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M40 Motorway Service Areas
Site 5 Lewknor C
Agricultural Land Classification
ALC Map and Report
October 1994

AGRICULTURAL LAND CLASSIFICATION REPORT

M40 MOTORWAY SERVICE AREAS SOUTH OXFORDSHIRE DISTRICT COUNCIL, LEWK NOR C AGRICULTURAL LAND CLASSIFICATION

Summary

- 1 1 ADAS was commissioned by MAFF's Land Use Planning Unit to provide information on land quality on land near Lewknor Site C. This work was in connection with proposed M40 motorway service areas.
- 1 2 Approximately 12.5 hectares of land relating to this area was surveyed in September 1994. The survey was undertaken at a detailed level of approximately one boring per hectare. A total of 11 borings and 1 soil inspection pit* were assessed in accordance with MAFF's revised guidelines and criteria for grading the quality of agricultural land (MAFF 1988). These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on its use for agriculture. Laboratory measured stone contents supplemented the field assessed data.
- 1 3 The work was carried out by members of the Resource Planning Team in the Huntingdon Statutory Group of ADAS.
- 1 4 At the time of survey the agricultural land use was under arable production (i.e. cereal stubble) and permanent pasture. The area of Urban includes the M40 slip road and associated land.
- 1 5 The distribution of the grades and subgrades is shown on the attached ALC map and the areas are given in the table below. The map has been drawn at a scale of 1:10,000. It is accurate at this scale but any enlargement would be misleading. This map supersedes any previous survey information for this site.

Table 1 Distribution of Grades and Subgrades

Grade	Area (ha)	% of Site	% of Agricultural Area
3a	7.2	57.6	61.0
3b	4.6	36.8	39.0
Urban	0.7	5.6	
Total	12.5 ha	100%	100% (11.8 ha)

* Additional pit information from adjacent sites was also used in the assessment.

1 6 A general description of the grades subgrades and land use categories is provided in Appendix 1 The main classes are described in terms of the type of limitation that can occur the typical cropping range and the expected level and consistency of yield

1 7 The land quality on the site has been classified as mainly subgrade 3a (good quality land) due to moderate droughtiness constraints with the western field graded 3b (moderate quality land) due to significant droughtiness which may be as a result of previous disturbance

2 0 Climate

2 1 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

2 2 The main parameters used in the assessment of an overall climatic limitation are average annual rainfall as a measure of overall wetness and accumulated temperature as a measure of the relative warmth of a locality The combination of rainfall and temperature at this site mean an overall climatic grade of 1

Table 2 Climatic Interpolation

Grid Reference	SU722979
Altitude (m AOD)	130
Accumulated Temperature (days Jan June)	1364
Average Annual Rainfall (mm)	718
Field Capacity Days	155
Moisture Deficit wheat (mm)	99
Moisture Deficit potatoes (mm)	88
Overall Climatic Grade	1

3 0 Relief

3 1 From the northern boundary at 125 m AOD the land rises to 130 m AOD at its southern boundary with the M40 slip road The site is bounded on the west by the M40 and on the east by a hotel Neither gradient nor relief constitute a limitation to the ALC grade

4 0 Geology and Soils

4 1 The published geology map for the site area (BGS Sheet 254 1980 Henley on Thames 1 50 000) shows the site to be underlain by Lower Chalk with a band of Totternhoe Stone

4 2 The published soils information for the area (SSEW 1983 Sheet 6 1 250 000) shows the site to comprise the Coombe 2 Association described as well drained calcareous fine silty soils over chalk or chalk rubble. Shallow soils in places especially on brows and steeper slopes (SSEW 1983)

5 0 **Agricultural Land Classification**

5 1 The ALC classification of the site is shown on the attached ALC map

5 2 The location of the soil observation points is shown on the attached sample point map

Subgrade 3a

5 3 The majority of the agricultural area (approximately 60%) has been mapped as subgrade 3a. Soils typically comprise very slightly stony calcareous heavy clay loam topsoils over moderately stony heavy clay loams. Upper subsoils overlie soft weathered chalk with rooting evident for 25-30 cms into this material. Availability of water and nutrients to crops is reduced by the relatively high stone contents in the upper horizons and the absence of rooting in the chalk at depth. Consequently a moderate droughtiness limitation restricts this land to subgrade 3b. There are small less droughty areas within the site which were assessed as grade 2 but they were considered too small to delineate separately.

Subgrade 3b

5 4 The remainder of the site has been mapped as subgrade 3b. Soils typically comprise slightly stony calcareous heavy clay loam topsoils to a depth of 20-30 cm. The subsoil comprises a clay loam matrix containing many flints (>45%) which was difficult to auger at the time of survey*. Evidence of disturbance in both layers was noted in terms of the high stone contents and the presence of brick material. The high level of stones in the subsoil causes an impediment to rooting and thus reduces the available water for crop growth. Consequently severe droughtiness imperfections restrict the land to subgrade 3b.

Urban

5 5 This area consists of the M40 slip road and associated land

REFERENCES

GEOLOGICAL SURVEY OF ENGLAND AND WALES 1980 sheet 254 Henley
on Thames 1 50 000 scale

MAFF 1971 Agricultural Land Classification map sheet 159 Provisional 1 63 360
scale

METEOROLOGICAL OFFICE 1989 Data extracted from the published
agroclimatic dataset

SOIL SURVEY OF ENGLAND AND WALES 1983 Sheet 6 South East England
1 250 000 scale

Appendix 1

DESCRIPTION OF THE GRADES AND SUBGRADES

The ALC grades and subgrades are described below in terms of the types of limitation which can occur typical cropping range and the expected level of consistency of yield. In practice the grades are defined by reference to physical characteristics and the grading guidance and cut offs for limitation factors in Section 3 enable land to be ranked in accordance with these general descriptions. The most productive and flexible land falls in Grades 1 and 2 and Subgrade 3a and collectively comprises about one third of the agricultural land in England and Wales. About half the land is of moderate quality in Subgrade 3b or poor quality in Grade 4. Although less significant on a national scale such land can be locally valuable to agriculture and the rural economy where farmland predominates. The remainder is very poor quality land in Grade 5 which most occurs in the uplands.

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 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 levels of yields It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yield 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

Descriptions of other land categories used on ALC maps

Urban

Built up or hard uses with relatively little potential for a return to agriculture including housing industry commerce education transport religious buildings cemeteries Also hard surfaced sports facilities permanent caravan sites and vacant land all types of derelict land including mineral workings which are only likely to be reclaimed using derelict land grants

Non agricultural

Soft uses where most of the land could be returned relatively easily to agriculture including private parkland public open spaces sports fields allotments and soft surfaced areas on airports/airfields Also active mineral workings and refuse tips where restoration conditions to soft after uses may apply

Woodland

Includes commercial and non commercial woodland A distinction may be made as necessary between farm and non farm woodland

Agricultural buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses Temporary structures (e.g. polythene tunnels erected for lambing) may be ignored

Open water

Includes lakes ponds and rivers as map scale permits

Land not surveyed

Where the land use includes more than one of the above land cover types e.g. buildings in large grounds and where map scale permits the cover types may be shown separately Otherwise the most extensive cover type will usually be shown

Appendix 2

FIELD ASSESSMENT OF SOIL WETNESS CLASS

Definition of Soil Wetness Classes

Wetness Class	Duration of Waterlogging ¹
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years ²
II	The soil profile is wet within 70 cm depth for 31 90 days in most years <u>or</u> , 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
III	The soil profile is wet within 70 cm depth for 91 180 days in most years <u>or</u> , 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
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 <u>or</u> , 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
V	The soil profile is wet within 40 cm depth for 211 335 days in most years
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years

¹ The number of days specified is not necessarily a continuous period

² In most years is defined as more than 10 out of 20 years

Appendix 3

SOIL BORING AND SOIL PIT DESCRIPTIONS

Contents

- * Soil boring descriptions
- * Soil pit description
- * Soil Abbreviations Explanatory Note

SAMPLE	DEPTH	TEXTURE	COLOUR	MOTTLES			PED		STONES			STRUCT/		SUBS			CALC
				COL	ABUN	CONT	COL	GLEY	2	6	LITH	TOT	CONSIST	STR	POR	IMP	
1	0 30	hc1	10YR41 00						1	0	CH	5					Y
	30 70	hc1	25 Y72 00						0	0	CH	30		M			Y
	70 95	ch	25 Y71 00						0	0		0		P			Y
1P	0 27	h 1	10YR41 00						0	0	HR	5					Y
	27 65	h 1	25 Y72 00						0	0	CH	30	MDMDAB	FR	M		Y
	65 90	hc1	10YR71 81						0	0	CH	45		P			Y
																	ROOTING TO 90
2	0 30	hc1	10YR41 00						1	0	CH	5					Y
	30 50	hc1	10YR54 00						0	0	CH	5		M			Y
	50 75	ch	25 Y71 00						0	0		0		P			Y
3	0 30	h 1	10YR41 00						1	0	CH	5					Y
	30 40	hc1	25 Y72 00						0	0	CH	30		M			Y
	40 65	ch	25 Y71 00						0	0		0		P			Y
4	0 30	mc1	10YR53 00						2	0	CH	10					Y
																	IMP 30 STONES
5	0 20	hc1	10YR42 00						3	0	HR	10					Y
																	IMP 20 STONES
6	0 30	h 1	10YR41 00						1	0	CH	5					Y
	30 50	h 1	25 Y72 00						0	0	CH	30		M			Y
	50 75	ch	25 Y71 00						0	0		0		P			Y
7	0 30	hc1	10YR41 00						1	0	CH	5					Y
	30 50	c	10YR54 00						0	0	CH	5		M			Y
	50 95	hc1	25 Y72 00						0	0	CH	30		M			Y
	95 120	ch	25 Y71 00						0	0		0		P			Y
8	0 30	hc1	10YR42 00						2	0	CH	10					Y
																	IMP 30 STONES
9	0 30	hc1	10YR42 00						3	0	HR	7					Y
																	IMP 30 STONES
10	0 30	hc1	10YR41 00						1	0	CH	5					Y
	30 45	hc1	10YR53 00						0	0	CH	30		M			Y
	45 70	ch	25 Y71 00						0	0		0		P			Y
12	0 30	hc1	10YR41 00						2	0	CH	10					Y
	30 50	h 1	10YR41 00						0	0	CH	10		M			Y
	50 75	ch	25 Y71 00						0	0		0		P			Y

SAMPLE NO	GRID REF	ASPECT		GRDNT	WETNESS	WHEAT	POTS	M REL		EROSN	FROST	CHEM	ALC	COMMENTS
		USE						DRT	FLOOD					
1	SU72207900	WHT	NE	01	1 2	117	17 110	21	2				DR 2	
1P	SU72207900	WHT	NE	01	1 2	110	10 106	17	2				DR 2	PIT @ AB1
2	SU72307900	WHT	NE	01	1 2	102	2 104	15	3A				DR 3A	
3	SU72407900	WHT	NE	01	1 2	87	13 92	3	3A				DR 3A	
4	SU72007890	PGR	NE	01	1 1	52	48 52	37	3B		Y		DR 3B	DISTURBED
5	SU72107890	PGR	NE	01	1 2	33	67 33	56	4		Y		DR 3B	DISTURBED
6	SU72207890	WHT	NE	01	1 2	99	1 101	12	3A				DR 3A	
7	SU72307890	WHT	NE	01	1 2	143	43 113	24	1				WK 2	
8	SU72009780	PGR	NE	01	1 2	52	48 52	37	3B		Y		DR 3B	DISTURBED
9	SU72109780	PGR	NE	01	1 2	50	50 50	39	3B		Y		DR 3B	DISTURBED
10	SU72209780	WHT	NE	01	1 2	93	7 99	10	3A				DR 3A	
12	SU72109770	PGR	NE	01	1 2	100	0 102	13	3A				DR 3B	DISTURBRD

f

SOIL PIT DESCRIPTION

Site Name M40 MSA LEWKNOR C OXON P t N be 1P

Gr d Refe ence SU72207900 A erage Ann l R fall 714 mm
 Ac m l ted Tempe at e 1370 deg ee d ys
 F ld C p c ty Le el 154 d ys
 L d U Whe t
 Slope d Aspect 01 deg ee NE

HORIZON	TEXTURE	COLOUR	STONES	2	TOT STONE	LITH	MOTTLES	STRUCTURE	CONSIST	SUBSTRUCTURE	CALC
0 27	HCL	10YR41 00	0		5	HR					Y
27 65	HCL	25 Y72 00	0		30	CH		MDMDAB	FR	M	Y
65 90	HCL	10YR71 81	0		45	CH				P	Y

Wetness Grade 2
 Wet ss Cl ss I
 Gley g cm
 SPL N SPL

Dro ght Grade 2
 APW 110mm MBW 10 mm
 APP 106mm MBP 17 mm

FINAL ALC GRADE 2
 MAIN LIMITATION Dro ght ness

Appendix 3 (Cont)

SOIL PROFILE DESCRIPTIONS EXPLANATORY NOTE

Soil profile and pit information obtained during ALC surveys is held on a database
This has commonly used notations and abbreviations as set out below

BORING HEADERS

- 1 GRID REF National grid square followed by 8 figure grid reference
- 2 USE Land use at the time of survey
The following abbreviations are used

ARA	arable	PAS/PGR	permanent pasture
WHT	wheat	RGR	rough grazing
BAR	barley	LEY	ley grassland
CER	cereals	CFW	coniferous woodland
OAT	oats	DCW	deciduous woodland
MZE	maize	SCR	scrub
OSR	oilseed rape	HTH	heathland
BEN	field beans	BOG	bog or marsh
BRA	brassicae	FLW	fallow
POT	potatoes	PLO	ploughed
SBT	sugar beet	SAS	set aside
FDC	fodder crops	OTH	other
FRT	soft and top fruit	LIN	linseed
HOR/HRT	horticultural crops		
- 3 GRDNT Gradient as measured by optical reading clinometer
- 4 GLEY/SPL Depth in centimetres (cm) to gleyed and/or slowly permeable horizons
- 5 AP (WHEAT/POTS) Crop adjusted available water capacity The amount of soil water (in millimetres) held in the soil profile that is available to a growing crop (wheat and potatoes are used as reference crops)

6 MB (WHEAT/POTS) The moisture balance for wheat and potatoes obtained by subtracting the soil moisture deficit from the crop adjusted available water capacity

7 DRT Grade according to soil droughtiness assessed against soil moisture balances

8 M REL Micro relief)
FLOOD Flood risk) If any of these factors are
EROSN Soil erosion) considered significant in terms
of
EXP Exposure) the assessment of agricultural
land
FROST Frost prone) quality a y will be entered in the
DIST Disturbed land) relevant column
CHEM Chemical limitation)

9 LIMIT Principal limitation to agricultural land quality
The following abbreviations are used

OC overall climate	CH chemical limitations
AE aspect	WE wetness
EX exposure	WK workability
FR frost	DR drought
GR gradient	ER erosion
MR micro relief	WD combined soil wetness/soil droughtiness
TX soil texture	ST topsoil stoniness
DP soil depth	

PROFILES AND PITS

1 TEXTURE Soil texture classes are denoted by the following abbreviations

S	sand
LS	loamy sand
SL	sandy loam
SZL	sandy silt loam
ZL	silt loam
MZCL	medium silty clay loam
MCL	medium clay loam
SCL	sandy clay loam
HZCL	heavy silty clay loam
HCL	heavy clay loam
SC	sandy clay
ZC	silty clay
C	clay

For the sand loamy sand sandy loam and sandy silt loam classes the predominant size of sand fraction may be indicated by the use of prefixes

F	fine (more than $\frac{2}{3}$ of the sand less than 0.2 mm)
C	coarse (more than $\frac{1}{3}$ of sand greater than 0.6 mm)
M	medium (less than $\frac{2}{3}$ fine sand and less than $\frac{1}{3}$ coarse sand)

The sub divisions of clay loam and silty clay loam classes according to clay content are indicated as follows

M	medium (less than 27% clay)
H	heavy (27-35% clay)

Other possible texture classes include

OL organic loam
P peat
SP sandy peat
LP loamy peat
PL peaty loam
PS peaty sand
MZ marine light silts

2 MOTTLE COL Mottle colour

3 MOTTLE ABUN Mottle abundance

F few less than 2% of matrix or surface described
C common 2 20% of the matrix
M many 20 40% of the matrix
VM very many 40% + of the matrix

4 MOTTLE CONT Mottle continuity

F faint indistinct mottles evident only on close examination
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

6 STONE LITH Stone lithology One of the following is used

HR all hard rocks or stones
MSST soft medium or coarse grained sandstone
SI soft weathered igneous or metamorphic
SLST soft oolitic or dolomitic limestone
FSST soft fine grained sandstone
ZR soft argillaceous or silty rocks
CH chalk
GH gravel with non porous (hard) stones
GS gravel with porous (soft) stones

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

- 7 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 well developed

ped size F fine
M medium
C coarse
VC very coarse

ped shape S single grain
M massive
GR granular
SB/SAB sub angular blocky
AB angular blocky
PR prismatic
PL platy

- 8 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

- 9 SUBS STR Subsoil structural condition recorded for the purpose of calculating profile droughtiness

G good
M moderate
P poor

- 10 POR Soil porosity If a soil horizon has less than 0.5% biopores >0.5 mm a y will appear in this column
- 11 IMP If the profile is impenetrable a y will appear in this column at the appropriate horizon
- 12 SPL slowly permeable layer If the soil horizon is slowly permeable a y will appear in this column
- 13 CALC If the soil horizon is calcareous a y will appear in this column
- 14 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