

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

## **LAND AT SHEEPBRIDGE LANDFILL SITE EXTENSION, CHESTERFIELD, DERBYSHIRE**

### **1.0 BACKGROUND**

- 1.1 The site, covering approximately 19 hectares is the subject of a planning application for an extension to an existing landfill site at Sheepbridge, Chesterfield.
- 1.2 In January 1995, ADAS Statutory Resource Planning Team conducted a detailed Agricultural Land Classification (ALC) survey of the site to assess the agricultural land quality of the site. Assessment was made following the guidelines in the MAFF publication "Revised Guidelines and Criteria for Grading the Quality of Agricultural Land". Information was collected from auger borings made at a density of one per hectare. These borings were supplemented by three soil inspection pits to provide more detailed information on subsoil conditions.
- 1.3 At the time of the survey the majority of the land was sown with cereal. The field in the extreme west and a field in the south of the site were covered with stubble from a previous cereal crop.
- 1.4 The provisional 1:63 360 scale ALC map, Sheet No. 111 (MAFF, 1973) shows the site to be graded 4.

## 2.0 **PHYSICAL FACTORS AFFECTING LAND QUALITY**

### Climate

- 2.1 Climate data for the site was extrapolated from the data contained in the published agricultural climatic data set (Meteorological Office 1989). This indicates that for an average altitude of 115 m AOD, the average annual rainfall is 805 mm. It also indicates that field capacity days are 198 and that moisture deficits for wheat and potatoes are 87 mm and 73 mm respectively. The accumulated temperature above 0°C for the period January to June (ATO) was found to be 1311 days °C. These climatic characteristics impose a minor climatic limitation on the ALC grade of the site in that, due to the combination of accumulated temperature and average annual rainfall, the site cannot be graded any higher than grade 2.

### Altitude and Relief

- 2.2 The land comprises a valley feature with the valley axis aligned approximately north east/south west through the middle of the site. The valley bottom rises from approximately 95 m AOD on the eastern boundary to 110 m on the western boundary. The tops of the slopes on each side of the valley rise to 123 m to the north and 127 m to the south. A small area in the south east of the site was found to have slopes of between 9° and 11°, thus limiting the grade of this area to a maximum of 3b. Over the remainder of the site gradient was not found to be a limiting factor.

### Geology and Soils

- 2.3 The published 1:50 000 solid and drift edition geology map (Sheet 100, Geological Survey of Great Britain (England and Wales), 1974) shows the whole site to be covered by Upper Carboniferous Lower Coal Measures with Sandstone.

- 2.4 The Soil Survey of England and Wales have mapped the soil in the Chesterfield area at a reconnaissance scale of 1:250 000 (Soil Survey, Sheet 3, 1983). The whole of the site is mapped as Bardsey Association (\*1).
- 2.5 During the current, more detailed survey work two soils types were identified which corresponds to the solid geology recorded for the site.

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

- 2.5.1 Soil type 1 covers most of the northern part of the site except for a small area on the eastern side. These soils typically comprise slightly stony silty loam, medium sandy loam or occasionally medium silty clay loam topsoils over similar upper subsoils which are slightly - moderately stony. The lower subsoil comprises a loamy medium sand/medium sandy loam or medium silty clay loam which often becomes impenetrable between 40-80 cm. Soil pits showed this horizon to be weathered sandstone in a medium silty clay loam matrix with a stone content of approximately 80%. Topsoil stone content within this areas varied normally between 3% and 8%. However, an area to the north of the site was found to have a stone content of between 15-20% of the soil volume. The stones were usually small to medium sized, subangular and angular sandstone fragments but occasional large stones were present. The profiles within this soil type are usually well drained and hence are assessed as wetness class I. At a single sample location evidence of imperfect drainage was present and this profile was assessed as wetness class II.

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(\*1) Bardsey Association:- Slowly permeable seasonally waterlogged loamy over clayey and fine silty soils over soft rock. Some well drained coarse loamy soils over harder rock.

Soil Type 2 (described in more detail in Appendix 1)

- 2.5.2 Soil type 2 is found in the southern part of the site but may be subdivided into two variants.

Variant 1 - comprises a very slightly - slightly stony silt loam topsoil which overlies a very slightly - slightly stony heavy silty clay loam subsoil. The stones were small to medium sized subangular sandstone fragments with occasional large stones present. The subsoil within this soil type was prominently mottled and constituted a slowly permeable layer, hence such profiles were assessed as wetness class IV.

Variant 2 - this variant of soil type 2 was similar to variant 1 but the topsoil consisted of very slightly stony heavy silty clay loam textured material. The topsoil overlay a stone free - very slightly stony clay/heavy silty clay loam subsoil similar to variant 1. In the west of the site this soil type was found to be shallow and overlay hard rock at between 50/80 cm. The subsoil constituted a slowly permeable layer and hence soils of this variant type were assessed as wetness class IV.

### 3.0 **AGRICULTURAL LAND CLASSIFICATION**

- 3.1 The site comprises a mix of grade 2, subgrades 3a and 3b and grade 4 quality land. The definitions of the ALC grades (MAFF, 1988) are included at Appendix 2.
- 3.2 All land within the site is limited to a maximum of grade 2 by climatic limitations however, site physical factors and interactive limitations between climate and physical factors may be equally or more limiting than climate. The table overleaf shows the breakdown of ALC grades for the site.

## AGRICULTURAL LAND CLASSIFICATION

Grade	Area (ha)	% of total area
2	7.60	40.8
3a	1.03	5.5
3b	5.64	30.3
4	4.03	21.7
Non-Agricultural	0.31	1.7
TOTAL	18.61	100.0

### Grade

- 3.3 Most of the land to the north of the site is grade 2 quality and is associated with soil type 1 described in paragraph 2.5.1. These soils are free draining and hence are assessed as wetness class I, however, interactive limitations between climate and topsoil texture limits those areas with a silty loam topsoil to grade 2. The stoniness of the soil profile together with the shallow depth to hard unrootable stone will reduce the moisture available within the profile for plant growth and hence at a number of sample points droughtiness equally limits ALC grade to 2. Stoniness of the topsoil also provides a limitation for agricultural usage in that wear and tear on machinery is high and crop establishment may be poor, hence a small area in the west of the site is equally limited to grade 2 by topsoil stoniness.

### Subgrade 3a

- 3.4 A small area of subgrade 3a land has been mapped in the north east of the site and is associated with a less well drained profile of soil type 1 as described in paragraph 2.5.1. Soil in this area has a moderate wetness and workability limitation and is assessed as wetness class II restricting this area to subgrade 3a.

### Subgrade 3b

- 3.5 Land in the south east of the site associated with variant 1 of soil type 2, as described in paragraph 2.5.2 has been assessed as subgrade 3b quality land. Soil wetness is the main limiting factor determining the grade of the land in this area with the soil profiles being slowly permeable immediately below the topsoil and hence are assessed as wetness class IV. These poorly drained soils impose a significant wetness and workability restriction. Within part of this area gradients of between 9° and 11° also limited this land to subgrade 3b. A further small area of grade 3b land has been mapped in the north of the site associated with a very stony area of soil type 1 described in paragraph 2.5.1. The topsoil stone content in this area is sufficient to cause significant problems for cultivation.

### Grade 4

- 3.6 Land in the south west of the site associated with variant 2 of soil type 2 as described in paragraph 2.5.2 has been assessed as grade 4 quality land. These soils are similar to those of the adjoining land of grade 3b quality being assessed as wetness class IV. However, the topsoil in this area is of heavier textures and hence overall ALC grade is limited to grade 4 by significant wetness and workability problems.

### Non-Agricultural

- 3.7 Two small areas of non-agricultural land are mapped in the south west of the site. One area being part of the disused railway line and the second a tree/shrub area around an overgrown pond.

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## REFERENCES

- Geological Survey of England and Wales (1974). Solid and Drift edition Sheet 100, Sheffield. Scale 1:50 000.
- MAFF (1973). Agricultural Land Classification Map Sheet 111. Provisional.
- 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 Mid and Western England Sheet 3 Scale 1:250 000.
- Soil Survey of England and Wales (1984). Soils and their use in Eastern England. J M Ragg *et al.* Harpenden.

## Appendix 1

### STATEMENT OF PHYSICAL CHARACTERISTICS

#### SOIL TYPE 1

Topsoil	Texture	:	silty loam, medium sandy loam or medium silty clay loam.
	Colour	:	typically 10YR3/2, 10YR4/2 and 10YR4/3. (very dark/dark greyish brown and brown).
	Stone	:	variable. In the range 3-20% but typically 4-8%. Small, medium and large angular sandstone fragments.
	Boundary	:	abrupt, smooth
	Roots	:	many fine and very fine
	Depth	:	30 cms typically
Upper Subsoil	Texture	:	medium sandy loam, silt loam (occasionally sandy clay).
	Matrix colour	:	typically 2.5Y6/3, 2.5Y6/4, 10YR4/4, 10YR5/6, 10YR6/6, 7.5YR4/3 (light yellowish brown, dark yellowish brown, yellowish brown and brownish yellow and dark brown.
	Stone	:	variable ranging from 5-25% small, medium and large angular sandstone fragments.
	Structure	:	weakly to moderately developed coarse subangular blocky.
	Consistence	:	friable
	Porosity	:	2-5% biopores
	Boundary	:	abrupt, smooth
	Roots	:	common to many fine and very fine
	Depth	:	40/80 cm, typical thickness of horizon = 35 cm.
	Lower Subsoil	Texture	:
Matrix colour		:	2.5Y7/4, 10YR6/6, 10YR6/8, 7.5YR6/8 (pale yellow, brownish yellow and reddish yellow).
Stone		:	variable, in the range 5-80% small to large angular sandstone fragments, weathered sandstone encountered.
Structure		:	not determined. Too stony
Consistence		:	not determined. Too stony
Porosity		:	not determined. Too stony
Roots		:	few fine and very fine
Depth		:	80 cm, typically



Additional information : assessed as wetness class I or II  
: few to many ochreous/grey mottles noted in the upper and lower subsoil.

## SOIL TYPE 2

### Variant 1

Topsoil            Texture        : silt loam occasionally medium silty clay loam  
                     Colour         : 2.5Y4/2, 10YR3/2, 10YR4/2, 10YR4/3 (dark greyish brown, very dark greyish brown, brown).  
                     Stone         : range 1-10%, typically 4% small, medium and large angular/subangular sandstone fragments.  
                     Boundary     : abrupt, smooth  
                     Roots         : many fine and very fine  
                     Depth        : 30 cms typically

Subsoil           Texture        : clay, heavy silty clay loam  
                     Matrix colour : 2.5Y5/3, 2.5Y6/3, 10YR5/3, 10YR6/3 (light olive brown, light yellowish brown, brown, pale brown).  
                     Stone         : range 3-10%, typically 4% small, medium and large angular/subangular sandstone fragments.  
                     Structure     : weakly developed adherent coarse and very coarse subangular blocky.  
                     Consistence  : firm  
                     Porosity      : <0.5% biopores  
                     Roots         : many fine and very fine  
                     Depth        : 120 + cm

Additional information : assessed as wetness class IV  
: common to many distinct and prominent ochreous/grey mottles in subsoil from 25-30 cm.

### Variant 2

Profile as for variant 1 but topsoil texture was heavy silty clay loam with typical depth of 25 cm.

## Appendix 2

### **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.