Land at Bridge Farm, Long Aston

Validation of Agricultural Land Classification Surveys

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INTRODUCTION

1. This report presents the findings of a validation survey of two existing Agricultural Land Classification (ALC) surveys. The surveys covered 65 ha of land at Bridge Farm, Long Ashton, near Bristol, and had been carried out in 1994 and 1996 by S. G. McRae (McRae 1994 and McRae 1996). Field survey for the validation was based on 16 auger borings, and was completed in September 1997.

2. The validation 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 replacement structure plan for the county previously known as Avon.

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 all of both sites at a reconnaissance scale as Grade 3, the sites had not been surveyed prior to the surveys being validated. Both the surveys being validated and the validation survey used the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF, 1988) and supersede any previous ALC survey. Grade descriptions are summarised in Appendix I.

4. At the time of the validation survey the land cover was permanent grassland in the north, and mainly arable in the south, with a small area of coppice willows.

5. The results of the validation survey differed only in detail from the original surveys, and the results of the original surveys are considered to be a valid representation of the area.

6. An additional area of 28 ha of land in the east, between the original surveys and the developed area, was surveyed at the same time as the validation survey. Most of this area was recent landfill.

SUMMARY

7. The distribution of ALC grades found by the surveys being validated, with the addition of 28 ha of land to the east not covered by the original surveys, 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: Bridge Farm, Long Ashton

Grade	Area (ha)	% Surveyed Area (74.5 ha)
3a	13.8	19
3b	25.1	34
4	24.2	32
5	11.4	15
Other land	18.2	
Total site area	92.7	

8. Table 1 shows that 19% of the surveyed area is Best and Most Versatile land, with a grade of 3a. This grade is due to a moderate wetness limitation. Half of the site is graded as 3b and 4 due to a severe wetness limitation. The remainder is recent landfill, and is only suitable for permanent grazing, restricting it to Grade 5.

CLIMATE

9. 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 the original surveys are compared with the validation survey data in Table 2 below. The FRCA data is given for approximately the middle of the site. The climatic variables did not vary significantly form the lowest to the highest part of the site.

10. 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.

11. 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: Bridge Farm, Long Ashton

		McRae	FRCA
Grid reference			ST 558 706
Altitude (m)			9
Accumulated Temperature (day °C)			1541
Average Annual Rainfall (mm)		861	858
Overall Climatic Grade			1
Field Capacity Days		192	192
Moisture deficit (mm):	Wheat	94	95
	Potatoes	85	86

GEOLOGY, RELIEF AND SOILS

12. The underlying geology of the site is shown on the published geology map (IGS, 1971) as mainly alluvial deposits, with Keuper Marl on higher points. Both the original surveys and the validation surveys confirmed this general description of the geology.

13. The altitude of the site varies from 8m to 18m aod. The site is almost flat with very gentle slopes.

14. Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW, 1983). The majority of the site was mapped as Brockhurst association, whilst Whimple 1 was mapped along the western boundary.

15. **The** Brockhurst association is described as a slowly permeable, seasonally waterlogged alluvial soil. It is reddish, fine loamy over clayey. The Whimple 1 association is described as reddish, fine loamy over clayey with slowly permeable subsoils.

16. Both the original surveys and the validation surveys confirmed this general description of the soils.

VALIDATION METHODOLOGY

17. A desk exercise was first carried out. This compared the climatic, soils and geological data in the original reports with climatic data for the site calculated by FRCA, and the soils and geological data held by FRCA. The auger boring descriptions given in the original reports were checked for correct grading against the published ALC system (MAFF 1988), and related to the mapped ALC grades. Using this information locations for new auger sample observations were targeted to meet the following criteria:

- In total to represent at least 20 % of the original survey borings.
- The pairs of adjacent validation borings to straddle mapped grade boundaries

18. Fieldwork consisted of walking the site and making auger borings at the targeted points. *On this survey it was not considered necessary to dig any profile pits.*

19. The results of the field work were compared with the auger sample descriptions and maps of the original surveys. Few differences were found, and none were found that had any significant bearing on the described distribution or location of ALC grades. It was not therefore considered necessary to re-map the area, and the original surveys were accepted as a valid representation of the ALC grading of the area.

AGRICULTURAL LAND CLASSIFICATION

20. The distribution of ALC grades found by the original surveys, with the additional area in the east, is shown on the accompanying 1:10,000 scale map. The validation survey confirmed the original surveys, differing only in detail. The two original surveys are considered to be a valid representation of the distribution of ALC Grades in the area. The 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.

Sub-Grade 3a

22. The Sub-Grade 3a soils generally have a medium clay loam topsoil over a reddish clay subsoil developed from Keuper Marl. The subsoil is slowly permeable from a depth of between 50cm and 60cm, leading to a wetness class III (see Appendix II).

Sub-Grade 3b

23. The Sub-Grade 3b soils are similar to the Sub-Grade 3a soils, but generally have a heavy clay loam topsoil. This, in conjunction with a wetness class of III leads to a 3B grading. Some of the 3b soils have a pale yellowish red gleyed subsoil. They are slowly permeable below 45cm depth, again leading to a wetness class III due to a wetness limitation.

Grade 4

24. The Grade 4 soils have a heavy clay loam topsoil over clay. The subsoil is gleyed and slowly permeable from between 25cm and 30cm deep. This leads to a wetness class IV, which in conjunction with the heavy clay loam topsoil give a Grade 4 due to a severe wetness limitation.

Grade 5

25. The Grade 5 land consists of impenetrable, stoney, highly compacted soil. It is very slowly permeable, and is restricted to use as permanent pasture.

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January 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).

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 **WK:** Weakly developed

Adherent

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.