 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 Grade 3. 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. Three neighbouring areas inside the current survey area were surveyed by ADAS in 1992 and 1993 and to the revised guidelines. The 1993 survey found mainly Subgrade 3b in the north site with Grade 4 and Subgrade 3b in the south site, all of which relates well to the current survey. The 1992 survey found Subgrade 3a on the lower slopes which also relates well to the current survey.

5. At the time of survey land cover was mainly permanent pasture for sheep and a small area for cereals. A small area of agricultural land was not surveyed because it was reputed to have planning permission for building. Other land which was not surveyed included residential areas, and playing fields.

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: Chudleigh . 99

Grade	Area (ha)	% Surveyed Area (75 ha)
3a	5	7
3b	31	41
4	39	52
Agricultural land not surveyed	4	
Other land	33	
Total site area	112	

7. This survey shows that only 2% of the area was found to be Best and Most Versatile, a small area of Subgrade 3a limited by wetness. The rest of the land has been graded as Subgrade 3b and Grade 4 limited by wetness and 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 the 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. A critical boundary of 200 FCDays was found above the 75 m contour.

Table 2: Climatic Interpolations: Chudleigh

Grid Reference		SX 872 794	SX 868 800
Altitude (m)		55	87
Accumulated Temperature (day °C)		1544	1507
Average Annual Rainfall (mm)		973	1012
Overall Climatic Grade		1	1
Field Capacity Days		199	205
Moisture deficit (mm):	Wheat	98	92
	Potatoes	89	81

RELIEF

11. Altitude ranges from 20 metres in the south west to 115 metres in the north of the site with mainly moderate to steep slopes which limit the land to Subgrade 3b or Grade 4.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS 1976) as mainly Upper Carboniferous Crackington Formation grey shales and sandstone with Lower Carboniferous Kate Brook Slate along the south east side of the site and with alluvium in the main river valley.

13. There does appear to be a correlation between the geology and the ALC grade. Over the Upper Carboniferous Crackington Formation the soils examined were assessed as Grade 4 and the soils examined over the Lower Carboniferous Kate Brook Slate were classed as Subgrade 3b with the soils examined over the Alluvium graded as Subgrade 3a.

14. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW 1983) and this shows mainly Halstow association on the Upper Carboniferous Crackington Formation with Hallsworth association on Lower Carboniferous Kate Brook Slate in the East of the site (SSEW 1972).

15. The Halstow associaiton soils are described as slowly permeable clayey soils over shale associated with some well drained fine loamy soils. The Hallsworth soils are also poorly drained, being described as slowly permeable seasonally waterlogged clayey soils.

16. This description and distribution was largely borne out by the current ALC survey, which mainly found poorly drained slowly permeable soils.

17. The detailed soils of Exeter District, Exeter and Newton Abbot Sheets 325 and 339 showed the following series; Halstow, Dunsford, Pulsford, Waddon Complex, Ugbrook and Torbryan in descending order of amount. Their distribution does not give as clear an indication as the reconnaissance survey as to final ALC grade.

AGRICULTURAL LAND CLASSIFICATION

18. 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

19. The area shown as Subgrade 3a in the north-east of the site was found to be limited by wetness. The profiles examined typically comprise heavy silty clay loam topsoils over clay upper subsoils and clay lower subsoils. Both the subsoils were found to be gleyed however neither were regarded as slowly permeable, therefore these profiles are assessed as Wetness Class II. Pit 1 is characteristic of this mapping unit.

Subgrade 3b

20. Most of the area mapped as Subgrade 3b was found to be limited by wetness. Typically the profiles examined had heavy clay loam topsoils over clay subsoils. The clay subsoils were found to be gleyed and slowly permeable below 40 cm and therefore assessed as Wetness Class III. Pits 2 and 4 represent these mapping units.

21. A distinct area of Wetness Class III Subgrade 3b land was picked out from the Grade 4 land around borings 31 and 35, as it was noticeably better with gleying below 40 cm in the soil profile. This area is represented by Pit 2.

22. Other land graded as Subgrade 3b is due to a gradient limitation (where wetness is not the most limiting factor), with slopes between 7° and 11°.

23. Borings 40 and 44E within this mapping unit displayed no signs of wetness and were therefore described as being Wetness Class I soils which with heavy silty clay loam topsoils were assessed as Subgrade 3a limited by topsoil workability.

Grade 4

24. Most of the land mapped as Grade 4 has a severe wetness limitation. The profiles examined typically have heavy clay loam topsoils over grey and pale coloured clay subsoils. The profiles were gleyed above 40 cm and the subsoils were slowly permeable and therefore assessed as Wetness Class IV.

25. There are a few Subgrade 3b profiles at borings 13 and 8 with moderate wetness limitations which are included in the Grade 4 mapping unit as they cannot be mapped individually at this level of survey.

26. Other Grade 4 land has a gradient limitation with slopes between 11° and 18°.

27. The previous ALC survey (ADAS 1993) found a distribution of grades similar to the present survey. Where there are differences in grade boundaries between the two surveys this is generally due to differences in the observation of the depth to gleying which shows extensive fluctuations over small areas.

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May 27 1999

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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:

V:	Visual	**S:**	Sieved	**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' might be noted as RRC.

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.