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WEST SUSSEX MINERALS PLAN
SITE 14 : DENSWORTH
AGRICULTURAL LAND CLASSIFICATION
ALC MAP & REPORT
SEPTEMBER 1993

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AGRICULTURAL LAND CLASSIFICATION REPORT**

1.0 Summary

1.1 ADAS was commissioned by MAFF's Land Use Planning Unit to provide information on land quality on a number of sites in West Sussex. The work forms part of MAFF's statutory input to the preparation of the West Sussex Minerals Plan.

1.2 Approximately 10 hectares of land relating to Site 14, west of Chapel Lane in Densworth, in West Sussex was surveyed during September 1993. The survey was undertaken at a detailed level of approximately one boring per hectare. A total of 11 soil auger borings and 2 soil inspection pits 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 Work was conducted by members of the Resource Planning Team in the Guildford Statutory Group. At the time of the survey the majority of the land was in cereal stubble, with the south-western most field under permanent grass.

1.4 The distribution of 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 1:5,000. It is accurate at this scale, but any enlargement would be misleading. This map supersedes any previous information for this site.

Table 1 : Distribution of Grades and Subgrades

<u>Grade</u>	<u>Area (ha)</u>	<u>% of Site</u>	<u>% of Agricultural Area</u>
2	5.8	56.3	59.2
3b	4.0	38.8	40.8
Urban	0.4	3.9	100 (9.8 ha)
Non Agricultural	<u>0.1</u>	<u>1.0</u>	
Total	10.3	100	

1.5 Appendix 1 gives a general description of the grades, subgrades and land use categories identified in the survey. 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.

1.6 The site has been classified as a mixture of Grade 2 and Subgrade 3a. Very good quality agricultural land, Grade 2, corresponds to soils with a slight droughtiness limitation. Profiles comprise slightly stony medium clay loam topsoils overlying slightly stony similar textured subsoils which become heavier and stonier at depth. Moderate quality agricultural land, Subgrade 3a, has been downgraded because of a significant soil droughtiness limitation. Moderately stony medium clay loam topsoils are underlain by very stony heavy textured subsoils.

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 the 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.

2.3 A detailed assessment of the prevailing climate was made by interpolation from a 5km gridpoint dataset (Met. Office 1989). The details are given in the table below and these show that there is no overall climatic limitation affecting the site. However, climatic factors do interact with soil factors to influence soil wetness and droughtiness. At this locality, the soil moisture deficits are relatively high, thus increasing the likelihood of soil droughtiness.

2.4 No local climatic factors such as exposure or frost risk affect the site.

Table 2 : Climatic Interpolation

Grid Reference :	SU832050
Altitude (m) :	25
Accumulated Temperature (days) :	1522
Average Annual Rainfall (mm) :	784
Field Capacity (days) :	159
Moisture Deficit, Wheat (mm) :	116
Moisture Deficit, Potatoes (mm) :	112
Overall Climatic Grade :	1

3.0 Relief

3.1 The survey area occupies a gentle V-shaped valley. The middle of the site, in the base of the valley, lies at 25m. The eastern and western boundaries lie along flatter, higher land at 30m. Nowhere on the site does gradient or relief impose any limitation to the land quality.

4.0 Geology and Soil

4.1 British Geological Survey (1957), Sheet 317, Chichester, shows the entire site to be underlain by Valley Gravel.

4.2 The soil type for the site, shown on the Soil Survey map of South East England (SSEW, 1983, 1:250,000) comprises the Charity 1 Association. These soils are described as 'well drained fine silty and fine silty over clayey soils, locally very flinty, some shallow over flint gravel' (SSEW, 1983).

5.0 Agricultural Land Classification

5.1 Table 1 provides the details of the area measurements for each grade and the distribution of each grade is shown on the attached ALC map.

5.2 The location of the soil observation points are shown on the attached sample point map.

Grade 2

5.3 Very good quality agricultural land, Grade 2, corresponds to land with a slight soil droughtiness limitation. This slightly restricts the available water for crops in the profile, which consequently reduces the range of crops which can be grown. Grade 2 land was found along the sides and base of the valley. Soils comprise medium clay loam and, occasionally, medium silty clay loam topsoils which are underlain by similar textured, moderately structured subsoils which become heavier with depth. Generally, topsoils are slightly stony (around 7% total hard flint rock by volume) and subsoils very slightly stony (2-5% total hard flint rock by volume). However, as shown by Pit 1 (which was dug to 120cm), at approximately 90cm depth, soils become moderately stony (33% total hard flint rock by volume) and were impenetrable to an auger. The combination of these soil textures, stone contents, substructural conditions and the local climatic regime (one in which the soil moisture deficits are relatively high) means this land can be classified no better than Grade 2. All stone contents were measured using volumetric displacement.

Subgrade 3a

5.4 The remaining flatter, higher areas of the site have been assessed as Subgrade 3a with soil droughtiness being the principal limitation. This reduces the available water for crops in the profile, which consequently limits the range of crops which can be grown. Pit 2 is typical of such profiles. Slightly stony (15% total hard flint rock by volume) medium clay loam topsoils overlie slightly stony (12% total hard flint rock by volume) moderately structured heavy clay loam upper subsoils. At approximately 52cm depth, soils become heavier textured and very stony (50% total hard flint rock by volume), and were impenetrable to an auger. At the time of survey, common rooting was observed to 52cm depth in soil inspection Pit 2 (which was dug to 120cm). However, it is thought that these clay lower subsoils would retain water in droughty periods, and if necessary roots would be able to extend to at least 120cm depth. Consequently, the combination of soil textures, stone contents, moderate substructural conditions and the local climatic regime (one in which the soil moisture deficits are relatively high) means this land is assessed as Subgrade 3a. All stone contents were measured using volumetric displacement.

APPENDIX I

DESCRIPTION OF THE GRADES AND SUB-GRADES

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 or horticultural crops can usually be grown but on some land on 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. When more demanding crops are grown yields are generally lower or more variable than on land in grades 1 and 2.

Sub-grade 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.

Sub-grade 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 the 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.

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture : 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.

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, eg. buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will be shown.

APPENDIX II

REFERENCES

- * British Geological Survey (1957), Sheet No. 317, Chichester, 1:50,000
- * MAFF (1988), Agricultural Land Classification of England And Wales : Revised guidelines and criteria for grading the quality of agricultural land.
- * Meteorological Office (1989), Climatological Data Sets for Agricultural Land Classification.
- * Soil Survey of England and Wales (1983), Sheet 6, Soils of South East England, 1:250,000 and accompanying legend.

APPENDIX III

DEFINITION OF SOIL WETNESS CLASSES

Wetness Class I

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

Wetness Class II

The soil profile is wet within 70cm depth for 31-90 days in most years or, if there is no slowly permeable layer within 80cm depth, it is wet within 70cm for more than 90 days, but not wet within 40cm depth for more than 30 days in most years.

Wetness Class III

The soil profile is wet within 70cm depth for 91-180 days in most years or, if there is no slowly permeable layer within 80cm depth, it is wet within 70cm for more than 180 days, but only wet within 40cm depth for 31-90 days in most years.

Wetness Class IV

The soil profile is wet within 70cm depth for more than 180 days but not wet within 40cm depth for more than 210 days in most years or, if there is no slowly permeable layer within 80cm depth, it is wet within 40cm depth for 91-210 days in most years.

Wetness Class V

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

Wetness Class VI

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

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

APPENDIX IV

SOIL PIT AND SOIL BORING DESCRIPTIONS

- Contents :
- * Soil Abbreviations : Explanatory Note
 - * Soil Pit Descriptions
 - * Database Printout : Boring Level Information
 - * Database Printout : Horizon Level Information

SOIL PROFILE DESCRIPTIONS : EXPLANATORY NOTE

Soil pit and auger boring information collected during ALC fieldwork is held on a database. This has commonly used notations and abbreviations as set out below.

Boring Header Information

1. **GRID REF** : national grid square and 8 figure grid reference.

2. **USE** : Land use at the time of survey. The following abbreviations are used.

ARA : Arable **WHT** : Wheat **BAR** : Barley **CER** : Cereals **OAT** : Oats **MZE** : Maize **OSR** : Oilseed rape
BEN : Field Beans **BRA** : Brassicae **POT** : Potatoes **SBT** : Sugar Beet **FCD** : Fodder Crops **LIN** : Linseed
FRT : Soft and Top Fruit **HRT** : Horticultural Crops **PGR** : Permanent Pasture **LEY** : Ley Grass **RGR** : Rough Grazing
SCR : Scrub **CFW** : Coniferous Woodland **DCW** : Deciduous Woodland **HTH** : Heathland **BOG** : Bog or Marsh
FLW : Fallow **PLO** : Ploughed **SAS** : Set aside **OTH** : Other

3. **GRDNT** : Gradient as measured by a hand-held optical clinometer.

4. **GLEY/SPL** : Depth in cm to gleying or slowly permeable layers.

5. **AP (WHEAT/POTS)** : Crop-adjusted available water capacity.

6. **MB (WHEAT/POTS)** : Moisture Balance.

7. **DRT** : Best grade according to soil droughtiness.

8. If any of the following factors are considered significant, an entry of 'Y' will be entered in the relevant column.

MREL : Microrelief limitation **FLOOD** : Flood risk **EROSN** : Soil erosion risk **EXP** : Exposure limitation **FROST** : Frost
DIST : Disturbed land **CHEM** : Chemical limitation

9. **LIMIT** : The main limitation to land quality. The following abbreviations are used.

OC : Overall Climate **AE** : Aspect **EX** : Exposure **FR** : Frost Risk **GR** : Gradient **MR** : Microrelief
FL : Flood Risk **TX** : Topsoil Texture **DP** : Soil Depth **CH** : Chemical **WE** : Wetness **WK** : Workability
DR : Drought **ER** : Soil Erosion Risk **WD** : Combined Soil Wetness/Droughtiness **ST** : Topsoil Stoniness

Soil Pits and Auger Borings

1. **TEXTURE** : soil texture classes are denoted by the following abbreviations.

S : Sand **LS** : Loamy Sand **SL** : Sandy Loam **SZL** : Sandy Silt Loam **CL** : Clay Loam **ZCL** : Silty Clay Loam
SCL : Sandy Clay Loam **C** : Clay **SC** : Sandy Clay **ZC** : Silty Clay **OL** : Organic Loam **P** : Peat **SP** : Sandy Peat
LP : Loamy Peat **PL** : Peaty Loam **PS** : Peaty Sand **MZ** : Marine Light Silts

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

F : Fine (more than 66% of the sand less than 0.2mm)

M : Medium (less than 66% fine sand and less than 33% coarse sand)

C : Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content.

M : Medium (< 27% clay) **H** : Heavy (27-35% clay)

2. **MOTTLE COL** : Mottle colour

3. **MOTTLE ABUN** : Mottle abundance, expressed as a percentage of the matrix or surface described.

F : few <2% C : common 2-20% M : many 20-40 VM : very many 40% +

4. **MOTTLE CONT** : Mottle contrast

F : faint - indistinct mottles, evident only on close inspection 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** : One of the following is used.

HR : all hard rocks and stones MSST : soft, medium or coarse grained sandstone

SI : soft weathered igneous or metamorphic SLST : soft oolitic or dolimitic 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 (> 2cm, > 6cm 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 developed

- ped size F : fine M : medium C : coarse VC : very coarse

- ped shape S : single grain M : massive GR : granular AB : angular blocky SAB : sub-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

SOIL PIT DESCRIPTION

Site Name : W.SSX MINS, SITE 14 Pit Number : 1P

Grid Reference: SUB3200730 Average Annual Rainfall : 784 mm
 Accumulated Temperature : 1522 degree days
 Field Capacity Level : 159 days
 Land Use : Arable
 Slope and Aspect : 01 degrees SE

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	MOTTLES	STRUCTURE
0- 34	MCL	10YR43 00	2	7		MDCSAB
34- 85	C	75YR54 00	0	0		MDCSAB
85-100	C	75YR54 00	0	0	C	MDCSAB
100-120	C	10YR56 00	0	33		

Wetness Grade : 1 Wetness Class : I
 Gleying : 000 cm
 SPL : No SPL

Drought Grade : 2 APW : 134mm MBW : 18 mm
 APP : 115mm MBP : 3 mm

FINAL ALC GRADE : 2
 MAIN LIMITATION : Droughtiness

SOIL PIT DESCRIPTION

Site Name : W.SSX MINS, SITE 14 Pit Number : 2P

Grid Reference: SUB3310715 Average Annual Rainfall : 784 mm
Accumulated Temperature : 1522 degree days
Field Capacity Level : 159 days
Land Use : Arable
Slope and Aspect : 01 degrees W

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	MOTTLES	STRUCTURE
0- 32	MCL	10YR43 00	3	15		WDMSAB
32- 52	HCL	10YR54 00	0	12		MDCSAB
52- 65	C	75YR56 00	0	50		MDCAB
65-120	C	75YR56 00	0	54		

Wetness Grade : 1 Wetness Class : I
Gleying : 000 cm
SPL : No SPL

Drought Grade : 3A APW : 104mm MBW : -12 mm
APP : 93 mm MBP : -19 mm

FINAL ALC GRADE : 3A
MAIN LIMITATION : Droughtiness

SAMPLE NO.	GRID REF	ASPECT USE	GRDNT	GLEYSPL	--WETNESS--		-WHEAT-		-POTS-		M.REL		EROSN	FROST	CHEM	ALC	COMMENTS
					CLASS	GRADE	AP	MB	AP	MB	DRT	FLOOD	EXP	DIST	LIMIT		
1	SUB3230749	ARA		000	1	1	60	-56	60	-52	4					DR 3B	IMPEN 40 -Q DR
1P	SUB3200730	ARA SE	01	000	1	1	134	18	115	3	2					DR 2	PIT DUG TO 120
2	SUB3300750	ARA		000	1	1	66	-50	66	-46	3B					DR 3A	IMPEN 45 -Q DR
2P	SUB3310715	ARA W	01	000	1	1	104	-12	93	-19	3A					DR 3A	PIT DUG TO 120
3	SUB3200740	ARA		000	1	1	111	-5	106	-6	3A					DR 2	IMPEN 95 -Q DR
4	SUB3300740	ARA SE	02	000	1	1	111	-5	114	2	3A					DR 2	IMPEN 82 -Q DR
5	SUB3200730	STB		000	1	1	140	24	116	4	2					DR 2	60-120 - Q SPL
6	SUB3300730	STB		000	1	1	135	19	112	0	2					DR 2	LESS STONY
7	SUB3400730	STB		000	1	1	73	-43	73	-39	3B					DR 3B	IMPEN 45 -Q DR
8	SUB3100720	PGR		000	1	2	93	-23	98	-14	3B					DR 3B	IMPEN 60 -Q DR
9	SUB3200720	STB W	01	050 050	3	3A	125	9	99	-13	3A					DR 3A	GR 3A - WE/DR
0	SUB3300720	STB W	01	000	1	1	107	-9	103	-9	3A					DR 3A	IMPEN 90 -Q DR
1	SUB3300710	STB		000	1	1	73	-43	74	-38	3B					DR 3B	IMPEN 52 -Q DR

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----- PED			----STONES-----			STRUCT/	SUBS	SPL	CALC					
				COL	ABUN	CONT	COL.	GLEY	>2					>6	LITH	TOT	CONSIST	STR
1	0-28	mc1	10YR42 00							2	0	HR	12					
	28-40	hc1	10YR54 00							0	0	HR	20			M		
1P	0-34	mc1	10YR43 00							2	0	HR	7	MCSAB	FR	M	Y	
	34-85	c	75YR54 00				75YR44 00			0	0		0	MCSAB	FR	M	Y	
	85-100	c	75YR54 00	10YR56 00	C					0	0		0	MCSAB	FR	M	Y	
	100-120	c	10YR56 00							0	0	HR	33			M		
2	0-25	mc1	10YR53 00							5	0	HR	15					
	25-45	mc1	10YR54 00							0	0	HR	15			M		
2P	0-32	mc1	10YR43 00							3	0	HR	15	WDMSAB	FR	M	Y	
	32-52	hc1	10YR54 00							0	0	HR	12	MCSAB	FR	M	Y	
	52-65	c	75YR56 00							0	0	HR	50	MDCAB	FM	M	Y	
	65-120	c	75YR56 00							0	0	HR	54			M	Y	
3	0-30	mc1	10YR53 00							7	0	HR	17					
	30-55	mc1	10YR54 00							0	0	HR	5			M		
	55-85	c	75YR54 00							0	0	HR	5			M		
	85-95	c	75YR56 00							0	0	HR	5			M		
4	0-30	mc1	10YR43 00							2	0	HR	7					
	30-60	mc1	10YR54 00							0	0	HR	2			M		
	60-75	mzc1	10YR54 00							0	0	HR	2			M		
	75-82	c	75YR54 00							0	0	HR	10			M		
5	0-30	hzc1	10YR53 00							0	0	HR	8					
	30-45	hc1	75YR54 00							0	0	HR	2			M		
	45-60	c	75YR56 00							0	0		0			M		
	60-120	c	75YR56 00	00MNO0 00	F					0	0		0			M		
6	0-25	mzc1	10YR43 00							0	0	HR	10					
	25-50	hc1	10YR54 00							0	0	HR	5			M		
	50-120	c	75YR56 00							0	0	HR	5			M		
7	0-30	mzc1	10YR43 00							0	0	HR	9					
	30-45	mzc1	10YR53 00							0	0	HR	20			M		
8	0-30	hzc1	10YR44 00							0	0	HR	6					
	30-60	hc1	10YR54 00							0	0	HR	8			M		
9	0-30	mc1	10YR43 00							1	0	HR	8					
	30-50	mc1	10YR54 00							0	0	HR	30			M		
	50-78	c	10YR53 00	10YR58 00	M				Y	0	0		0			P	Y	Y
	78-120	c	10YR58 00						Y	0	0	HR	2			M	Y	
10	0-22	mzc1	10YR43 00							1	0	HR	5					
	22-30	mc1	10YR54 00	10YR56 00	F					0	0	HR	15			M		
	30-70	mc1	10YR54 00							0	0	HR	20			M		
	70-90	mc1	10YR54 00							0	0	HR	30			M		

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES-----		PED	----STONES----			STRUCT/	SUBS			
				COL	ABUN	CONT	COL.	GLEY >2	>6	LITH TOT	CONSIST	STR	POR	IMP
11	0-20	mc1	10YR43 00	10YR56	00	F		1	0	HR	8			
	20-30	mc1	10YR43 00					0	0	HR	20		M	
	30-45	mc1	10YR56 00	10YR43	00	C		0	0	HR	20		M	
	45-52	mc1	10YR56 00					0	0	HR	25		M	