

**AGRICULTURAL QUALITY
OF LAND NEAR NECTON**

Report 2070/1

16th December, 2022

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OF LAND NEAR NECTON**

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Report 2070/1
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16th December, 2022

SUMMARY

A soils and agricultural land quality survey has been undertaken of 87.7 ha of land near Necton in December 2022.

The land mainly has fine loamy over clay soils with wetness/workability restrictions to agricultural use, giving a mixture of subgrade 3a and 3b quality. Patches with deep loamy soils are of grade 2 quality, limited by slight droughtiness, stoniness and wetness.

1.0 Introduction

- 1.1 This report provides information on the soils and agricultural quality of 87.7 ha of land north of Necton, Norfolk. The report is based on a survey of the land in December 2022.

SITE ENVIRONMENT

- 1.2 The survey area comprises five fields, bordered to the west by the A47 and by an electrical substation, to the north by a stream and on other sides by adjoining agricultural land. The land is gently sloping, at an average elevation of approximately 60 m AOD.
- 1.3 At the time of survey most of the land was under a mixture of cereals, beet and game cover crops.

PUBLISHED INFORMATION

- 1.4 1:50,000 scale BGS information records the underlying geology as Glacial till over Lewes Chalk Formation, with a strip of river alluvium recorded along the northern boundary.
- 1.5 The National Soil Map (published at 1:250,000 scale) records two soil associations at the site:
- The land in the west is recorded as Beccles Formation: mainly seasonally waterlogged fine loams over clay and clays, developed in in chalky glacial till¹.
 - The land in the east is recorded as Burlingham 3 Association: mainly loamy soils with slight waterlogging formed over chalky till or Head deposits.

¹ Hodge, C.A.H. *et al.*, (1984). *Soils and their use in Eastern England*. Soil Survey of England and Wales Bulletin No. 13, Harpenden.

2.0 Soils

2.1 A soils and agricultural quality survey was carried out in December 2022 in accordance with MAFF (1988) Agricultural Land Classification guidelines². It was based on observations at intersects of a 100 m grid, giving a density of one observation per hectare. During the survey, soils were examined by hand augerings and pits to a maximum depth of 1.2 m. A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

2.2 Soils were found to vary in texture and drainage, as described below.

FINE LOAMS OVER CLAY WITH SLOWLY PERMEABLE LAYERS

2.3 The dominant soils comprise slightly flinty sandy clay loam topsoil and upper subsoil, over slowly permeable clay, often becoming chalky at depth. The subsoils mainly show evidence of seasonally waterlogging (greyish and pale colours and ochreous mottles) at shallow depth. These soils are mainly judged imperfectly to poorly-draining under the local climate (Soil Wetness Class III or IV) depending on the depth to the slowly permeable subsoil layer.

2.4 Some variation in topsoil texture occurs, with heavy clay loams in places, and occasional sandy loams on the boundary to the loamy soils described below.

2.5 Example profiles from pits at observation points 32 and 45 (Map 1) are described in an appendix to this report.

DEEP LOAMS WITH FREE DRAINAGE

2.6 These soils occur in patches throughout the site, particularly in the south but also as a minor variation within areas of the soils described above. They comprise slightly flinty medium sandy loams and sandy clay loams, over permeable subsoil of the same texture, which is variably moderately flinty or chalky. In places they show evidence of seasonal waterlogging (greyish subsoil colours with ochreous mottles), although rarely to shallow depth.

2.7 Example profiles from pits at observation points 14 and 77 (Map 1) are described in an appendix to this report.

²MAFF, (1988). *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

3.0 Agricultural land quality

- 3.1 To assist in assessing land quality, the Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF ALC system classifies land into five grades numbered 1 to 5, with grade 3 divided into two subgrades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.
- 3.2 The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification³.
- 3.3 The relevant site data for an average elevation of 60 m is given below.
- Average annual rainfall: 701 mm
 - January-June accumulated temperature >0°C 1367 day°
 - Field capacity period (when the soils are fully replete with water) 148 days
mid Nov-mid Apr
 - Summer moisture deficits for: wheat: 103 mm
potatoes: 94 mm
- 3.4 The survey described in the previous section was used in conjunction with the agro-climatic data above to classify the site using the revised guidelines for ALC issued in 1988 by MAFF⁴. There are no climatic limitations at this locality.

SURVEY RESULTS

- 3.5 The agricultural quality of the land is primarily determined by droughtiness, wetness/workability and stoniness. Other factors have been assessed but do not affect the land grade. Land of grades 2 and 3 has been identified.

Grade 2

- 3.6 This land occurs in the south and in small patches elsewhere with loamy soils. The soils are mainly limited by slight topsoil stoniness, droughtiness and wetness/workability, often in combination. In places observations did not show any significant limitations to agriculture, but as it is not possible to separate these areas out it is judged that this land

³Meteorological Office, (1989). *Climatological Data for Agricultural Land Classification*.

⁴MAFF, (1988). *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

type should be mapped as grade 2 with slight limitations to use, but capable of producing high yields of a range of crops.

Subgrade 3a

- 3.7 This subgrade includes areas with moderately high topsoil clay content (sandy clay loam) and imperfect drainage (Soil Wetness Class III). Under the local climate this combination causes wetness/workability constraints, which limits machinery access for cultivations in winter and early spring, although late spring (as well as autumn) sowings are usually possible.

Subgrade 3b

- 3.8 This subgrade includes areas with moderately high to high topsoil clay content (sandy clay loam and heavy clay loam) and poor drainage (Soil Wetness Class IV). This combination causes significant wetness/ workability limitation, which means that spring access to land with cultivation machinery is rarely possible and arable use is therefore mainly limited to autumn sowings.

Other land (non-agricultural)

- 3.9 This comprises wooded areas, farm tracks and water bodies.

Grade areas

- 3.10 The land grades are shown on Map 2 and the areas occupied shown below.

Table 1: Areas occupied by the different land grades

<i>Grade/subgrade</i>	<i>Area (ha)</i>	<i>% of the land</i>
Grade 2	9.6	11
Subgrade 3a	52.2	60
Subgrade 3b	22.7	26
Other land	3.3	4
Total	87.7	100

APPENDIX
DETAILS OF OBSERVATIONS
MAPS

Land at Necton: Soils and ALC survey – Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality		
	No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture			Mottling	Grade	Main limitation
1		0-25	slstSCL	5-10	25-74	SC	xx	74 -90+	SCchky	xxx	3	II	2	D/St/W
2		0-27	slstSCL	5-10	27-47	SCL	o	47 -90+	C	xxx	3	III	3a	W
3		0-30	slstSCL	5	30-41	SCL	xxx	41-58 58 -80+	C SC	xxx xxx	2	III/IV	3a/3b	W
4		0-30	slstSCL	5-10	30 -53	SCL/SC	xxx				2	III/IV	3a/3b	W
5		0-36	slstSCL	5-10	36-90+	SCL/LMS interbedded	xxx				2	II	2/3a	D
6		0-42	slstSCL	5-10	42-55	SCL	xxx	55 -72 72 -90+	SCL vstSCL	xxx xxx	1	III/II	3a/2	W
7		0-30	slstSCL	5	30-52	SCL	xxx	52 -90+	Cchky	xxx	3	III	3a	W
8		0-25	HCL	<5	25 -54	Cchky	xxx	54+	Stopped on stones		1	IV	3b	W
9		0-32	slstSCL	5-10	32 -84	C	xxx	84 -90+	Cchky	xxx	3	IV	3b	W
10		0-24	slstSCL	5-10	24 -54	Cchky	xxx	54+	Stopped on stones		3	IV	3b	W
11		0-25	slstSCL	5-10	35-55	SCL	xx	55 -90+	SC	xxx	2	II	2	D/W
12		0-31	slstSCL	5	31-70	MSL	xxx	70-90+	SCL	xxx	1	III/IV	3a/3b	W
13		0-35	HCL	<5	35 -44	HCL	xxx	44 -70 70 -90+	C Cchky	xxx xxx	1	IV/III	3b/3a	W
14		0-32	slstSCL	5-10	32-44	SCL	xx	44-120+	SCLchky	xxx	1	II	2	D/St
15		0-32	slstSCL	5-10	32-64	mstSCL	xxx	64 -90+	SCLchky	xxx	2	III	3a	W
16		0-50+	mstSCL(dist)	10							3	-	-	-
17		0-28	SCL/HCL	<5	28 -65	C	xxx	65 -85 85 -100+	CSL Cchky	xxx xxx	0	IV	3b	W
18		0-33	slstHCLca	5-10	33-63	slstSCL	xxx	63 -90+	C	xxx	0	III	3a	W
19		0-25	HCL/SCL	<5	25 -40	C	xxx	40 -90+	Cchky	xxx	3	IV	3b	W
20		0-38	slstSCL	5	38 -90+	Cchky	xxx				3	IV	3b	W
21		0-30	SCL	5-10	30 -39	C	xxx	39 -64 64 + 44-90+	Cchky Stopped on stones SCL	xxx	2	IV	3b	W
22		0-30	slstSCL	5-10	30-44	SCL	xxx	44-90+		xxx	2	III	3a	W
23		0-50+	HCLca(dist)	5-10							0	-	-	-
24		0-36	slstSCL	5	36 -65	SC	xxx	65 -90+	Cchky	xxx	3	IV	3b	W
25		0-33	SCL	<5	33 -51	HCL	xxx	51 -90+	Cchky	xxx	1	III/IV	3a/3b	W
26		0-35	HCL/SC	5-10	32-62	HCL	xx	62 -90+	HCLchky	xxx	2	II	3a/3b	W
27		0-26	slstHCL/SCL	<5	26-30	HCL/SCL	xxx	30 -70 70 -90+	C Cchky	xxx xxx	3	IV	3b	W
28		0-26	slstMSL/SCL	<5	26 -60+	SC	xxx	49+	Stopped on stones		2	IV	3a/3b	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
29	0-31	slstMSL	<5	31-65	MSL	xxx	65-90+	SCL	xxx	2	III	2	W
30	0-35	vslstMSL	<5	35-81	vslstMSL	xxx	81-90+	SC	xxx	1	I/II	1	-
31	0-27	slstSCL	5	27-34	SCL	xxx	34-70 70-90+	C Cchky	xxx xxx	3	IV	3b	W
32	0-23	slstHCL	5-10	23-34	HCL/C	xxx	34-100+	Cchky	xxx	3	IV	3b	W
33	0-22	slstSCL	5-10	22-32	C	xxx	32-43 43+	Cchky Stopped on stones	xxx	3	IV	3b	W
34	0-27	MSL	<5	27-70	LCS	xxx	70-90+	C	xxx	0	II	3a	D
35	0-40	HCLca	<5	40-62	Cchky	x	62-80+	SCL(dist)	-	3	-	-	-
36	0-27	SCLca	5-10	27-71	SCLchky	x	71-90+	SCLchky	xx(x)	3	I	2	St
37	0-30	slstSCL	5-10	30-38	SCL	xxx	38-58 58-70 70+	C Cchky Stopped on stones	xxx xxx	3	IV	3b	W
38	0-32	SCL	5-10	32-63	SCL	xx	63-90+	Cchky	xxx	3	II	2	D/St/W
39	0-28	slstSCLca	<5	28-45	SCLchky	xx	45-58 58-90+	SCL SCL	xxx xxx	2	II	2	W
40	0-25	slstHCLvsca	5-10	25-90+	Cchky	xxx				1	IV	3b	W
41	0-24	slstSCL	5	24-37	C	xxx	37-90+	Cchky	xxx	1	IV	3b	W
42	0-28	SCL	>5	28-52	C	xxx	52-90+	Cchky	xxx	1	IV	3b	W
43	0-30	SCLsca	<5	30-38	C	xxx	38-90+	Cchky	xxx	1	IV	3b	W
44	0-26	SCL	<5	26-44	C	xxx	44+	Stopped on stones		2	IV?	3b?	W
45	0-34	SCL	<5	34-46	SCL	xxx	46-120	C	xxx	2	III	3a	W
46	0-24	SCL	<5	24-42	SCL	xxx	42-67 67-90+	SCL Cchky	xxx xxx	1	III	3a	W
47	0-30	slstSCL	5	30-90+	SCL	xxx				2	II	2	St/W
48	0-25	slstSCL	5	25-45	SCL	xxx	45-55 55+	C Stopped on stones	xxx	3	III	3a	W
49	0-30	slstHCL/SCL	5	30-45	SCL	xxx	45-90+	SCchky	xxx	3	III	3b/3a	W
50	0-28	slstSCL	5	28-34	SCL	xxx	34-48 48-55 55+	C Cchky Stopped on stones	xxx xxx	2	IV	3b	W
51	0-31	SCL	5-10	31-45	mstSCL	xxx	45-80+	Cchky	xxx	2	III	3a	W
52	0-22	HCLca	5-10	22-46	HCLchky	xxx	46-90+	HCLchky	xxx	3	III	(3a)	W
53	0-27	HCL/SCLca	<5	27-40	HCLchky	xx	40-53 53-90+	Cchky SCLchky	xxx xxx	3	III	3a	W
54	0-25	SCL	5	25-44	SCL	xxx	44-90+	HCL/Cchky	xxx	1	III	3a	W
55	0-32	slstSCL	5-10	32-63	slstSCL	o	63-88 88+	SCLchky Stopped on stones	xxx	1	I	2	St
56	0-32	HCL	<5	32-57	SC/HCL	xxx	57+	Stopped on stones		2	III?	3b?	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
57	0-27	HCLslca	<5	27-48	HCL	xxx	48-90+	HCLchky	xxx	2	III/II	3a	W
58	0-26	vslstSCL	<5	26-58	SCL	o	58-90+	SCL/HCLvchky	x	1	I/II	2	W
59	0-26	vslstSCL	<5	26-43	HCL	xxx	43-60 60-90+	C Cchky	xxx xxx	1	III	3a	W
60	0-23	HCL	<5	23-63	C	xxx	63-90+	Cchky	xxx	0	IV	3b	W
61	0-32	slstSCL	5-10	32-61	SCL	xxx	61-90+	HCL/SCL	xxx	1	III	3a	W
62	0-34	SCL	<5	34-55	C	xxx	55-60 60+	Cchky Stopped on stones	xxx	1	IV	3b	W
63	0-30	SCL	<5	30-42	HCL	xxx	42-84 84-90+	C Cchky	xxx xxx	1	III	3a/3b	W
64	0-20	vslstSCL	5-10	20-37	SCL	xxx	37-60 60+	SC Stopped on stones	xxx	2	IV/III	3b/3a	W
65	0-60+	SCL(dist)	<5							3	-	-	-
66	0-33	vslstSCLca	5-10	33-57	SCLca	o	57-90+	SCL	xxx	2	II/III	2/3a	W
67	0-25	SCLca	5-10	25-35	SCL	xxx	35-90+	Cchky	xxx	2	IV	3b	W
68	0-30	HCLca	5-10	30-69	Cchky	xxx	69+	Stopped on stones		2	IV	3b	W
69	0-35	SCLca	5-10	35-48	SCLslca	o	48-90+	SCLchky	xxx	1	III/II	3a/2	W
70	0-32	SCL	5-10	32-63	SCL	xxx	63-90+	Cchky	xxx	1	III	3a	W
71	0-44	MSL	<5	44-64	MSL	o	64-80+	LMS(dist?)	o	0	I	1	-
72	0-60+	SCL(dist)	<5							0	-	-	-
73	0-42	slstSCL	<5	42-90+	SCL	o				2	I	1	-
74	0-30	slstSCL	5	30-55	slstSCLfmn	xxx	55-70 70+	SCfmn Stopped on stones	xxx	3	II/III?	2/3a	W
75	0-38	slstMSL	5	38-80	MSL	xx	80-90+	SCL	xxx	4	I/II	2	St
76	0-50+	mstSCL(dist)	10							3	-	-	-
77	0-25	slstMSL	5-10	25-55	mstSCL/MSL	x	55-90+	slstSCL	xxx	3	II/III	2	St
78	0-34	slstSCL	5	34-67	slstSCL	xxx	67-90+	LMS	xx	3	II	2	D/W/St
79	0-30	HCL	<5	30-68	HCL	xxx	68-90+	SCL	xxx	0	IV/III	3b/3a	W

Soil log key

Gley indicators¹

o	unmottled
x	1-2% ochreous mottles and brownish matrix (or a few to common root mottles (topsoils)) ³
xx	>2% ochreous mottles and brownish matrix and/or dull structure faces (slightly gleyed horizon)
xxx	>2% ochreous mottles and greyish or pale matrix (gleyed horizon) or reddish matrix and >2% greyish, brownish or ochreous mottles and pale ped faces mottles or f-m concentrations (gleyed horizon)
xxxx	dominantly blueish matrix, often with some ochreous mottles (gleyed horizon)

Slowly permeable layers⁴

a depth underlined (e.g. 50) indicates
the top of a slowly permeable layer

A wavy underline (e.g. 50) indicates
the top of a layer borderline to slowly permeable

¹Gley indicators in accordance with Hodgson, J.M., 1997. Soil Survey Field Handbook (third edition). Soil survey technical monograph No. 5

²Texture in accordance with particle size classes in Hodgson (1997)

³ Occasionally recorded in the texture box

⁴Permeability is estimated for auger borings and must be confirmed by full pit observations in accordance with the definitions in:
Revised Guidelines for grading the quality of Agricultural Land (Maff 1988)

⁵Soil Wetness Classes are defined in Hodgson (1997)

⁷calcareous classes as defined in Hodgson (1997)

Texture²

C	- clay
ZC	- silty clay
SC	- sandy clay
CL	- clay loam (H-heavy, M-medium)
ZCL	- silty clay loam (H-heavy, M-medium)
SZL	- sandy silt loam (F-fine, M-medium, C-coarse)
LS	- loamy sand (F-fine, M-medium, C-coarse)
SL	- sandy loam (F-fine, M-medium, C-coarse)
S	- sand (F-fine, M-medium, C-coarse)
SCL	- sandy clay loam
P	- peat (H-humified, SF-semi-fibrous, F-fibrous)
LP	- loamy peat; PL - peaty loam

Wetness Class⁵

I (freely drained) to VI (very poorly drained)

Limitations:

W	- wetness/workability
D	- droughtiness
De	- depth
F	- flooding
St	- stoniness
SI	- slope
T	- topography/microrelief
C	- Climate

Suffixes & prefixes:

o - organic

(vsl, sl, m, v, x)st – (very slightly, slightly,
moderately, very, extremely) stony⁶

(vsl, sl, m, v, x)
(very slightly, slightly,
moderately, very, extremely) calcareous⁷

Other abbreviations

fmn - ferri-manganiferous concentrations
dist - disturbed soil layer;
R – bedrock (CH – chalk, SST – sandstone
LST – limestone, MST – Mudstone)
r-reddish, gn – greenish

Soil pit descriptions

Pit 14 (see Map 1)

0-32 cm	Dark greyish brown (10YR 4/2) sandy clay loam; slightly stony (small and medium flints (5-10% >20 mm); moderately developed medium sub-angular blocky structure; friable; non-calcareous; smooth sharp boundary to:
32-44 cm	Light yellowish brown (2.5Y 6/4) sandy clay loam with 10% faint fine light olive brown (2.5Y 5/6) mottles; slightly stony; moderately developed very coarse sub-angular blocky structure; friable; porous; non-calcareous; gradual uneven boundary to:
44-120 cm	Light grey (10YR 7/1) sandy clay loam with 30% distinct medium and coarse prominent brownish yellow (10YR 6/8) mottles; 10% flints and 20% small soft chalk fragments; moderately developed coarse and very coarse angular blocky structure; friable; medium packing density.

Pit 32 (see Map 1)

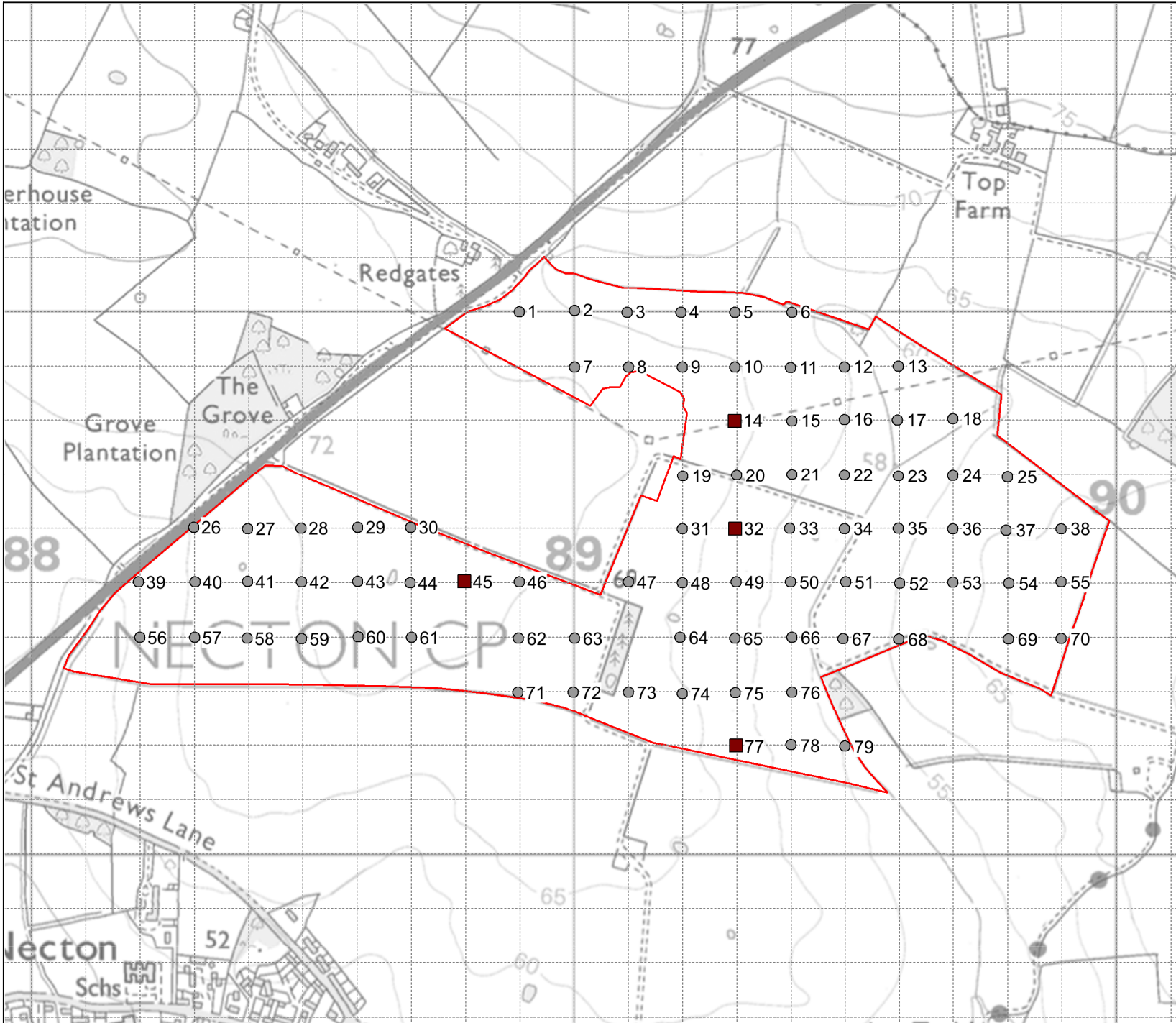
0-23 cm	Dark greyish brown (10YR 4/2) heavy clay loam; 10% small and medium sub-angular flints (5-10% >20 mm); weakly developed very coarse sub-angular blocky structure; firm; very slightly calcareous; smooth gradual boundary to:
23-34 cm	Light yellowish brown (2.5Y 6/4) heavy clay loam/clay with 5% faint fine olive yellow (2.5Y 6/6) mottles and 2% very fine black ferri-manganiferous concentrations; 10% flints; moderately developed very coarse sub-angular blocky structure; very firm; no macropores; non-calcareous; smooth gradual boundary to:
34-100 cm+	Light grey (2.5Y 7/2) clay with 5% distinct fine strong brown (7.5YR 5/8) mottles; weakly developed coarse angular blocky structure; firm; no macropores.

Pit 45 (see Map 1)

0-34 cm	Dark greyish brown (10YR 4/2) sandy clay loam; 10% small and medium sub-angular flints (5-10% >20 mm); moderately developed medium and coarse sub-angular blocky structure; friable; non-calcareous; smooth clear boundary to:
34-46 cm	Light grey (2.5Y 7/1) sandy clay loam with 25% prominent fine and medium strong brown (7.5YR 5/8) mottles; slightly stony; moderately developed coarse sub-angular blocky structure; friable; porous; non-calcareous; smooth diffuse boundary to:
46-120 cm	Grey (10YR 6/1) sandy clay with 40% prominent medium and coarse strong brown (7.5YR 5/8) mottles; slightly stony; weakly developed very coarse angular blocky structure; firm; no macropores; non-calcareous.

Pit 77 (see Map 1)

0-25 cm	Dark greyish brown (10YR 4/2) medium sandy loam; 10% flints (5-10% >20 mm); moderately developed medium sub-angular blocky structure; friable; non-calcareous; smooth gradual boundary to:
25-55 cm	Yellowish brown (10YR 5/6) sandy clay loam with pale brown (10YR 6/3) ped faces; 20% medium and large flints; moderately developed coarse sub-angular blocky structure; friable; non-calcareous; gradual diffuse boundary to:
55-120 cm	Brown (10YR 5/3) sandy clay loam with 15% distinct fine strong brown (7.5YR 5/8) mottles; 10% flints; weakly developed very coarse angular blocky structure; firm; no macropores; non-calcareous.



KEY

- Auger observations
- Pits
- Site boundary

Site:

Necton

Map title:

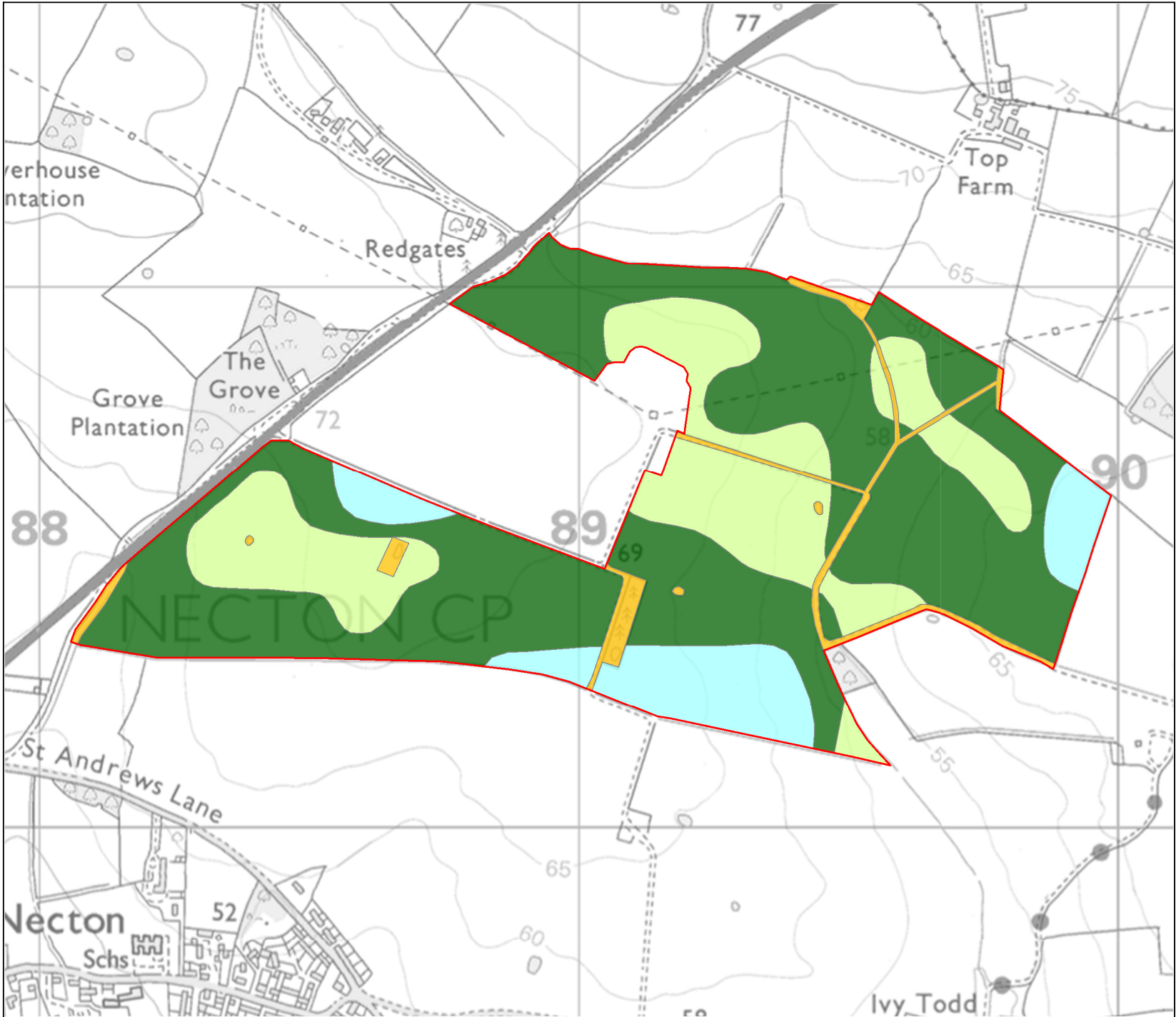
MAP 1
Observations

Land Research
ASSOCIATES

Lockington Hall
Lockington
Derby
DE74 2RH
www.lra.co.uk

Date: 18/12/2022

Scale: 1:10,000



KEY

- Grade 2
- Subgrade 3a
- Subgrade 3b
- Other land
- Site boundary

Site:

Necton

Map title:

MAP 2
Agricultural Land
Classification

Land
Research
ASSOCIATES

Lockington Hall
Lockington
Derby
DE74 2RH
www.lra.co.uk

Date: 18/12/2022

Scale: 1:10,000