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UPPER THAMES LOCAL PLAN

MINERALS AREAS OF SEARCH, C AND D

Agricultural Land Classification: Report of Survey

1. Introduction

1.1 A detailed Agricultural Land Classification (ALC) was carried out in October 1990, on approximately 350 hectares between Whelford and Kempsford in Gloucestershire. The work was requested as part of MAFF's statutory input to the production of a Development Brief as a precursor to a review of the Upper Thames Local Plan. The Plan was approved in January 1989 and identified 'Areas of Search' within the Cotswold Water Park where sand and gravel deposits were believed to exist in commercially viable amounts. In these areas, mineral working would generally be permitted, subject to the relevant policies of the Plan. Two of the four areas of search have either been worked or have been granted planning permission; there is now considerable interest in the two remaining areas, C and D, and MAFF was asked to comment on the agricultural aspects of restoration in these areas.

1.2 The ALC survey was conducted at an observation density of approximately one boring per hectare. In Area C, 62 auger borings and 4 soil pits were described; 233 borings and 14 pits were examined in Area D. The location of the auger borings and soil pits is illustrated on the Auger Sample Point Map. A 16 hectare block in the south-east of Area D (Stubbs Farm application) was surveyed before the initial request was received; these borings and pit locations are indicated separately on the ASP map.

1.3 The ALC system provides 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. Classification was made according to MAFF's revised guidelines and criteria for grading agricultural land (operational from 1.1.89).

1.4 The distribution of the ALC grades and sub-grades is shown on the accompanying ALC map at a scale of 1:10,000; the information is accurate at this scale, but any enlargement would be misleading. The ALC statistics are outlined below, showing Area C and Area D separately.

Table 1: Distribution of Grades and Sub-Grades: Area C

Grade	Area (ha)	% of Survey Area	% of Agric Land
2	40.7	60.8	63.4
3B	23.5	35.1	36.6
Urban	0.7	1.0	
Non-agric	2.1	3.1	
	67.0 ha	100%	100% (64.2 ha)

Table 2: Distribution of Grades and Sub-Grades: Area D

Grade	Area (ha)	% of Survey Area	% of Agric Area
2	169.1	60.3	61.8
3A	52.5	18.7	19.2
3B	52.0	18.6	19.0
Urban	1.2	0.4	100% (273.6 ha)
Non-agric	5.5	2.0	
	280.3	100%	

2. Climatic Interpolations

Detailed assessments of the prevailing climate were obtained by interpretation from a Met Office/MAFF 5 km grid dataset for three representative locations (see Table 3). The two parameters used to assess the effect of overall climate are average annual rainfall (a measure of overall wetness) and accumulated temperature (a measure of the relative warmth of a locality). The three assessments show that there is in fact no overall climatic limitation affecting the site, and that there is little climatic variation over the whole area.

Table 3: Climatic Interpolations

Grid Reference	SU 180990 (Area C)*
Altitude (m)	76
Average Annual Rainfall (mm)	693
Accumulated Temperature (^{o}days)	1438
Field Capacity (days)	153
Moisture Deficit, Wheat (mm)	105
Moisture Deficit, Potatoes (mm)	97
Overall Climatic Grade	1

*Same data for SU170980 and SU170970 in Area D

No additional minor climatic factors such as frost risk were noted.

3. Previous Surveys

This fieldwork and the ALC results now supercede previous ALC work for this area presented on the 1:63,360 ALC map (Sheet 157) and information collected for the Cotswold Water Park Survey at 1:25,000 in 1979.

4. Agricultural Land Classification

4.1 Soil Wetness, General

The majority of the soils in both areas of search can be generally described as groundwater gleys, and experience a fluctuating groundwater level. Most soils exhibit mottling in broad zones within 40 cm depth, but it is difficult to accurately assess the duration of waterlogging that causes

this evidence of wetness. The wetness assessment that follows has been made on the assumption that the groundwater table can be dealt with effectively by underdrainage systems. The soils therefore qualify for Wetness Class I (ie, they should not be wet within 70 cm for more than 30 days in most years). Soil wetness is not therefore the most limiting ALC factor across the site.

4.2 Soil Droughtiness, General

The assessment of soil droughtiness is critical to the grading of the soils, and the measurement of subsoil stone content is the key factor. It is not possible to visually estimate the percentage stone content (by volume) with any degree of reliable accuracy; these stony soils must be sieved and the percentage calculated by a reliable field method (such as water displacement) or samples should be taken for office or laboratory measurement. In ALC terms, the technical definition of 'Gravel' means stone contents in excess of 70% by volume. Fifteen subsoil stone contents were measured by water displacement. Of these, only one exceeded 70%. Generally, therefore, gravel does not exist in the top 120 cm of the soil profile, the material is still a stony, sandy soil.

4.3 Area C

Grade 2: These soils have droughtiness as the main limiting factor. Although they mostly show evidence of wetness this is believed to be groundwater gleying and the soils are placed in wetness classes 1 and 2. The typical profile is stony, with stone contents increasing with depth but never reaching the gravel percentage. Soil profiles exhibit a medium clay loam topsoil, with a heavier upper subsoil of heavy clay loam or clay and a loamy sand lower subsoil to depth from about 50 cm. It is this lower horizon which is most stony, but the profile can hold sufficient moisture for the soils to be placed in grade 2.

Sub-Grade 3B: The soils along the River Coln showed evidence of severe wetness. The medium clay loam topsoils overly gleyed and mottled subsoils. Closest to the River the subsoils display a prismatic structure whilst at greater distance they are sub-angular blocky; these subsoils are slowly permeable layers which inhibit free drainage and cause waterlogging. The soils are placed in wetness class 4 (ie wet with 70 cm for 180 days but not within 40 for more than 210 days). Waterlogging gives rise to limitations to the range of possible crops, cultivation timings and crop productivity and this land has therefore been downgraded to 3B.

4.4 Area D

Grade 2: These soils typically exhibit medium clay loam topsoils, have clear evidence of groundwater gleying at shallow depths, and grade into very stony sandy loams or loamy sands in the lower subsoil. Soil droughtiness is the most limiting factor, as most of the soils are placed in wetness

class I/II. The stony lower subsoils generally occur at depths greater than 45 cm, thus allowing adequate moisture reserves to be available in the profile for the soils to qualify for Grade 2.

Sub-Grade 3A: These soils are similar to the Grade 2 soils above, but are placed into 3A due to a more restricting droughtiness limitation. This limitation is caused by stony sandy soils at depths shallower than 45 cm or by very high subsoil stone contents (50-60%).

Sub-Grade 3B: In the south-west of Area D, gravel (ie +70% stone) was encountered at shallow depths causing a significant droughtiness limitation. Good root penetration, however, was noted in theses soils but the high stone contents greatly reduced the available water for extraction by these roots.

The 3B land adjacent to the River Coln is downgraded due to a severe soil wetness limitation. The soil profiles contain slowly permeable layers at shallow depths which obstruct drainage and cause soil waterlogging and associated soil workability problems.

Additional details relating to the Stubbs Farm survey are contained in a separate schedule relating to file 8FCS 3689 (job no 60/90/16).

[RPG.0107/NH]

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Upper Thames Valley	1 area C	Flat	Ley	Av Rainfall :- 693 ATO :- 1438 FC Days :- 153 Climatic grade:- 1	River Alluvium
	DATE: 16/10/90	GRID REFERENCE: SU 185984			

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	25	10YR3/3	MCL	Few sst	-	Wk Med SAB	> .5%	Good	Friable	Many	-	-	Smooth abrupt
2	51	10YR6/3	MZCL	-	cdom	Mod Med Prism breaking to Mod Med SAB	0.25%	Good/ Moderate	Friable	Common	-	-	Smooth clear
3	90+	10YR5/1	ZC	-	cdom	Strong coarse Prismatic	0.15%	Moderate	Friable	Few/Common	-	-	-

Depth to Slowly Permeable Horizon :- 35 cm
Gleyed < 40 cm

Wetness Class :- IV

Wetness Grade :- 3b

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Available Water Wheat :- N/A
Potatoes :- N/A

Moisture Deficit Wheat :- 105
Potatoes :- 97

Moisture Balance Wheat :- N/A
Potatoes :- N/A

Droughtiness Grade :- 1

Final ALC Grade :- 3b

Main Limiting Factor(s) :- Wetness

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Upper Thames Valley	3 area C	Flat	Arable	Av Rainfall :- 693 ATO :- 1438 FC Days :- 153 Climatic grade:- 1	Terrace Gravels
	DATE 16/10/90	GRID REFERENCE SU 174992			

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	25	10YR32	MCL	5% visual	-	MDFSAB	Common	Good	Friable	Many	-	None	Clear smooth
2	70	10YR42	MCL	5% visual	-	MDMSAB	Common	Good	Friable	Common	-	None	Abrupt smooth
3	110+	10YR73	LMS	46% 2 mm-2 cm sieving	cdom	single grain	Common	Good	V Friable	Few	-	None	-

Depth to Slowly Permeable Horizon :- -

Wetness Class :- I

Wetness Grade :- 1

RPG-0023/WJC

Available Water Wheat :- 155

Potatoes :-

Moisture Deficit Wheat :- 105

Potatoes :- 97

Moisture Balance Wheat :- +50 (to 120 cm)

Potatoes :-

Droughtiness Grade :- 1

Final ALC Grade :- 1

Main Limiting Factor(s) :-

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE		PARENT MATERIAL
Upper Thames Valley	2 area C	Flat	Ley	Av Rainfall :- 693 ATO :- 1438 FC Days :- 153 Climatic grade:- 1	Terrace Gravels
	DATE: 16/10/90	GRID REFERENCE: SU 186985			

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	23	10YR43	MCL	-	-	WDMSAB	Common	Good	Friable	Common	-	None	Sharp smooth
2	35	10YR54	MCL	-	cdom	MDCSAB	Common	Good	Friable	Common	-	None	Abrupt smooth
3	46	10YR62	HZCL	-	cdom	MDCP breaking to MDCSAB	< .5%	Moderate	Friable	Common	-	None	Abrupt smooth
4	68	10YR32	C	-	cdom	SDVCAB	< .5%	Poor	Firm	Few	-	None	Sharp smooth
5	90+	10YR72	SCL	42% 2 mm-2 cm sieving	-	Too stoney assume good				None	-	None	-

Depth to Slowly Permeable Horizon :- 35

Wetness Class :- IV

Wetness Grade :- 3b

RPG-0023/WJC

Available Water Wheat :-

Potatoes :-

Moisture Deficit Wheat :- 105

Potatoes :- 97

Moisture Balance Wheat :-

Potatoes :-

Droughtiness Grade :- Not limiting

Final ALC Grade :- 3b

Main Limiting Factor(s) :- Wetness

Remarks :-

SITE NAME	PROFILE NUMBER	SLOPE AND ASPECT	LAND USE	Av Rainfall :- 693	PARENT MATERIAL
Upper Thames Valley	4 area C	Flat	Cereals	ATO :- 1438	Terrace Gravels
	DATE	GRID REFERENCE		FC Days :- 153	
	17/10/90	SU 181992		Climatic grade:- 1	

Horizon Number	Lowest Av Depth	Matrix and Ped Face Colours	Texture	Stoniness: Size, Shape, Type, and Field Method	Mottling Abundance, Contrast Size and Colour	Structure: Development Size and Shape	Pores and Fissures	Structural Condition	Consistence	Roots Abundance Size and Nature	Calcium Carbonate Content	Mangan Concs etc	Horizon Boundary: Distinctness and Form
1	20	10YR32	MCL	3% visual	-	MDMSAB	> .5%	Good	Friable	Common	-	-	Clear smooth
2	35	10YR42	C	1% visual	cdom	MDCP	< .5%	Moderate	Friable	Few	-	-	Abrupt smooth
3	65+	10YR72	LMS	46% sieve	-	too stoney to assess assume good structure				None	-	-	-

Depth to Slowly Permeable Horizon :- None

Wetness Class :- I

Wetness Grade :- 1

RPG-0023/WJC

Available Water Wheat :- 96

Potatoes :- 78

Moisture Deficit Wheat :- 105

Potatoes :- 97

Moisture Balance Wheat :- - 9

Potatoes :- -19

Droughtiness Grade :- 3a

Final ALC Grade :- 3a

Main Limiting Factor(s) :- Wetness

Remarks :-