

Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three Offshore Wind Farm

Preliminary Environmental Information Report:
Annex 6.1 – Agricultural Land Classification Published Data (Part 2)

Date: July 2017


Hornsea 3
Offshore Wind Farm

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Environmental Impact Assessment
Preliminary Environmental Information Report

Volume 6
Annex 6.1 – Agricultural Land Classification Published Data

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www.dongenergy.co.uk/hornseaproject3

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AGRICULTURAL LAND CLASSIFICATION
 NORWICH AREA LOCAL PLAN
 LAND AT COLNEY LANE A, NORFOLK

1. BACKGROUND

- 1.1 The site, an area of 204.8 hectares, is the subject of a local plan review for the Norwich area. Within the site, 71.4 hectares of land, adjacent to Hethersett Lane, and 20.6 hectares of land, adjacent to Newfound Farm, were surveyed previously by MAFF in 1988, in connection with proposals to develop a new hospital. The remaining 112.7 hectares were surveyed by MAFF during August 1989.
- 1.2 On the published Agricultural Land Classification map sheet number 126 (provisional, scale 1:63360 MAFF 1969), the area is shown as grade 3.

PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

- 2.1 Climatic data for the site was obtained from the published agricultural climatic dataset (Met. Office 1989). This indicates for the site's mid range altitude (25m AOD) the annual average rainfall is 619mm (24.4"). This dataset also indicates that field capacity days are 120 and moisture deficits are 117mm for wheat and 112mm for potatoes. These climatic characteristics do not impose any climatic limitation on the ALC grading of the survey site.

Altitude and Relief

- 2.2 A valley feature (at approx. 15m AOD) runs from west to east through the centre of the site. From this valley feature the land rises gently to the north and south to a maximum altitude of 32m AOD, at the south-western corner of the site. Gradient and altitude do not constitute limitations to the ALC grade.

Geology and Soils

- 2.3 The published 1:50,000 scale drift edition geology map sheet 161 and the 1:25,000 scale Sand and Gravel Resources sheet TG10 show the survey area to comprise mainly sand and gravel deposits interspersed by smaller areas of boulder clay.
- 2.4 The Soil Survey of England and Wales have mapped the area on two occasions firstly, in 1973, at a scale of 1:100,000 and secondly, in 1983, at a reconnaissance scale of 1:250,000. These maps show the occurrence of the Burlingham 1 Association (*1). During the current survey a more detailed inspection of the soils was carried out.

Two main soil types occur over the site.

- 2.4.1 The most extensively occurring soil type is a coarse textured soil which is freely draining (wetness class I) and significantly droughty. Typical profiles comprise loamy sand (or occasionally sandy loam) topsoils over loamy sand or sand upper subsoils which overlies medium sand. Surface and profile stone content varies from 0-10%* small and medium subangular flints. Stony variants of these soils occur in the vicinity of the wood (GR: TG185070) where profiles often overlies gravelly horizons below 60cm depth.
- 2.4.2 The second soil type is better bodied, occurs in isolated pockets and may coincide with areas of boulder clay drift. This soil has a wetness class of I or occasionally II, and typically comprises sandy loam topsoils over sandy loam, loamy sand or sandy clay loam subsoils which may overlies loamy sand, sand or clays at depth. Surface and profile stone content generally varies from 0-10%* small and medium sub-angular flints.

- (*1) Burlingham 1 Association: Deep coarse and fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging. Some deep well drained coarse loamy and sandy soils.

- * Occasionally isolated patches, too small to delineate at this scale, of 10-20% surface and/or subsoil stone content can occur.

AGRICULTURAL LAND CLASSIFICATION

- 3.1 The definition of the agricultural land classification grades are included in Appendix 1.
- 3.2 The table below shows the breakdown of ALC grades for the survey area.

AGRICULTURAL LAND CLASSIFICATION

Grade	ha	%
2	3.2	1.5
3a	72.2	35.0
3b	117.2	57.0
Urban	1.0	0.5
Non Agricultural	6.9	4.0
Agricultural Buildings	4.3	2.0

TOTAL	204.8	100.0

3.3 Irrigation

The central part of the site around Newfound Farm is regularly irrigated; this irrigation significantly enhances the potential of the light textured soils which characterise the site. The ALC grade assigned to this area takes into account the reduction in drought risk afforded by irrigation.

3.4 Grade 2

A small area of land, to the south west of Newfound Farm, has been mapped as Grade 2. This land is associated with slightly droughty variants of the soils described in paragraph 2.4.2. The regular irrigation water this area receives could significantly enhance the potential of these soils, however, topsoil stone ranges from 5-10%;

as a result these flints act as a slight impediment to cultivation, harvesting and crop growth. It is this slight topsoil stone limitation which excludes the land from a higher grade.

3.5 Subgrade 3a

Two main situations occur.

- 3.5.1 In the vicinity of Newfound Farm, land has been mapped as subgrade 3a, where significantly droughty coarse textured soils occur. (refer paragraph 2.4.1) Regular irrigation enhances the water holding capacity of these soils; as a result the land has been graded 3a.
- 3.5.2 In the remaining areas of land graded 3a the moderately droughty variants of soils described in paragraph 2.4.2 occur. The coarse soil textures have a moderate limiting effect on the available water holding capacity of these soil profiles. As a result moderate droughtiness imperfections exclude this land from a higher grade.

3.6 Subgrade 3b

The majority of the survey area has been mapped as 3b. This land is associated with the soils described in paragraph 2.4.1. These coarse textured sandy soils are freely draining and only hold low reserves of available water. As a result droughtiness is the chief limitation ** to the ALC grade.

3.7 Non Agricultural

Woodland scrub, vacant land and recreational areas have been mapped as non agricultural.

3.8 Urban

Residential buildings have been mapped as urban.

April 1990

Resource Planning Group

Cambridge RO

** Occasionally the soils may also be limited to subgrade 3b by surface stone content (15%+).

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 includes 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 root 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. When 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.

References

- GEOLOGICAL SURVEY OF ENGLAND AND WALES (1975) Solid and Drift Edition
Geology Map No 161. Scale 1:50,000
- INSTITUTE OF GEOLOGICAL SCIENCES, (1972) 1: 25,000 scale, Sand and Gravel
Resources of the country around Hethersett sheet TG10, Mineral
Assessment Report No 73/4 HMSO, London.
- MAFF 1969. Agricultural Land Classification Map Number 126, scale 1:63,360
- MAFF 1988. Agricultural Land Classification of England and Wales. Revised
Guidelines and Criteria for grading the quality of Agricultural Land.
Alnwick.
- METEOROLOGICAL OFFICE 1989. Climatic Data extracted from the Agricultural
climatic dataset.
- SOIL SURVEY OF ENGLAND AND WALES 1973. 'The Soils of Norfolk', Scale
1:100,000.
- SOIL SURVEY OF ENGLAND AND WALES 1983. "The soils of Eastern England" Sheet
4, 1:250,000 scale.

Agricultural Land Classification Norwich Area Local Plan, Cringleford, Norfolk

AGRICULTURAL LAND

Agricultural Grades		Agricultural Land Quality
Grade 1		Very high  Very low
Grade 2		
Grade 3	a 	
	b 	
Grade 4		
Grade 5		
Disturbed		Agricultural Buildings 
		Unsurveyed 

NON AGRICULTURAL LAND

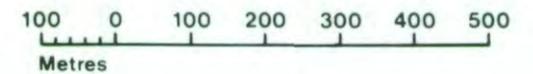
Land predominantly in urban use	
Other land primarily in non-agricultural use	

* Land in this category does not occur on this map

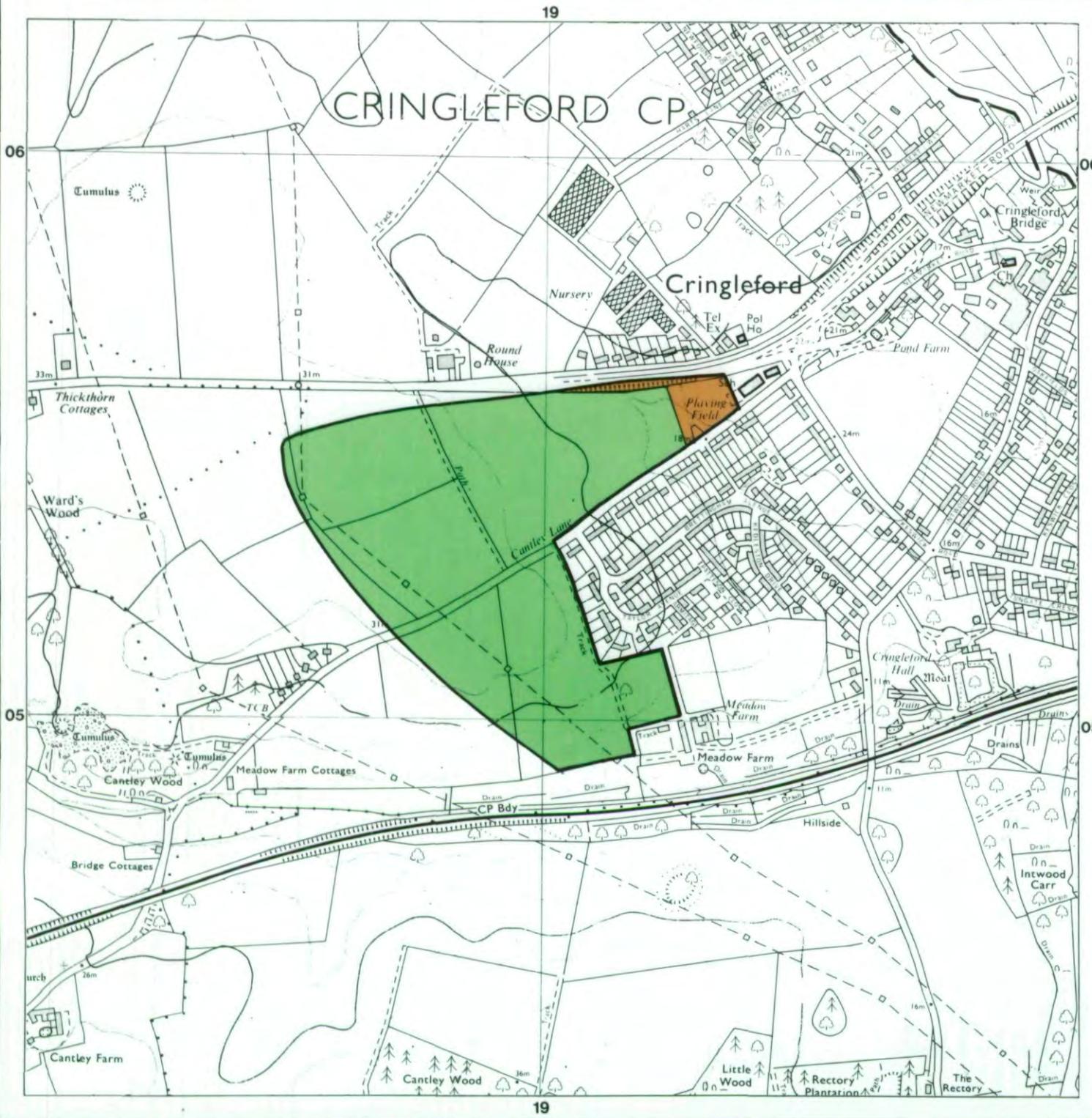
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Sheets TG 10 NE, TG 10 SE

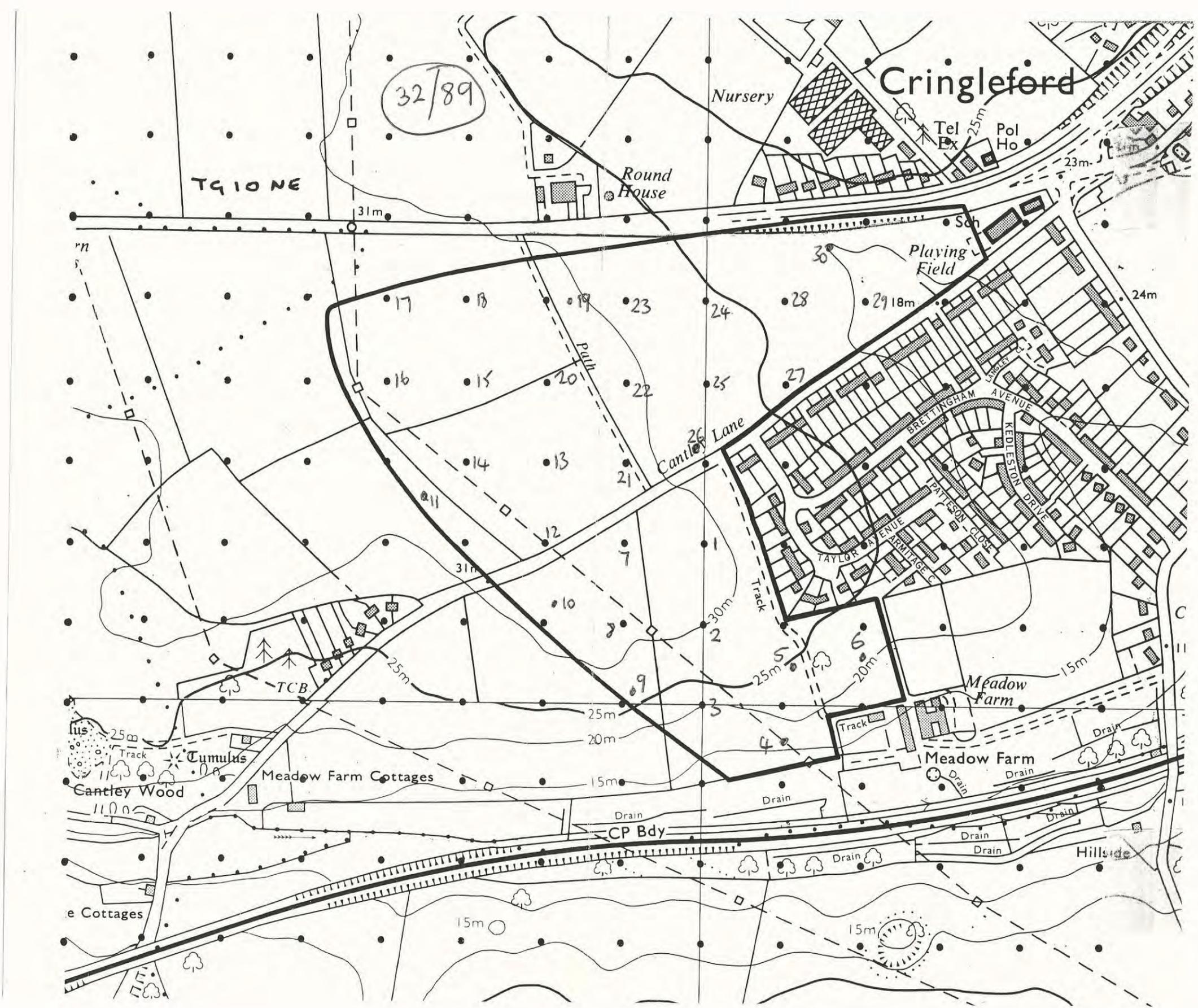
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Scale 1:10 000



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32/89

TQ 10 NE

Cringleford

Nursery

Round House

Tel Ex

Pol Ho

Playing Field

Cantley Lane

BRETtingham AVENUE

PATERSON AVENUE

TAYLOR AVENUE

TRITRIDGE CLOSE

KEDESTON DRIVE

TCB

Meadow Farm Cottages

Meadow Farm

Meadow Farm

CP Bdy

Hillside

e Cottages

Cantley Wood

Tumulus

Track

Track

Drain

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Drain

15m

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Agricultural Land Classification North of Hall Farm, Intwood, Norfolk



AGRICULTURAL LAND

Agricultural Grades Agricultural Land Quality

Grade 1		Very high ↑ ↓ Very low
Grade 2		
Grade 3	a	
	b	
Grade 4		
Grade 5		

Disturbed		Agricultural Buildings	
		Unsurveyed	

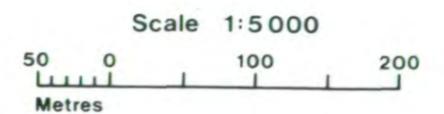
NON AGRICULTURAL LAND

Land predominantly in urban use	
Other land primarily in non-agricultural use	

* Land in this category does not occur on this map

SOURCE MAPS Base maps taken from the O.S.
Sheets TG 10 NE & TG 10 SE

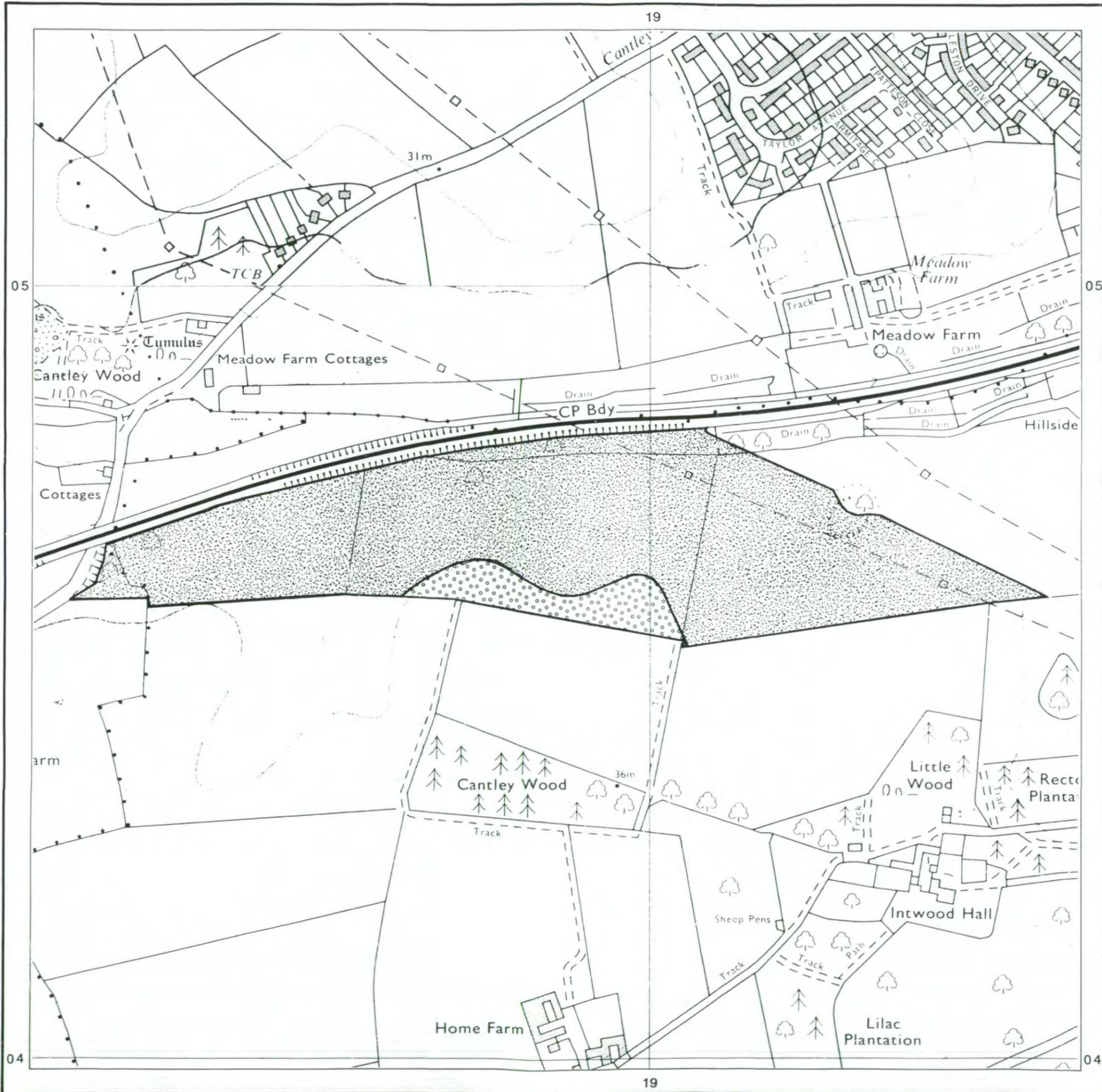
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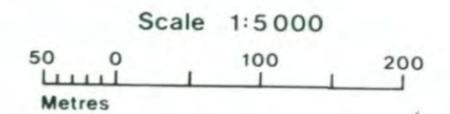
Soil Map North of Hall Farm, Intwood, Norfolk



SOIL TYPE	TOPSOIL	UPPER SUBSOIL	LOWER SUBSOIL
1	mSL (or occ LmS) 5-10% flints	LmS or mS 0-30% flints variable	
2	mSL 5-10% flints	mSL 10% flints	SCL 15-20% flints

SOURCE MAPS Base maps taken from the O.S. Sheets TG 10 NE & TG 10 SE

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PHYSICAL CHARACTERISTICS REPORT INCORPORATING AGRICULTURAL LAND CLASSIFICATION

LAND NORTH OF HALL FARM, INTWOOD, NORFOLK

1.0 INTRODUCTION

1.1 A Soil and Agricultural Land Classification survey was carried out over 20.3 ha of land to the north of Hall Farm, Intwood, Norfolk, in connection with a proposed sand and gravel extraction. The survey was conducted on 24 October 1989.

1.2 A total of 23 observations were made, using a dutch auger, to a depth of 1.2m, unless stopped by impenetrable gravel. In addition two soil pits were dug to assess subsoil conditions in more detail. Five topsoil samples were sieved to assess the stone content.

1.3 The site comprised all or parts of 3 fields. The field to the west was under a grass ley and the one to the east under winter wheat. The middle field was supporting permanent grass.

2.0 AGRICULTURAL LAND CLASSIFICATION

2.1 The land has been classified predominantly as Grade 3b, with a small area to the south of the site, at the top of the slope, as Grade 3a. Four small areas of non agricultural land have been identified, with three being woodland and the fourth at the eastern end being an old sand and gravel pit currently used as a tip for farm waste.

2.2 The following table gives a breakdown of the areas and grades:

Grade	Area ha	%
3a	1.8	8.9
3b	17.0	83.7
Non Agricultural	1.5	7.4
<hr/>		
Total	20.3	100

2.3 The major limitation associated with this site is droughtiness. The majority of the area which is Grade 3b has sandy soils with a variable stone content. On the Grade 3a area the soils are slightly heavier, but tend to be moderately stony and hence still suffer from a drought limitation. Although irrigation is available on the farm, it is considered that there is insufficient to warrant upgrading. In addition as much of the site has a moderate slope with the central area restricted to 3b on slope, irrigation could cause erosion on these sandy soils if not carefully controlled.

2.4 A full description of the site and soil physical characteristics is given below.

3.0 **SITE PHYSICAL CHARACTERISTICS**

Climate

3.1 Climatic information for the site has been interpolated from the 5km grid dataset produced by the Meteorological Office (Met Office, 1989). The average annual rainfall for the site is 608mm which is low by national standards. The number of days at which the site is likely to be at field capacity is moderately low at 118.

3.2 The accumulated temperature for this area is 1415 degrees celsius. This parameter indicates the cumulative build-up of warmth available for crop growth, and along with rainfall has an influence on the development of soil moisture deficits and susceptibility to drought. The calculated soil moisture deficits for wheat and potatoes are 119 and 113 mm respectively and thus the soils will require good reserves of available water to prevent drought stress.

Relief

3.3 The site has a northerly aspect forming one site of a dry valley, with the lowest lying land adjacent to the railway on the northern boundary.

3.4 The altitude rises from approximately 14 m AOD adjacent to the railway to 32 m AOD on the mid point of the southern boundary.

SOIL MAPPING UNIT 2

Topsoil Texture : medium sandy loam.
Colour : Brown (10 YR 4/4 or 4/3)
Stone : typically 5-10%, comprising mainly small and medium subrounded and subangular flints.

Depth : in the range 30-40 cm.

Boundary : smooth sharp boundary.

Roots : common to many fine or very fine.

Subsoil 1 Texture : medium sandy loam.

Colour : Yellowish brown (10 YR 5/4).

Stone : typically 10% small and medium subrounded and subangular flints.

Depth : in the range 45-60 cm.

Structure : masked by stones.

Consistence: friable

Boundary : clear wavy.

Subsoil 2 Texture : sandy clay loam

Colour : strong brown (7.5 YR 5/6).

Stones : variable 15-20% small and medium flints as above.

Depth : Assumed to go below 1.2 m as unable to auger as too stony.

Structure : masked by stones.

Consistence: firm.

Additional Information :

At the eastern end of the site near the existing pit a stony sandy clay loam till was found underlying the loamy sand or sand subsoil generally below 80 cm depth. However over the majority of the mapping unit, no till was found within the top 1.2 m depth. At the site of pit 2 this till occurred at 50 cm depth, but was not found at this level in any of the auger bores. The characteristics of this pit equate more closely with the auger bores in mapping unit 2.

Additional Information : The soils are free draining wetness class I. As this is a narrow area the soils will be variable due to the neighbouring fluvioglacial sand and gravel.

October 1989

Resource Planning Group
Cambridge

References

Geological survey of Great Britain (1975) 1:50,000 scale map Sheet No.161, Norwich, Solid and Drift Edition.

MAFF (1988). Agricultural Land Classification of England and Wales.

Meteorological Office (1989) Climatological data for Agricultural Land Classification.

Soil Survey of England and Wales (1984) Soils and their use in Eastern England.

Agricultural Land Classification

Harford Farm Ipswich Rd, Norfolk

AGRICULTURAL LAND

Agricultural Grades
(Irrigated)

- Grade 1
- Grade 2
- Grade 3 a
 b
- Grade 4
- Grade 5

Agricultural Land Quality

Very high



Very low

Disturbed

Agricultural Buildings

Unsurveyed

NON AGRICULTURAL LAND

Land predominantly in urban use

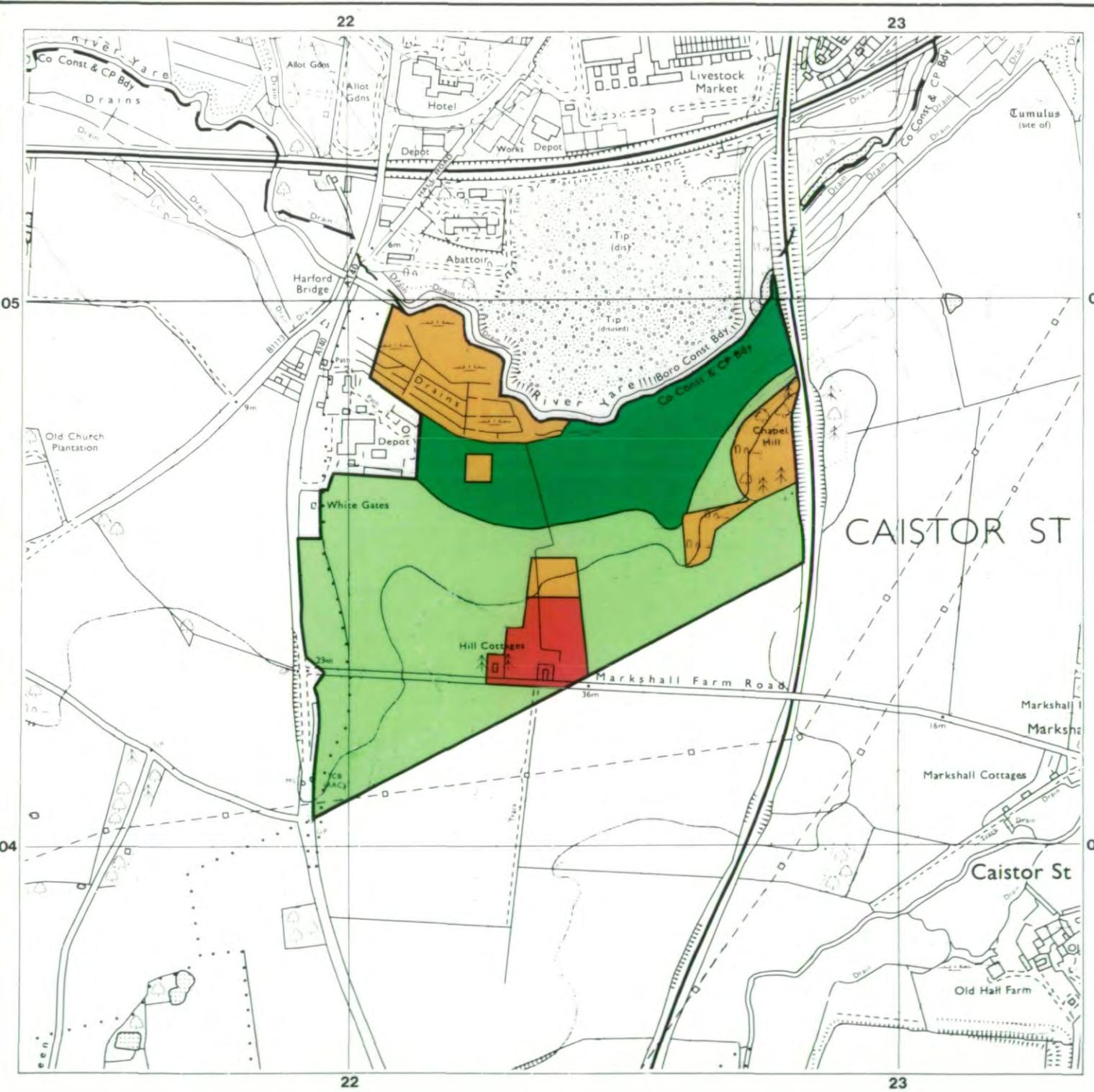
Other land primarily in non-agricultural use

* Land in this category does not occur on this map

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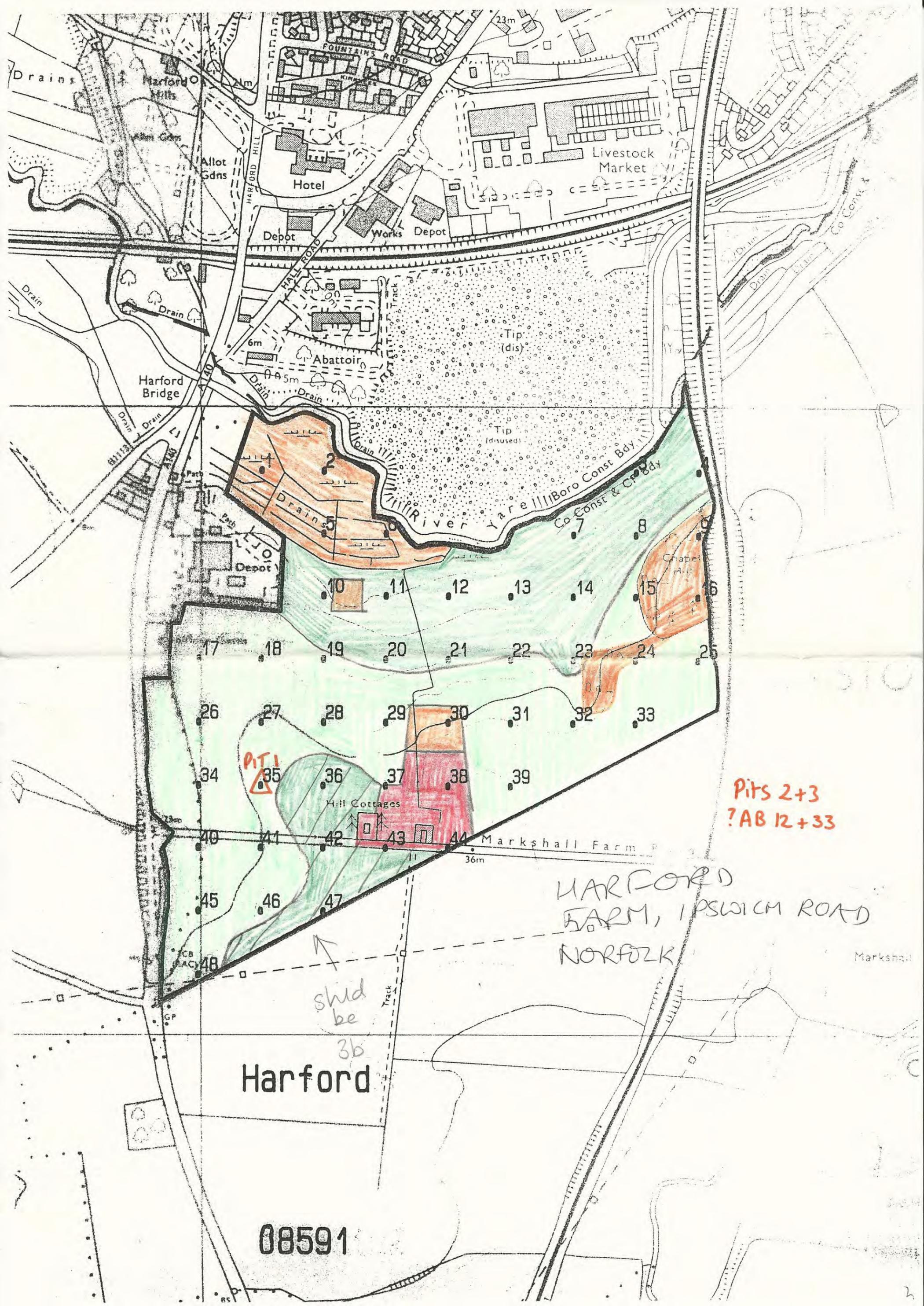
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Pits 2+3
?AB 12+33

HARFORD
FARM, IPSWICH ROAD
NORFOLK

shid
be
3b

Harford

08591

AGRICULTURAL LAND CLASSIFICATION
HARFORD FARM, IPSWICH ROAD, NORWICH

1.0 BACKGROUND

1.1 Land on this 50 ha site was inspected on the 9th and 10th January 1992, in connection with proposals for a light industrial development. A total of 41 auger borings were made mainly on a 100 metre grid basis, supplemented by additional auger borings as necessary. This information was supplemented by data collected from 3 soil profile pits. At the time of survey the land was under winter barley, but had until relatively recently been under an intensive irrigated potato cropping regime. Approximately 10 hectares were in non agricultural or urban use.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Altitude and Relief

2.1 The site occupies level and sloping ground on the north facing valley sides of the River Yare. From a maximum altitude of approximately 36 m AOD on the relatively level ground close to Hill Cottage, the land falls over moderately steep to steep gradients (measured at 6° to 17°) to a minimum altitude of approximately 5 m AOD on the river valley floodplain, in the northwest of the site.

2.2 Gradient constitutes a limitation to land quality where it exceeds 7° and effectively limits quality to subgrade 3b. This occurs on sloping ground to the north and south west of the farm building, and to the south of the Depot. On the west facing slopes north of Marshall Farm Road, gradients were measured at 6° or occasionally 7° and did not constitute a limitation to land quality. Some particularly steeply sloping agricultural land immediately east-north-east of the farm buildings was measured at 11° which represents the maximum gradients permissible in 3b.

2.3 Areas of land with gradients in excess of 11° occur immediately south west of Chapel Hill Wood and are currently uncultivated and under scrub vegetation.

Surface Stoniness

2.4 Estimates of total stoniness and surface stones in excess of 2 cm were made at each auger location across the site, and riddling undertaken where necessary to confirm quantities critical to individual ALC grades. The descriptions which follow relate to stones in excess of 2 cm:

2.5 Over much of the gently sloping land south of, and adjoining the River Yare, surface stone was typically between 5-10% of soil volume, although patches in excess of 10% were found to occur locally, thus limiting this area to grade 3a.

2.6 South of Marshall Farm Road surface stoniness increased from 5% in the vicinity of the road to just in excess of 15% in the southwest corner of the site where it effectively restricts land quality to 3b.

2.7 Over much of the intervening land surface stoniness was estimated at 3-6% of soil volume, with patches of up to 10% occurring rarely. Much land is therefore eligible for grades 1 or 2 on stoniness grounds.

2.8 Exceptions occur on the level upper slopes east of the farm buildings and to the south of Chapel Hill Wood and the adjoining scrub where patches of between 10% and 22% of soil volume occur commonly, restricting much of this area to 3b on stoniness grounds.

Topsoil Texture

2.9 This only constitutes a limitation to land quality on the level upper slopes southwest and west of Hill Cottage where medium sand top soils predominate.

Climate

2.10 The site is eligible climatically for grade 1. The relevant climate parameters are as follows:

Average Annual Rainfall	597 mm
Accumulated Temperature	1408°C
Field Capacity Days	114
Moisture Deficit (Wheat)	120 mm
Moisture Deficit (Potatoes)	115 mm

Geology

2.11 The solid geology of the site is Upper Chalk, although this is only mapped as being exposed in relatively small areas of gently sloping ground adjoining the River Yare. Elsewhere the Chalk is obscured by spreads of glacial sands and gravels, or in small areas immediately adjoining the river, by first terrace river gravels. Alluvium is mapped as occurring on the lowlying marshland to the north of the site and in a narrow tongue along the valley floor extending southwards from the Depot.

Soils

Two main soil types occur on the agricultural land on site and these are related closely to relief.

2.12 On the gently sloping land adjoining the River Yare soils are moderately well bodied, slightly stony and comprise sandy loam or sandy clay loam textures overlying chalk marl (silty clay loam in texture) below 50 cm depth. Wetness class is assessed as predominantly II, occasionally I.

2.13 Elsewhere soils mainly comprise free draining (wetness class I) light textured loamy sands, sands and sandy loam topsoils overlying progressively higher textured subsoils. The stone content of these profiles is variable ranging from very slightly stony to moderately stony in some locations (see paragraphs 2.4 to 2.8). Due to their light texture these soils are particularly prone to surface water erosion, which may be severe in areas of sloping ground.

2.14 In small areas to the west of the site, heavier soils outcrop on the shoulders of some slopes. Profiles in these areas are typically stony and comprise sandy loam or sandy clay loam textures overlying stiff clay at shallow depth, which may in turn overlie gravel or hoggin. Wetness class is assessed predominantly as III.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 A reliable and adequate source of irrigation water is available on site and has been taken into account in grading the land. It should be noted however that upgrading has only occurred in one relatively small area of gently sloping or level land with reduced risk of surface water erosion and no over riding gradient, or stoniness or topsoil texture constraints.

3.2 The site is graded 3a and 3b. A breakdown of ALC grades in hectares and percentage terms is provided below.

ALC	Ha	%
3a	11.5	22.8
3b	28.4	56.2
Non agricultural	8.2	16.2
Urban	<u>2.4</u>	<u>4.8</u>
Totals	50.5	100.0

Subgrade 3a

3.3 This occurs on the gently sloping land immediately south of the River Yare. The soils in this area are more fully described in paragraph 2.11 and the land is limited predominantly by droughtiness constraints. Although irrigation water could partially offset this droughtiness limitation, the occurrence of stonier areas (in excess of 10% topsoil volume) effectively excludes this area from a higher grade.

Subgrade 3b

3.4 This is mapped over the rest of the site where light textured soils predominate (see paragraphs 2.12 and 2.13). The majority of this area is limited by gradient and droughtiness constraints although the less stony, level upper slopes west and southwest of Hill Cottage are restricted to 3b by their medium sand topsoils. Many areas of sloping ground are also affected by surface water erosion which was evident on site at the time of survey. These individual constraints collectively constitute a pattern limitation which significantly reduces the beneficial effects of available irrigation, since large areas remain restricted to 3b by gradient, surface stoniness and topsoil texture constraints. This land is therefore assessed in an unirrigated state as 3b.

3.5 Small areas of particularly steeply sloping ground east-north-east of the farm buildings on approach grade 4 (see paragraph 2.2). These areas remain in continued arable cultivation producing cereals and until recently, potatoes, and are therefore included in 3b.

3.6 An exception to the above findings occurs on the relatively level upper slopes east of the farm buildings and south of Chapel Hill Wood where soils graded 4 on droughtiness (due to the high profile stone contents described in paragraph 2.8) are upgraded to 3b with irrigation.

Non Agricultural Land

3.7 This is mapped on the lowlying marshland to the north west of the site which lies wet for much of the year and is under rough vegetation. It also occurs in a small area to the east of the Depot on the site of an old marling pit, to the north of the farm buildings in an area of new planting on disturbed ground, in Chapel Hill Wood, and the scrubland adjoining it to the south west.

Urban

3.8 The farm buildings, yard and adjacent cottage are included in this category.

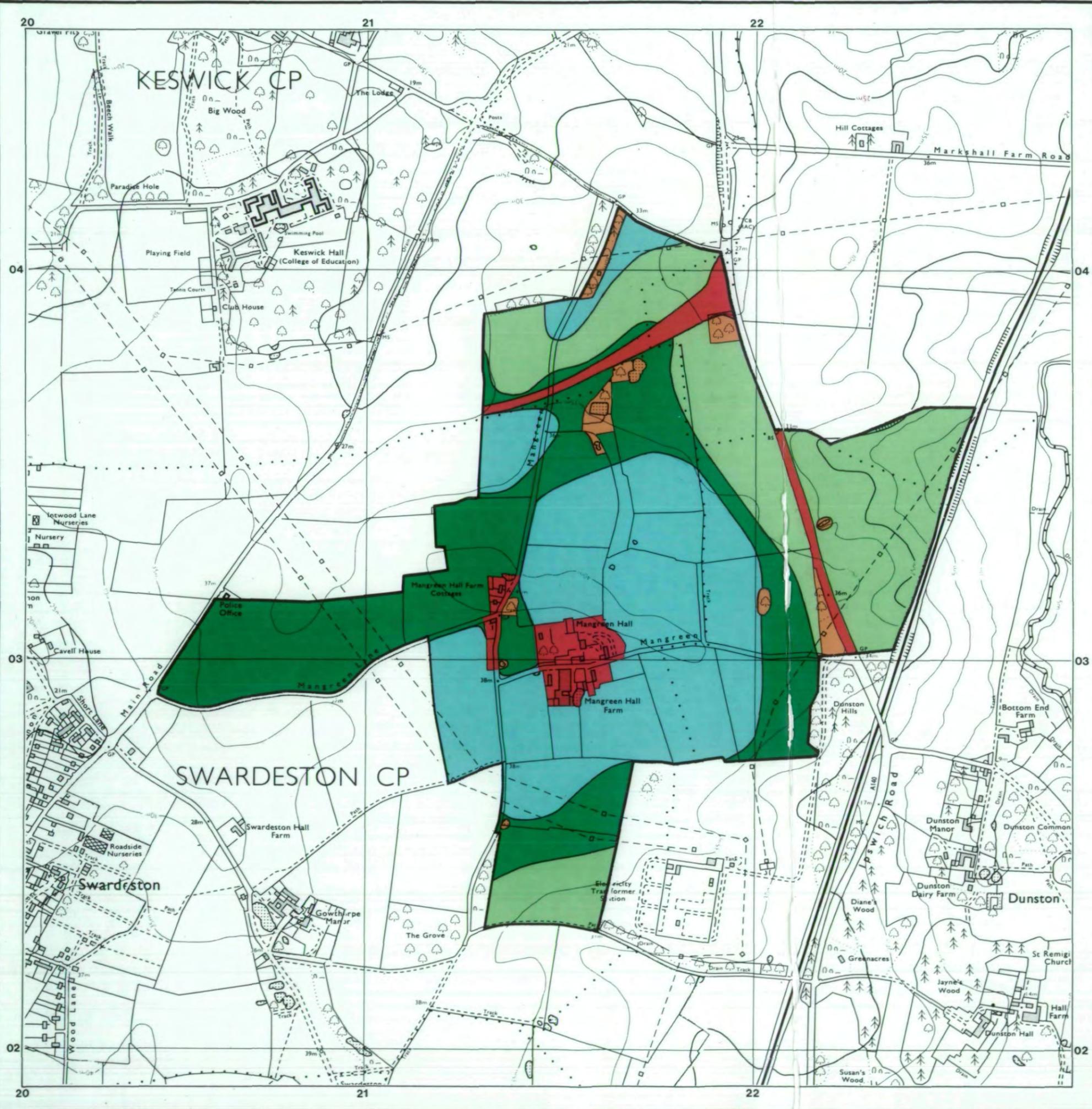
January 1992

KATHERINE A JEWSON
Resource Planning Group
Cambridge RO

Agricultural Land Classification

Mangreen Hall Farm

Norwich



AGRICULTURAL LAND

Agricultural Grades

Agricultural Land Quality

Grade 1



Very high

Grade 2



Grade 3

a



b



Grade 4



Grade 5



Very low

Disturbed



Agricultural Buildings



Unsurveyed



NON AGRICULTURAL LAND

Land predominantly in urban use



Other land primarily in non-agricultural use

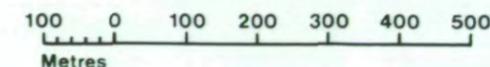


* Land in this category does not occur on this map

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AGRICULTURAL LAND CLASSIFICATION

MANGREEN HALL FARM

INTRODUCTION

- 1.1 This 152 hectare site was inspected during October and November 1990 in connection with residential/light industrial development proposals. A total of 212 soil inspections were made on site supplemented by information from 9 soil profile pits. At the time of survey the central part of the site surrounding Mangreen Hall was under horticultural use - typical crops including organically grown cabbages, carrots, leeks, parsnips, sprouts, onions and potatoes. The peripheral areas of the farm were under cereals and peas or set-aside.
- 1.2 On the provisional one inch to one mile ALC map sheet numbers 126 (MAFF 1972) the site is shown as grade 3. Subsequent semi detailed work in the vicinity of the Norwich southern bypass route indicates a predominance of subgrade 3a, with smaller areas of subgrade 3b. (Isolated auger borings of grade 2 quality are not identified at this scale of mapping.) The current survey was undertaken to provide a more detailed representation of agricultural land quality within the proposed development area.

2.0 PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

- 2.1 Site specific climate data has been obtained by interpolating information contained in the 5km grid dataset produced by the Meteorological Office (Met Office, 1989).
- 2.2 This shows the Mangreen site has an average annual rainfall of approximately 617 mm, which is low by national standards. Soils are at field capacity for a relatively short period of about 118 days.

2.3 The accumulated temperature for this area is approximately 1389° celsius. This parameter gives an indication of the cumulative build up of warmth and influences the development of soil moisture deficits (SMD)* and hence susceptibility to drought. The soil moisture deficits for wheat and potatoes at the Mangreen site are calculated as 116 mm and 111 mm respectively.

2.4 The site is neither particularly exposed nor frost prone.

2.5 Climate itself is not limiting to agricultural land quality. However, the interaction of climate with soil texture in this fairly dry geographical area results in some soils being susceptible to drought. Although an irrigation facility is available on site, water is not available in sufficient quantity to justify upgrading land with an overall droughtiness constraint. The availability of irrigation water has therefore not been considered in determining ALC grade.

Altitude and Relief

2.6 The site occupies a watershed location between two north flowing tributaries to the River Yare. The majority of the site is level or very gently sloping and lies between altitudes of 35 metres and 40 metres AOD. Around the northwestern and eastern fringes, however the ground falls over moderately steep gradients (typically 7.5°)** towards the valleys of the River Yare tributaries. In these latter areas gradient constitutes an overriding limitation to agricultural land quality restricting it to no higher than subgrade 3b.

* SMD represents balance between rainfall and evapotranspiration which occurs during the growing season. For ALC purposes the SMD's 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.

** Measured by Suunto hand held optical reading clinometer.

Geology & Soils

2.7 The geology of this area is mapped on the 1:50,000 scale solid and drift edition geology map sheet number 161 (Geol. Surv. 1975). This shows the site to be mainly comprised of glacial boulder clay drift, with smaller areas of glacial sands and gravels overlying the drift around the northern and eastern fringes.

2.8 Field Survey observation broadly support this description but indicates that smaller areas of glacial sands and gravels also occur on the more gently sloping ground towards the extreme south of the site.

Two main soil types were identified:

2.9 Over the majority of the central and southwestern parts of the site soils have developed over underlying chalky boulder clay drift and are relatively uniform in nature. Typically profiles comprise sandy loam or sandy clay loam (rarely clay loam) topsoils overlying similar upper subsoils which in turn overlie clay lower subsoils below 40-75 cm depth. In many locations the clay overlies a friable chalky drift below approximately 80 cm. Rarely topsoils directly overlie clay upper subsoils at 30/35 cm depth.

2.10 These profiles are typically non calcareous in the upper horizons and become calcareous as the underlying chalky drift is approached. Profile stone content is generally slight or very slight (3-8% soil volume) at the surface, becoming more variable in the upper subsoils where values in the range 5-25% of soil volume were recorded. Stones are commonly in the size range small and medium and comprise mainly flints in the upper horizons and chalk in the underlying boulder clay drift. Soil drainage is assessed predominantly as wetness class II with smaller areas of wetness class III and I.

2.11 The second main soil type occurs around the northern, eastern and extreme southern fringes of the site, largely coinciding with the mapped deposits of glacial sand and gravel. Soils in these areas typically comprise sandy loam, less frequently loamy sand topsoils over similar or lighter, slightly or moderately stony subsoils (5-35% soil

volume), which may extend to depth or overlie gravel/hoggin below 40-60cm.

2.12 Surface stone within these areas is variable ranging from slight to very slight (3-8% soil volume) in the north and north east, becoming stonier (10-15% soil volume) in the east and extreme south. A small area of more severe surface stone (15-25% soil volume) was recorded to the immediate north of Dunston Hills and east of the A140. Soil drainage is free and wetness class is assessed predominantly as I. Isolated auger borings of this soil type also occur in shallow valley features in the southwest of the site.

3.0 AGRICULTURAL LAND CLASSIFICATION

3.1 The site is predominantly graded 2, with smaller areas of 3a and 3b. A breakdown of land quality in hectares and percentage is provided below:

ALC	Ha	%
2	52.4	35.6
3a	44.4	29.1
3b	41.1	27.0
Urban	9.3	6.1
Non Agricultural	<u>3.4</u>	<u>2.2</u>
Total	<u>152.4</u>	<u>100.0</u>

Grade 2

3.2 This occurs in the vicinity of Mangreen Hall in the central part of the site and in smaller areas adjacent the northern and western boundaries. These areas comprise the less stony, better drained variants of soils described in paragraphs 2.9 to 2.10. The land is limited by minor winter wetness and summer droughtiness constraints. Even without the benefit of irrigation it remains capable of producing moderate to high yields of a wide range of agricultural and horticultural crops.

Subgrade 3a

3.3 This occurs fairly extensively on site encompassing the stonier, heavier and less well drained variants of soils described in paragraphs

2.9 to 2.10 together with the deeper, less stony and more water retentive variants of the lighter soils described in paragraph 2.11 to 2.12. (The latter represent soils which are transitional between the two main types.) This land is predominantly limited by winter wetness, although smaller areas of lighter soil types are limited by summer droughtiness constraints. Small areas of lighter soils in the vicinity of the A140 and in the extreme south of the site are limited by surface stoniness (see paragraph 2.12). Towards the southwest corner of the site many soil inspections are or approach grade 2 in quality, these have not been delineated separately due to their random distribution amongst borings of sub grade 3a.

Subgrade 3b

- 3.4 This is mapped around the northern, eastern and extreme southern fringes, coinciding largely with the areas mapped as glacial sands and gravels on the published geological map sheet number 161. Land in this area comprises the lighter, shallower, and/or stonier variants of soils described in paragraph 2.11 to 2.12 and is predominantly limited by moderately severe droughtiness constraints. Smaller areas in the extreme northwest of the site, and east of the A140 are also limited by gradient and surface stoniness constraints (see paragraphs 2.6 and 2.12).

Non Agricultural & Urban

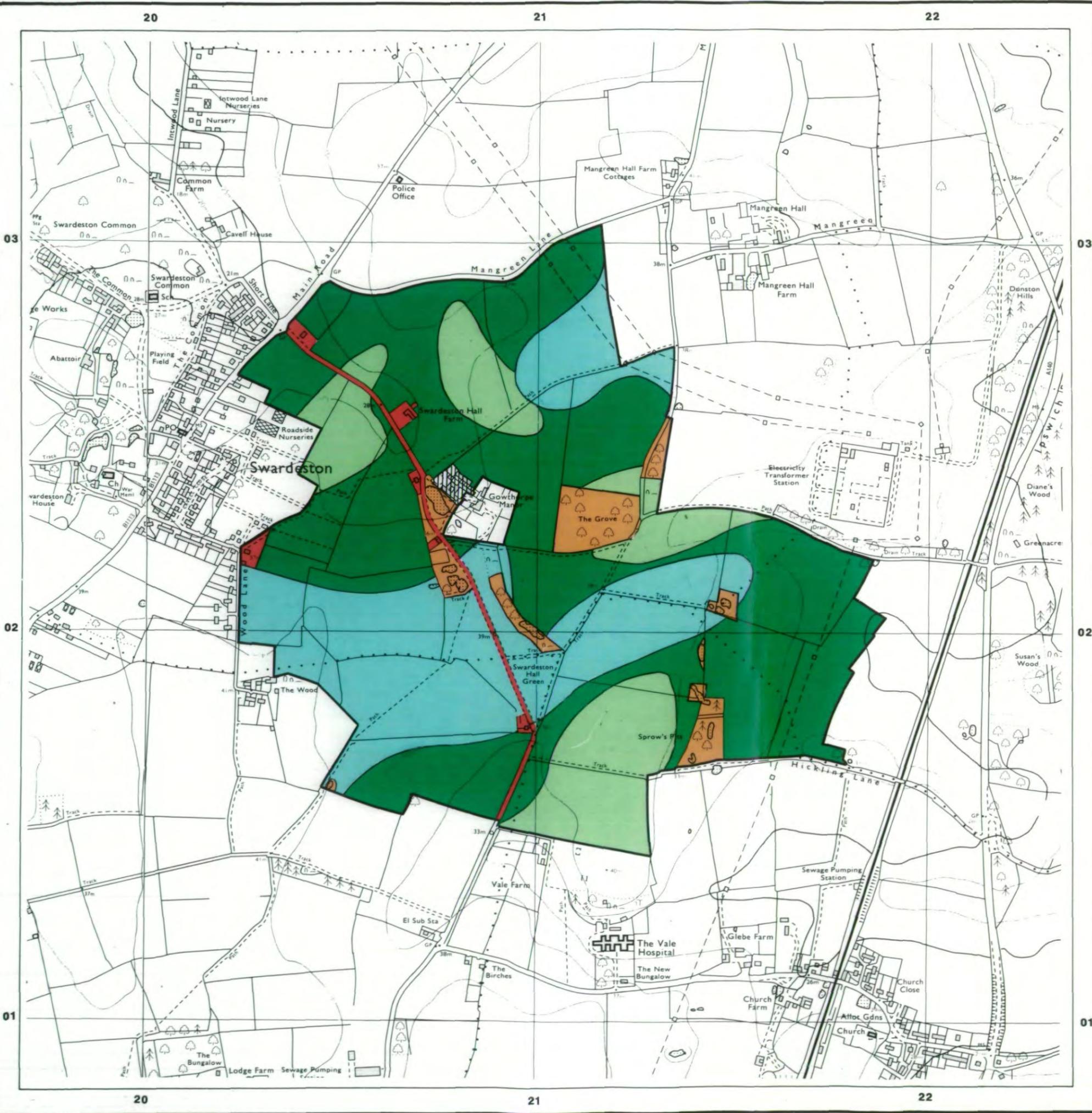
- 3.5 Areas of woodland, larger ponds and waste ground are mapped as non agricultural. Major roads, buildings and their associated grounds appear as urban.

January 1991

Resource Planning Group
Cambridge RO

Agricultural Land Classification

Gowthorpe Manor, Norfolk



AGRICULTURAL LAND

Agricultural Grades

- Grade 1
- Grade 2
- Grade 3 a b
- Grade 4
- Grade 5

Agricultural Land Quality

Very high



Very low

Disturbed

Agricultural Buildings

Unsurveyed

NON AGRICULTURAL LAND

Land predominantly in urban use

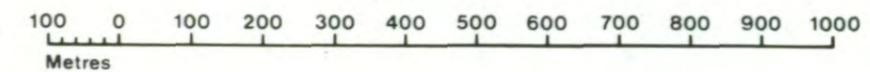
Other land primarily in non-agricultural use

* Land in this category does not occur on this map

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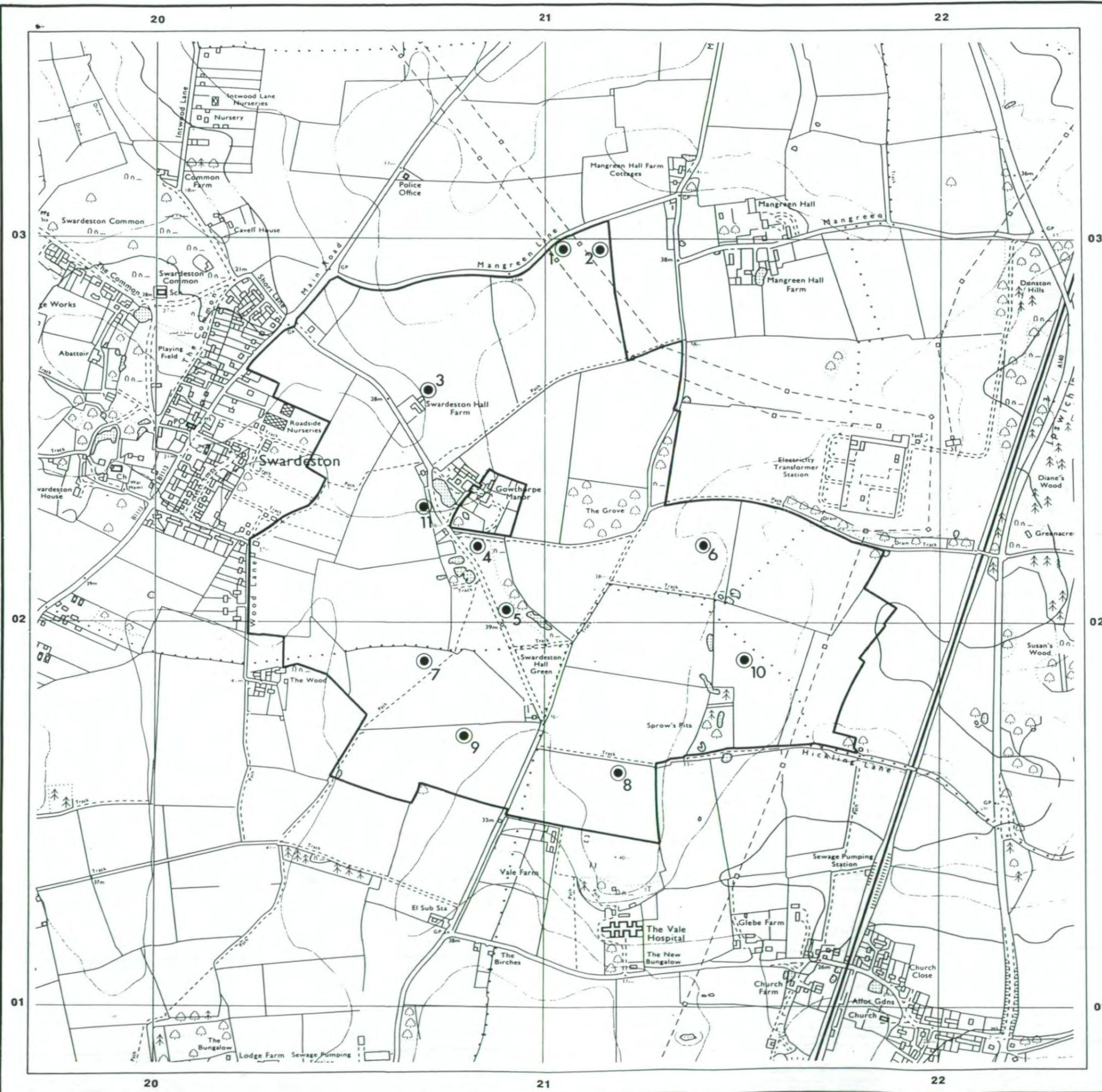
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Agricultural Land Classification

Gowthorpe Manor, Norfolk

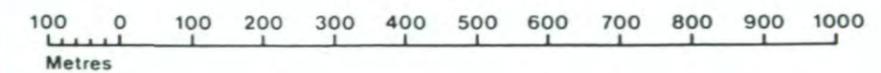


● Location of soil pit

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Agricultural Land Classification

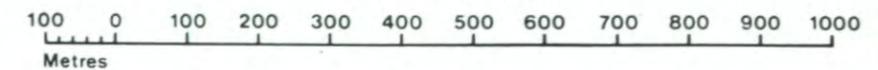
Gowthorpe Manor, Norfolk

• Location of auger boring

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