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KENT MINERALS LOCAL PLAN REVIEW
Land east of Sevenoaks Quarry, Seal, Kent

Agricultural Land Classification
ALC Map and Report

October 1998

Resource Planning Team
Eastern Region
FRCA Reading

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AGRICULTURAL LAND CLASSIFICATION REPORT

KENT MINERALS LOCAL PLAN REVIEW LAND EAST OF SEVENOAKS QUARRY, SEAL, KENT

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey of 5.1 ha of land east of Sevenoaks Quarry at Seal, north-east of Sevenoaks in Kent. The survey was carried out during October 1998.
2. The survey was undertaken by the Farming and Rural Conservation Agency (FRCA)¹ on behalf of the Ministry of Agriculture, Fisheries and Food (MAFF), in connection with its statutory input to the Kent Minerals Local Plan Review. The survey supersedes any previous ALC information for this land.
3. The work was conducted by members of the Resource Planning Team in the Eastern Region of FRCA. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.
4. At the time of survey agricultural land use was stubble following a crop of linseed. The areas mapped as 'Other land' comprise a farm building and woodland.

SUMMARY

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10,000. It is accurate at this scale but any enlargement would be misleading.
6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1.

Table 1: Area of grades and other land

Grade/Other land	Area (hectares)	% surveyed area	% site area
3a	1.1	25.0	21.6
3b	3.3	75.0	64.7
Other land	0.7	-	13.7
Total surveyed area	4.4	100.0	86.3
Total site area	5.1	-	100.0

7. The fieldwork was conducted at an average density of 1 boring per hectare. In total, 8 borings and two soil pits were described.

¹ FRCA is an executive agency of MAFF and the Welsh Office

8. The agricultural land at this site has been classified as Subgrade 3a (good quality) and Subgrade 3b (moderate quality). The principal limitations include soil wetness and soil droughtiness.
9. The land classified as Subgrade 3a is located in the south-west of the site. Soils in this area comprise deep, medium loamy topsoils overlying similar and more clayey subsoils. The soils are moderately to very stony and, given the local climate, the reserves of soil available water are restricted. This acts to impart a soil droughtiness limitation which may slightly lower the level and consistency of crop yields. In many cases the profiles also exhibit some signs of soil wetness.
10. Where Subgrade 3b land is mapped, soil wetness or topsoil stoniness are the main limiting factors. Soils are deep but have a higher clay content than the Subgrade 3a soils. Evidence of significant soil wetness is common, related to the presence of poorly structured clay subsoils which obstruct drainage through the profile. Soil wetness reduces the versatility of the land in terms of access by machinery (e.g. for cultivations or harvesting) and grazing by livestock if damage to the soil is to be avoided. Soil wetness will also adversely affect seed germination and root growth and will therefore reduce the level and consistency of yields. Where topsoil stoniness is the most limiting factor, the presence of large amounts of stone will increase production costs by causing wear and tear to implements and tyres, and crop quality will also be affected.

FACTORS INFLUENCING ALC GRADE

Climate

11. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.
12. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5km grid datasets using the standard interpolation procedures (Met. Office, 1989).
13. 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.

Table 2: Climatic and altitude data

Factor	Units	Values	
		TQ 546 575	TQ 546 574
Grid reference	N/A		
Altitude	m, AOD	90	95
Accumulated Temperature	day°C (Jan-June)	1408	1403
Average Annual Rainfall	mm	745	749
Field Capacity Days	days	157	156
Moisture Deficit, Wheat	mm	103	104
Moisture Deficit, Potatoes	mm	94	95
Overall climatic grade	N/A	Grade 1	Grade 1

14. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (AT0, January to June), as a measure of the relative warmth of a locality.
15. The combination of rainfall and temperature at this site means that there is no overall climatic limitation, and in addition the site does not suffer from exposure or frost risk. As such, the site may be considered as being climatically Grade 1. However, climatic factors do interact with soil properties to influence soil wetness and soil droughtiness.

Site

16. The survey area lies between approximately 90m and 95m AOD. The highest land is located towards the south of the site with a gentle slope towards the north-east. Nowhere on the site do gradient, microrelief or flooding adversely affect agricultural land quality.

Geology and soils

17. The most detailed published geological information for this area (BGS, 1971) maps the majority of the site to comprise solid Gault, with Folkestone Beds in the south.
18. The most recent published soils information covering the area (SSEW, 1983) shows the site to consist of soils from the Denchworth and Fyfield 2 Association. Soils of the Denchworth Association are described as 'Slowly permeable seasonally waterlogged clayey soils with slight seasonal waterlogging with similar fine loamy over clayey soils. Some fine loamy over clayey soils with slight seasonal waterlogging and some slowly permeable calcareous clayey soils. Landslips and associated irregular terrain locally' (SSEW, 1983). These soils are similarly described in Soils of Kent (SSEW, 1980).
19. Soils of the Fyfield 2 Association are described as 'Well drained coarse loamy and sandy soils over sands and sandstones. Some very acid sandy soils with bleached subsurface horizons on heaths and in woodlands. Risk of water erosion' (SSEW, 1983)

AGRICULTURAL LAND CLASSIFICATION

20. The details of the classification of the survey area are shown on the attached ALC map and the area statistics of each grade are given in Table 1.
21. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix II.

Subgrade 3a

22. Land of good quality has been mapped in the south-west of the site. The principal limitation is soil droughtiness and the profiles are typified by soil pit 2 (see Appendix II). Soil profiles in this area typically comprise a non-calcareous medium clay loam topsoil overlying heavy clay loam or clay upper subsoils over clay lower subsoils. The profiles are moderately to very stony, with up to 57% hard stones by volume occurring in the subsoil. In the local climate this acts to impart a soil droughtiness limitation which may lower the consistency of

crop yields and thus Subgrade 3a is appropriate. At the time of survey, the pit was impenetrable below 80 cm due to the high stone content. Roots may be able to penetrate further, but they would have to extend to 120 cm before being eligible for Grade 2. As stone contents below 80 cm may increase, this leads to the land being placed in Subgrade 3a.

23. Ochreous mottles in pale coloured matrices occur within 40 cm of the surface and indicate that soil wetness is present in these soils. However, the pit confirms that the subsoil horizons are not slowly permeable and, in the local climate, this places these profiles in Wetness Class II. When combined with the medium clay loam topsoils this land only experiences a Grade 2 wetness limitation. Soil droughtiness is therefore the most limiting factor.
24. Although isolated borings of grade 2 quality occur within this area, Subgrade 3a is the most appropriate overall grade.

Subgrade 3b

25. Land of moderate quality has been mapped over the greater part of the site. The principal limitation within this area is soil wetness and the profiles are typified by soil pit 2 (see Appendix II).
26. The soils within this area typically comprise medium clay loam topsoils over clay upper subsoils and clay lower subsoils. The soils are moderately stony containing up to 10% hard stones by volume throughout. The upper subsoils exhibit signs of wetness in the form of ochreous mottles in a pale coloured matrix. The pit confirms that this horizon forms a slowly permeable layer and, in the local climate, this places these profiles in Wetness Class IV. When combined with the medium clay loam topsoils this leads to Subgrade 3b being appropriate. The drainage impedance is sufficient to give some restriction on access to the land for cultivations and/or grazing if soil damage is to be avoided. The imperfect drainage is also likely to cause crop yields to be less consistent than on land of higher quality.
27. Within this subgrade there are areas where the volume of stones in the topsoil greater than 2 cm diameter, is sufficient to limit the land to Subgrade 3b. The main effect of stones are to act as an impediment to cultivation, harvesting and crop growth. A high stone content can increase production costs by causing extra wear and tear to implements and tyres. Crop quality may be reduced in stony soils by causing, for example, the distortion of root crops or bruising of potatoes during harvesting. Stones can impair crop establishment by causing reduced plant populations in precision drilled crops, and they reduce the nutrient capacity of the soil.

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SOURCES OF REFERENCE

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Met. Office: Bracknell.

Soil Survey of England and Wales (1980) *Soils of Kent, Soil Survey Bulletin No. 9*.
SSEW: Harpenden

Soil Survey of England and Wales (1983) *Sheet 6, Soils of South East England, 1:250,000*.
SSEW: Harpenden

APPENDIX I

DESCRIPTIONS OF THE 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 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 of this 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 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the 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.

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 the level of yields. It is mainly suited to grass with occasional arable crops (e.g. 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 severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

SOIL DATA

Contents:

Sample location map

Soil abbreviations - explanatory note

Soil pit and soil boring descriptions (boring and horizon levels)

SOIL PROFILE DESCRIPTIONS: EXPLANATORY NOTE

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

Boring Header Information

1. **GRID REF:** national 100 km 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	FLW: Fallow
PGR: Permanent pasture	LEY: Ley grass	RGR: Rough grazing
SCR: Scrub	CFW: Coniferous woodland	OTH: Other
DCW: Deciduous woodland	BOG: Bog or marsh	SAS: Set-Aside
HTH: Heathland	HRT: Horticultural crops	PLO: Ploughed

3. **GRDNT:** Gradient as estimated or measured by a hand-held optical clinometer.
4. **GLEYSPL:** Depth in centimetres (cm) to gleying and/or slowly permeable layers.
5. **AP (WHEAT/POTS):** Crop-adjusted available water capacity.
6. **MB (WHEAT/POTS):** Moisture Balance. (Crop adjusted AP - crop adjusted MD)
7. **DRT:** Best grade according to soil droughtiness.
8. If any of the following factors are considered significant, 'Y' will be entered in the relevant column:

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

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

OC: Overall Climate	AE: Aspect	ST: Topsoil Stoniness
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: Erosion Risk	WD: Soil Wetness/Droughtiness
EX: Exposure		

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
ZL: Silt 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 the following 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 using Munsell notation.

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 using Munsell notation.

6. **GLEYS:** If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

7. **STONE LITH:** Stone Lithology - one of the following is used:

HR:	all hard rocks and stones	FSST:	soft, fine grained sandstone
ZR:	soft, argillaceous, or silty rocks	CH:	chalk
MSST:	soft, medium grained sandstone	GS:	gravel with porous (soft) stones
SI:	soft weathered igneous/metamorphic rock	GH:	gravel with non-porous (hard) stones

Stone contents (>2cm, >6cm and total) are given in percentages (by volume).

8. **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	
Ped shape	S: single grain	M: massive
	GR: granular	AB: angular blocky
	SAB: sub-angular blocky	PR: prismatic
	PL: platy	

9. **CONSIST:** Soil consistence is described using the following notation:

L: loose	FM: firm	EH: extremely hard
VF: very friable	VM: very firm	
FR: friable	EM: extremely firm	

10. **SUBS STR:** Subsoil structural condition recorded for the purpose of calculating profile droughtiness:

G: good M: moderate P: poor

11. **POR:** Soil porosity. If a soil horizon has less than 0.5% biopores >0.5 mm, a 'Y' will appear in this column.

12. **IMP:** If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

13. **SPL:** Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

14. **CALC:** If the soil horizon is calcareous, a 'Y' will appear in this column.

15. 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

SAMPLE NO.	GRID REF	USE	ASPECT		--WETNESS--				-WHEAT-		-POTS-		M.REL		EROSN	FROST	CHEM	ALC	COMMENTS
			GRDNT	GLEY	SPL	CLASS	GRADE	AP	MB	AP	MB	DRT	FLOOD	EXP	DIST	LIMIT			
1	TQ545 575	STU	NE	4	30	30	4	3B	100	-4	99	4					WE	3B	IMP 90
2	TQ546 575	STB	NE	2	60	60	3	3A	106	2	81	-14					ST	3B	
3	TQ545 574	STU	NE	2	30	30	4	3B	123	19	99	4					WE	3B	
4	TQ546 574	STB			000	28	4	3B	136	32	112	17					WE	3B	
5	TQ545 573	STU	E	2	30	75	2	2	135	31	108	13					WE	2	QSPL75
6	TQ544 573	STB			28	28	4	3B		0		0					WE	3B	
7	TQ546 573	STU	NE	2			1	1	74	-30	77	-18					DR	3B	IMP 60 PROB3A
8	TQ545 573	SBR	NE	2	32	75	2	2	132	28	110	15					WD	2	1P LOC
1P	TQ545 573	STU	NE	2	28		2	2	92	-12	93	0					DR	3A	IMP 80
2P	TQ546 574	STB	NE	2	32	32	4	3B	124	20	102	7					WE	3B	PIT65 AUG120 W

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES----			PED	----STONES----			STRUCT/	SUBS	SPL	CALC
				COL	ABUN	CONT	COL.	GLEY	>2	>6	LITH	TOT		
1	0-30	MCL	10YR41						1	0	HR	4		
	30-75	C	25Y63	10YR68	C	D		Y	0	0	HR	10	P	Y
	75-90	C	25Y63	10YR68	M	D		Y	0	0	HR	15	P	Y
2	0-28	MCL	10YR41						18	0	HR	25		
	28-60	MSL	25Y61	10YR68	F	D			0	0	HR	40	M	
	60-120	C	25Y5262	10YR68	M	D		Y	0	0	HR	5	P	Y
3	0-30	MCL	10YR41						1	0	HR	4		
	30-75	C	25Y64	10YR68	M	D		Y	0	0	HR	10	P	Y
	75-120	C	25Y62	10YR58	M	D		Y	0	0		0	P	Y
4	0-28	SCL	10YR42	10YR46	C	D		Y	3	0	HR	6		
	28-80	C	25Y61	10YR68	M	D		Y	0	0		0	M	Y
	80-120	C	25Y62	10YR68	C	D		Y	0	0		0	M	Y
5	0-30	SCL	10YR41						1	0	HR	3		
	30-50	SCL	25Y62	10YR58	C	D		Y	0	0	HR	5	M	N
	50-75	SCL	25Y6372	10YR58	M	D		Y	0	0		0	M	
	75-120	C	25Y63	10YR68	M	D		Y	0	0		0	P	Y
6	0-28	MCL	10YR42						3	0	HR	6		
	28-90	C	25Y61	10YR68	M	D		Y	0	0		0		Y
7	0-28	MCL	10YR42						3	0	HR	15		
	28-45	SCL	10YR54	10YR56	F	F			0	0	HR	15	M	
	45-60	SCL	10YR54	10YR56	F	D			0	0	HR	50	M	
8	0-32	MCL	10YR41						2	0	HR	5		
	32-55	SCL	25Y 62	10YR58	C	D		Y	0	0	HR	5	M	
	55-75	HCL	25Y 64	10YR68	M	D		Y	0	0	HR	10	M	
	75-120	C	25Y 63	10YR58	M	D		Y	0	0	HR	10	P	Y
1P	0-28	MCL	10YR41						2	0	HR	5		
	28-46	HCL	25Y52	10YR58	C	D		Y	0	0	HR	10	MDCSAB	FR M
	46-65	HCL	25Y62	10YR68	M	D		Y	0	0	HR	57	MDCSAB	M
	65-80	C	25Y72	10YR58	M	D		Y	0	0	HR	30		FM P Y
2P	0-32	MCL	10YR4142						3	0	HR	10	WKCSAB	FR
	32-44	C	25Y 63	10YR68	M	D	25Y 62	Y	0	0	HR	8	WKCAB	FR M Y
	44-120	C	25Y 62	10YR68	M	D	25Y 61	Y	0	0	HR	5	MDVCAB	FM P Y