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KINGSKERSWELL

AGRICULTURAL LAND CLASSIFICATION SURVEY

CONTENTS

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INTRODUCTION

1. This report presents the findings of a semi-detailed Agricultural Land Classification (ALC) survey of 204 ha of land at Kingskerswell, Devon. Field survey was based on 104 auger borings and 5 soil profile pits, and was completed in March 1999. During the survey 7 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 considerable areas of Grade 2 on all sides of the town with the rest of the area shown as Grade 3 and Grade 4 in the wetest and steepest parts. The only previous detailed survey coincident with the current survey area (Torbay Borough, ADAS 1972) shows a very small area around Kerswell Gardens as Grade 4. However, both this and the published regional ALC map are based on guidelines for classification which have now been superceeded, whereas the current survey uses the Revised Guidelines and Criteria for Grading the Quality of Agriclutural Land (MAFF 1988) and therfore supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.

4. Serveral small sites adjacent to the current survey area have been previously surveyed to the revised guidelines. Two of these (both ADAS 1992) were in connection with the proposed Kingskerswell bypass and the others were at Edginswell Lane (ADAS 1993) and at Fluder Hill (ADAS 1993). These previous surveys mainly show Subgrade 3a limited by workability and Subgrade 3b limited by wetness to west of the railway with more mixed grades mainly limited by gradient in the area above Kerswell Gardens and with a small area of Grade 2 at the top of the hill running up towards Rosehill Farm. All these previous surveys proved to be consistent with the findings of the current survey, although the mapping of grades in the rather convoluted topography around Rosehill Farm can be open to a variety of interpretation into generalised mapping units. This explains any apparent discrepancy between the 1993 at Fluder Hill with the current survey north of ASP 88. The small area around ASP 106 of the current survey was previously included in the 1992 survey of the south end of Kingskerswell Bypass but has been included again as the area of non-agriclutural land has increased since the previous survey.

5. At the time of survey land cover was mainly grass for mixed grazing with smaller areas of cereals. Other land which was not surveyed was mainly residential land and roads with a school on the east side of the town and an expanding waste disposal site on the west side of the town.

SUMMARY

6. The distribution of ALC grades is shown on the accompanying 1: 15 000 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: Kingskerswell

Grade	Area (ha)	% Surveyed Area (156 ha)
2	4	3
3a	50	32
3b	56	36
4	42	27
5	3	2
Other land	49	
Total site area	204	

7. This shows that 35% of the area was found to be best and most versatile, mainly Subgrade 3a limited mainly by workability with smaller areas limited by wetness and droughtiness. The rest of the land surveyed was found to be Subgrade 3b and Grade 4 limited by gradient and wetness with very small areas of Grade 5 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 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 FC Days was found to run at around 40m altitude in the west and around 50 m altitude in the east of the site.

Table 2: Climatic Interpolations: Kingskerswell

Grid Reference		SX 876687	SX 886683	SX 885678
Altitude (m)		15	105	50
Accumulated Temperature (day °C)		1594	1492	1555
Average Annual Rainfall (mm)		943	1043	979
Overall Climatic Grade		1	1	1
Field Capacity Days		195	210	200
Moisture deficit (mm):	Wheat	105	90	99
	Potatoes	99	78	91

RELIEF

11. Altitude ranges from 15 metres at Aller Bridge to 105 metres at Kerswell Hill and also near Rosehill Farm to the east of the town. Although gradients to the west of the town are mainly gentle and moderate and therefore not limiting to ALC, land surveyed to the east of the town was found to be generally steeper with gradient being the principal limitation, restricting the land to Subgrade 3b, Grade 4 and even to Grade 5 in small areas.

GEOLOGY AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1976) as mainly Permian Watcombe Breccia with Oddicombe Breccia around Kerswell Hill in the north east of the survey area and frequent narrow bands of alluvium in the several river valleys. The current ALC survey found the several large areas shown at Watcombe Breccia to show considerable variation of significance to ALC Grade, less stony in the south west, heavier in the west and sandier and lighter in the east.

13. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW 1983) as mainly Credition association which is described as well drained gritty reddish loamy soils over breccia. More detailed soils information is also available in the one inch scale survey of Sheets 329 and 339, Soils of the Exeter District (SSEW 1972). This shows mainly Wrington series with some Milbur Complex and mixed bottom lands in the main floodplain. Wrington series is described as loamy and gravelley brown earths developed on Permian limestone conglomerate. This is shown on both the Oddicombe Breccia and the Watcombe Breccia. Just as described above for geology, the broad area shown as Wrington soil series shows considerable variation of significance to ALC grade, particularly in topsoil texture and stone content.

AGRICULTURAL LAND CLASSIFICATION

14. The distribution of ALC grades found by the current survey is shown on the accompanying 1: 15 000 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

15. The small areas shown as Grade 2 at the tops of the hills around Rosehill Farm and Kingskerswell Cross were found to be limited mainly by droughtiness and workability with sandy clay loam and medium clay loam topsoil textures at Wetness Class I. A typical profile is illustrated by Pit 4, although this is not within the Grade 2 mapping unit. Sandy clay loam topsoil texture was confirmed by PSD analysis at ASP 75.

Subgrade 3a

16. The largest area of Subgrade 3a, to the south west of the town was found to be mainly heavy clay loam topsoil at Wetness Class I, illustrated primarily by Pit 1 of the 1993 survey of adjoing land at Edginswell Lane. Pit 2 of the current survey is located on the lower slopes of this mapping unit and also shows heavy clay loam topsoil but at Wetness Class II with gleying evident in the lower subsol and a somewhat porous slowly permeable layer starting just within 80 cm.

17. The area of Subgrade 3a to the west of the town was found to be mainly Wetness Class I with no evidence of wetness and with a topsoil which felt clayey on hand texturing and produced hard clods after ploughing. However, PSD analysis at Pit 1 showed this to be heavy clay loam as did an apparently similar sample at ASP 38 on the other side of town.

18. The small areas of Subgrade 3a to the south east of the town were found to be rather variable with Pit 5 showing sandy clay loam boderline medium clay loam topsoil at Wetness Class II with gleying evident in the lower subsoil but no SPL. The small area around Pit 4, which in itself was assessed as Grade 2 with borderline medium clay loam topsoil at Wetness Class I, was found to be considerably variable including several borings likely to be limited by droughtiness at least to Subgrade 3a.

Subgrade 3b

19. Most of the area shown as Subgrade 3b was found to be limited by gradient with slopes of 8 to 11 degrees.

20. Other small areas shown as Subgrade 3b were found to be limited by wetness, typically with heavy clay loam topsoil at Wetness Class III.

Grade 4

21. Most of the area shown as Grade 4 was found to be limited by gradient with slopes of 12 to 18 degrees.

22. The area shown as Grade 4 to the east of the railway around Aller Brook was found to be mainly limited by wetness with gleying evident in the upper subsoil or even from the surface and a slowly permable layer frequently starting also in the upper subsoil. A typical profile is illustrated by Pit 3 which found heavy clay loam topsoil at Wetness Class IV. However, such wetness when found on alluvial deposits can be highly variable and this

mapping unit also includes several borings of Subgrade 3b which tend to be found in slightly elevated areas perhaps with freely draining material in the subsoil.

Grade 5

23. The small areas shown as Grade 5 are all limited by gradient with slopes just in excess of 18 degrees and are all found to the east of the town.

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21 April 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:

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.