

**Mineral/Waste Site,  
Land at Craven Keep,  
Hamstead Marshall, Berkshire**

**Agricultural Land Classification &  
Statement of Site Physical Characteristics**

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# AGRICULTURAL LAND CLASSIFICATION & STATEMENT OF SITE PHYSICAL CHARACTERISTICS

## MINERALS/WASTE SITE, LAND AT CRAVEN KEEP, HAMSTEAD MARSHALL, BERKSHIRE

### INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey and assessment of site physical characteristics of approximately 4.8 hectares of land at Craven Keep, Hamstead Marshall, Berkshire. The survey was carried out during June 1998.
2. The survey was undertaken by the Farming and Rural Conservation Agency (FRCA)<sup>1</sup> on behalf of the Ministry of Agriculture, Fisheries and Food (MAFF). The site has been proposed for the extraction of sand and gravel resources. The land at Craven Keep has already been worked for minerals in the past. The survey was carried out in order to determine the current agricultural land quality and site physical characteristics after its initial restoration. This 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 the land-use was rough grassland. The topography was uneven as a result of the various soil movement operations that had taken place both in the recent past and when the land was reinstated after the original extraction of mineral resources. Some soil stripping had taken place in the south-west of the site and soil bunds were also present. Ditches had been widened and an access road/track was in the process of being constructed.

### 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 fieldwork was conducted at an average density of 1 boring per hectare of agricultural land. In total 6 borings and 1 soil inspection pit (taken from an existing cutting where the access road was being constructed) were described.
7. All of the land on this site has been disturbed and is classified as poor quality (Grade 4). The soils generally comprise well drained profiles which have moderately to very stony (up to 44% total flint stone, 20% > 2cm, 10% > 6cm), medium clay loam topsoils which overlie a gravelly substrate that is impenetrable to the soil auger at depths between 30cm and 50cm. The combination of soil textures, structures, and stone contents acts to restrict the

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<sup>1</sup> FRCA is an executive agency of MAFF and the Welsh Office.

amount of profile available water for crops. As a result the level and consistency of crop yields is likely to be severely restricted. In addition to this the extensive re-working of the topsoil material (as well as its variability in depth) across the site has lead to surface unevenness and areas where topsoil is missing. Due to areas of localised disturbance and soil stripping, mechanised farming operations will be severely restricted. As a consequence of these various limitations the land is restricted to Grade 4.

## FACTORS INFLUENCING ALC GRADE

### Climate

8. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.
9. The key climatic variables used for grading this site are given in Table 1 and were obtained from the published 5km grid datasets using the standard interpolation procedures (Met. Office, 1989).

**Table 1: Climatic and altitude data**

Factor	Units	Values
Grid reference		SU 416 663
Altitude	m, AOD	120
Accumulated Temperature	day°C (Jan-June)	1396
Average Annual Rainfall	mm	773
Field Capacity Days	days	172
Moisture Deficit, Wheat	mm	98
Moisture Deficit, Potatoes	mm	87
Overall climatic grade		Grade 1

10. 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.
11. 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.
12. The combination of rainfall and temperature at this site mean that there is no overall climatic limitation. Other local climatic factors such as exposure and frost risk are not believed to have a significant effect on the site. The site is climatically Grade 1.

### Site

13. The agricultural land at this site lies at an altitude of 115-125m AOD. Gradient restrictions do not affect land quality. There is extensive earth movement related to the

mineral extraction in the form of soil stripping, earth bunds, a deep open ditch and the construction of an access road which runs from the site entrance to the centre of the site. The dissected nature of this area means that mechanised operations such as cultivations will be severely restricted and thus prevents much of the land being classified any higher than Grade 4. Land use is restricted to permanent pasture.

### **Geology and soils**

14. The most detailed published geological information (BGS, 1971) maps the entire site as being underlain by plateau gravel drift deposits which lie over Reading Beds.

15. The most recently published soil information for the site (SSEW, 1983) shows the entire site to be mapped as Sonning 2 Association. This is described as 'Well drained coarse loamy and gravelly soils. Associated with slowly permeable seasonally waterlogged fine loamy over clayey soils, and coarse loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.' (SSEW, 1983).

16. Although land has been worked for minerals in the past, detailed field examination shows that soils are broadly consistent with the description of the Sonning 2 association. Where soil stripping had taken place in the south-west side of the site, localised patches of sand mixed with clay material were also observed.

### **AGRICULTURAL LAND CLASSIFICATION**

17. The details of the classification of the site are shown on the attached ALC map.

18. 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.

### **Grade 4**

19. The site is of poor quality and is currently in a state whereby many mechanised operations such as normal cultivations are not feasible and as such is only suited to permanent grazing (see paragraph 14 above). In addition to this, the variability in depth of the soil resource over the gravelly substrate material imposes a further limitation to the land quality. In some localised areas topsoil is believed to be absent due to recent stripping.

20. The high stone (flint) content throughout these soils makes them drought prone, and high topsoil stone content is also a limitation, although not overriding.

21. The soils are impenetrable to the auger at variable depths across the site. The pit indicate that this is caused by the high proportion of flints in the soil profiles.

22. The majority of topsoils consist of non-calcareous, moderately to very stony (up to 44% total flint stone, 20% > 2cm, 10% > 6cm) medium clay loam. This topsoil appears unnaturally deep in places and absent in others, perhaps due to recent stripping. Occasional shallow upper subsoils of heavy clay loam are encountered which are moderately stony and show evidence of wetness in the form of gleying. These are however considered permeable

due to the high flint content. At depths of between 30cm and 50cm gravel is encountered which is impenetrable to the soil auger. Pit 1 (see Appendix II) shows that this gravel has a variable matrix of mixed sand and clay. All the soils across the site are assessed as Wetness Class I or occasionally II (where upper subsoils show signs of wetness).

23. Due to the combination of soil characteristics and the local climate regime, these soils have restricted amounts of water, such that the land suffers a moderate to severe droughtiness limitation. The combination of soil textures, high stone contents and structures acts to restrict the amount of profile available water for crops. Consequently, crop growth and yields will be adversely affected. In some sporadic locations, droughtiness alone is sufficient to downgrade the soils to a maximum of Grade 4.

## **SOIL RESOURCES**

24. This section describes the soil resources identified on the site. It should be emphasised that this is not intended as a prescription for soil stripping, but merely as an illustration of the soil resources available for restoration on the site. Due to the natural variability of soils, the depths of topsoil and subsoil given should be treated with caution. Soils were sampled to a maximum depth of 120cm, where possible, during survey work. In some cases soil resources will extend below this depth. Textures described relate predominantly to hand texturing.

### **Soil Units : considerations for restoration**

#### *Soil Unit 1*

25. One soil unit covers the entire site which comprises variably shallow to moderately deep fine loamy soils which are considered to lie directly over gravel horizons across the majority of the site.

26. The topsoils comprise an average 30cm of very dark and dark greyish brown (10YR 3/2, 10YR 4/2,) medium clay loam which are moderately to very stony (containing up to 44% total flints of which up to 20% are greater than 2cm diameter and up to 10% are greater than 6cm diameter). The high volume of flints in the topsoil makes the soils impenetrable to the soil auger at depths between 30cm and 40cm. From observations made in the soil pit (see Appendix II) the topsoils comprise moderately developed coarse sub-angular peds of friable consistence.

Representative soil profile for Soil Unit 1

Horizon	Average Depth (cm)	Description
Topsoil	0-30	medium clay loam; very dark and dark greyish brown (10YR 3/2, 4/2); moderately stony to very stony (up to 44% total flints, up to 20% > 2cm, up to 10% > 6cm); moderately developed coarse sub-angular blocky structure; friable.
	30-120	gravel; 10YR 4/4 4/6 matrix consisting of mixed sand and clay.

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## SOURCES OF REFERENCE

British Geological Survey (1971) *Sheet No. 267, Hungerford, Drift Edition*, 1:63,360 scale. BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land*. MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification*. Met. Office: Bracknell.

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

## APPENDIX I

### DESCRIPTION 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 that 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 severe limitations that restricts 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 descriptions

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:

<b>ARA:</b> Arable	<b>WHT:</b> Wheat	<b>BAR:</b> Barley
<b>CER:</b> Cereals	<b>OAT:</b> Oats	<b>MZE:</b> Maize
<b>OSR:</b> Oilseed rape	<b>BEN:</b> Field beans	<b>BRA:</b> Brassicae
<b>POT:</b> Potatoes	<b>SBT:</b> Sugar beet	<b>FCD:</b> Fodder crops
<b>LIN:</b> Linseed	<b>FRT:</b> Soft and top fruit	<b>FLW:</b> Fallow
<b>PGR:</b> Permanent pasture	<b>LEY:</b> Ley grass	<b>RGR:</b> Rough grazing
<b>SCR:</b> Scrub	<b>CFW:</b> Coniferous woodland	<b>OTH:</b> Other
<b>DCW:</b> Deciduous woodland	<b>BOG:</b> Bog or marsh	<b>SAS:</b> Set-Aside
<b>HTH:</b> Heathland	<b>HRT:</b> Horticultural crops	<b>PLO:</b> 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:

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

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

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

## Soil Pits and Auger Borings

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

<b>S:</b> Sand	<b>LS:</b> Loamy Sand	<b>SL:</b> Sandy Loam
<b>SZL:</b> Sandy Silt Loam	<b>CL:</b> Clay Loam	<b>ZCL:</b> Silty Clay Loam
<b>ZL:</b> Silt Loam	<b>SCL:</b> Sandy Clay Loam	<b>C:</b> Clay
<b>SC:</b> Sandy Clay	<b>ZC:</b> Silty Clay	<b>OL:</b> Organic Loam
<b>P:</b> Peat	<b>SP:</b> Sandy Peat	<b>LP:</b> Loamy Peat
<b>PL:</b> Peaty Loam	<b>PS:</b> Peaty Sand	<b>MZ:</b> 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:

<b>F:</b> Fine (more than 66% of the sand less than 0.2mm)
<b>M:</b> Medium (less than 66% fine sand and less than 33% coarse sand)
<b>C:</b> 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:

<b>HR:</b> all hard rocks and stones	<b>FSST:</b> soft, fine grained sandstone
<b>ZR:</b> soft, argillaceous, or silty rocks	<b>CH:</b> chalk
<b>MSST:</b> soft, medium grained sandstone	<b>GS:</b> gravel with porous (soft) stones
<b>SI:</b> soft weathered igneous/metamorphic rock	<b>GH:</b> 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	<b>WK:</b> weakly developed	<b>MD:</b> moderately developed
	<b>ST:</b> strongly developed	
Ped size	<b>F:</b> fine	<b>M:</b> medium
	<b>C:</b> coarse	
Ped shape	<b>S:</b> single grain	<b>M:</b> massive
	<b>GR:</b> granular	<b>AB:</b> angular blocky
	<b>SAB:</b> sub-angular blocky	<b>PR:</b> prismatic
	<b>PL:</b> platy	

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

<b>L:</b> loose	<b>FM:</b> firm	<b>EH:</b> extremely hard
<b>VF:</b> very friable	<b>VM:</b> very firm	
<b>FR:</b> friable	<b>EM:</b> 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:
- |             |  |
|-------------|--|
| <b>APW:</b> | available water capacity (in mm) adjusted for wheat    |
| <b>APP:</b> | available water capacity (in mm) adjusted for potatoes |
| <b>MBW:</b> | moisture balance, wheat                                |
| <b>MBP:</b> | moisture balance, potatoes                             |

SAMPLE NO.	GRID REF	ASPECT USE	--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	SU41506630	RGR				1	1		38	-60	38	-49	4		Y	DS	4	I30 SEE 1P
2	SU41606630	RGR				1	1		44	-54	44	-43	4		Y	DS	4	I30 SEE 1P
3	SU41706630	RGR		20		2	2		34	-64	34	-53	4		Y	DS	4	I30 SEE 1P
4	SU41506620	RGR				1	1		32	-66	32	-55	4		Y	DS	4	I30 SEE 1P
5	SU41556625	RGR				1	1		36	-62	36	-51	4		Y	DS	4	I30 SEE 1P
6	SU41706620	RGR				1	1		48	-50	48	-39	38		Y	DS	4	I40 SEE 1P
1P	SU41606625	RGR				1	1		67	-31	64	-23	38		Y	DS	4	CUTTING

SAMPLE	DEPTH	TEXTURE	COLOUR	----MOTTLES-----			PED	----STONES----			STRUCT/	SUBS	IMP	SPL	CALC
				COL	ABUN	CONT	COL.	GLE	>2	>6	LITH	TOT			
1	0-30	MCL	10YR42					12	0	HR	32				IMP GRAVELLY
2	0-10	MCL	10YR4232					15	5	HR	30				IMP GRAVELLY
	10-30	HCL	10YR52					0	0	HR	40	M			
3	0-20	MCL	10YR4232					15	5	HR	35				IMP GRAVELLY
	20-30	HCL	25Y 6372	10YR4658	C	D	Y	0	0	HR	40	M			
4	0-30	MCL	10YR42					16	0	HR	44				IMP GRAVELLY
5	0-30	MCL	10YR3242					15	10	HR	35				IMP GRAVELLY
6	0-40	MCL	10YR3242					20	5	HR	35				IMP GRAVELLY
1P	0-50	MCL	10YR4232					15	5	HR	35	MDCSAB	FR		ROAD CUTTING MTX VARIABLE S+C
	50-120	GH	10YR4446					0	0		0		P		