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STOWE HILL QUARRY, ST BRIAVELS

**AGRICULTURAL LAND CLASSIFICATION
& SITE PHYSICAL CHARACTERISTICS
REPORT OF SURVEY**

Resource Planning Team
Taunton Statutory Unit

May 1994

ADAS 

STOWE HILL QUARRY
AGRICULTURAL LAND CLASSIFICATION AND
SITE PHYSICAL CHARACTERISTICS

Report of Survey

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STOWE HILL QUARRY

AGRICULTURAL LAND CLASSIFICATION AND SITE PHYSICAL CHARACTERISTICS

Report of Survey

1. SUMMARY

Land at Stowe Hill Quarry, St Briavels, Gloucester, amounting to 13.1 ha was surveyed in May 1994 using the MAFF Agricultural Land Classification (ALC). The surveys were carried out on behalf of MAFF as part of its statutory role in connection with a planning application to the Minerals Planning Authority under the Town and Country Planning Act 1990.

Fieldwork was carried out by ADAS Resource Planning Team, Taunton Statutory Unit, at a scale of 1:10,000. The information is correct at this scale but any enlargement would be misleading. The findings of the survey and the distribution of grades are detailed below.

Distribution of ALC grades: Stowe Hill Quarry

Grade	Area (ha)	% of Survey Area	% of Agricultural Land	(9.0 ha)
Grade 2	3.4	24.9	36.2	
3a	2.9	21.5	31.3	
3b	3.0	22.4	32.5	
Urban	4.2	31.1		
TOTAL	13.5			

2. INTRODUCTION

13.1 ha of land at Stowe Hill Quarry, St Briavels, was surveyed using the MAFF Agricultural Land Classification system in May 1994. The surveys were carried out on behalf of MAFF as part of its statutory role in connection with a planning application to the local Minerals Planning Authority under the Town and Country Planning Act 1990.

The fieldwork was carried out by ADAS Resource Planning Team, Taunton Statutory Unit, at a scale of 1:10,000. A total of 11 auger sample points and 2 soil profile pits were examined and 2 soil samples were taken for particle size distribution analysis. The findings of the surveys and the distribution of the grades are detailed below. The information is correct at the published scale but any enlargement would be misleading.

The published provisional 1" to one mile ALC map (MAFF, 1971) shows the grades of the site at a reconnaissance scale, but this is considered inadequate for current purposes and the recent survey was undertaken to provide a more detailed representation of the agricultural land quality. It supersedes any previous survey. The recent survey also uses the Revised *Guidelines and Criteria for Grading the Quality of Agricultural Land* (MAFF, 1988).

The Agricultural Land Classification system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The grading takes account of the top 120 cm of the soil profile. A description of the grades used in the ALC system can be found in Appendix 2.

3. CLIMATE

The grade of the land is determined by the most limiting factor present. The overall climate is considered first because it can have an overriding influence on restricting land to a lower grade despite other favourable conditions.

Estimates of climatic variables were obtained for the site by interpolation from the 5-km grid Agricultural Climate Dataset (Meteorological Office, 1989) and are shown in the table below. These show that there is an overall climatic limitation to Grade 2.

The parameters used for assessing overall climatic limitation are accumulated temperature, a measure of the relative warmth of a locality, and average annual rainfall, a measure of overall wetness. Climatic data on Field Capacity Days (FCD) and Moisture Deficits for wheat (MDW) and potatoes (MDP) are also shown. These data are used in assessing the soil wetness and droughtiness limitations referred to in later sections. A description of the Soil Wetness Classes used can be found in Appendix 3.

Table 1: Climatic Interpolation

Grid Reference	SO 565065
Altitude (m)	182
Accumulated Temperature (day °)	1328
Average Annual Rainfall (mm)	1029
Overall Climatic Grade	2
Field Capacity Days	218
Moisture deficit (mm): Wheat	71
Potatoes	55

4. RELIEF AND LANDCOVER

Altitude ranges from 180 to 190 m AOD.

Slopes are gentle to very gentle and are not limiting.

At the time of survey, landcover was mainly winter cereals.

5. GEOLOGY AND SOILS

The published 1:50,000 scale solid and drift geology map, sheet 233 (Geological Survey of England and Wales, 1974), indicates that the site is underlain by Carboniferous Lower Limestone with shale to the south.

Soils mapped by the Soil Survey of England and Wales (1983) indicate soils of the Ston Easton Association. These are described as well drained fine silty over clayey soils on limestone.

6. AGRICULTURAL LAND CLASSIFICATION

The distribution of ALC grades identified in the survey is shown on the accompanying ALC map and areas are summarised in the table below. The information is correct at the scale shown but any enlargement would be misleading.

Distribution of ALC grades: Stowe Hill Quarry

Grade	Area (ha)	% of Survey Area	% of Agricultural Land	(9.0 ha)
Grade 2	3.4	24.9	36.2	
3a	2.9	21.5	31.3	
3b	3.0	22.4	32.5	
Urban	4.2	31.1		
TOTAL	13.5			

Grade 2

Areas mapped as Grade 2 suffer a minor limitation due to difficulties in working the medium silty clay loam or medium clay loam topsoil with 218 Field Capacity Days.

The soil profile pit dug in this unit indicates a variable horizon of sandy loam texture lying above the carboniferous limestone bedrock. This is thinly bedded soft sandstone which can be broken with the fingers and is interbedded with thin layers of clay. This was not found at all borings, so must also be variable in distribution and a nominal depth is assumed in the soil resources assessment below.

The total depth of soil profile to bedrock is also variable, ranging from 80 to over 100 cm at the points examined.

Subgrade 3a

Soils classified as Subgrade 3a have a moderate limitation, as described in Appendix 2, commonly due to wetness. The soil profile pit in this unit indicated a slowly permeable horizon starting at 40 cm, Wetness Class III.

This mapping unit may also contain small areas of better Grade 2 soils.

Subgrade 3b

The area mapped as 3b suffers a more serious limitation due to wetness, with a sticky clay slowly permeable layer starting at 20-30 cm, Wetness Class IV. The mapping unit also includes areas of soil where the topsoil was found to be a heavy clay loam which would be properly described as Grade 4 with a serious wetness limitation, as described in Appendix 2.

Other Land

The quarry has already been extended eastwards and the topsoil stripped and removed from much of the area shown as urban.

7. SOIL RESOURCES

Soil resources on this site are most conveniently described by referring directly to the ALC grade mapping units.

Topsoil is defined as the surface horizon relatively rich in organic matter. On this site most of the topsoils are medium clay loam or medium silty clay loam in texture, with small unmappable areas of heavy clay loam within the area of Grade 3b. Depths of topsoil range from around 20 to 25 cm and the volume available is assessed in the table below.

Table 3: Topsoil Resources

Map unit	Texture	Depth (cm)	Area (ha)	Volume (m ³)
2	MCL/MZCL	25	3.4	8500
3a	MCL	20	2.9	5800
3b	MCL(HCL)	25	3.0	<u>7500</u>
			Total topsoil	<u>21800</u>

Subsoil is defined as the less organic-rich lower horizons. At this site a variable depth of clay lower subsoil is overlain, particularly in the better grades, with a heavy clay loam upper subsoil and in the Grade 2 mapping unit a variable lower subsoil of sandy loam texture may be found.

The heavy clay loam upper subsoil is typically friable with moderately developed coarse sub-angular blocky structure and a colour of 7.5YR56 or 5YR44 and an abrupt or clear lower boundary.

The clay lower subsoil tends to be firm with a weakly developed coarse sub-angular blocky structure and a typical colour of 2.5YR46.

Significant stone contents were not found, but the total depth to bedrock varied from 45 to over 100 cm in those profiles examined during the survey.

Subsoil resources are assessed in the table below.

Table 4: Subsoil Resources

Map unit	Texture	Depth (cm)	Area (ha)	Volume (m ³)
2	HCL	35	3.4	11900
	FSL	15	3.4	5100
	C	15	3.4	5100
3a	HCL	20	2.9	5800
	C	25	2.9	7250
3b	C	60	3.0	<u>18000</u>
			Total topsoil subsoil	<u>53150</u>

APPENDIX 1

REFERENCES

GEOLOGICAL SURVEY OF ENGLAND AND WALES, 1974, Solid and Drift edition, sheet 233, Monmouth, 1:50,000 scale

MAFF (1971) Agricultural Land Classification Map, Provisional 1:63,360, sheet 155

MAFF (1988), Agricultural Land Classification of England and Wales, Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick

METEOROLOGICAL OFFICE (1989), published climatic data extracted from the agroclimatic dataset, compiled by the Meteorological Office

SOIL SURVEY OF ENGLAND AND WALES (1983), sheet 5, Soils of South-west England, 1:250,000 scale

APPENDIX 2

DESCRIPTION OF ALC 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 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 root 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 level of yields. It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yields 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 park land, 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.

Agricultural buildings

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

Open water

Includes lakes, ponds and rivers as map scale permits.

Land not surveyed

Agricultural land which has not been surveyed.

Where the land use includes more than one of the above landcover types, eg buildings in large grounds, and where may be shown separately. Otherwise, the most extensive cover type will usually be shown.

Source: MAFF (1988) Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for Grading the Quality of Agricultural Land), Alnwick.

APPENDIX 3

DEFINITION OF SOIL WETNESS CLASSES

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years.

Wetness Class 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.

Wetness Class 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.

Wetness Class 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.

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years.

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years.

Notes: The number of days specified is not necessarily a continuous period. 'In most years' is defined as more than 10 out of 20 years.

Source: Hodgson, J M (in preparation) Soil Survey Field Handbook (revised edition).

HVP538

SITE NAME		PROFILE NO.	SLOPE AND ASPECT	LAND USE	Av Rainfall: 1029 mm	PARENT MATERIAL
Stowe Hill Quarry		Pit 2	0°	Cereals	ATO: 1328 day °C	Carboniferous limestone
JOB NO.		DATE	GRID REFERENCE	DESCRIBED BY	FC Days: 218	SOIL SAMPLE REFERENCES
56.94		17.5.94	ASP5 SO 567064	P Barnett/G M Shaw	Climatic Grade: 2	PB 133
				Exposure Grade:		

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	20	MCL	05YR43	0% Visual	None	None					CMF		Clear smooth
2	40	HCL	05YR44	0% Visual	None	Few	MCSAB	Friable	Moderate	Good	FF		Clear irregular
3	80	C	2.5YR46	0% Visual	None	Few	WCSAB	Firm		Poor	FF		

Profile Gleyed From: 40 cm

Depth to Slowly Permeable Horizon: 40 cm

Wetness Class: III

Wetness Grade: 3a

VP336-12

Available Water Wheat: 108 mm

Potatoes: 116 mm

Moisture Deficit Wheat: 71 mm

Potatoes: 55 mm

Moisture Balance Wheat: +37 mm

Potatoes: +61 mm

Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 3a

Main Limiting Factor(s): Wetness

Remarks:

80 cm plus large carboniferous stones then into pavement (based on quarry).

SITE NAME Stowe Hill Quarry		PROFILE NO. Pit 1	SLOPE AND ASPECT 0°	LAND USE Cereals	Av Rainfall: 1029 mm ATO: 1328 day °C	PARENT MATERIAL Sandstone over Carboniferous Limestone
JOB NO. 56.94		DATE 17.5.94	GRID REFERENCE ASP 8 SO 567063	DESCRIBED BY G M Shaw/P Barnett	FC Days: 218 Climatic Grade: 2 Exposure Grade:	SOIL SAMPLE REFERENCES PB 132

Horizon No.	Lowest Av. Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness: Size, Type, and Field Method	Mottling Abundance, Contrast, Size and Colour	Mangan Concs	Structure: Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots: Abundance and Size	Calcium Carbonate Content	Horizon Boundary: Distinctness and form
1	20	MZCL	75YR43	0	0	0	-	-	-	-	MF		Abrupt smooth
2	48	HCL	75YR56	0	0	0	MCSAB	Friable	Moderate	Good	FF		Abrupt smooth
3	80	FSL	10YR56	See "Remarks"	0	0	SVC Platy	Ex friable	Poor	Poor	O		Abrupt smooth
4	80+	Top of carboniferous limestone (HR)											

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 2

VP336-12

Available Water Wheat: 119 mm

Potatoes: 120 mm

Moisture Deficit Wheat: 71 mm

Potatoes: 55 mm

Moisture Balance Wheat: +48 mm

Potatoes: +65 mm

Droughtiness Grade: 1 (Calculated to 120 cm)

Final ALC Grade: 2

Main Limiting Factor(s): Workability

Remarks:

H3 is soft bedded FSST: can be broken with fingers.
Thin layer of red clay at top of H3.
Thin layer of grey clay at bottom of H3.