Cambs 55/92

AGRICULTURAL LAND CLASSIFICATION AND SOIL PHYSICAL CHARACTERISTICS

STARTHWOOD FARM, WATNALL, NOTTINGHAMSHIRE

1.0 INTRODUCTION

1.1 The Agricultural Land Classification provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can operate in one or more of four principal ways: they may affect the range of crops which can be grown, the level of yield, the consistency of yield and the cost of obtaining it. The classification system gives considerable weight to flexibility of cropping, whether actual or potential, but the ability of some land to produce consistently high yields of a somewhat narrower range of crops is also taken into account.

1.2 The principal physical characteristics influencing agricultural production are climate, site and soil. The main climatic factors which are taken into account are temperature and rainfall, although account is also taken of exposure, aspect and frost risk. The site factors used in the classification are gradient, microrelief and flood risk. Soil characteristics of particular importance are texture, structure, depth and stoniness. In some situations, chemical properties may also influence the long-term potential of the land and are taken into account.

1.3 These factors result in varying degrees of constraint on agricultural production. They can act either separately or in combination, the most important interactive limitations being soil wetness and droughtiness. The grade or subgrade of land is determined by the most limiting factor present. Five grades of land are recognised ranging from Grade 1 land of excellent quality to Grade 5 land of very poor quality. Grade 3, which constitutes about half the agricultural land in England and Wales, is divided into two subgrades designated 3a and 3b.

1.4 Details of the Agricultural Land Classification (ALC) system are contained in MAFF's revised guidelines and criteria for grading the quality of agricultural land (MAFF 1988). A description of the ALC grades and subgrades is provided in Appendix 1.

2.0 BACKGROUND TO THE SITE

2.1 The site, an area of 89.3 hectares, is being considered by UK Waste Management Ltd as a possible location for the deposit of waste. Within the site, an area of 52 hectares would form the operational area, this includes 12.3 hectares of urban/non agricultural land.

2.2 An initial indication of land quality at Starthwood Farm is available from the MAFF 1:63,360 scale ALC map 112 (MAFF 1970). This shows the south of the site as predominately grade 2 and the north as grade 3. In the north-west the brickworks have been shown as non-agricultural.

2.3 A detailed ALC survey was undertaken in August 1992, during which a full inventory of soil resources was also compiled for restoration planning purposes.

2.4 At the time of the survey, the land was in arable use. A total of 81 soil inspections were made over the site on a 100 m grid basis giving an intensity of inspection of approximately 1 per hectare. Soils were sampled to a depth of 120 cms using a hand held Dutch soil auger, and data collected was supplemented by observations from 5 soil profile pits.

3.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

3.1 Site specific climatic data has been obtained by interpolating information contained in the 5 km grid dataset produced by the Meteorological Office (Met Office, 1989).

3.2 This shows that in the vicinity of Starthwood Farm the annual average rainfall is approximately 708 mm (28") and that soils are at field capacity for 160 days.

3.3 The accumulated temperature for the majority of the site is approximately 1326 day degrees Celsius. This parameter gives an indication of the build up of warmth available for plant growth and influences the development of soil moisture deficits

(SMD*) and hence susceptibility to drought. The soil moisture deficits for wheat and potatoes are 95 mm and 83 mm respectively.

3.4 In a small area to the north west, the average annual rainfall is 715 mm (29") and field capacity days are 161. The accumulated temperature is 1314 day degrees Celsius and the soil moisture deficits for wheat and potatoes are 94 mm and 81 mm respectively. This areas corresponds with altitudes exceeding 120 m AOD.

3.5 The site is neither particularly exposed nor frost prone.

3.6 For the majority of the site, climate itself is not limiting to agricultural land quality, however to the north west where the average annual rainfall is higher and the accumulated temperature is lower climate restrictions limit the land to grade 2.

Altitude and Relief

3.7 The site occupies gently sloping land falling from 125 m, in the north, to 98 m AOD on the southern boundary. Neither gradient nor altitude constitute a limitation to agricultural land quality.

Geology and Soils

3.8 The published 1:63,360 scale drift edition geology map sheet 125 (Geological Survey of Great Britain, 1963) shows the majority of the site to comprise Red Marl, with smaller areas of Magnesium Limestone and sand and gravel deposits. The current detailed inspection identified five soil types.

---

* SMD represents the balance between rainfall and potential evapotranspiration occurring during the growing season, for ALC purposes the soil moisture deficits developing under a winter wheat and maincrop potato cover are considered. These 'reference' crops have been selected because they are widely grown, and in terms of their susceptibility to drought, are representative of a wide range of crops.

Soil Type A1 (Refer to Appendix 2 and Soil Types Map)

3.8.1 Poorly drained clayey soils occur on the periphery of the site and cover 4.8 hectares of the operational area. Profiles typically comprise medium or heavy clay loam topsoils, over gleyed, slowly permeable clay subsoils.

Soil Type A2 (Refer to Appendix 2 and Soil Types Map)

3.8.2 Slightly lighter textured Marl derived soils cover 11.1 hectares of the operational area mainly in the northern section of the site with a small area near the southwestern boundary. Profiles comprise medium clay loam or occasionally heavy clay loam topsoils over slightly stony, gleyed heavy clay loam or clay (or occasionally sandy clay loam) upper subsoils to depths of 50/55 cms. These overlie gleyed, slowly permeable clays.

Soil Type B1 (Refer to Appendix 2 and Soil Types Map)

3.8.3 Deep soils derived from sandstone rock cover a broad southern section and account for 19.8 hectares of the operational area. Profiles typically comprise medium clay loam topsoils over slightly stony medium or heavy clay loams to depth (55/80 cms), over sandstone rock.

Soil Type B2 (Refer to Appendix 2 and Soil Types Map)

3.8.4 Profile textures are similar to soils described in paragraph 3.8.3 above. However, in these profiles, the depth to sandstone is shallower and ranges from 40/50 cms. These soils cover the southern site boundary outside the operational area and extend to 6.8 hectares.

Soil Type C (Refer to Appendix 2 and Soil Types Map)

3.8.5 These coarse textured soils extend to 4.0 hectares within the operational area and occur in a small block near Starthwood Farm. They typically comprise medium sandy loam or medium sandy silt loam topsoils over similar, slightly stony upper subsoils. Lower subsoils comprise loamy medium sands and may contain up to 30% flint stones.

4.0 AGRICULTURAL LAND CLASSIFICATION

4.1 Land at Starthwood Farm has been graded mainly 2 and 3a, with smaller areas of 3b. A breakdown of land quality in hectares and percentage terms within the operational area is provided below.

Grades	Hectares	Percentage
2	21.4	41
3a	13.9	27
3b	4.4	8
Urban/Non Agricultural/Agricultural Buildings	12.3	24
Total	52.0*	100

* Measurements adjusted to conform with engineers operational area.

Grade 2

Land graded 2 corresponds with soil types B1 and C, which are described in paragraphs 3.8.3 and 3.8.5 respectively.

4.2 The well drained soils of type B1 overlie sandstone bedrock below 55/80 cms. Due to the presence of the rock a slight droughtiness limitation is associated with this land.

4.3 The soils of type C are freely draining, coarse in texture and may be stony in the lower horizons. Slight droughtiness imperfections due to the presence of light textures and lower subsoil stones restrict the land to grade 2 (very good quality agricultural land).

Subgrade 3a

Land graded 3a corresponds with the soils described in paragraphs 3.8.4 and 3.8.2

4.4 At the southern edge of the site the presence of sandstone rock at moderate depths (40/50 cms) imposes a moderate droughtiness imperfection which restricts the land to subgrade 3a.

4.5 The majority of the soils mapped as Type A2 are slowly permeable at depth. These soils have been assigned a wetness class of III and this combined with the fine topsoil textures restricts the land to subgrade 3a.

Subgrade 3b

Land graded 3b occurs in association with soil type A1 and the heavier textured variant of soil type A2, described in paragraphs 3.8.1 and 3.8.2.

4.6 In both soil types, the presence of slowly permeable subsoils immediately below the relatively heavy textured topsoils (35 cms+) result in a wetness class assessment of IV. The above factors combine to impose a significant limitation on the wetness and workability of the site, thus the land has been graded 3b (moderate quality agricultural land).

Urban/Non Agricultural

4.7 The brickworks and woodland have been mapped as urban and non agricultural land respectively.

March 1993

Resource Planning Team
ADAS Statutory Unit, Cambridge

REFERENCES

GEOLOGICAL SURVEY OF GREAT BRITAIN (1963). 1:63,360 scale Drift edition geology map sheet 125 "Derby".

MAFF (1970). 1:63,360 scale Agricultural Land Classification Map sheet 112. 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). Climate data extracted from the published agricultural climatic dataset.

Appendix 1

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 yields 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 winter 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 (eg. 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.

Appendix 2

DESCRIPTION OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE A1

Topsoil	Texture	:	medium or heavy clay loam
	Depth	:	25 cm
Subsoil	Texture	:	clay
	$CaCO_3$	:	non
	Structure	:	moderately developed medium prisms
	Consistence	:	firm
	Gleying	:	yes
	Depth	:	120 cm

SOIL TYPE A2

Topsoil	Texture	:	medium clay loam or occasionally heavy clay loam.
	Depth	:	30 cm
Upper Subsoil	Texture	:	heavy clay loam or clay, occasionally sandy clay loam.
	$CaCO_3$	:	non
	Structure	:	moderately developed coarse sub-angular blocky.
	Consistence	:	firm
	Stone	:	10 to 15% flints
	Depth	:	50/55 cm, occasionally 70 cm
Lower Subsoil	Texture	:	clay
	$CaCO_3$	:	non
	Structure	:	well developed coarse prisms
	Consistence	:	very firm
	Gleying	:	yes
	Stone	:	negligible
	Depth	:	120 cm

SOIL TYPE B1

Topsoil	Texture	:	medium clay loam
	Stone	:	4-5% (very slightly stony) sandstones
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium or heavy clay loam, occasionally clay.
	Stone	:	10% standstones
	$CaCO_3$	:	non
	Structure	:	well developed coarse subangular blocky.
	Consistence	:	friable
	Gleying	:	no
	Depth	:	55/80 cm
Lower Subsoil/ Parent Material		:	sandstone rock. Comprises blocky pieces of sandstone in layers with rooting occurring in the weathered areas between the rocks. Some rooting was evident within the rocks too.

SOIL TYPE B2

Topsoil	Texture	:	medium clay loam
	Stone	:	4-5% sandstones
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium or heavy clay loam
	Stone	:	10% sandstones
	$CaCO_3$	:	non
	Structure	:	moderately developed coarse sub-angular blocky.
	Consistence	:	friable
	Gleying	:	non
	Depth	:	40/50 cm, typically 50 cm
Lower Subsoil/ Parent Material		:	sandstone rock. Comprises blocky pieces of sandstone in layers with rooting occurring in the weathered areas between the rocks. Some rooting was evident within the rocks too.

SOIL TYPE C

Topsoil	Texture	:	medium sandy loam or sandy silt loam
	Depth	:	30 cm
Upper Subsoil	Texture	:	medium sandy silt loam or sandy loam
	Stone	:	slightly stony (10%)
	$CaCO_3$	:	non
	Structure	:	moderately developed coarse sub-angular blocky, tending to angular blocky.
	Consistence	:	friable
	Gleying	:	non
	Depth	:	60 cm
Lower Subsoil	Texture	:	loamy medium sand
	Stone	:	negligible to moderately stony (flints)
	$CaCO_3$	:	non
	Structure	:	weakly developed coarse subangular blocky.
	Consistence	:	very friable
	Gleying	:	no
	Depth	:	120 cm

Drainage status

Wetness Class I., ie freely draining in soil types B1, B2 and C.
Wetness Class III, or occasionally IV in soil type A2.
Wetness Class IV in soil type A1.

Rooting

Visible to depth in all soil types.