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PHYSICAL CHARACTERISTICS REPORT INCORPORATING
AGRICULTURAL LAND CLASSIFICATION

LAND AT LONDON BRICKWORKS, WHITTLESEY, CAMBRIDGESHIRE

1.0 INTRODUCTION

1.1 A soil and Agricultural Land Classification (ALC) survey was carried out on two sites at London Brickworks, Whittlesey. The larger of the two sites is located at Must Farm and comprises an area of land immediately to the west of the Brickworks. The smaller area lies to the north of the brickworks and comprises a single field in an area of Wash land immediately to the south of the River Nene.

1.2 The site at Must Farm extends to approximately 80 ha and is triangular in shape, bounded on its northern side by a railway line and to the south by the Kings Dyke, across which is the A605 road. The western boundary of the site abuts open agricultural land. The eastern end of the site comprises an area of old clay workings extending to approximately 20 ha, part of which is a flooded clay pit, with the remainder being either derelict or used for brick storage.

1.3 At the time of survey the agricultural land at Must Farm was mainly under cereal stubble, with areas of potatoes, sugar beet, a small area of beans together with a field of grass. A total of 62 inspections were made over the agricultural land using a spade and dutch auger to a depth of 1.2 m and in addition four soil pits were dug to help assess subsoil conditions in greater detail.

1.4 The small site to the north of the brickworks extends to an area of approximately 2.5 ha and comprises a single field which at the time of survey was under permanent grass. A total of 3 observations were made on this site.

1.5 On the published Provisional ALC map, Sheet number 134 (MAFF, 1964) the area at Must Farm is shown as "other land primarily in non-agricultural use" whilst the small site to the north is shown as Grade 4.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

2.1 Climatic information for the site has been interpolated from the 5 km grid dataset produced by the Meteorological Office (Met Office, 1989). The average annual rainfall for both sites is 569 mm making this one of the drier areas of the country. The number of days that the soils are likely to be at field capacity in this area is 98 days on the larger site and 99 days on the smaller site to the north.

2.2 The accumulated temperature for the sites is approximately 1458 degrees Celsius. This parameter indicates the cumulative build up of warmth available for crop growth and in conjunction with rainfall has an influence on the development of soil moisture deficits and susceptibility to drought. The moisture deficits for wheat and potatoes are 119 mm and 115 mm respectively for both sites.

2.3 Although there is no climatic limitation to the agricultural use of the land, the low rainfall and high moisture deficits may impose droughtiness restrictions due to the interactions between climate and soils.

Relief

2.4 The larger site is predominantly flat with some very minor undulations within the fields. Drainage of the land is controlled by a series of ditches which traverse the site, which are controlled by a pumping station at the south west of the site. The altitude of the land is approximately 2 m AOD.

2.5 The smaller site is also relatively flat and lies at an altitude of approximately 3 m AOD.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The land has been classified in accordance with the guidelines of the Agricultural Land Classification of England and Wales (MAFF, 1988). A breakdown of the individual grades for both sites is given below:

Northern Site

Grade	Area	%
4		100

Southern Site

Grade	Area	%
1		
3a		
3b		
Agric. Buildings		
Urban		
Total		100

Northern Site

3.2 The whole of the northern area has been mapped as Grade 4. This area comprises soils mapped as Soil Type 3 which are described in detail in Para 4.6. These soils have a clay topsoil over a strongly mottled clay upper subsoil, which becomes coarser textured with depth. These soils are classified as Wetness Class III and as such have a moderately severe wetness and workability restriction. The ALC guidelines indicate that such soils should be classified as Grade 3b, but due to the location of the site within an area of Wash land, where the land will be subjected to prolonged flooding when the River Nene is allowed to flood, the area has been classified as Grade 4.

Southern Site

3.3 The agricultural land on the southern site comprises areas of Grades 1, 3a and 3b. The major limitations associated with the Grade 3 land are wetness and workability restrictions on the land to the south of the site and droughtiness to the north and west.

Grade 1

3.4 The deep organic soils that occur through the middle of the site have been classified as Grade 1. These soils which are mapped as Soil Type 1, and described in detail in para 4.4, have an organic clay topsoil, over an organic clay upper subsoil which becomes peaty loam or loamy peat at depth. They have high available water capacities and consequently, despite the relatively high moisture deficits that are prevalent in the area, will not be susceptible to drought.

3.5 Furthermore, despite the clay content in the topsoils, these soils will be easily worked due to the moderately high organic matter levels (typically 13-14%) which occur. This area therefore has been assessed as land with no or very minor limitations to agricultural use and is therefore classified as Grade 1.

Grade 3a

3.6 Two areas of Grade 3a have been mapped and these correlate with the areas of Soil Types 2 and 4 which are described in paragraphs 4.5 and 4.7. The major limitation associated with the areas mapped as Soil Type 2 is droughtiness. These soils which occur over the northwestern part of the site and also around the farm buildings have organic clay topsoils over very acid peaty loam or loamy peat subsoils. The presence of these very acid subsoils prevents rooting into this material and consequently the amount of plant available water from the soil is severely restricted. Moisture balance calculations indicate that droughtiness is likely to be a major limitation to crop growth in this low rainfall area.

3.7 The soils which have been mapped as Soil Type 4 are restricted to this grade due to a workability limitation and also a droughtiness restriction. These soils have a clay topsoil and upper subsoil over an acidic organic subsoil and have been assessed as Wetness Class I/II. Despite the free draining nature of the soils, the high clay content in the topsoil mean that they will be susceptible to structural damage if trafficked and cultivated during the wetter periods of the year. Also during the drier periods of the year, there will be a droughtiness limitation caused by a restriction in rooting depth due to the acidic layers, which will limit the available water from the soil to the crops.

Grade 3b

3.8 The heavy clay soils that occur along the southern side of the site, Soil Type 3 (see para 4.6), have been mapped as Grade 3b as a result of a wetness and workability limitation. These soils have slowly permeable subsoils and have been assessed as Wetness Class III and consequently with the clay topsoils that are present have a moderately severe workability restriction. Cultivations and harvesting therefore need to be carefully controlled to prevent serious structural damage occurring to the soils.

4.0 SOIL PHYSICAL CHARACTERISTICS

Geology

4.1 The 1:50,000 geology map for the area (Geol Surv, 1984) has mapped the whole of the southern site and the south western corner of the northern site as "Oxford Clay - open cast workings wholly or partially backfilled". The remainder of the northern site is mapped as River Terrace Deposits. The current survey however reveals that only the eastern part of the southern site has been worked for clay and that the remainder of the area is undisturbed.

Soils

4.2 The reconnaissance soil survey map for the area (Soil Surv, 1983) shows the northern site to comprise soils of the Waterstock Association* and the southern site to comprise soils of the Waterstock Association on the northeast side with the remainder mapped as Midelney Association+.

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*Waterstock Association: Soils developed on level or gently sloping river terrace drift overlying Jurassic clay. Deep permeable mainly fine loamy soils variably affected by groundwater. Some deep well drained fine and coarse loamy soils.

+Midelney Association: Groundwater gley soils comprising clayey river alluvium overlying peat, occurring on flat lowlands.

4.3 The current survey identified four soil types, 3 of which correlate with the soils of the Midelney Association, with the fourth comprising soils developed in Oxford Clay.

Soil Type 1 (refer to Appendix I and Soil Types map)

4.4 This soil type has been mapped through the central part of the larger southern site and comprises deep, organic soils which do not have very acidic subsoils. The soils typically comprise organic clay topsoils (organic matter levels ranging from 11% to 14%) over similar upper subsoils which are generally moderately well structured. Below approximately 60 cm depth the soils become significantly more organic having a peaty loam or loamy peat texture. This horizon is generally moderately acid (c. pH 5) and overlies a greyish silty clay loam or silt loam. The soils are moderately porous throughout and with the watertable being controlled by the network of ditches and the local pumping station, the soils are classified as Wetness Class I. In some profiles the upper horizons are more loamy and silty possibly indicating the location of a former river channel, whilst other profiles peaty loam or loamy peat horizons occur immediately below the topsoil.

Soil Type 2 (refer to Appendix I and Soil Types map)

4.5 Soils in this mapping unit are broadly similar to those described above, but the main difference is the presence of strongly acidic subsoil horizons, which prevent rooting. These soils typically have an organic clay topsoil (15-18% organic matter) over a peaty loam or loamy peat upper subsoil which is "drummy" and very acidic (pH < 4.5). Gypsum crystals and jarosite are often present in this horizon. Below 80-90 cm depth the subsoil is generally a silt loam or fine sandy clay loam which is soft, wet, strongly gleyed and possibly slightly organic. As in the case of Soil Type I the soils are permeable and have therefore been assessed as Wetness Class I.

Soil Type 3 (refer to Appendix I and Soil Types map)

4.6 These heavy clayey soils are found at the southern part of the larger site alongside the Kings Dyke, and similar soils are also mapped on the northern site. They have a dark grey brown clay topsoil over a strongly mottled greyish brown clay subsoil which has a coarse angular blocky or coarse prismatic structure. At depth the soils typically become silty clay loams or occasionally peaty loam. On the northern site the deeper subsoils were typically clay loam or sandy clay loam. These soils have slowly permeable subsoils and are therefore classified as Wetness Class III.

Soil Type 4 (refer to Appendix I and Soil Types map)

4.7 Soil Type 4 correlates well with the soils of the Midelney series having clay upper horizons over peaty layers. Soils within this soil type typically comprise a stoneless greyish brown clay topsoil over a slightly paler, mottled clay upper subsoil. Below approximately 45 cm depth an organic clay or peaty loam horizon occurs which is generally strongly acidic (pH 4.5-5). Below 80-90 cm depth the soil generally becomes a silt loam or silty clay loam which is soft and plastic. In some profiles the peaty horizons were found immediately below the topsoil. These soils have been assessed as Wetness Class I/II.

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REFERENCES

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MAFF (1964). Agricultural Land Classification Map (provisional) Sheet No. 134 1:63,360 scale

MAFF (1988). Agricultural Land Classification of England and Wales - Revised guidelines and criteria for grading the quality of agricultural land.

METEOROLOGICAL OFFICE (1989). Climatological Data for Agricultural Land Classification.

SOIL SURVEY OF ENGLAND AND WALES (1984). Soils and their Use in Eastern England.

APPENDIX I

SOIL PHYSICAL CHARACTERISTICS

LONDON BRICKWORKS, WHITTLESEY

SOIL TYPE 1 (ha)

Topsoil	Texture	organic clay
	Colour	7.5YR2/3
	Organic matter	11-14%
	$CaCO_3$	non calcareous
	Roots	common fine and very fine
	Depth	30-40 cm typically 35 cm
	Boundary	clear smooth
Subsoil 1	Texture	organic clay
	Colour	7.5YR2/2
	Structure	weak very coarse subangular blocky and coarse platy
	pH	5.5-6.5
	Consistence	firm
	Roots	common fine and very fine
	Depth	50-60 cm
	Boundary	clear wavy
Subsoil 2	Texture	peaty loam or loamy peat
	Colour	7.5YR2/2
	Structure	moderate coarse platy
	pH	5-5.5
	Consistence	slightly plastic
	Roots	common fine and very fine
	Depth	80-100
	Boundary	clear wavy
Subsoil 3	Texture	silt loam, silty clay loam, fine sandy clay loam
	Colour	7.5YR5/3
	Structure	massive
	Consistence	plastic and moist
	Roots	none
	pH	5-5.5

Wetness Class I
Soil profile stoneless throughout.

SOIL TYPE 2 (ha)

Topsoil	Texture	organic clay, occasionally organic clay loam
	Colour	7.5YR2/3
	Organic matter	15-18%
	$CaCO_3$	non calcareous
	Roots	many fine and very fine
	Depth	30-40 cm typically 35 cm
	Boundary	clear smooth
Subsoil 1	Texture	peaty loam, loamy peat
	Colour	5YR 2/3
	Structure	moderate medium subangular blocky and coarse platy
	Consistence	hard and drummy, firm below 50 cm
	pH	< 4.5
	Roots	root mat at top of horizon, then very rare below
	Depth	80-90 cm
	Boundary	sharp smooth
Subsoil 2	Texture	silt loam, fine sandy clay loam
	Colour	7.5YR5/2 and 5/3
	Mottles	few ochreous tubes
	Structure	massive
	Consistence	firm occasionally plastic
	Roots	none
	pH	4.5

Wetness Class I
Soil profile stoneless throughout

SOIL TYPE 3 (ha)

Topsoil	Texture	clay
	Colour	10YR4/3
	$CaCO_3$	non calcareous except where limed
	Roots	common fine and very fine
	Depth	30-35 cm
	Boundary	clear smooth
Subsoil 1	Texture	clay
	Colour	10YR5/3 or 5/2
	Mottles	common distinct ochreous
	Structure	strong coarse angular blocky and very coarse prismatic
	Consistence	firm
	$CaCO_3$	generally non calcareous occasionally calcareous at depth
	Roots	common fine and very fine
	Depth	80-90 cm
	Boundary	clear smooth
Subsoil 2	Texture	silty clay loam, clay loam, sandy clay loam and occasionally peat loam
	Colour	variable depending on organic matter content
	Structure	massive
	$CaCO_3$	calcareous unless organic
	Roots	few fine and very fine

Wetness Class III
Soil profile stoneless throughout

SOIL TYPE 4 (ha)

Topsoil	Texture	clay
	Colour	10YR4/3
	$CaCO_3$	non calcareous unless limed
	Roots	many fine and very fine
	Depth	30-35 cm
	Boundary	abrupt smooth
Subsoil 1*	Texture	clay
	Colour	2.5Y5/2
	Mottles	common distinct ochreous
	Structure	moderate coarse angular blocky breaking to medium angular blocky
	Consistence	firm
	$CaCO_3$	non calcareous
	Roots	many fine and very fine
	Depth	45-50 cm
	Boundary	abrupt smooth
Subsoil 2	Texture	organic clay, peaty loam, loamy peat
	Colour	7.5YR2/2
	Structure	Weak coarse subangular blocky and coarse platy
	Consistence	firm
	pH	4.5-5
	Roots	many fine and very fine, but none where pH is <5
	Depth	80-90 cm
	Boundary	clear smooth
Subsoil 3		
	Texture	slightly organic silt loam, silty clay loam
	Colour	2.5Y3/2
	Structure	massive
	Consistence	soft and plastic
	Roots	none
	$CaCO_3$	calcareous

Wetness Class I/II
Soil profile stoneless throughout
*This horizon is absent in some profiles.