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MILTON KEYNES EXPANSION STUDY
Land off Hillway,
Woburn Sands, Buckinghamshire

Agricultural Land Classification
ALC Map and Report

February 1999

Resource Planning Team
Eastern Region
FRCA Reading

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AGRICULTURAL LAND CLASSIFICATION REPORT

MILTON KEYNES EXPANSION STUDY
LAND OFF HILLWAY, WOBURN SANDS, BUCKINGHAMSHIRE

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 14 ha of land at Woburn Sands, near Milton Keynes. The survey was carried out during January 1999.

2. The survey was undertaken by the Farming and Rural Conservation Agency (FRCA)[1] on behalf of the Ministry of Agriculture, Fisheries and Food (MAFF). The survey was carried out in connection with MAFF's statutory input to Milton Keynes Expansion Study. Part of the western survey area has been classified previously (FRCA Ref. 0304/091/97). However, this current survey supersedes any previous ALC information for this land.

3. The work was conducted by members of the Resource Planning Team in the Eastern Region of FRCA. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.

4. At the time of survey the land use on the site was either permanent pasture or cereals. The area mapped as 'Other land' includes a turf growing and associated machinery outlet and a private residential home.

SUMMARY

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10,000. It is accurate at this scale but any enlargement would be misleading.

6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1.

Table 1: Area of grades and other land

Grade/Other land	Area (hectares)	% surveyed area	% site area
3a	12.8	100.0	91.4
Other land	1.2	N/A	8.6
Total surveyed area	12.8	100.0	91.4
Total site area	14.0	-	100.0

7. The fieldwork was conducted at an average density of 1 boring per hectare of agricultural land. In total, 14 borings and 2 soil pits were described.

[1] FRCA is an executive agency of MAFF and the Welsh Office

8. The entire site has been classified as Subgrade 3a (good quality agricultural land). The principal limitation to agricultural quality is soil wetness.

9. The land classified as Subgrade 3b occurs on all three separate parcels of land surveyed. Soils throughout typically comprise medium loamy and fine loamy topsoils over similar upper subsoils over clay lower subsoils. Evidence of soil wetness is common, related to the presence of low porosity lower subsoils, which obstruct drainage of water through the soil profile. Soil wetness reduces the versatility of the land in terms of access by machinery (e.g. for cultivations or harvesting) and grazing by livestock if damage to the soil is to be avoided. Soil wetness will also adversely affect seed germination and root growth and will therefore reduce the level and consistency of yields.

FACTORS INFLUENCING ALC GRADE

Climate

10. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

11. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5km grid datasets using the standard interpolation procedures (Met. Office, 1989).

Table 2: Climatic and altitude data

Factor	Units	Values	
Grid reference	N/A	SP925369	SP922366
Altitude	m, AOD	88	82
Accumulated Temperature	day°C (Jan-June)	1390	1397
Average Annual Rainfall	mm	619	621
Field Capacity Days	days	127	128
Moisture Deficit, Wheat	mm	108	108
Moisture Deficit, Potatoes	mm	100	100
Overall climatic grade	N/A	Grade 1	Grade 1

12. The climatic criteria are considered first when classifying land as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

13. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (AT0, January to June), as a measure of the relative warmth of a locality.

14. The combination of rainfall and temperature at this site means that there is no overall climatic limitation. In addition, the site does not suffer from significant exposure or frost risk. As such, the site may be considered as being climatically Grade 1. Climatic factors do however interact with soil properties to influence soil wetness and soil droughtiness.

Site

15. The survey area lies at 82–88 m AOD and is comprised of three separate units of land. The two eastern units are predominantly flat-lying, while the western unit dips gently in a north-south direction. Nowhere on the site do gradient, microrelief or flooding adversely affect agricultural land quality.

Geology and soils

16. The most detailed published geological information for this area (BGS, 1992) maps the western surveyed area to comprise Quarternary Head deposits, while the eastern units predominantly comprise glacial till with a small area of Oxford Clay along the southern edge.

17. The most recent published soils information covering the area (SSEW, 1983) shows the southern and central units to consist of soils from both the Hanslope and Oxpasture series. The most easterly unit of land is mapped as comprising soils from the Oxpasture series only. Soils from the Hanslope series are described as 'Slowly permeable calcareous and non-calcareous clayey soils with slight risk of erosion' (SSEW, 1983). Soils of the Oxpasture series are described as 'Fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterologging. Some slowly permeable seasonally waterlogged clayey soils' (SSEW, 1983). Detailed survey work found soils similar to those described here.

AGRICULTURAL LAND CLASSIFICATION

18. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 1.

19. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix II.

Subgrade 3a

20. Land of Subgrade 3a (good agricultural quality) has been mapped over the whole of the surveyed area. The principal limitation is soil wetness and the profiles are typified by pits 1P and 2P. Soil profiles comprise non-calcareous medium clay loam topsoils overlying either similar textured or clay upper subsoils, over clay lower subsoils. Wetness in both the upper and lower subsoils is predominant, evident in the form of ochreous mottles. This was supported by an assessment of the clay lower subsoils, which found them to be slowly permeable, having poor structural conditions (coarse prismatic) and low porosity. The slowly permeable layer imparts a soil wetness limitation, creating profiles that are imperfectly drained. Given these soil characteristics, in combination with the prevailing field capacity day level (127 days), these soils are placed in Wetness Class III. This, in combination with the topsoil textures and the FC days, limits this land to Subgrade 3a. In some areas, land of slightly lower quality may exist where topsoils are heavier (heavy clay loam). However, such profiles were isolated and limited in extent, therefore it was deemed inappropriate to map any land of poorer quality.

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SOURCES OF REFERENCE

British Geological Survey (1992) *Sheet No.* 220, *Leighton Buzzard.*
BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.*
MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification.*
Met. Office: Bracknell.

Soil Survey of England and Wales (1983) *Sheet* 6, *South East England, 1:250,000.*
SSEW: Harpenden.

APPENDIX I

DESCRIPTIONS OF THE 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 includes 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 or horticultural crops can usually be grown but on some land of this 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 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When 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 the level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist 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 severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

SOIL DATA

Contents:

SOIL PROFILE DESCRIPTIONS: EXPLANATORY NOTE

Soil pit and auger boring information collected during ALC fieldwork is held on a computer database. This uses notations and abbreviations as set out below.

Boring Header Information

1. **GRID REF**: national 100 km grid square and 8 figure grid reference.

2. **USE**: Land use at the time of survey. The following abbreviations are used:

ARA:	Arable	**WHT:**	Wheat	**BAR:**	Barley
CER:	Cereals	**OAT:**	Oats	**MZE:**	Maize
OSR:	Oilseed rape	**BEN:**	Field beans	**BRA:**	Brassicae
POT:	Potatoes	**SBT:**	Sugar beet	**FCD:**	Fodder crops
LIN:	Linseed	**FRT:**	Soft and top fruit	**FLW:**	Fallow
PGR:	Permanent pasture	**LEY:**	Ley grass	**RGR:**	Rough grazing
SCR:	Scrub	**CFW:**	Coniferous woodland	**OTH**	Other
DCW:	Deciduous woodland	**BOG:**	Bog or marsh	**SAS:**	Set-Aside
HTH:	Heathland	**HRT:**	Horticultural crops	**PLO:**	Ploughed

3. **GRDNT**: Gradient as estimated or measured by a hand-held optical clinometer.

4. **GLEY/SPL**: Depth in centimetres (cm) to gleying and/or slowly permeable layers.

5. **AP (WHEAT/POTS)**: Crop-adjusted available water capacity.

6. **MB (WHEAT/POTS)**: Moisture Balance. (Crop adjusted AP - crop adjusted MD)

7. **DRT**: Best grade according to soil droughtiness.

8. 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				

9. **LIMIT**: The main limitation to land quality. The following abbreviations are used:

OC:	Overall Climate	**AE:**	Aspect	**ST:**	Topsoil Stoniness
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
EX:	Exposure				

Soil Pits and Auger Borings

1. **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)

2. **MOTTLE COL**: Mottle colour using Munsell notation.

3. **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% +

4. **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

5. **PED. COL:** Ped face colour using Munsell notation.

6. **GLEY:** If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

7. **STONE LITH:** Stone Lithology - one of the following is used:

HR:	all hard rocks and stones	**FSST:**	soft, fine grained sandstone
ZR:	soft, argillaceous, or silty rocks	**CH:**	chalk
MSST:	soft, medium grained sandstone	**GS:**	gravel with porous (soft) stones
SI:	soft weathered igneous/metamorphic rock	**GH:**	gravel with non-porous (hard) stones

Stone contents (>2cm, >6cm and total) are given in percentages (by volume).

8. **STRUCT:** the degree of development, size and shape of soil peds are described using the following notation:

Degree of development	**WK:**	weakly developed	**MD:**	moderately developed
	ST:	strongly developed		
Ped size	**F:**	fine	**M:**	medium
	C:	coarse		
Ped shape	**S:**	single grain	**M:**	massive
	GR:	granular	**AB:**	angular blocky
	SAB:	sub-angular blocky	**PR:**	prismatic
	PL:	platy		

9. **CONSIST:** Soil consistence is described using the following notation:

L: loose	**FM:** firm	**EH:** extremely hard
VF: very friable	**VM:** very firm	
FR: friable	**EM:** extremely firm	

10. **SUBS STR:** Subsoil structural condition recorded for the purpose of calculating profile droughtiness:
G: good **M:** moderate **P:** poor

11. **POR:** Soil porosity. If a soil horizon has less than 0.5% biopores >0.5 mm, a 'Y' will appear in this column.

12. **IMP:** If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

13. **SPL:** Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

14. **CALC:** If the soil horizon is calcareous, a 'Y' will appear in this column.

15. Other notations:

APW:	available water capacity (in mm) adjusted for wheat
APP:	available water capacity (in mm) adjusted for potatoes
MBW:	moisture balance, wheat
MBP:	moisture balance, potatoes

SAMPLE NO.	GRID REF	USE	ASPECT	GRDNT	GLEY	SPL	--WETNESS-- CLASS	GRADE	-WHEAT- AP	MB	-POTS- AP	MB	M.REL DRT	FLOOD	EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SP92503700	PGR			30	52	3	3A	133	25	111	11	2				WE	3A	SEE 1P
2	SP92403690	PGR			0	55	3	3A	115	7	113	13	2				WE	3A	SEE 1P
3	SP92503690	PGR			28	90	2	2	145	37	117	17	1				WE	2	
4	SP92303680	PGR			0	50	3	3B	121	13	112	12	2				WE	3B	SEE 1P
5	SP92403680	PGR			28	60	3	3A	117	9	115	15	2				WE	3A	SEE 1P
6	SP92453675	PGR			35	57	3	3A	136	28	114	14	2				WE	3A	SEE 1P
7	SP92603680	PGR			0	55	3	3A	135	27	113	13	2				WE	3A	SEE 1P
8	SP92703680	PGR			0	58	3	3A	136	28	113	13	2				WE	3A	SEE 1P
9	SP92503670	LEY			37	37	3	3B	95	-13	107	7	3A				WE	3B	
10	SP92203660	CER	S	2	35	45	3	3A	92	-16	98	-2	3A				WE	3A	CALC T/S
11	SP92103640	CER	W	1	60	60	2	3A	116	8	113	13	2				WE	3A	SEE 2P
12	SP92203650	CER	S	1	32	55	3	3A	133	25	112	12	2				WE	3A	SEE 2P
13	SP92103650	CER			30		2	2	131	23	117	17	2				WD	2	IMP95 SEE 2P
14	SP92203640	CER			35		2	2	151	43	118	18	1				WE	2	SEE 2P
1P	SP92453675	PGR			28	50	3	3A	131	23	109	9	2				WE	3A	
2P	SP92203650	CER	S	1	30	60	3	3A	134	26	114	14	1				WE	3A	

SAMPLE	DEPTH	TEXTURE	COLOUR	MOTTLES COL	MOTTLES ABUN	MOTTLES CONT	PED COL.	GLEY	STONES >2	STONES >6	STONES LITH	STONES TOT	STRUCT/ CONSIST	SUBS STR	SUBS POR	SUBS IMP	SUBS SPL	SUBS CALC	
1	0-30	MCL	10YR42						0	0		0							
	30-52	HCL	25Y 53	10YR56	C	D		Y	0	0	HR	2		M					
	52-120	C	25Y 52 62	10YR56	58 M	D		Y	0	0	CH	2			P		Y	Y	DENSE
2	0-30	MCL	25Y 42	10YR56	C	D		Y	0	0		0							
	30-55	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					
	55-90	C	25Y 53	10YR58	M	D		Y	0	0	CH	2			P		Y	Y	DENSE
3	0-28	MCL	10YR42						0	0		0							
	28-55	HCL	25Y 53	10YR56	C	D		Y	0	0		0		M					
	55-90	HCL	25Y 52 53	10YR56	C	D		Y	0	0	CH	3		M				Y	
	90-120	C	25Y 51 62	10YR56	58 M	D		Y	0	0	CH	5			P		Y	Y	DENSE
4	0-32	HCL	25Y 42	10YR56	C	D		Y	0	0		0							
	32-50	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					
	50-85	C	25Y 53	10YR68	M	D		Y	0	0		0			P		Y		DENSE
	85-100	C	25Y 53	10YR68	M	D		Y	0	0	HR	2			P		Y	Y	DENSE
5	0-28	MCL	10YR42						0	0		0							
	28-60	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					
	60-90	C	25Y 53	10YR68	58 M	D		Y	0	0	CH	2			P		Y	Y	DENSE
6	0-35	MCL	10YR42						0	0		0							
	35-57	HCL	25Y 53	10YR56	C	D		Y	0	0	HR	2		M					
	57-120	C	25Y 52 53	10YR58	M	D		Y	0	0	HR	3			P		Y	Y	
7	0-28	MCL	25Y 32	10YR58	C	D		Y	0	0		0							
	28-55	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					
	55-120	C	25Y 62	10YR58	68 M	D		Y	0	0	HR	2			P		Y	Y	DENSE
8	0-25	MCL	25Y 42	10YR58	C	D		Y	0	0		0							
	25-58	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					
	58-120	C	25Y 53	10YR58	68 M	D		Y	0	0	CH	2			P		Y		DENSE
9	0-37	HCL	10YR42	10YR46	F	D			0	0	HR	2							
	37-70	C	25Y 52 62	10YR58	M	D		Y	0	0	HR	3			P		Y	Y	DENSE
10	0-35	HCL	25Y 42						0	0		0						Y	
	35-45	HCL	25Y 53	10YR46	56 C	D		Y	0	0	HR	2		M				Y	
	45-60	C	05Y 51 62	10YR56	58 M	D		Y	0	0	CH	3			P		Y	Y	PLASTIC
11	0-30	HCL	10YR42						0	0	HR	2							
	30-60	HCL	25Y 52						0	0		0		M					
	60-90	C	25Y 52	10YR58	C	D		Y	0	0		0			P		Y		PLASTIC
12	0-32	MCL	10YR42						0	0	HR	2							
	32-55	C	25Y 53	10YR56	58 C	D		Y	0	0	HR	2		M					
	55-120	C	05Y 51 62	10YR56	58 M	D		Y	0	0	CH	5			P		Y	Y	PLASTIC

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----- COL	ABUN	CONT	PED COL.	GLEY	----STONES---- >2	>6	LITH	TOT	STRUCT/ CONSIST	SUBS STR	POR	IMP	SPL	CALC	
13	0-30	MCL	10YR42						0	0		0							
	30-60	HCL	25Y 52	10YR58	C	D		Y	0	0		0		M					FRIABLE
	60-95	SCL	25Y 54	10YR58	C	D		Y	0	0		0		M					
14	0-35	MCL	10YR41 42						0	0	HR	2							
	35-70	C	25Y 53	10YR56 58	C	D		Y	0	0		0		M					
	70-120	HCL	25Y 53	10YR56 58	C	D		Y	0	0	HR	2		M					LOOSE
1P	0-28	MCL	10YR42						0	0	HR	2							
	28-50	HCL	25Y 53	10YR56	C	D		Y	0	0	HR	3	MDCSAB	FR	M				FRIABLE
	50-120	C	25Y 51 62	10YR58	M	D		Y	0	0	CH	3	MDCPR	FM	P	Y	Y	Y	DENSE
2P	0-30	MCL	10YR42						0	0	HR	2							
	30-60	C	25Y 53	10YR56	C	D		Y	0	0		0	MDCSAB	FM	M				POROUS WET
	60-120	C	05Y 51 61	10YR58	M	D		Y	0	0	CH	2	WKCPR	FM	P	Y	Y	Y	PLASTIC