

A2

**ARDLEY WOOD AND ARDLEY FIELDS
OXFORDSHIRE**

**Agricultural Land Classification and
Statement of Physical Characteristics**

February 1999

**Resource Planning Team
Eastern Region
FRCA Reading**

**RPT Job Number 3301/002/99
FRCA Reference EL 15/01678**

**AGRICULTURAL LAND CLASSIFICATION &
STATEMENT OF SITE PHYSICAL CHARACTERISTICS**

**ARDLEY WOOD AND ARDLEY FIELDS
OXFORDSHIRE**

INTRODUCTION

- 1 This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of approximately 24 hectares of land at Ardley Quarry Oxfordshire. The survey was carried out during February 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 work was carried out in order to determine the land quality and site physical characteristics of land affected by proposals for extension to an existing limestone quarry as part of the Statutory Review of Mineral Planning Permission. This 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 agricultural land was in cereals. The areas mapped as Other land comprise areas currently being worked as part of the existing quarry.

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	6.4	46.7	27.0
3b	7.3	53.3	30.8
Other land	10.0	N/A	42.2
Total surveyed area	13.7	100	57.8
Total site area	23.7		100

- 7 The fieldwork was conducted at an average density of 1 boring per hectare of agricultural land. In total 17 borings and 3 soil pits were described.

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

- 8 The agricultural land on the site has been classified as Subgrade 3a (good quality) and Subgrade 3b (moderate quality) with soil droughtiness the principal limitation
- 9 Agricultural land quality on this site is characterised by well drained soils having stony subsoils and a progressively diminishing soil resource where limestone deposits are closer to the surface. The deeper Subgrade 3a soils comprise non calcareous medium silty clay loam topsoils which are very slightly stony overlying slightly stony clay upper subsoils. These pass to stony and then very stony heavy silty clay loam lower subsoils overlying the limestone. The shallower Subgrade 3b soils are typically non calcareous medium silty clay loam topsoils which are slightly stony overlying very stony heavy silty clay loam subsoils over the limestone bedrock. Moisture balance calculations indicate that soils on this site suffer from a slight to moderate soil droughtiness limitation which in turn may affect the consistency and level of yields particularly in drier years.

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	SP 543 255	SP 539 253
Altitude	m AOD	105	110
Accumulated Temperature	day C (Jan June)	1384	1378
Average Annual Rainfall	mm	691	692
Field Capacity Days	days	150	150
Moisture Deficit Wheat	mm	100	100
Moisture Deficit Potatoes	mm	90	89
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 (ATO January to June) as a measure of the relative warmth of a locality

- 14 The combination of rainfall and temperature at this site mean that there is no overall climatic limitation. Other local climatic factors such as exposure and frost risk are not believed to be significant at the site. The site is climatically Grade 1.

Site

- 15 The site is generally very gently undulating lying in the altitude range 100–110 m AOD. Along the eastern boundary the land falls gently towards the Gagle Brook. Nowhere on the site do gradient, microrelief or flooding affect land quality.

Geology and soils

- 16 The most detailed published geological information (Geological Survey of Great Britain 1863) shows the whole site as Great Oolitic Limestone.
- 17 The most detailed published soils information for this area (SSEW 1983) shows the entire site to be mapped as soils of the Aberford association. These soils are described as shallow locally brashy well drained calcareous fine loamy over limestone. Some deeper soils (calcareous) in colluvium. Soils fitting this general description were observed across the site.

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 good is associated with slightly lower lying ground on the higher flatter part of the site. Pit 2 (see Appendix II) is representative of these soils which are permeable and well drained (wetness Class I) and comprise a non calcareous medium silty clay loam topsoil overlying a permeable clay upper subsoil. Stone contents in both these upper horizons was assessed as 1 % total hard rock (limestone) by volume. These pass to two porous heavy clay loam lower subsoils (from 39 and 65 cm) with increasing stone contents which were assessed respectively at 34 % and 53 % total hard rock (limestone) by volume. From 82 cm solid limestone (>70 % limestone by volume) was encountered which was assessed as being non rootable. Moisture balance calculations taken to this depth which combine the interaction of these soil properties with the prevailing climate indicate a soil droughtiness limitation which restricts land quality to Subgrade 3a. In the event of rooting extending down to 120 cm moisture balance calculations would still classify this land as Subgrade 3a. Droughtiness limitations will adversely affect the level and consistency of crop yields. There are a few auger borings however where the soil resource is deeper indicating potentially better quality land but this area was too small to map separately.

Subgrade 3b

- 21 Land of moderate quality has been mapped on the slightly higher land in the west and centre of the site and on the lower land adjoining the Gagle Brook. Again soil droughtiness is the main limitation. Pit 1 (see Appendix II) is typical of most of these soils with a non-calcareous medium silty clay loam topsoil which may contain up to 15 % total hard rock (limestone) by volume (2–14 % > 2cm). Below the topsoil this passed to a very stony (62 % total hard rock by volume) heavy silty clay loam upper subsoil with a similarly textured and stony lower subsoil with solid limestone (>70 % limestone by volume) from 75 cm. In addition to Pit 1, evidence from the existing quarry face along the whole northern boundary and a recently excavated pit (see Pit 3) on the south west boundary indicated a complicated pattern of very stony subsoils over limestone or alternating bands of limestone and very stony subsoil material overlying stony subsoils over limestone (Pit 3). Pit 3 also indicated that some soils within the 3b mapping unit have a thin slightly stony upper subsoil horizon before the very stony lower subsoil is reached. The amount of available water in these soils is therefore somewhat limited even though evidence from the quarry face and Pit 3 indicates that rooting may be possible to depth. All profiles are permeable and well drained (wetness class I). Moisture balance calculations indicate Subgrade 3b is appropriate for these soils which will consequently be more drought prone than those graded 3a.

SOIL RESOURCES

- 22 This section describes the soil resources identified on the site. It should be emphasised that this is not intended as a prescription for soil stripping but merely as an illustration of the soil resources available for restoration on the site. Due to the natural variability of soils the depths of topsoil and subsoil given should be treated with caution. Soils were sampled to a maximum depth of 120 cm where possible during survey work. In some cases soil resources may extend below this depth. Textures described relate predominantly to hand texturing incorporating the results of laboratory analysis (particle size distribution) where taken.

Soil Units considerations for restoration

- 23 Two soil units have been identified across the site the extent and distribution of which are illustrated on the accompanying soil resources map.

Soil Unit 1

- 24 This unit covers an area of 6.4 hectares and comprises a very slightly stony medium silty clay loam topsoil over a very slightly stony permeable clay upper subsoil and a very stony and variable heavy clay loam or clay lower subsoil. Observations based on 2P indicate that below this lies impenetrable flaggy limestone.

Table 3 Representative soil profile for Soil Unit I

Horizon	Average Depth (cm)	Description
Topsoil	0–29	calcareous medium silty clay loam yellowish brown (10YR4/4) up to 5% total stone (flints and hard limestone) sub angular blocky structure (coarse in size and moderately developed) friable
Upper Subsoil	29–47	non calcareous clay dark yellow brown (10YR4/6) up to 10% total stone (hard limestone) sub angular blocky structure (coarse in size and moderately developed) friable
Lower Subsoil 1	47–65	calcareous heavy clay loam or clay light yellowish brown (2.5Y 6/4) up to 60% total stone (hard limestone) sub angular blocky structure (coarse in size and moderately developed) friable
Lower Subsoil 2	65/85–120	flaggy limestone (> 70% by volume) possibly alternating with less stony layers limited root penetration

Soil Unit 2

- 25 This unit covers an area of 7.3 hectares and comprises a slightly stony medium silty clay loam topsoil over a slightly stony permeable clay or heavy silty clay loam upper subsoil. Observations based on pits 1P and 3P indicate a very stony heavy silty clay loam lower subsoil over solid limestone or banded limestone.

Table 4 Representative soil profile for Soil Unit II

Horizon	Average Depth (cm)	Description
Topsoil	0-29	non calcareous medium silty clay loam yellowish brown (10YR4/4) up to 15% total stone (flints and hard limestone) sub angular blocky structure (coarse in size and moderately developed) friable
Upper Subsoil	29-37 ⁺	non calcareous clay or heavy silty clay loam dark yellowish brown (10YR4/6) up to 15% total stone (hard limestone) sub angular blocky structure (coarse in size and moderately developed) friable
Lower Subsoil	37 ⁺	limestone (60-70% by volume) possibly alternating with less stony layers some root penetration indicated from soil pits

Colin Pritchard
 Resource Planning Team
 Eastern Region
 FRCA Reading

SOURCES OF REFERENCE

Geological Survey of Great Britain (1863) *Sheet No 45 NE 1 inch to 1 mile*
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 Soils of South East England 1 250 000 scale*
SSEW Harpenden.

Soil Survey of England and Wales (1984) *Soils and their Use in South East England*
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

Sample location map

Soil abbreviations explanatory note

Soil pit and soil boring descriptions (boring and horizon levels)

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. **GLEYSPL:** 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. **GLEYS:** 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	ASPECT		WETNESS		-WHEAT		POTS		M REL		EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
		USE	GRDNT	GLEY	SPL	CLASS	GRADE	AP	MB	AP	MB					
4	SP54072545	CER			1	1	98	2	109	19	3A			DR	3A	I63 PROBGR2
9	SP54102540	CER			1	1	116	16	120	30	2			DR	2	I85
10	SP54202540	CER			1	1	60	-40	60	30	3B			DR	3B	I35 SEE1P
11	SP54302540	CER			1	1	49	51	49	-41	4			DR	3B	I30 SEE1P
13	SP53802525	CER			1	1	57	-43	57	33	3B			DR	3B	I35 SEE3P
14	SP53902525	CER			1	1	70	30	70	20	3B			DR	3A	I42 SEE2P
15	SP54002530	CER			1	1	63	37	63	27	3B			DR	3A	I35 SEE2P
16	SP54102530	CER			1	1	87	13	87	3	3A			DR	3A	I50 SEE2P
17	SP54202530	CER			1	1	93	7	96	6	3A			DR	3A	I55 SEE2P
18	SP54302530	CER	NE	1	1	1	54	-46	54	36	3B			DR	3B	I32 SEE1P
19	SP54402530	CER	NE	2	1	1	64	36	64	26	3B			DR	3B	I38 SEE1P
20	SP54002520	CER			1	1	64	36	64	26	3B			DR	3A	I38 SEE2P
21	SP54102520	CER			1	1	85	15	85	5	3A			DR	3A	I49 SEE2P
22	SP54202520	CER	S	1	1	1	51	-49	51	39	3B			DR	3B	I33 SEE1P
23	SP54302520	CER	E	1	1	1	62	38	62	28	3B			DR	3B	I40 SEE1P
24	SP54402520	CER	NE	3	1	1	59	-41	59	31	3B			DR	3B	I38 SEE1P
25	SP54332513	CER	SE	3	1	1	98	2	106	16	3A			DR	3A	I80 PROBGR2
1P	SP54302530	CER	NE	1	1	1	64	36	68	22	3B			DR	3B	PIT T075CM
1P	SP54102530	CER			1	1	96	-4	98	8	3A			DR	3A	PIT T082CM
3P	SP53722523	OTH			1	1	75	25	61	29	3B			DR	3B	CUTTING

SAMPLE	DEPTH	TEXTURE	COLOUR	-MOTTLES			PED	STONES			STRUCT/	SUBS						
				COL	ABUN	CONT	COL	GLE	2	6	LITH	TOT	CONSIST	STR	POR	IMP	SPL	CALC
4	0-35	MZCL	10YR44						0	0	HR	3						
	35-63	C	10YR46						0	0	HR	2		M				
9	0-35	MZCL	10YR44						0	0	HR	3						
	35-45	C	10YR46						0	0	HR	2		M				
	45-75	C	10YR44	10YR5658	C	D		S	0	0		0		M				
	75-85	C	10YR4446						0	0	HR	10		M				Y
10	0 35	MZCL	10YR44						4	0	HR	10						
11	0 30	MZCL	10YR44						6	3	HR	15						
13	0 22	MZCL	10YR44						0	0	HR	3						
	22 35	C	10YR46						0	0	HR	10		M				
14	0 24	MZCL	10YR44						2	0	HR	5						
	24-42	C	10YR46						0	0	HR	10		M				Y
15	0 35	MZCL	10YR44						0	0	HR	5						
16	0 35	MZCL	10YR44						0	0	HR	3						
	35-43	C	10YR46						0	0	HR	2		M				
	43-50	C	10YL4656						0	0	HR	10		M				Y
17	0 36	MZCL	10YR4344						0	0	HR	3						
	36 55	HCL	10YR4446						0	0	HR	3		M				
18	0 28	MZCL	10YR44						3	0	HR	10						
	28 32	C	10YR46						0	0	HR	10		M				
19	0 28	MZCL	10YR44						2	0	HR	8						
	28 38	HZCL	10YR4656						0	0	HR	15		M				Y
20	0 25	MZCL	10YR44						2	0	HR	5						
	25-38	C	10YR56						0	0	SLST	10		M				Y
21	0 25	MZCL	10YR44						0	0	HR	3						
	25-49	C	10YR46						0	0		0		M				
22	0 26	MZCL	10YR44						14	3	HR	20						
	26 33	C	10YR46						0	0	HR	2		M				
23	0 28	MZCL	10YR44						9	2	HR	20						
	28-40	HCL	10YR46						0	0	HR	15		M				
24	0 28	MZCL	10YR44						11	2	HR	15						
	28-38	C	10YR46						0	0	HR	15		M				

SAMPLE	DEPTH	TEXTURE	COLOUR	-MOTTLES-		PED COL	GLEYS	STONES		STRUCT/ CONSIST	SUBS			SPL	CALC
				COL	ABUN			CONT	2		6	LITH	TOT		
25	0-23	MZCL	10YR44					8	0	HR	15				
	23-80	C	10YR56					0	0	HR	10		M		Y
1P	0-21	MZCL	10YR4344					8	4	HR	13	MDCSAB	FR		
	21-48	HZCL	10YR4446					0	0	HR	65		FR M		Y
	48-75	HZCL	25Y 5464					0	0	HR	65		FR M		Y
2P	0-23	MZCL	10YR43					1	0	HR	1	MDCSAB	FR	Y	N
	23-39	C	10YR44					0	0	HR	1	MDCSAB	FR M	Y	N
	39-65	HCL	25Y64					0	0	HR	40	MDCAB	FR M	Y	Y
	65-82	HCL	25Y64					0	0	HR	60		M		Y
3P	0-15	MZCL	10YR414					0	0	HR	7	MDCSAB	FR		Y
	15-35	HCL	10YR4446					0	0	HR	7	MDCSAB	FR M		Y
	35-68	HR						0	0		0		P		Y
	68-106	HCL	25Y 64					0	0	HR	60		M		Y