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**CAVERSHAM LAKES, EYE AND DUNSDEN,
OXFORDSHIRE
Mineral Planning Permission Review**

Statement of Physical Characteristics

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**Resource Planning Team
Eastern Region
FRCA Reading**

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STATEMENT OF PHYSICAL CHARACTERISTICS

CAVERSHAM LAKES, EYE AND DUNSDEN, OXFORDSHIRE MINERAL PLANNING PERMISSION REVIEW

INTRODUCTION

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) survey and assessment of site physical characteristics on 275.6 ha of land to the south of the Henley Road and north of the River Thames, between Caversham and Sonning Eye in Oxfordshire, close to the border with Berkshire. Most of this site is currently open water.
2. The field work was carried out during November 1997 on a larger area than is shown on the accompanying maps. The original 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 the proposal for the 'South Oxfordshire Water Park'. Adjacent land has also been the subject of detailed survey; this was carried out by FRCA (formerly Statutory ADAS) in 1992 (FRCA Ref: 3303/052/92). This current appraisal of the 1997 survey was carried out in response to a review under the Environment Act, 1995, of the minerals planning permissions on the site, being undertaken by Oxfordshire County Council.
3. The work was conducted by members of the Resource Planning Team in the Eastern Region of the 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. The majority of the site is mapped as 'Other land' which includes gravel workings, flooded gravel pits, a marina, a sailing club, some woodland as well as some tracks and roadways. The agricultural land is confined to the fringes of the survey area and at the time of survey land use comprised permanent grazing some of which was being utilised for cattle grazing.

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	5.9	27.8	2.9
3b	15.3	72.2	7.4
Other land	184.4	-	89.7
Total surveyed area	21.2	100	10.3
Total site area	205.6	-	100

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

7. The fieldwork was conducted at an average density of slightly more than 1 boring per hectare of agricultural land. Twenty borings and two soil pits were described within the area for review; two additional pits dug during the original larger survey are relevant and included.
8. The agricultural land within this review area has been classified as either Subgrade 3a (good quality) or Subgrade 3b (moderate quality). Principal limitations to land quality include soil wetness and soil droughtiness.
9. Approximately one-quarter of the agricultural land at this site has been mapped as Subgrade 3a. The land towards the north of the review area is principally limited by soil droughtiness. The observations comprise a loamy topsoil and upper subsoil overlying a very stony loamy lower subsoil. The local climate dictates that soils of this type are likely to have inadequate available water to fully meet crop needs, especially during the summer. As a result crop yields are likely to be adversely affected. Towards the south of the review area the Subgrade 3a mapping unit is limited by soil wetness. The soils observed comprise medium loamy topsoils overlying loamy and clayey subsoils. The clayey subsoil horizons impede soil drainage and occur at moderate depths in the profile. This depth influences the severity of the soil wetness problem and, in combination with topsoil texture, determines the ALC grade. Soil wetness reduces the versatility of the land in terms of access by machinery (e.g. for cultivations or harvesting) and for grazing by stock, if damage to the soil is to be avoided. It also has the effect of reducing the level and consistency of yields.
10. The remaining agricultural land has been classified as Subgrade 3b. The principal limitation in these areas is soil wetness. Soils are heavy and comprise a loamy or clayey topsoil overlying clayey subsoils. The clayey subsoils impede drainage and occur at a shallow depth. Flexibility of agricultural use in terms of cropping and stocking is reduced and yield levels and consistency are also likely to be less predictable than on the land shown as Subgrade 3a.

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).

Table 2: Climatic and altitude data

Factor	Units	Values	
		SU 750 758	SU 734 752
Grid reference	N/A		
Altitude	m, AOD	36	40
Accumulated Temperature	day°C (Jan-June)	1481	1476
Average Annual Rainfall	mm	667	672
Field Capacity Days	days	141	141
Moisture Deficit, Wheat	mm	116	115
Moisture Deficit, Potatoes	mm	111	110
Overall climatic grade	N/A	Grade 1	Grade 1

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.
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 mean that there is no overall climatic limitation. Other local climatic factors such as exposure and frost risk are also not believed to affect the site; it is climatically Grade 1.

Site

16. The site lies between approximately 35 and 40m AOD. The majority of the site is flat. The slopes that are present are gentle and do not adversely affect agricultural land quality. The River Thames at the southern and eastern boundary is effectively managed and therefore flooding is not significant in terms of agricultural land quality. Other site factors such as microrelief are also not significant.

Geology and soils

17. The published geological information (BGS, 1971) shows the majority of the site to be underlain by loam and alluvial drift deposits with an area to the south-west mapped as valley gravel. All the mapped deposits within this area of review have been worked for minerals (sand and gravel).
18. The most detailed published soils information for the site (SSEW, 1967, SSGB, 1968) shows it to comprise a combination of the Purley, Thames and Usher soil series. Purley soils cover the majority of the agricultural area at the site. They are described as 'well drained brown earths in fine textured loamy drift over calcareous river gravel' (SSGB, 1968). Thames series soils are calcareous groundwater gley soils and are mapped in the poorly drained phase. They occur at the river margins towards the south of the site. They may be described as 'clayey overlying calcareous clayey alluvium' (SSGB, 1968). Usher series soils are mapped at the margin of the River Thames towards the south-east of the site in a relatively small area. They are described as 'calcareous brown earths with gleying, which are developed in very calcareous, stoneless loamy alluvium which overlie either grey clay or calcareous gravel' (SSGB, 1968). Soils of all these broad types were encountered during the survey.

AGRICULTURAL LAND CLASSIFICATION

19. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 1.
20. 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 III.

Subgrade 3a

21. Land of good quality has been mapped in two separate units towards the north and south of the area surveyed. The principal limitation to land quality in the northern map unit is soil droughtiness; soil wetness dominates towards the south. The soils are characterised by the pit observations, 2P and 4P (see Appendix III), although 2P is outside the area currently being reviewed.
22. Two soil types were described during the survey. The most common lies to the north of the review area and comprises a non-calcareous medium clay loam topsoil overlying heavy clay loam subsoils which become more stony with depth. Stone contents in the topsoil and upper subsoil (to between 50 and 60cm) were commonly up to 10% flints by volume. The lower subsoils were commonly impenetrable to the soil auger from between 50 and 65cm. In the pit observation, 2P (see Appendix III), the stone content was measured at 49% flints by volume from 65cm. In addition, the profile was calcareous in many cases and up to 5% chalk fragments occur in addition to the flints, further reducing the potential crop available water. Gleying within the profile was also observed, commonly within 40cm. This, in the absence of a slowly permeable horizon is suggestive of a fluctuating watertable. Given these soil characteristics Wetness Class II (see Appendix II) best describes the drainage status. However, soil droughtiness is the overriding limitation. The stony subsoils restrict the moisture content of the profiles, and moisture balance calculations indicate that the amount of water available to a growing crop may be insufficient for its needs throughout the growing season. The resulting drought stress may adversely affect the level and consistency of yields.
23. The second soil type observed, represented by Pit 4 (see Appendix III), towards the south of the area being reviewed, is principally limited by soil wetness. The profiles comprise a medium to heavy clay loam, sandy clay loam or occasionally medium silty clay loam topsoil, overlying similar upper subsoils. These pass to slowly permeable clay or silty clay lower subsoils from between 45 and 70cm. The evidence of soil wetness in the profiles, ie the depths to gleyed and slowly permeable layers, are such that Wetness Class III (see Appendix II) is applied given the moderate local climate. Soil pit 4 (see Appendix III) is generally representative of these soils, except that the profile was found to be calcareous and, as such, it is of slightly better (Grade 2) quality. Calcareous profiles were described sporadically throughout the mapping units. However, the location of this land, close to water, the range of topsoil textures and the local climatic parameters, lead these areas to be assessed as being of Subgrade 3a quality overall. Soil wetness restricts the versatility of the land by limiting cultivation and/or grazing opportunities without damaging the soil. It is also likely to adversely affect plant growth and, therefore the level and consistency of yields may be reduced.
24. Occasional observations of both slightly better and slightly worse quality were recorded in the Subgrade 3a map units during the survey. However, they were of too scattered a distribution to be mapped separately.

Subgrade 3b

25. Land of moderate quality has been mapped in two separate units. The principal limitation in these areas is soil wetness, with soil droughtiness dominating occasionally. The soils are characterised by the pit observations 1P and 3P, although 3P is outside the area currently being reviewed (see Appendix III).

26. The soils across the majority of this area are of a single type. They comprise a medium/heavy clay loam or clay topsoil overlying poorly structured, gleyed and slowly permeable clay at shallow (20-40cm) depths. The profiles are mostly very slightly or slightly stony and occasionally chalky, containing up to 10% flints and/or chalk fragments by volume. Evidence of soil wetness is recorded in all the profiles either in, or immediately below, the topsoil in the form of gleying and manganese concretions. From the pit observation, 3P (see Appendix III), the clay horizons were found to be poorly structured and slowly permeable. Given the moderate local climate with this soil drainage status, Wetness Class IV (see Appendix II) is appropriate which, in combination with the topsoil textures, results in a Subgrade 3b classification. The effects of soil wetness are described in para. 23 above. Subgrade 3b land is less versatile than that classified as Subgrade 3a because the limitations are more severe; ie, access restrictions are greater and crop yields are more likely to be adversely affected.
27. The remaining Subgrade 3b land is that mapped to the south of Lowfield Farm. This area is principally limited by a combination of soil wetness, soil droughtiness and compaction, probably caused during the gravel workings. The soil profiles were similar to those described in the droughtiness limited Subgrade 3a mapping unit (para. 22), ie slightly stony (8% flints by volume) medium clay loam topsoils overlying increasingly stony (15-32% flints by volume) heavy clay loam subsoils. But, profiles in this area became impenetrable to the auger and spade at 60-75cm, due to an increase in the stone content. The major differences were the presence of many manganese nodules in the upper subsoil and the structural condition of this horizon. The manganese nodules suggest that groundwater often lies at this depth (30-60cm) and as such Wetness Class IV may be appropriate. The upper subsoil (30-60cm) at the representative soil pit, 1P (see Appendix III), was considered to be compacted as the peds were very firm in consistence and platy in structure, additionally, there was no visible porosity. As such, this horizon is slowly permeable. Other similar soils on the site (see para. 22), however, did not contain slowly permeable horizons. It is therefore considered that the continual passage of heavy machinery during gravel extraction from the adjacent land has led to the formation of the slowly permeable layer between 30 and 60cm in this area. As a result, these soils are now classified as Wetness Class IV where Wetness Class II (see Appendix II) may have previously been appropriate. This leads to Subgrade 3b being applied given the interaction between the local climate, the restricted water movement in the profile and the medium topsoil textures encountered. In addition, the combination of soil textures, stone content and poor subsoil structural conditions leads to Subgrade 3b also being appropriate on the basis of soil droughtiness in the local climate. The effects of soil droughtiness are described above (para. 22). In this area, the effects are likely to be more severe and crop yields are likely to be further reduced.
28. Occasional observations of both slightly better and slightly worse quality were recorded in the Subgrade 3b map units during the survey. However they were of too scattered a distribution to be mapped separately.

SOIL RESOURCES

29. 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. Towards the north of the site, where soil droughtiness was the principal limitation, observations were only possible to a depth at which the profile was impenetrable to the soil auger and the spade in the soil pits (see Soil Unit I). Over the remaining area to the south, profile descriptions are generally to between 60 and 80cm, sufficient to establish an agricultural classification, but they did not always extend to the full 120cm depth.

The exception is soil pit 4 (see soil unit III) which extends to 120cm. In some cases soil resources will extend below this depth. Textures described relate to hand texturing.

Soil Units : considerations for restoration

30. Three soil units have been identified across the site, the extent and distribution of which are illustrated on the accompanying soil resources map.

Soil Unit I

31. This unit covers an area of 7.8 hectares and generally comprises upper horizons of a moderate depth overlying gravelly or otherwise moderately flinty lower soil horizons. Profiles typically comprise non-calcareous, medium clay loam or sandy clay loam topsoil to a depth of 17-35cm, (average 26cm). These topsoils are slightly stony containing approximately 10% flints by volume overall. They pass to a similarly stony medium or heavy clay loam, occasionally medium sandy loam and/or clay upper subsoils to a depth between 40 & 60cm from the surface (average 48cm from surface or 22cm horizon width). The profiles were then impenetrable to the soil auger. The soil pits (1P and 2P) reveal that the subsoil to 75 and 70cm respectively, from the surface, was very stony, with measured volumes of 32% and 49% flints in a heavy clay loam matrix. Evidence from the soil pits (gleying) suggest that the water table fluctuates in these soils, such that the structure is likely to be adversely affected if these soils are moved in wet conditions. The area south of Lowfield Farm is believed to contain compacted upper subsoils as a result of trafficking by heavy machinery; these have been assessed as slowly permeable. A description of a representative soil profile in this unit is given below (Table 3).

Table 3: Representative soil profile for Soil Unit I

Horizon	Average Depth (cm)	Description
Topsoil	0-26	Non-calcareous; medium clay loam or sandy clay loam, dark greyish brown, brown or dark yellowish brown (10YR4/2-4/3-4/4); common, faint to distinct, strong brown to dark yellowish brown (75YR 4/6, 10YR4/6) ochreous mottles present in some observations; slightly stony (5-10% flints); friable.
Subsoil	26-48	Non-calcareous; medium or heavy clay loam, occasionally medium sandy loam over clay, dark grey, dark brown, dark greyish brown, dark yellowish brown, greyish brown or brown (10YR4/1-4/2-4/4-5/2-5/3, 75YR4/2, 2.5Y 5/2-5/3); common to many, faint to distinct, strong brown, dark yellowish brown, yellowish brown and brownish yellow (75YR4/6, 10YR4/6-5/6-6/6) ochreous mottles; slightly to moderately stony (5-25%flints); moderately developed coarse sub-angular blocky or moderately developed coarse platy structure; friable to firm.
Subsoil	48-120 ²	Non-calcareous; heavy clay loam, greyish brown, light brownish grey (2.5Y 5/2, 10YR6/2); common, faint to distinct, yellowish brown (10YR5/6) ochreous mottles; moderately to very stony (32-49% measured flints); moderately developed coarse angular blocky structure where possible to observe; firm

² Soil resource assumed to 120cm, impenetrable to the soil auger and spade at the time of survey from a maximum of 75cm.

Soil Unit II

32. This unit covers a further 11.1 hectares to the south of the review area and comprises deeper soils developed in clayey drift deposits. Calcareous heavy clay loam, or occasionally medium clay loam topsoils extend to a depth of 20-28cm, (average 23cm). Subsoils comprise a slowly permeable calcareous clay to the depth of sampling (up to 80cm). Pit 3, although outside of the review area is representative of this soil unit. Pit 4 located within Soil Unit III indicates that a very stony/gravelly deposit may be present in this area at approximately 100cm. A description of a representative soil profile in this unit is given below (Table 4).

Table 4: Representative soil profile for Soil Unit II

Horizon	Average Depth (cm)	Description
Topsoil	0-23	Calcareous; medium or heavy clay loam, occasionally clay, very dark greyish brown, dark greyish brown (2.5Y 3/2-4/2, 10YR3/2); common distinct yellowish brown (10YR5/6-5/8) ochreous mottles present on occasion; stoneless to very slightly stony (0-2% flints); friable.
Subsoil	23-at least 80	Calcareous; clay, grey, greyish brown, light olive brown, light brownish grey (2.5Y 5/1-5/2-5/3-5/4-6/1-6/2); many distinct strong brown, yellowish brown or brownish yellow (7.5YR5/6-5/8, 10YR5/6-5/8-6/8) ochreous mottles; very slightly stony (up to 5% flints and 2% chalk), occasionally very stony at approximately 100cm (40% flints); massive or weakly/moderately developed coarse angular blocky structure; firm.

Soil Unit III

33. This unit covers the remaining relatively small area (2.2 ha) of the review site coinciding with the land mapped as Subgrade 3a towards the south. The soils in this area are generally deep and developed in clayey drift deposits. They comprise calcareous heavy, occasionally medium clay loam topsoils to a depth of 20-25cm (average 22cm). The upper subsoils comprise calcareous clays and heavy clay loams which do not exhibit signs of wetness to a depth between 42 and 70cm (average 52cm). These overlie a calcareous poorly drained, slowly permeable clay, similar to that described in Soil Unit II to observed depths between 60 and 120cm. In the pit observation, P4, representative of this unit, this lower subsoil overlies a moderately stony (40% total flints by volume) calcareous clay at 100cm. A description of a representative soil profile in this unit is given overleaf (Table 5).

Table 5: Representative soil profile for Soil Unit III

Horizon	Average Depth (cm)	Description
Topsoil	0-23	Calcareous; heavy, occasionally medium clay loam, very dark greyish brown, or dark greyish brown (2.5Y 3/2-4/2, 10YR3/2); stoneless to very slightly stony (0-2% flints); friable
Subsoil	23-52	Calcareous; clay, occasionally heavy clay loam, dark greyish brown, greyish brown and light olive brown (10YR4/2-5/2, 2.5Y 5/3-5/4); few faint yellowish brown to brownish yellow (10YR5/6-6/6) ochreous mottles present occasionally; stoneless to very slightly chalky (0-2% chalk); moderately developed very coarse angular blocky; friable.
Subsoil	52-100	Calcareous; clay, greyish brown, light olive brown, grey, light brownish grey (2.5Y 5/2-5/3-6/1-6/2); common distinct strong brown, yellowish brown or brownish yellow (7.5YR5/6, 10YR5/8-6/8) ochreous mottles; stoneless to very slightly stony (0-5% chalk and/or flints); moderately developed coarse angular blocky; firm.
Subsoil ³	100-120	Calcareous; clay, light brownish grey (2.5Y 6/2); common distinct strong brown (7.5YR5/6) ochreous mottles; very stony (40% flints); indistinct structure

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³ Not observed in all observations in this unit.

SOURCES OF REFERENCE

British Geological Survey (1971) *Sheet 268. Reading. Drift Edition. 1:63360 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 (1967) *Sheet 268. Reading. 1:63360 Scale.*
SSEW: Harpenden.

Soil Survey of Great Britain (1968) *Soils of the Reading District. Memoirs of the Soil Survey of Great Britain, England & Wales. Sheet 268.*
SSGB: 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 WETNESS CLASSIFICATION

Definitions of Soil Wetness Classes

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six soil wetness classes are identified and are defined in the table below.

Wetness Class	Duration of waterlogging ¹
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years. ²
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 only wet within 40 cm depth for 30 days in most years.
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 present within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31-90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not wet within 40 cm depth for more than 210 days in most years or , if there is no slowly permeable layer present within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

Assessment of Wetness Class

Soils have been allocated to wetness classes by the interpretation of soil profile characteristics and climatic factors using the methodology described in *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

¹ The number of days is not necessarily a continuous period.

² 'In most years' is defined as more than 10 out of 20 years.

APPENDIX III

SOIL DATA

Contents:

Sample location map

Soil abbreviations - Explanatory Note

Soil Pit Descriptions

Soil boring descriptions (boring and horizon levels)

Database Printout - Horizon Level Information

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

- GRID REF:** national 100 km grid square and 8 figure grid reference.
- 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	DCW: Deciduous Wood
HTH: Heathland	BOG: Bog or Marsh	FLW: Fallow
PLO: Ploughed	SAS: Set aside	OTH: Other
HRT: Horticultural Crops		
- GRDNT:** Gradient as estimated or measured by a hand-held optical clinometer.
- GLEYS/SPL:** Depth in centimetres (cm) to gleying and/or slowly permeable layers.
- AP (WHEAT/POTS):** Crop-adjusted available water capacity.
- MB (WHEAT/POTS):** Moisture Balance. (Crop adjusted AP - crop adjusted MD)
- DRT:** Best grade according to soil droughtiness.
- 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		
- 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: Erosion Risk	WD: Soil Wetness/Droughtiness
ST: Topsoil Stoniness		

Soil Pits and Auger Borings

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

<u>degree of development</u>	WK: weakly developed	MD: moderately developed
	ST: strongly developed	
<u>ped size</u>	F: fine	M: medium
	C: coarse	VC: very coarse
<u>ped shape</u>	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	VF: very friable	FR: friable	FM: firm	VM: very firm
EM: extremely firm		EH: extremely hard		
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	ASPECT USE	--WETNESS--		-WHEAT-		-POTS-		M.REL		EROSN EXP	FROST DIST	CHEM LIMIT	ALC COMMENTS	
			GRDNT	GLEYSPL	CLASS	GRADE	AP	MB	AP	MB					DRT
69	SU73607540	PGR		26	2	2	59	-57	59	-52	4				
85	SU73407530	PGR		0	2	2	69	-47	69	-42	3B		DR	3A	IMP40 DR3A-120
86	SU73507530	PGR		17	2	2	59	-57	59	-52	4		DR	3A	IMP40 DR3A-120
87	SU73607530	PGR		32	2	2	69	-47	69	-42	3B		DR	3B	IMP50 SLGLEYS 0
89	SU73807530	PGR		18	2	2	55	-61	55	-56	4		DR	3B	IMP40 DR3B-120
104	SU73407520	PGR		0	2	2	82	-34	85	-26	3B		DR	3A	IMP55 DR3A-120
125	SU73407510	PGR		0	2	2	88	-28	93	-18	3B		WD	3B	IMP 60 SEE P1
172	SU74067489	PGR	0	25	4	3B		0		0			WE	3B	QG4 HYDRO VEG
175	SU74307490	PGR	45	45	3	3A		0		0			WE	3A	
176	SU74407491	PGR	45	45	3	2		0		0			WD	2	SEE P4
177	SU75407488	PGR	70	70	2	2	134	18	115	4	2		WD	2	
191	SU74107480	PGR	28	28	4	3B		0		0			WE	3B	
192	SU74247480	PGR	0	20	4	3B		0		0			WE	3B	QG4 HYDRO VEG
201	SU74007470	PGR	20	20	4	3B		0		0			WE	3B	
202	SU74157470	PGR	25	25	4	3B		0		0			WE	3B	
212	SU74057460	PGR	0	28	4	3B		0		0			WE	3B	
226	SU73967450	PGR	45	45	3	3A		0		0			WE	3A	
239	SU73877440	PGR	22	22	4	3B		0		0			WE	3B	
250	SU73807430	PGR	22	22	4	3B		0		0			WE	3B	
261	SU73827423	PGR	45	45	3	3A		0		0			WE	3A	
P1	SU73407510	PGR	0	30	4	3B	88	-27	93	-17	3B		WE	3B	
P2	SU73207520	PGR	0		2	2	91	-21	100	-7	3B		DR	3A	IMP70 3ADR-120
P3	SU75007580	STB	0	24	4	3B	89	-27	101	-10	3B		WE	3B	PIT 55 AUG 70
P4	SU74407491	RGR	42	42	3	2	130	14	114	3	2		WD	2	PIT 70 AUG 120

SAMPLE	DEPTH	TEXTURE	COLOUR	---MOTTLES---			PED COL.	---STONES---			STRUCT/ CONSIST	SUBS			CALC		
				COL	ABUN	CONT		GLE	>2	>6		LITH	TOT	STR		POR	IMP
69	0-26	SCL	10YR43							0	0	HR	10				
	26-40	HCL	10YR42	10YR56	C	D		Y	0	0	HR	15	M				IMP FLINTS 40
85	0-35	MCL	10YR42	10YR46	C	D		Y	0	0	HR	5					
	35-40	MCL	10YR52	53 10YR56	M	D		Y	0	0	HR	5	M				IMP FLINTS 40
86	0-17	MCL	10YR44							0	0	HR	10				
	17-40	HCL	10YR41	10YR56	M	D		Y	0	0	HR	15	M				IMP FLINTS 40
87	0-22	SCL	10YR44	10YR46	C	D		S	0	0	HR	10					SLIGHTLY GLEYED
	22-32	MSL	10YR44	10YR46	C	D		S	0	0	HR	15	M				SLIGHTLY GLEYED
	32-50	C	10YR42	10YR56	66	C	D	Y	0	0	HR	25	P				IMP FLINTS 50
89	0-18	SCL	10YR43							0	0	HR	10				
	18-40	SCL	75YR42	75YR46	C	D		Y	0	0	HR	20	M				IMP FLINTS 40
104	0-35	MCL	10YR42	10YR46	C	D		Y	0	0	HR	5					
	35-55	MCL	10YR53	10YR56	C	D		Y	0	0	HR	25	M				IMP FLINTS 55
125	0-32	MCL	75YR43	75YR46	C	F		Y	0	0	HR	5					SEE P1
	32-60	HCL	10YR52	75YR46	M	D	MANY MN	Y	0	0	HR	15	M				IMP FLINTS 60
172	0-25	HCL	25Y 32 42	10YR58	C	D		Y	0	0	HR	2					Y
	25-60	C	25Y 61	10YR58	M	D		Y	0	0	CH	5	P		Y	Y	
175	0-22	HCL	25Y 42							0	0	HR	2				Y
	22-45	C	25Y 53 54							0	0	CH	5	M			Y
	45-70	C	25Y 52 61	10YR68	C	D		Y	0	0	CH	5	P		Y	Y	
176	0-20	MCL	25Y 42							0	0	HR	2				Y
	20-45	C	25Y 53	10YR66	F	F				0	0	CH	5	M			Y
	45-70	C	25Y 53	10YR58	C	D		Y	0	0	CH	5	P		Y	Y	SEE P4
177	0-25	HCL	25Y 42							0	0	HR	2				Y
	25-70	C	25Y 53 54							0	0	CH	5	M			Y
	70-120	C	25Y 53	10YR58	C	D		Y	0	0	CH	5	P		Y	Y	
191	0-28	HCL	25Y 32 42							0	0	HR	2				Y
	28-40	C	25Y 53	10YR66	C	D		Y	0	0	CH	5	P		Y	Y	
	40-70	C	25Y 61	10YR58	M	D		Y	0	0	CH	5	P		Y	Y	
192	0-20	C	25Y 42	10YR58	C	D		Y	0	0	HR	2					Y
	20-40	C	25Y 53	10YR58	M	D		Y	0	0	CH	5	P		Y	Y	
	40-70	C	25Y 51	10YR58	M	D		Y	0	0	CH	5	P		Y	Y	
201	0-20	HCL	10YR32							0	0	HR	2				Y
	20-40	C	25Y 52 53	10YR58	C	F		Y	0	0	CH	5	P		Y	Y	
	40-70	C	25Y 62 61	10YR58	C	D		Y	0	0	CH	5	P		Y	Y	

SAMPLE	DEPTH	TEXTURE	COLOUR	---MOTTLES---			PED COL.	---STONES---			STRUCT/ CONSIST	SUBS			SPL	CALC			
				COL	ABUN	CONT		GLEY	>2	>6		LITH	TOT	STR			POR	IMP	
202	0-25	HCL	25Y 32 42						0	0	HR	2				Y			
	25-50	C	25Y 52 53	10YR58	C	D		Y	0	0	CH	5		P		Y	Y		
	50-70	C	25Y 61	10YR58	M	D		Y	0	0	CH	5		P		Y	Y		
212	0-28	HCL	25Y 32 42	10YR58	C	D		Y	0	0	HR	2					Y		
	28-45	C	25Y 52	10YR58	C	D		Y	0	0	CH	5		P		Y	Y		
	45-70	C	25Y 61	10YR58	M	D		Y	0	0	CH	5		P		Y	Y		
226	0-22	HCL	10YR32						0	0	HR	2					Y		
	22-35	HCL	25Y 54						0	0	CH	5		M			Y		
	35-45	C	25Y 53	10YR66	F	F			0	0	CH	10		M			Y		
	45-80	C	25Y 53	10YR68	C	D		Y	0	0	CH	10		P		Y	Y		
239	0-22	MCL	10YR32						0	0	HR	2					Y		
	22-50	C	25Y 52 53	10YR58	C	D		Y	0	0	CH	2		P		Y	Y		
	50-70	C	25Y 61	10YR58	M	D		Y	0	0	CH	2		P		Y	Y		
250	0-22	MCL	10YR32						0	0	HR	2					Y		
	22-60	C	25Y 51 52	10YR68	M	D		Y	0	0	CH	2		P		Y	Y		
261	0-20	HCL	10YR32						0	0	HR	2					Y		
	20-45	C	25Y 53	10YR66	F	F			0	0	CH	2		M			Y		
	45-80	C	25Y 53	10YR68	C	F		Y	0	0	CH	2		P		Y	Y		
P1	0-30	MCL	75YR42	75YR46	C	F	COM MN	Y	3	1	HR	8					N	AT BOR 125	
	30-60	HCL	25Y 53	10YR56	C	F	25YR53	Y	0	0	HR	15	MDCPL	FM	P	Y	Y	N	COMPCT MANYMN SVD
	60-75	HCL	25Y 52	10YR56	C	F	25YR53	Y	0	0	HR	32	MDCAB	FM	M	N	N	N	IMP FLINTS 75 SVD
P2	0-24	MCL	10YR52	10YR56	C	D	FEW MN	Y	1	0	HR	4					N	AT BOR 102	
	24-61	HCL	10YR53	10YR56	C	D	FEW MN	Y	0	0	HR	7	MDCSAB	FR	M	N	N	N	SVD = SIEVED
	61-70	HCL	10YR62	10YR56	M	D	FEW MN	Y	0	0	HR	49		M	N	N	N	IMP FLINTS 70 SVD	
P3	0-24	HCL	10YR32	10YR56	C	D		Y	0	0	HR	2					Y	AT BOR 26	
	24-46	C	25Y 62	75YR56	M	D		Y	0	0	HR	3	MASSIV	FM	P	Y	Y	Y	
	46-70	C	25Y 61	75YR58	M	D		Y	0	0	HR	3	WKCAB	FM	P	Y	Y	Y	
P4	0-20	MCL	10YR32						0	0		0					Y	AT BOR 176	
	20-29	HCL	10YR42						0	0		0	MDVCAB	FR	M		Y		
	29-42	C	10YR52	10YR56	F	F			0	0		0	MDVCAB	FR	M		Y		
	42-100	C	25Y 62	75YR56	C	D	COM MN	Y	0	0	HR	5	MDCAB	FM	M	Y	Y	Y	
	100-120	C	25Y 62	75YR56	C	D	05Y 61	Y	0	0	HR	40			P		Y	Y	