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M40 Motorway Service Areas
Site 7 Waterstock, Oxon
Agricultural Land Classification
ALC Map and Report
October 1994

AGRICULTURAL LAND CLASSIFICATION REPORT

M40 MOTORWAY SERVICE AREAS, SOUTH OXFORDSHIRE DISTRICT COUNCIL, WATERSTOCK 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 Waterstock This work was in connection with proposed M40 motorway service areas

1 2 Approximately 9 6 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

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 permanent pasture The Non agricultural areas comprise earth banks and scrub and the area of Urban comprises access roads

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
3b	8 4	87 5	100
Non Agricultural	0 4	4 2	
Urban	0 8	8 3	
Total	**9 6 ha**	**100 %**	**100 / (8 4 ha)**

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 3b (moderate quality land) as a result of significant wetness and workability limitations

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	SP 628052
Altitude (m AOD)	65
Accumulated Temperature (days Jan June)	1437
Average Annual Rainfall (mm)	642
Field Capacity Days	133
Moisture Deficit wheat (mm)	108
Moisture Deficit potatoes (mm)	101
Overall Climatic Grade	1

3 0 Relief

3 1 The site slopes from a maximum height of 72 m AOD in the south east to 60 m AOD (in the north and north west) on the floodplain of the River Thame Neither relief nor gradient impose a limitation to ALC grade

4 0 Geology and Soils

4 1 The published geology map for the site area (BGS 1979 Ten Mile to 1 inch Map South Sheet) shows the site to be underlain by Kimmeridge Clay

4 2 The published soil map SP60 (SSEW 1980) shows a pattern of clayey soils predominantly the Rowsham Series (*1) with smaller areas of the Evesham (*2) Fladbury (*3) and Shabbington (*4) Series in the north and west of the site

4 3 The more recent but less detailed published soil map for the area (SSEW 1983 Sheet 6 1 250 000) shows the site to comprise in the north the Fladbury 1* Association and in the south the Wickham 2** Association This information confirms the presence on site of clayey soils with wetness imperfections

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

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(*1) Rowsham Series Fine loamy over clayey soils developed in Head over clay

(*2) Evesham Series Clayey typically calcareous soils developed in clay or clay shale

(*3) Fladbury Series Clayey alluvial soils in river alluvium on level floodplains

(*4) Shabbington Series Fine loamy gley soils developed in Head or river terrace deposits sometimes over gravel

(*) Fladbury 1 Association Stoneless clayey soils in places calcareous variably affected by groundwater

(**) Wickham 2 Association Slowly permeable seasonally waterlogged fine loamy over clayey fine silty over clayey and clayey soils

Subgrade 3b

5 3 All of the agricultural land on the site has been graded 3b Profiles typically comprise heavy clay loam (occasionally medium clay loam or clay) topsoils which directly overlie slowly permeable clays Generally wetness class has been assessed as IV however locally profiles were encountered which were assessed as wetness class III Profiles are typically non calcareous and very slightly stony throughout The poor drainage status combines with the relatively heavy topsoil to restrict the flexibility of the land to agricultural use Consequently significant wetness and workability constraints restrict the land to subgrade 3b

5 4 The whole site has in addition been significantly trafficked during construction of the adjacent golf course and associated roads This disturbance has caused a degree of compaction in the topsoil on site

5 5 A number of sporadic profiles of subgrade 3a quality were noted where a profile wetness class of II was encountered These areas were too small to delineate seperately at this survey scale

Non Agricultural

5 6 The non agricultural areas comprise a small area of scrub in the extreme north of the site and two areas of earth banks associated with the roads and golf course construction

5 7 The urban area comprises access roads

ADAS Reference 3303/211/94
MAFF Reference EL33/903

Resource Planning Team
Huntingdon Statutory Group
ADAS Huntingdon

REFERENCES

GEOLOGICAL SURVEY OF ENGLAND AND WALES 1979 Ten Mile to 1 inch South Sheet

MAFF 1971 Agricultural Land Classification map sheet 158 Provisional 1 63 360 scale

METEOROLOGICAL OFFICE 1989 Data extracted from the published agroclimatic dataset

SOIL SURVEY OF ENGLAND AND WALES 1980 Sheet SP60 Tiddington Soils in Oxfordshire II 1 25 000 scale

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 *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
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
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
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

				-MOTTLES			PED		STONES				STRUCT/	SUBS				
SAMPLE	DEPTH	TEXTURE	COLOUR	COL	ABUN	CONT	COL	GLEY	2	6	LITH	TOT	CONSIST	STR	POR	IMP	SPL	CALC
1	0 35	hcl	10YR43 00						0	0		0						
	35 120	c	25YR53 00	10YR58 00	C			Y	0	0	HR	10		P	Y		Y	
2	0 20	hcl	10YR43 00						0	0		0						
	20 120	c	25YR53 00	10YR58 62	C			Y	0	0	HR	5		P	Y		Y	Y
3	0 25	mcl	10YR43 00						1	0	HR	1						
	25 45	hcl	10YR64 54	10YR56 00	C			Y	0	0		0		M	Y			
	45 120	c	10YR53 00	10YR58 62	C			Y	0	0		0		P	Y		Y	
4	0 30	c	10YR44 00						0	0		0						Y
	30 40	c	25YR53 00	10YR58 00	C			Y	0	0		0		P	Y		Y	Y
	40 120	c	25YR52 53	10YR58 62	M			Y	0	0		0		P	Y		Y	Y
5	0 30	hcl	10YR43 00						10	0	HR	10						
	30 120	c	10YR53 00	10YR58 62	C			Y	0	0		0		P	Y		Y	
5P	0 25	hcl	10YR43 00						7	3	HR	10						
	25 120	c	10YR53 00	10YR68 51	C		10YR52 00	Y	3	1	HR	4	STCAB	VM P	Y		Y	
6	0 20	mcl	10YR54 00						0	0		0						
	20 120	c	10YR53 54	10YR58 62	C			Y	0	0		0		P	Y		Y	
7	0 25	hcl	10YR44 00						3	0	HR	3						Y
	25 35	h l	10YR42 00	10YR58 62	C			S	0	0		0		M				
	35 120	hcl	10YR53 00	10YR58 62	M			Y	0	0		0		M				
8	0 30	hcl	10YR44 00						4	0	HR	4						
	30 120	hcl	10YR53 00	10YR58 62	C			Y	0	0	HR	20		M				
9	0 35	mcl	10YR54 00						10	0	HR	10						
	35 120	hcl	10YR53 54	10YR58 62	C			Y	0	0	HR	15		M				
10	0 25	hcl	10YR54 00						5	0	HR	5						
	25 35	hcl	10YR54 00						0	0	HR	10		M				
	35 40	c	10YR53 00	10YR58 62	C			Y	0	0	HR	12		P	Y			
	40 60	c	10YR53 00	10YR58 62	C			Y	0	0	HR	3		P	Y		Y	
	60 120	c	10YR62 00	10YR58 00	M			Y	0	0		0		P	Y		Y	
11	0 25	mcl	10YR54 00						1	0	HR	1						
	25 35	c	10YR53 54	10YR56 00	C		10YR53 00	Y	0	0	HR	5		P	Y			
	35 55	c	10YR53 00	10YR58 00	C		10YR53 00	Y	0	0	HR	1		P	Y		Y	
	55 120	c	10YR53 00	10YR58 52	C		10YR54 00	Y	0	0	HR	1		P	Y		Y	

SAMPLE NO	GRID REF	USE	ASPECT	GRDNT	GLEY	SPL	WETNESS CLASS	WHEAT GRADE	WHEAT AP	WHEAT MB	POTS AP	POTS MB	M REL DRT	FLOOD	EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SP62700520	PGR	N	06	035	035	4	3B	125	17	104	3	2				WE	3B	
2	SP62800520	PGR	N	05	020	020	4	3B	120	12	98	3	2				WE	3B	
3	SP62900520	PGR	N	02	025	045	3	3A	132	24	109	8	2				WE	3A	
4	SP62700510	PGR	N	04	030	030	4	3B	126	18	103	2	2				WE	3B	
5	SP62800510	PGR	NW	02	030	030	4	3B	124	16	101	0	2				WE	3B	
5P	SP62800510	PGR	NW	02	025	025	4	3B	119	11	97	4	2				WE	3B	
6	SP62900510	PGR	N	02	020	020	4	3B	124	16	101	0	2				WE	3B	
7	SP62700500	PGR	W	04	035		2	3A	154	46	116	15	1				WE	3A	d st rbed?
8	SP62800500	PGR	W	03	030		2	3A	111	3	91	10	3A				WE	3A	dist rbed?
9	SP62900500	PGR	N	02	035		2	2	115	7	93	8	2				WE	2	
10	SP62800490	PGR	W	04	035	040	3	3B	125	17	101	0	2				WE	3B	d st rbed?
11	SP62900490	PGR	W	02	025	035	4	3B	125	17	102	1	2				WE	3B	

SOIL PIT DESCRIPTION

S te Name M40 MSA WATERSTOCK OXON P t N mbe 5P

Grid Reference SP62800510 A e ge A n al Ra nfall 642 mm
Accumulated Temperat re 1437 degree days
Field C p c ty Le el 133 days
Land Use Permane t G ass
Slope and Aspect 02 deg ees NW

HORIZON	TEXTURE	COLOUR	STONES 2	TOT STONE	LITH	MOTTLES	STRUCTURE	CONSIST	SUBSTRUCTURE	CALC
0 25	HCL	10YR43 00	7	10	HR					
25 120	C	10YR53 00	3	4	HR	C	STCAB	VM	P	

Wet ess Grade 3B Wetness Class IV
Gley g 025 cm
SPL 025 cm

Dro ght G ade 2 APW 119mm MBW 11 mm
APP 97 mm MBP 4 mm

FINAL ALC GRADE 3B
MAIN LIMITATION Wetness

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 ⅔ of the sand less than 0 2 mm)
C coarse (more than ⅓ of sand greater than 0 6 mm)
M medium (less than ⅔ fine sand and less than ⅓ 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 in 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