STATEMENT OF PHYSICAL CHARACTERISTICS AND AGRICULTURAL LAND CLASSIFICATION

DRAX AND BARLOW:

Proposed Waste (PFA) disposal and
Industrial development site

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DRAX AND BARLOW: PROPOSED WASTE (PFA) DISPOSAL AND INDUSTRIAL DEVELOPMENT SITE

1. STATEMENT OF PHYSICAL CHARACTERISTICS

INTRODUCTION

The site (NGR SE 660295) is located north west of the Drax CEGB Station, about 6 km south east of Selby. It covers about 358 hectares, almost all of which is in agricultural use.

Survey work was carried out in March and April 1989 when soils were examined by hand auger borings at 100 metre intervals at points predetermined by the National Grid. Further borings were made, where necessary, to refine grade boundaries.

Detailed soil descriptions, and sampling for laboratory analyses, were carried out in inspection pits located at representative points in each of the 5 main soil types. All assessments of agricultural land quality were made using the methods described in the "Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land (MAFF 1988)."

LAND USE

The site is entirely in arable use except for a small area of woodland (Roundhouse Plantation) and several small areas of under utilised grassland along the extreme southern edge.

CLIMATE AND RELIEF

Mean annual rainfall is approximately 583 mm. Accumulated temperature (above $0^{o}C$) between January and June is 1407 and the field capacity period is about 121 days.

These factors indicate that there is no overall climatic restriction on ALC grade. Summer soil moisture deficits of 110 mm for winter wheat and 102 mm for potatoes, however, mean that droughtiness will be moderately limiting on all sandy soils, and slightly limiting on some coarse loamy soils.

Although irrigation would remove much of the drought risk it is not practised in the areas where droughty soils are widespread and has, therefore, not been taken into account in grading assessments.

Most of the site is level at a mean altitude of 4 m a.o.d. There are, therefore no restrictions on the use of agricultural machinery anywhere on the site.

DRAINAGE AND FLOOD RISK

The site is drained by a network of ditches in which the water is maintained at the required level by pumping to the River Ouse.

The last serious flood on parts of the site was about 20 years ago. Since then improvements have been made to the Ouse embankments and flood risk is no longer considered to be a limitation on ALC grade.

GEOLOGY

Glacial and post glacial drift deposits cover the whole area. The oldest deposit; a glaciolacustrine clay which is widespread in the Vale of York, underlies most of the site. This is covered by post glacial drift except in the south east corner, west of Drax Abbey Farm. The post glacial sediments consist of calcareous clayey and silty alluvium (warp) which is widespread in the central, eastern, and northern parts of the site, and variable sandy and loamy fluvial deposits in the west and south. Peat occurs within 1 metre of the surface in the centre of the site north of Barlow Hagg and may be more extensive below this depth elsewhere.

B. SOIL PROPERTIES

Five main soil types occur on the site.

1. LIGHT TO VERY LIGHT TEXTURED SOILS

These occur in the south west and along parts of the southern site boundary. They usually consist of sandy loam or loamy sand topsoils over similarly textured subsoils. These occasionally pass into lacustrine clay at about 80-90 cm depth.

A representative inspection pit **(Profile Pit 1)** showed a moderately developed fine sub angular blocky topsoil structure over a similarly structured upper subsoil which became moderately developed coarse and medium sub angular blocky at depth. With rare exceptions these soils are all stoneless and non calcareous.

Topsoils in this soil unit are separated according to variations in thickness and texture.

Topsoil Sub Unit **(T1)**

These consist of stoneless medium and fine sandy loams with an optimum thickness of 30 cm.

Topsoil Sub Unit **(T1A)**

Soils in this sub unit are somewhat lighter and consist of loamy medium sands with an optimum thickness of 35 cm.

Topsoil Sub Unit **(T1B)**

These topsoils occur near a soil type boundary and consist of medium textured sandy clay loam with an optimum thickness of 35 cm. They are texturally similar to topsoil unit **(T2)**, although they tend to be slightly deeper and overlie different subsoils.

Subsoils are divided into 3 units, as follows:

Subsoil Sub Unit **(S1)**

These consist of sandy loam upper subsoils which usually pass into loamy medium sand at depth.

Subsoil Sub Unit **(S1A)**

These subsoils usually consist of stoneless loamy medium sand to depth.

Subsoil Sub Unit **(S1B)**

Soils in this sub unit occur on the margins of the soil type and consist of sandy loam and loamy sand textures that commonly pass into silty clay at about 80-90 cm depth.

2. MEDIUM OVER HEAVY TEXTURED SOILS

These soils occur in the west and consist of stoneless and non calcareous sandy clay loam, sandy loam, or clay loam topsoil textures over similar upper subsoils which commonly pass into lacustrine clay below 50 cm depth.

A representative inspection pit (profile pit 2) showed a weakly developed coarse angular blocky topsoil structure over a similar but moderately developed upper subsoil structure. Below about 50 cm depth strongly developed coarse prismatic silty clay occurred.

Only one topsoil unit **(T2)** is separated. This has an optimum thickness of 35 cm and overlies the following subsoils.

Subsoil Unit **(S2)**

This unit predominates and consists of sandy clay loam and sandy loam upper subsoils that pass into silty clay at variable depths.

Subsoil Sub Unit **(S2A)**

This sub unit consists of medium textured sandy clay loam or silty clay loam subsoils to depth.

3. MEDIUM TO HEAVY CALCAREOUS WARP SOILS

These soils are extensive throughout the central part of the site and usually consist of heavy to medium silty clay loam topsoils over heavy silty clay loam or silty clay subsoils. All soils are stoneless and calcareous.

A representative inspection pit **(profile pit 3)** showed a weakly developed, adherent, coarse angular blocky topsoil structure over a strongly developed medium and coarse prismatic subsoil. Below 75 cm, massive silty clay occurred.

Topsoils

Two topsoil sub units are separated **(T3, T3A)**, although both are texturally similar, Sub unit **(T3A)** is the thicker resource. It has a patchy distribution confined to the western part of the site and consists of medium textured material with an optimum thickness of 40 cm. Sub unit **(T3)** occurs east of this and consists of similar material with an optimum thickness of 30 cm.

Subsoils

4 sub units are separated. Sub units **(S3)** and **(S3C)** both consist of heavy to medium silty clay loam which passes at depth into heavy silty clay. Sub unit **(S3C)** however, also contains peaty loam and humified peat lower subsoil horizons within 1 metre of the surface. This peaty material may occur in other sub units below this depth.

Sub unit **(S3A)** consists of deep medium textured upper subsoils which pass into heavy silty clay at depth. Because it underlies deep topsoil it has a mean depth of only 60 cm.

Sub unit **(S3B)** occurs on the margins of the soil type. It is, overall, lighter than other subsoils in this soil type and consists of calcareous medium textured material to depth.

4. MEDIUM TO LIGHT CALCAREOUS WARP SOILS

This soil type has a patchy distribution confined to the north and east, near the River Ouse. It consists mainly of medium silty clay loam or fine sandy silt loam topsoils over similar textured subsoils to depth. All soils are stoneless and calcareous, especially in the subsoil.

A soil profile pit showed a moderately developed coarse angular blocky topsoil structure over a coarse and medium angular blocky upper subsoil. This passed into a moderately developed medium platy structure below about 70 cms.

Topsoils

Four topsoil units are separated.

Sub units **(T4) (T4A) and T4C)** are texturally similar and consist of stoneless medium silty clay loam. They are separated on optimum topsoil thickness differences of 40 cm, 30 cm and 35 cm respectively.

Sub Unit **(T4B)** is lighter and consists of medium sandy silt loam with an optimum thickness of 35 cm.

SUBSOILS

5 sub units have been identified in the subsoil.

Sub unit **(S4)** consists largely of medium silty clay loam.

Sub unit **(S4A)** and **(S4B)** are texturally similar and consist of medium silty clay loam subsoils containing variable lenses of medium sandy silt loam. They differ only in thickness due to differences in the thickness of the overlying topsoil.

Sub unit **(S4C)** consists of sandy silt loam upper subsoils which pass at variable depths into a lower subsoil of heavy silty clay.

Sub unit **(S4D)** also has heavy lower subsoil horizons, but is overlain by a medium textured silty clay loam upper subsoil.

5. HEAVY TEXTURED SOILS

This soil which is equivalent to the Foggathorpe series, occurs in the extreme south east near Drax Abbey. It consists of heavy silty clay loam or clay loam topsoils over clay to depth. All soils are stoneless and non calcareous.

A soil profile pit **(profile pit 5)** was dug on similar land adjoining this site. This showed a weakly developed, adherent, coarse sub angular blocky topsoil structure over weakly developed adherent angular blocky subsoil, passing into a coarse prismatic structure at depth.

TOPSOILS

Only one topsoil unit is separated **(Unit T5)**. This has an optimum thickness of 25 cm with the exception of a small disturbed area around Drax Abbey, where topsoils are thin or absent.

SUBSOILS

Two subsoil units occur in this soil type. Sub unit **(S5)** predominates and consists of non calcareous clay to depth. Sub unit **(S5A)** occurs around Drax Abbey where the topsoils are thin or absent due to past disturbance. This sub unit therefore consists of a full metre of disturbed medium to heavy textured material.

AGRICULTURAL LAND CLASSIFICATION GRADES

The ALC grades occurring on this site are as follows.

Grade	Hectares	Per cent of total site area
1	55.2	15%
2	91.5	26%
3a	145.0	40%
3b	54.4	15%
4	8.8	3%
Non Agricultural	3.7	1%
Total	358.6	100%

Grade 1

Grade 1 land occurs along parts of the eastern and northern site boundaries. Soils are light, fertile, easily worked and have adequate reserves of available water. As such, there are few or no restrictions on agricultural use.

Grade 2

Land in this grade occurs mainly in the western and eastern parts of the site. In the east it consists of medium sandy loams or sandy clay loams which become lighter at depth.

Soil droughtiness is slightly restricting for potatoes in this area and is the main grading limitation.

Elsewhere, soils consist of heavy to medium calcareous silty clay loams (warps) over similarly textured upper subsoils which often become heavier at depth. These soils fall within Wetness Classes I and II and are limited to Grade 2 by slight topsoil workability and wetness problems.

Subgrade 3a

In the west, soils in this subgrade consist mainly of non calcareous clay loam topsoils over similar, or lighter upper subsoils. These pass into silty clay at depth. All fall into wetness class III and are limited by a combination of soil wetness and topsoil workability problems.

Along the southern edge, by Hook's Fields, soils are lighter and consist of medium sandy loam over a similar subsoil material which becomes lighter with depth. Soil droughtiness is limiting for potatoes in this area and here this is the main grading limitation.

In the central part of the site subgrade 3a occurs on warp land. Topsoils are formed of calcareous heavy silty clay loam over similar or heavier subsoils. All profiles fall within Wetness Classes II and III and are limited by slight wetness and topsoil workability problems.

Subgrade 3b

This subgrade occurs only in the southern and central parts of the site. In the extreme south west, soils consist of loamy medium sand topsoils over similar or lighter textures to depth. Soil droughtiness is limiting for both winter wheat and potatoes and is the main grade limitation.

In the south east, soils consist of non calcareous heavy clay loam or silty clay loam topsoils over gleyed and slowly permeable clay. These soils fall within Wetness Class III and are limited by soil wetness and workability difficulties.

In the central part of the site, near Hook's Fields, there are small depressions caused by differential settlement of shallow peat deposits. Soils in this area are saturated for long periods and are limited to the subgrade by wetness and topsoil workability problems.

Grade 4

Grade 4 land occurs near Drax Abbey and north west of Hook's Fields. The area near Drax Abbey consists of disturbed land known to be the site of an Augustinian Priory. Topsoil is largely absent and this area is limited to Grade 4 for this reason. The area near Hook's Fields consists of a waterlogged depression limited by extreme wetness and workability problems.

Non Agricultural

This consists of the woodland and scrub at Roundhouse Plantation.

3. SOIL PROFILE DESCRIPTIONS

LAND AT DRAX AND BARLOW

PIT 1: LIGHT TO VERY LIGHT TEXTURED SOIL

LAND USE: CEREALS
SLOPE : 2^{o}
ASPECT : EAST

HORIZON	DEPTH CM	DESCRIPTION
1.	0-35	Dark grey (10YR 4/1) loamy medium sand; stoneless; unmottled; moderately developed fine sub angular blocky structure; moist; many fine pores and fissures; many fine fibrous roots; non calcareous sharp smooth boundary.
2.	35-80	Greyish brown (10YR 5/2) loamy medium sand; stoneless; common medium and coarse clear yellowish red (5YR 4/6) mottles; moderately developed fine sub angular blocky structure; moist; many fine pores and fissures; common fine fibrous roots; non calcareous sharp irregular boundary.
3.	80-120+	Strong brown (7.5 YR 4/6) loamy medium sand; stoneless; no mottles; weakly developed medium sub angular blocky; wet; common fine pores and fissures; few fine fibrous roots; many hard ferrimanganiferous concretions.

LAND AT DRAX AND BARLOW

PIT 2: MEDIUM OVER HEAVY TEXTURED SOIL

LAND USE: CEREALS
SCOPE : 0^{o}
ASPECT :

HORIZON	DEPTH CM	DESCRIPTION
1.	0-35 cm	Very dark greyish brown (10YR 3/2) sandy clay loam; few faint fine greyish brown (5YR 4/4) mottles; stoneless; moist weakly developed coarse angular blocky structure; high packing density; moderately porous; few fine fissures; moderately firm soil strength; moderately sticky; moderately plastic; many fine fibrous roots; non calcareous; abrupt smooth boundary.
2.	35-50 cm	Greyish brown (10YR 5/2) medium sandy loam; many distinct medium strong brown (7YR 4/6) mottles; stoneless; moist; moderately developed coarse sub angular blocky structure; medium packing density; very porous; many very fine pores and fine fissures; moderately weak soil strength; slightly sticky and moderately plastic; common very fine fibrous roots; non calcareous; abrupt smooth boundary.

3.	50-100 cm	Brown (7.5 YR 4/2) silty clay; many distinct medium grey (N5) and dark brown (7.5YR 4/4) mottles; stoneless; moist; strongly developed coarse prismatic structure; high packing density; slightly porous common very fine pores and fissures; very firm soil strength; very sticky very plastic; few very fine fibrous roots; non calcareous.

LAND AT DRAX AND BARLOW

PIT 3: MEDIUM TO HEAVY CALCAREOUS WARP SOIL

LAND USE: ARABLE
SLOPE : 0^{o}
ASPECT :

HORIZON	DEPTH CM	DESCRIPTION
1.	0-25	Very dark greyish brown (10YR 3/2) silty clay loam; stoneless; unmottled; moist; weakly developed adherent coarse angular blocky structure; high packing density slightly porous; moderately firm soil strength; moderately sticky and very plastic; few fine fibrous and coarse fleshy roots; calcareous; abrupt wavy boundary.
2.	25-75	Grey (N5) silty clay; stoneless; many fine clear distinct light olive brown (2.5Y 5/4) mottles; moist; strongly developed medium and coarse prismatic structure; high packing density; very slightly porous; few fine fissures; very firm soil strength; very sticky and very plastic; few fine fibrous roots; calcareous; abrupt irregular boundary.
3.	75-100+	Dark grey (N4) silty clay; stoneless; very many prominent medium, sharp light olive brown (2.5Y 5/4) mottles; very moist; massive soil structure; high packing density; very slightly porous;

very few fine pores and fissures; moderately firm soil strength; very sticky and very plastic; no roots; non calcareous.

LAND AT DRAX AND BARLOW

PIT 4: MEDIUM TO LIGHT CALCAREOUS WARP SOIL

LAND USE: CEREALS
SLOPE : 0
ASPECT : 0

HORIZON	DEPTH CM	DESCRIPTION
1.	0-33	Very dark greyish brown (10YR 3/2) medium silty clay loam; unmottled; stoneless; very moist; moderately developed coarse angular blocky structure; medium packing density; slightly porous; moderately weak soil strength; moderately sticky and moderately plastic; common very fine fibrous and medium fleshy roots; very slightly calcareous; abrupt smooth boundary.
2.	33-70	Pale brown (10YR 6/3) fine sandy silt loam with greyish brown (10YR 5/2) structure faces; common distinct medium sharp yellowish brown (75YR 5/6) mottles; stoneless; moist; moderately developed coarse and medium sub angular blocky structure; medium packing density; moderately weak soil strength; slightly sticky and slightly plastic; few very fine fibrous roots above 50 cm; very slightly calcareous; gradual smooth boundary.

3.	70-100+	Pale brown (10YR 6/3) medium silty clay loam; with greyish brown (10YR 5/2) structure faces; common distinct medium clear yellowish brown (7.5YR 5/6) mottles; stoneless; moist moderately developed medium platey structure; medium packing density; moderately porous; moderately weak soil strength; moderately sticky and moderately plastic; no roots; slightly calcareous.

LAND AT DRAX AND BARLOW

PIT 5: HEAVY TEXTURED SOIL

LAND USE: ARABLE
SLOPE : 0
ASPECT :

HORIZON	DEPTH CM	DESCRIPTION
1.	0-25	Dark greyish brown (10YR 4/2) heavy clay loam; stoneless; wet; weakly developed adherent coarse sub angular blocky structure; medium packing density; slightly porous with a few fine pores and fissures; deformable; very sticky and very plastic; many very fine fibrous roots; non calcareous; abrupt smooth boundary.
2.	25-50	Brown (10YR 5/3) clay with distinct medium strong brown (7.5YR 5/8) and grey (10YR 6.1) mottles; brown (10YR 5/3) and greyish brown (10YR 5/2) structure faces; stoneless very moist; weakly developed adherent coarse angular blocky structure; medium packing density; slightly porous with few fine pores and fissures; semi deformable; very sticky and very plastic; very few fine fibrous roots; non calcareous; clear smooth boundary.

3.	50-100	Brown (7.5YR 4/2) clay with many distinct medium and coarse brown (7.5YR 5/4) and grey (5Y 5/1) mottles; grey (5Y 5/1) structure faces; stoneless; moist; moderately developed coarse prismatic structure; high packing density; very slightly porous with a few coarse pores and structure face fissures; moderately strong soil strength; very sticky and very plastic; few very fine fibrous roots; non calcareous.