SFCS 2643 137/88

AVON MINERAL LOCAL PLAN: NORTH YATE, AVON

SITE PHYSICAL CHARACTERISTICS

REPORT OF SURVEY

1. Introduction

This report describes the survey of agricultural land carried out in response to a request for information from North Avon District Council in connection with the Mineral Local Plan. The area surveyed lies between Chipping Sobury and Wickwar and straddles the B4060.

The field survey work was carried out in February, 1989, by the Resource Planning Group (South West Region) in order to fulful MAFF's statutory role under the Town and Country Planning (Minerals) Act 1981, by providing a statement of the land quality and the site physical characteristics.

2. Agricultural Land Classification (ALC)

2.1 A detailed ALC survey was carried out on the 261 hectare site in order to assess the degree to which the physical characteristics of the land impose long-term limitations to its use for agriculture, using MAFF's revised guidelines and criteria for grading the quality of agricultural land. Appendix I provides a general description of MAFF's ALC grades and sub-grades.

The distribution of the ALC grades is shown on the ALC map, Map 1, at a scale of 1:10,000 and their relative proportions are detailed below in Table 1. An auger sampling density of approximately one boring per hectare was adopted and details of the soil profiles found are contained in Appendix II. The location of the auger sample points is shown on Map 2.

Table 1: Areas of Grades and Sub-grades

Grade	Area (ha)	% of Agricultural Area
3A	1.78	0.8
3B	142.47	66.5
4	70.09	32.7
Urban	26.0	100%
Farm Buildings	1.83	
Non-Agric	18.71	
Total Area	260.88 ha	Total Agricultural Area = 214.34 ha

2.2 **Climate:** estimates of important climatic variables have been obtained by interpolation from a 5 km grid database and are detailed in Table 2 below. The main parameters used in assessing 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). Together, these parameters reveal that there is no overall climatic limitation at the site.

Table 2: Climatic Interpolations*

Accumulated Temperature (ATO):	1430° days
Average Annal Rainfall (AAR):	809 mm
Field Capacity Days (FCD):	181 days
Moisture Deficit, Wheat (MD Wheat):	92 mm
Moisture Deficit, Potatoes (MD Pots):	80 mm

* For Grid Reference ST724839 at an average altitude of 100 metres. Altitude varies little over the site, but a number of interpolations were carried out to prove that the climatic interpolation is in fact representative of this large area.

2.3 **Sub-grade 3B:** The majority of the survey area falls with this classification and comprises two distinct types of soil. The extreme western edge of the site overlies hard limestone at shallow depths which has given rise to medium clay loam textured soils which are impenetrable between 20-30 cm. Soil depth is the most limiting factor in this area. Similar geology and soils also occur east of the B4060 at its junction with Brinsham Lane (ST 725848).

The rest of the 3B land has developed over Rhaetic Clay which has given rise to medium clay loam (medium silty clay loam) topsoils with deep clay subsoils which are gleyed above 40 cm. The subsoil contains a slowly permeable layer at depths less than 50 cm. At the prevailing FCD level the soils fall into Wetness Class IV which combines with the medium clay loam topsoils to produce an ALC grade of 3B.

2.4 **Grade 4:** one large Grade 4 map unit has been identified in the extreme east of the survey area. This section overlies Lower Lias Clays which have given rise to similar soils to the 3B areas with the exception of a heavy rather than a medium clay loam topsoil texture. This textural difference is significant in ALC terms because, when combined with a shallow slowly permeable layer and the prevailing FCD value, it produces a Grade 4 classification.

A small area of Grade 4 slope has been identified on the northern side of Brinsham Lane.

2.5 **Sub-grade 3A:** a very small area of 3A has been identified on the Western fringe. These soils lie within Wetness Class III as a result of slightly deeper slowly permeable layers (50-70 cm). Topsoil textures are also slightly lighter (sandy silt loam) although this has no significant effect on ALC.

3. Soil Pit Information

Map 2 shows the six sites at which soil pits were dug to examine the soil properties in greater detail and Appendix III contains the results of their

descriptions. The pits were chosen to be representative of the profiles occurring thoughout the area and to facilitate examination of soil structure.

Pits 1 and 2 are typical of the deep 3B sites and reveal structural units below approximately 40 cm which obstruct the free drainage of excess water through the profile and cause wetness and workability problems above. Clay content gradually increases with depth producing very heavy subsoils with low porosity.

Pit 4 is typical of the Grade 4 soils, and reveals wetness problems at very shallow depths. Soil structure immediately below the topsoil becomes coarse and angular with sharply reduced porosity. Good levels of farm management could reduce this obstruction, at least to a depth of 35 cm.

Pit 5 describes a very small area of stony topsoils (20% >2 cm) with a zone below of 20 cm of mostly weathered rock with approximately 30% soil resource.

4. Soil Resources: Topsoil

'Topsoil' is defined as the organic rich surface horizons. A broad distinction can be made between the medium and heavy topsoil textures which mirror the ALC map units 3B and 4 respectively, and these distinct topsoils should be handled separately as they are significantly different in terms of workability.

Average topsoil depth varies little over the site and is typically 20 cm deep. One additional map unit of medium and light textures has been identified north of Yate Rocks where topsoil is typically 30 cm deep.

A total topsoil resource of 435,360 m³ is available (see Table 3 for details and Map 3 for distribution).

Table 3: Topsoil Resources

Map Unit	Average Depth (cm)	Area (ha)	Volume (m³)
Topsoil A[1]	20	137.57	275,140
Topsoil B[2]	30	6.68	20,040
Topsoil C[3]	20	70.09	140,180
		214.34 ha	435,360 m³

Note: 1: Medium Clay Loam and Medium Silty Clay Loam
2: Medium Clay Loam, Medium Silty Clay Loam and Fine Sandy Silt Loam
3: Heavy Clay Loam and Heavy Silty Clay Loam

Topsils from map unit C should be kept separate from units A and B (which may be handled together).

5. Soil Resources: Subsoil

'Subsoil' is defined as the non-organic rich lower horizons. Over the majority of the site a deep clay textured subsoil extends to below 100 cm and should be stripped to at least 120 cm where possible (this will permit full rooting depth of cereals on the restored land). A small area in the extreme south east has a clay subsoil extending to only 50 cm depth. At four limited sites

an upper subsoil horizon of heavy clay loam has been identified extending below the topsoil to a depth of 50 or 60 cms. This resource should be stripped and handled separately from the lower clay horizons where possible.

A total subsoil resource of 1,598,730 m³ is available (see Table 4 for details and Map 4 for distribution).

Much of the western fringes, where the topsoil overlies hard limestone, has no subsoil resource available. This affects 51.59 ha.

Table 4: Subsoil resources

Map Unit	Average Depth (cm)	Area (ha)	Volume (m³)
A[1]	100	149.40	1,494,000
B[2]	30	4.11	12,330
C[3]	100	7.18	71,800
D[4]	100	2.06	20,600
		162.75 ha	1,598,730 m³

Note: 1: Clay to Depth
2: Clay to 50 cm; Impenetrable below
3: HCL to 50 cm (21,540 m³); Clay below to depth (50,260 m³)
4: HCL to 60 cm (8,240 m³): Clay to depth (12,360 m³)

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 and 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 into 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 poorer farmland predominates. The remainder is very poor quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

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 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 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 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: golf courses, 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 (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 land cover types, eg 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

Soil Profile Descriptions: Explanatory Note

Soil texture classes are denoted by the following abbreviations:

Sand **S**; Loamy Sand **LS** Sandy Loam **SL**; Sand Silt Loam **SZL**; Silt Loam **ZL**;

Medium Silty Clay Loam **MZCL**; Medium Clay Loam **MCL**; Sandy Clay Loam **SCL**;

Heavy Silty Clay Loam **HZCL**; Heavy Clay Loam **HCL**; Sandy Clay **SC**;

Silty Clay **ZC**; Clay **C**

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, thus:

F fine (more than $\frac{2}{3}$ of 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:

Peat **P**; Sandy Peat **SP**; Loamy Peat **LP**; Peaty Loam **PL**;
Peaty Sand **PS**; Marine Light Silts **MZ**

The prefix "**Calc**" is used to identify naturally calcareous soils containing more than 1% Calcium Carbonate.

For organic mineral soils, the texture of the mineral fraction is prefixed by "**org**".

Other notation:

st	stones (6 cm)
sst	small stones (2 cm - 6 cm)
vsst	very small stones (2 mm - 2 cm)
Mn	manganese
cdom/cfom	common distinct/feint ochreous mottles
mpom	many prominent ochreous mottles (**VMPOM** = very many ..)

Few = 1-5%; **common** = 6-15%; **many** = 16-35%; **very many** = +35%

APPENDIX 3

SOIL PIT DESCRIPSIONS

Pit No 1

Topsoil	:	0-24 cm Medium Silty Clay Loam Grey Matrix Colour (10YR41) Medium to Coarse Subangular Blocky 1-2% Biopores
Subsoil 1	:	24-40 cm Clay Matrix Colour obscured by intense ochreous and grey mottling Well developed Medium Angular Blocky (some Coarse) Approx 1% Biopores
Subsoil 2	:	40-120+ cm Clay Gradual change at approx. 40 cm Intense mottling Moderately developed Coarse Angular Blocky (some Medium) Low porosity (approx. 0.5% biopores) Calcareous (increasing with depth)

Soil Pit dug to 75 cm; augered to 120 cm
Slowly Permeable Layer at less than 50 cm; Wetness Class IV; Grade 3B

Pit No 2

Topsoil	:	0-19 cm Medium Silty Clay Loam 10YR42/10YR33 Medium Sub-Angular Blocky
Subsoil 1	:	19-40 cm Clay 2.5Y62; grey matrix over 35% ochreous mottles Coarse Angular Blocky (just over 20 mm)
Subsoil 2	:	40-52 cm Transitional from Subsoil 1; no abrupt change Clay 2.5Y62; grey matrix Coarse Angular Blocky with some Medium Blocky between the larger structural units Common Manganese over 35% ochreous mottling Less than 0.5% biopores
Subsoil 3	:	52-120+ cm Clay 5Y62; light olive grey Calcareous approx 20% ochreous mottling Coarse Angular Blocky Less than 0.5% biopores

Soil Pit dug to 85 cm
Slowly Permeable Layer at less than 50 cm; Wetness Class IV; Grade 3B

Pit No 3

Topsoil	:	0-20 cm Medium Silty Clay Loam Mottle free 10YR32/33 Fine Subangular Blocky to Medium Granular Approx, 10% of hard stone (greater than 6 cm); visual replacement
Rock	:	20-44 cm Profile Impenetrable at 20 cm to soil auger Rock broken up by pick-axe along lines of weakness to a depth of 44 cm. Lines of weakness are soil stained and reveal penetration by roots and water to at least this depth Minimal percentage of soil in this layer.

Pit No 4

Topsoil : 0-20 cm
Heavy Clay Loam
10YR42

Subsoil 1 : 20-58 cm
Clay
2.5Y52/62
Very many ochreous and grey mottling
Moderately developed Coarse Angular Blocky Structure
Less than 0.5% biopores
Slowly Permeable Layer

Subsoil 2 : 58-105 cm
Raw grey mottled calcareous Clay

Impenetrable : + 105 cm

Soil Pit dug to 60 cm; augered to 105 cm
Slowly Permeable Layer at less than 50 cm; Wetness Class IV; Grade 4

Pit No 5

Topsoil : 0-30 cm
Medium Clay Loam
20% stones larger than 2 cm (most in the range 2-6 cm); not a soft limestone, slightly hardened, but one that can still be scratched

Subsoil : 30- approx 50 cm
Medium Clay Loam
Approximately 70% stones/weathered rock

Rock : 50-120 cm

Grade according to Droughtiness is 3A; according to Stone Content = 3B

Pit No 6

Topsoil : 0-26 cm
Medium Clay Loam (towards HCL)
10YR42/43

Rock : +26 cm
Rock just shatters by pick-axe between 26-33 cm;
Impenetrable below 33 cm
Hard rock (not scratched)

Grade according to Soil Depth and Droughtiness = 3B