

# **AGRICULTURAL LAND CLASSIFICATION AND STATEMENT OF SOIL PHYSICAL CHARACTERISTICS**

## **TYTTENHANGER QUARRY EXTENSION, LONDON COLNEY, HERTFORDSHIRE**

### **1.0 BACKGROUND**

- 1.1 The site covers an area of 42.2 ha, and is the subject of an application by Redland Aggregates for the extraction of sand and gravel.
- 1.2 In January 1996, ADAS Statutory Resource Planning Team undertook a detailed Agricultural Land Classification (ALC) and soil physical characteristics survey. A total of 44 soil inspections using a hand held dutch auger were made on a 100 m grid basis. Additional information on subsoil conditions was gained from 4 soil pits and topsoil and upper subsoils were riddled at various locations to assess stone content.
- 1.3 On the published 1:63 360 scale ALC map, sheet 160 (Provisional, MAFF 1970) the whole site is mapped as grade 3. Since this map is of a reconnaissance nature designed primarily for strategic planning purposes, the current survey was undertaken to provide more detailed site specific information on land quality.
- 1.4 At the time of the survey the northern part of the site was under grass, some permanent and some new leys, with scattered parkland trees. The southern part of the site had the remnants of a brassica crop and a new grass ley.

## 2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

### Climate

- 2.1 Climatic criteria are considered when classifying land as these may have an overriding limitation in terms of the agricultural use of the land. 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 (day °C Jan-June), as a measure of the relative warmth of an area.
- 2.2 A detailed assessment of the prevailing climate for the site has been made by interpolation from the 5 km grid dataset produced by the Meteorological Office (Met Office, 1989). The details are given in Table 1 and these show that there is no overall limitation affecting the site.

Table 1: Climatic Interpolation

Grid Reference	TL 193 044
Altitude (m, AOD)	72
Accumulated Temperature Day °C, Jan-June	1418
Average Annual Rainfall (mm)	659
Moisture Deficit, Wheat (mm)	111
Moisture Deficit, Potatoes (mm)	105
Field Capacity Days	138
Overall Climatic Grade	1

### Altitude and Relief

- 2.3 The majority of the site is relatively flat lying at an approximate altitude of 73 m AOD. To the south of Bowmansgreen Farm there is a shallow valley running west with the land falling to approximately 69 m AOD. Neither altitude nor gradient on the site constitute a limitation to the ALC grade.

## Geology and Soils

- 2.4 The published 1:50 000 scale drift edition geology map (sheet 239, Geological Survey of Great Britain (England and Wales) 1978) shows the majority of the site as glacial gravel (with Bunter Pebbles) over Upper Chalk. Along the north western boundary between Bowmansgreen Farm and Tyttenhanger House a narrow band of valley gravels is mapped.
- 2.5 No detailed soil map exists of the area but the reconnaissance 1:250 000 scale soil map "Soils of Eastern England" (Soil Survey of England and Wales 1983), shows the whole site to be covered by Hamble 2 Association soils. These are generally described as deep stoneless well drained silty soils and similar soils affected by groundwater; over gravel locally.
- 2.6 During the current, more detailed survey work three soil types were identified reflecting the variations in the drift deposits on the site.

### Soil Type I (described in more detail in Appendix 1)

- 2.7 This is the main soil type on the site covering approximately half the area, (see soil type map for locations). These soils typically comprise slightly to moderately stony (range 4-20%, typically 10-20%), non calcareous medium sandy silt loam (occasionally medium sandy loam or silt loam) topsoils. Upper subsoils are generally similar in texture, although occasionally lighter with stone content slightly higher than the topsoil (typically 15-20%). Stone content increases (typically 20-30%) with depth and soil textures are typically loamy medium sand or medium sandy loam. Gravel is typically encountered between 50/80 cm although in a few locations it may be shallower. All the profiles are well drained and assessed as wetness class I (see Appendix 2 for definitions).

Soil Type II (described in more detail in Appendix 1)

- 2.8 Soil Type II occurs in the centre of the northern part of the site and also a small area just to the north of the Bell Roundabout. These soils typically *comprise very slightly stony (1-2%) non calcareous silt loam topsoils over similar upper and lower subsoils. Occasionally at depth (below 80 cm) textures may become heavier (medium silty clay loam) and stone content increase to 10-15% of soil volume. Again these soils are typically well drained and assessed at wetness class I.*

Soil Type III (described in more detail in Appendix 1)

- 2.9 Soil Type III occurs adjacent to Coursers Road on the eastern side of the site and in the shallow valley to the south of Bowmansgreen Farm. These soils typically *comprise very slightly to slightly stony (typically 1-10%) non calcareous medium silty clay loam (occasionally medium clay loam or silty loam) topsoils over similar upper subsoils. Lower subsoils are typically heavier and consist of medium silty clay loam, clay, silty clay or sandy clay which are generally moderately stony. In the shallow valley south of Bowmansgreen Farm, the heavier textured subsoils are more usually encountered at shallower depths (35/45 cm). Elsewhere heavier textured lower subsoils are commonly encountered at 50/70cm. Profiles typically show evidence of drainage impedance with mottling common in the subsoils and therefore have been assessed as wetness classes II or III.*

**3.0 AGRICULTURAL LAND CLASSIFICATION**

- 3.1 The land has been classified using the guidelines contained in the Agricultural Land Classification of England and Wales (MAFF, 1988). A breakdown of the individual grades found on the site is given in Table 2. A description of each grade is given in Appendix 3.

## Irrigation

- 3.2 The whole site is irrigated. This irrigation facility enhances the potential of the agricultural land for crop production and consequently the ALC grade mapped at this site takes into account the reduction in drought risk it affords.

**Table 2.**

### AGRICULTURAL LAND CLASSIFICATION

Grade	ha	%
1	10.8	25.6
2	24.0	56.9
Subgrade 3a	5.9	14.0
Other land	1.5	3.5
Total	42.2	100

## Grade 1

- 3.3 Grade 1 land occurs in association with soil type II described in paragraph 2.8, together with a small area of the least stony variant of soil type I described in paragraph 2.7.
- 3.4 Firstly soil type II comprises deep very slightly stony coarse loamy soils. These soils are well drained (wetness class I) and very moisture retentive. This land effectively has no limitation for agricultural use and thus has been graded 1 (excellent quality agricultural land).
- 3.5 Secondly the least stony variant of soil type I occurs in a small area to the north of the main area of soil type II (south of Tyttenhanger House). These soils exhibit no sign of drainage impedance (wetness class I). The soils hold moderately good reserves of available water for crop growth, which is enhanced by the availability of irrigation. Consequently this land also has no or very minor limitations to agricultural use and thus has been graded 1.

## Grade 2

- 3.6 Grade 2 land is mapped over approximately half of the site and is associated with soil type I described in paragraph 2.7 and the better drained variant of soil type III described in paragraph 2.9.
- 3.7 Firstly soil type I comprises coarse loamy profiles over gravel at variable depth, but typically between 50/80 cm. Profile stone increases with depth and textures typically become lighter in the subsoils. The combination of profile textures and stone content result in the profiles being moderately droughty. However, with irrigation this significantly enhances the potential of the agricultural land and this land has been graded 2 (very good quality agricultural land).
- 3.8 Secondly the better drained variant of soil type III is also graded 2. Soil profiles comprise very slightly stony coarse silty soils which become heavier textured with depth. These soils exhibit drainage imperfections at depth, with gleying and a slowly permeable horizon evident. These profiles have been assessed as wetness class II and this combined with topsoil textures limits the land to grade 2 due to wetness and workability constraints.

## Subgrade 3a

- 3.9 Land graded 3a is associated with the stoniest variant of soil type I as described in paragraph 2.7 and the poorer drained variant of soil type III described in paragraph 2.9.
- 3.10 The stoniest variant of soil type I comprises moderately stony coarse loamy soils which become stonier with depth. Profile textures are generally medium sandy loam over loamy medium sand and profile stone contents are higher than other soil type I profiles. The combination of lighter profile textures and

higher stone contents reduce the soil moisture reserves available for crop growth. Regular irrigation alleviates this to some extent and as a result the land has been graded 3a (good quality agricultural land).

- 3.11 In a small area to the south of the shallow valley topsoil stone is a limiting factor. Total topsoil stone was measured at 16%, with 12% being greater than 2 cm. A high topsoil stone content increases production costs and affects the success of crop drilling and establishment thus limiting the land to subgrade 3a.
- 3.12 The remaining area graded 3a is located in the shallow valley to the south of Bowmansgreen Farm and comprises the poorer drained soils of soil type III. Profiles are typically fine loamy over clayey soils which are slowly permeable at 40/50 cm. These profiles are assessed as wetness class III and thus the land is limited to subgrade 3a on wetness and workability constraints.

#### Other Land

- 3.13 Other land comprises a hard standing area used as a car park and storage area to the east of Bowmansgreen Farm together with access roads.

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## REFERENCES

GEOLOGICAL SURVEY OF ENGLAND AND WALES, 1978. Drift Edition, Sheet 239, 1:50 000 scale.

MAFF, 1970. Agricultural Land Classification Map No. 160. Provisional. 1:63a 360 scale.

MAFF, 1988. Agricultural Land Classification of England and Wales (Revised Guidelines and Criteria for Grading the Quality of Agricultural Land. Alnwick.

METEOROLOGICAL OFFICE, 1989. Published climatic data extracted from the agroclimatic dataset compiled by the Meteorological Office.

SOIL SURVEY OF ENGLAND AND WALES, 1983. Soils of Eastern England, Sheet 4, 1:250 000.

SOIL SURVEY OF ENGLAND AND WALES, 1984. Soils and their use in Eastern England by C A Hodge *et al.* Harpenden.



## Appendix 1

### STATEMENT OF PHYSICAL CHARACTERISTICS

#### SOIL TYPE I ( 24.0 hectares)

Topsoil	Texture	:	medium sandy silt loam (occasionally medium sandy loam).
	Colour	:	10YR3/2, 3/3 and 7.5YR3/2 (very dark greyish brown, dark brown).
	Stone	:	typically 10-20% total of soil volume. Small and medium rounded flints, typically 5-10% >2 cm in size, (occasionally slightly higher 11-13% >2 cm).
	Boundary	:	clear, smooth
	Roots	:	many/common fine and very fine
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium sandy silt loam, medium sandy loam (occasionally loamy medium sand). Becomes lighter textured with depth.
	Colour	:	10YR5/4, 5/5, 6/4 and 7.5YR4/3. Yellowish brown, light yellowish brown, dark brown.
	Stone	:	15-30% small and medium rounded flints (occasionally >40%)
	Structure	:	moderately well developed medium and coarse subangular blocky.
	Consistence	:	friable
	Porosity	:	>0.5% biopores
	Boundary	:	clear, smooth
	Roots	:	common becoming few fine and very fine
	Depth	:	typically 50/80 cm
*Lower Subsoil	Texture	:	loamy medium sand
	Colour	:	7.5YR5/5, 5/4 and 10YR5/4. Brown, strong brown, yellowish brown.
	Stone	:	50% gravel, small flints (pea gravel) or larger flints.
	Structure	:	too stony
	Consistence	:	loose
	Porosity	:	>0.5% biopores
	Roots	:	few fine and very fine
	Depth	:	100 cm+

\*Lower subsoil impenetrable to auger. Information extrapolated from pit information.

Additional information : assessed as wetness class I  
 : non calcareous throughout  
 : in pit heavy textured horizon of clay  
 encountered at 100 cm+.

SOIL TYPE II ( 8.9 hectares)

Topsoil Texture : silty loam (occasionally medium sandy  
 silt loam).  
 Colour : 10YR3/3, and 4/3, 7.5YR3/2 and 4/2.  
 Dark brown/brown  
 Stone : typically 1-3% small and medium  
 rounded flints  
 Boundary : clear, smooth  
 Roots : many becoming common fine and very  
 fine.  
 Depth : typically 30 cm

Upper Subsoil Texture : silty loam, occasionally medium sandy  
 silt loam.  
 Colour : 7.5YR4/3, 4/4. Dark brown/brown  
 Stone : typically stoneless  
 Structure : moderately developed coarse subangular  
 blocky.  
 Consistence : friable  
 Porosity : >0.5% biopores and worm channels  
 Boundary : clear smooth  
 Roots : few fine and very fine  
 Depth : 80/90 cm

\*Lower Subsoil Texture : ~~silty~~ silty loam, occasionally medium or heavy  
 silty clay loam.  
 Colour : 7.5YR5/4 and 6/3, 10YR5/3. Brown and  
 light brown.  
 Stone : 0-10% small and medium rounded flints.  
 Stones associated with heavier textured soils \*  
 Structure : weakly developed coarse and very coarse  
 angular blocky.  
 Consistence : friable  
 Porosity : <0.5% biopores  
 Roots : few fine roots  
 Depth : 120 cm+

Additional information : assessed as wetness class I  
 : mottles in lower subsoil  
 : non calcareous throughout

### SOIL TYPE III ( 5.8 hectares)

Topsoil	Texture	:	medium sandy silt loam, silt loam or medium clay loam.
	Colour	:	10YR4/3, 4/2, 3/3. Dark brown/brown and dark greyish brown.
	Stone	:	typically in the range 0-10% small and medium rounded flints.
	Boundary	:	clear, smooth
	Roots	:	many becoming common fine and very fine.
	Depth	:	typically 30 cm
Upper Subsoil	Texture	:	medium silty clay loam (occasionally silt loam or medium sandy silt loam).
	Colour	:	10YR5/4, 5/3. Yellowish brown/brown
	Stone	:	variable ranging from 0-20% small and medium rounded flints.
	Structure	:	moderately developed very coarse and coarse subangular blocky.
	Consistence	:	friable to firm
	Porosity	:	<0.5% biopores
	Boundary	:	clear, smooth
	Roots	:	few fine and very fine
Depth	:	45/80 cm	
Lower Subsoil	Texture	:	clay, silty clay, sandy clay or heavy silty clay loam
	Colour	:	10YR5/2, 5/3, 6/1 and 6/2. Greyish brown, brown, grey or light grey.
	Stone	:	10-25% small and medium rounded flints
	Structure	:	moderately developed coarse and very coarse angular blocky
	Consistence	:	firm
	Porosity	:	<0.5% biopores
	Roots	:	few fine roots
	Depth	:	120 cm+
Additional information	:	assessed as wetness class II or III	
	:	mottles are common, distinct in upper subsoil	
	:	non calcareous throughout	
	:	occasionally sandier lower subsoil horizons occur below clay 100 cm+	

## Appendix 2

### **Field Assessment of Soil Wetness Class**

#### **Soil Wetness Classification**

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

#### **Definition of Soil Wetness Classes**

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<b>Wetness Class</b>	<b>Duration of Waterlogging<sup>1</sup></b>
<b>I</b>	The soil profile is not wet within 70 cm depth for more than 30 days in most years <sup>2</sup> .
<b>II</b>	The soil profile is wet within 70 cm depth for 31-90 days in most years <b>or</b> , 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.
<b>III</b>	The soil profile is wet within 70 cm depth for 91-180 days in most years <b>or</b> , 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.
<b>IV</b>	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 <b>or</b> , 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.
<b>V</b>	The soil profile is wet within 40 cm depth for 211-335 days in most years.
<b>VI</b>	The soil profile is wet within 40 cm depth for more than 335 days in most years.

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Soils can be allocated to a wetness class on the basis of quantitative data recorded over a period of many years or by the interpretation of soil profile characteristics, site and climatic factors. Adequate quantitative data will rarely be available for ALC surveys and therefore the interpretative method of field assessment is used to identify soil wetness class in the field. The method adopted here is common to ADAS and the SSLRC.

<sup>1</sup> The number of days specified is not necessarily a continuous period.

<sup>2</sup> 'In most years' is defined as more than 10 out of 20 years.

## Appendix 3

### **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 include top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

### **Grade 2 - very good quality agricultural land**

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable crops. The level of yield is generally high but may be lower or more variable than Grade 1.

### **Grade 3 - good to moderate quality agricultural land**

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

#### **Subgrade 3a - good quality agricultural land**

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

#### **Subgrade 3b - moderate quality agricultural land**

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

#### **Grade 4 - poor quality agricultural land**

Land with severe limitations which significantly restrict the range of crops and/or levels of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yield of which are variable. In most 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.