

**AGRICULTURAL QUALITY OF
LAND AT MANOR FARM
NOKE**

Report 1648/1

15th January, 2020

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OF LAND AT MANOR FARM, NOKE**

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Report 1648/1
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15th January, 2020

SUMMARY

An agricultural land quality survey has been undertaken of 63.2 ha of land at Manor Farm, Noke.

The land has either shallow soils over limestone, or heavy soils with restricted drainage over clay or clayey alluvium. The land is dominantly limited by wetness or droughtiness to subgrade 3b agricultural quality.

1.0 Introduction

- 1.1 This report provides information on the agricultural quality of 63.2 ha of land at Manor Farm, Noke, Oxfordshire. The report is based on a survey of the land in January 2020.

SITE ENVIRONMENT

- 1.2 The site is bordered to the north by the River Ray, to the east by a drainage ditch and on other sides by adjoining agricultural land.
- 1.3 The land is level to gently undulating, at an average elevation of approximately 60 m AOD.

PUBLISHED INFORMATION

- 1.4 1:50,000 scale BGS information records the solid geology of the land as Cornbrash Formation limestone on higher ground in the south and north-east, and Kellaways Clay Member elsewhere. The basal geology is recorded to be overlain by river alluvium in the north and east.
- 1.5 The National Soil Map (published at 1:250,000 scale) shows Fladbury 1 Association (groundwater-affected clays) in the north and Shabbington Association (groundwater-affected loamy soils) in the east. Elsewhere Elmton 3 Association (shallow loamy and clayey soils over limestone) is recorded¹.

¹Jarvis, M.G., *et al.*, (1984). *Soils and their Use in South East England*, Soil Survey of England and Wales Bulletin No. 15, Harpenden.

2.0 Soils

2.1 A detailed soil resource and agricultural quality survey was carried out in January 2020. It was based on observations at intersects of a 100 m grid, giving a sampling density of one observation per hectare. During the survey, soils were examined by a combination of pits and augerings 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 at the site were found to vary in drainage and depth. The main soil types are described below and their distribution shown by Map 2 in an appendix to this report.

SHALLOW SOILS OVER LIMESTONE

2.3 These soils are located in the south-west of the site and comprise heavy clay loam or clay topsoils over hard limestone bedrock. In many places, the topsoil directly overlies the bedrock; in others a thin subsoil is present.

2.4 An example deeper profile is described below from observation 24 (Map 1).

0-31 cm	Dark brown (10YR 3/3) heavy clay loam; moderately stony (10% small subangular hard limestones and 10% medium and large tabular hard limestones); well developed fine subangular blocky structure; friable; calcareous; smooth clear boundary to:
31-48 cm	Reddish brown (5YR 5/4) heavy clay loam with few fine faint reddish yellow (7.5YR 7/8) mottles; moderately stony (15% small and medium subangular hard limestones); well developed medium subangular blocky structure; friable; calcareous; smooth uneven boundary to:
48 cm+	Hard limestone.

2.5 An example shallow profile is given below from observation 23 (Map 1).

0-27 cm	Dark brown (10YR 3/3) heavy clay loam; moderately stony (10% small subangular hard limestones and 15-20% medium and large tabular hard limestones); well developed fine subangular blocky structure; friable; calcareous; smooth clear boundary to:
27 cm +	Hard limestone.

2.6 These soils are freely-draining (Soil Wetness Class I).

DEEP CLAY SOILS

2.7 These soils are located in the north of the site flanking the River Ray, and on lower ground in the east. They comprise heavy clay loam or clay topsoils over slowly permeable dense clay. They are uniformly non-calcareous in topsoil and upper subsoil, and show evidence of seasonal waterlogging (greyish and ochreous mottled subsoil *gley* colouration) to shallow depth.

2.8 An example profile is described below from a pit at observation 1 (Map 1).

0-27 cm	Dark greyish brown (10YR 4/2) heavy clay loam; very slightly stony (5% small and medium subangular hard flints); moderately developed medium subangular blocky structure; firm; non-calcareous; smooth clear boundary to:
27-110 cm+	Light yellowish brown (10YR 6/4) clay with abundant distinct medium brownish yellow (10YR 6/8) and grey (10YR 5/1) mottles; very slightly stony (5% small subangular hard stones); weakly developed very coarse prismatic structure to massive (structureless); very firm.

2.9 These soils are mainly poorly-draining (Soil Wetness Class IV).

FINE LOAMS AND FINE LOAMS OVER CLAY

These soils are found over Jurassic clay/mudstone on the slopes between the shallow soils of the higher ground and the clays of the alluvial areas. They comprise non-calcareous topsoil and upper subsoil, over dense poorly-structured heavy clay loam or clay. They show evidence of seasonal waterlogging (greyish and ochreous mottled subsoil *gley* colouration) to shallow depth.

2.10 An example profile is described below from a pit at observation 39 (Map 1).

0-29 cm	Dark greyish brown (10YR 4/2) heavy clay loam; very slightly stony (5% small and medium subangular hard flints); moderately developed coarse to very coarse subangular blocky structure; firm; non-calcareous; smooth clear boundary to:
29-47 cm	Greyish brown (10YR 5/2) heavy clay loam with common distinct fine yellowish brown (10YR 5/6) mottles; stoneless; moderately developed coarse sub-angular blocky structure; firm; >2% macro-pores; non-calcareous; smooth gradual boundary to:
47-120 cm+	Light brownish grey (10YR 6/2) clay with many distinct fine yellowish brown (10YR 5/8) mottles; stoneless; weakly developed very coarse prismatic structure to massive (structureless); very firm and dense.

2.11 These soils are imperfectly-draining (Soil Wetness Class III).

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 Classification². The relevant site data for an average elevation of 60 m is given below.

- Average annual rainfall: 642 mm
- January-June accumulated temperature >0°C 1440 day°
- Field capacity period 136 days
(when the soils are fully replete with water) late Nov-early Apr
- Summer moisture deficits for: wheat: 109 mm
potatoes: 102 mm

3.3 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 MAFF³. There are no climatic limitations to agriculture at this locality.

SURVEY RESULTS

3.4 The agricultural quality of the land is determined by either wetness or droughtiness. Land of grade 3 has been identified.

Subgrade 3a

3.5 This land occurs in small areas where soils are intermediate between the shallow soils over limestone and the deeper soils with significant wetness restrictions. They are limited by slight droughtiness caused by restricted

²Meteorological Office, (1989). *Climatological Data for Agricultural Land Classification*.

³MAFF, (1988). *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

rooting (which is likely to slightly limit yields) and/or slight wetness which limits flexibility of cropping, particularly in early spring.

Subgrade 3b

3.6 Wetness is the main limitation on the land in the north and east of the site. The combination of a moderately high topsoil clay content and imperfect to poor drainage means that this land will be too wet to cultivate in spring, limiting arable use of the land to autumn-sown crops. In the northern area adjoining the River Ray, frequent winter flooding is likely to be an equally limiting factor. A small number individual sampling points were found to have slightly lesser wetness restriction, but they could not be mapped or managed separately and are therefore graded according to the dominant level of limitation.

3.7 Also included is most of the land in the south-west, which has shallow stony soils over hard limestone bedrock. The combination of stony soils and shallow rooting depth means that under the local climate this land does not supply adequate moisture reserves to support crop growth, and average yields of cereals are likely to be low. In places, very shallow depth and stoniness are likely to cause cultivation restrictions and are equally limiting factors.

Non Agricultural

3.8 This land comprises a slurry tank and surrounding area.

Grade areas

3.9 The boundary of the land grades are shown on Map 3 and the areas occupied shown below.

Table 1: Areas occupied by the land grades

<i>Grade/subgrade</i>	<i>Area (ha)</i>	<i>% of the land</i>
Subgrade 3a	3.5	6
Subgrade 3b	59.6	94
Other land	0.1	<1
Total	63.2	100

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land at Manor Farm, Noke: ALC and soil resources survey – Details of observations at each sampling point

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
1	0-27	HCL	<5	27-100+	C	xxx				0	IV	3b	W
2	0-28	HCL	<5	28-60+	C	xxx				0	IV	3b	W
3	0-30	HCL	<5	30-70+	C	xxx				0	IV	3b	W
4	0-40	HCL ca	<5	40-54	HCL ca	xxx	54-80+	C ca	xxx	2	III	3a	W
5	0-30	HCL	<5	30-60+	C	xxx				0	IV	3b	W
6	0-32	HCL	<5	32-94+	HCL	xxx				0	II/III	3a/3b	W
7	0-30	HCL ca	5-10	30-35	HCL ca	x	35+	LST		1	I	3b	D
8	0-30	HCL ca	<5	30-40	C ca	xxx	40-68 68-100+	SC ca C ca	xxx xxx	0	IV	3b	W
9	0-26	HCL ca	<5	26-60	HCL ca	xxx	60-85+	C ca	xxx	2	III	3a	W
10	0-30	HCL ca	10-15	30-56+	HCLr	o	56+	LST		1	I	3b	D
11	0-31	HCL/C	<5	31-61	C	xxx	60-92+	C x ca chalky	xxx	0	IV	3b	W
12	0-30	HZCL ca	<5	30-51	HZCL ca	xxx	51-86+	HCL x ca chalky	xxx	3	II	2	W
13	0-32	HCL	<5	32-68	C	xxx	68-92+	C	xxx	2	IV	3b	W
14	0-30	HCL	<5	30-65+	C	xxx				1	IV	3b	W
15	0-30	HCL	<5	30-60	C	xxx	60-100+	C ca chalky	xxx	1	IV	3b	W
16	0-30	HCL	<5	30-45	HCL	x	45+	LST		2	I	3b	D
17	0-31	HCL	5-10	31-100+	C	xxx				4	IV	3b	W
18	0-30	HCL ca	<5	30-52	HCL ca	xx	52-61 61-100+	C ca SCL ca	xxx xxx	3	III	3a	W
19	0-32	HCL sl ca	<5	32-56	HCL ca	xxx	56-80+	C ca chalky	xxx	2	III	3b	W
20	0-28	HCL ca	10-15	28-38	HCLr x ca	x	38+	LST		0	I	3b	D
21	0-28	HCL ca	10-15	28-31	HCLr	o	31+	LST		0	I	3b	D
22	0-30	HCL ca	20-30	30+	LST					0	I	3b	D/St
23	0-36	HCL sl ca	15-20	36+	LST					0	I	3b	D
24	0-27	HCL ca	10-15	27-40	HCLr ca	x	40+	LST		0	I	3b	D
25	0-24	HCL ca	20-25	24+	LST					0	I	3b	D/St
26	0-26	HCL ca	5-10	26-50	HCLr ca	o	50+	LST		0	I	3b	D
27	0-32	HCL slca	10-15	32-41	C	xx	41+	LST		1	II	3b	D
28	0-24	C	0	24-90+	C	xxx				0	IV	3b	W
29	0-32	HCL	0	32-90+	C	xxx				0	III/IV	3b	W
30	0-24	HCL	0	24-39	HCL	xxx	39-90+	C	xxx	1	III	3b	W
31	0-28	HCL	0	28-38	HCL	xxx	38-90+	C	xxx	2	III	3b	W
32	0-28	Cslca	5-10	28-37	mstCca	xxx	37-90+	Cca	xxx	3	III/IV	3a/3b	W
33	0-29	HCL	0	29-43	HCL	xxx	43-90+	C	xxx	0	III	3b	W
34	0-30	HCL	0	30-41	HCL	xxx	41-80+	C	xxx	0	III	3b	W

Obs No	Topsoil			Upper subsoil			Lower subsoil			Slope (°)	Wetness Class	Agricultural quality	
	Depth (cm)	Texture	Stones >20 mm (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling			Grade	Main limitation
35	0-24	HC;L	<5	24-90+	C	xxx				1	IV	3b	W
36	0-24	HCL	<5	24-34	HCL	xx	34-72 72+	C LST	xxx	2	III	3b	W
37	0-26	HCLvslca	<5	26-37	HCL	xxx	37-74 74-90+	C Cca	xxx xxx	1	III/IV	3b	W
38	0-28	HCL	<5	28-38	HCL	xxx	38-90+	C	xxx	1	III	3b	W
39	0-29	HCL	<5	29-48	HCL	xxx	48-90+	C	xxx	1	III	3b	W
40	0-25	HCL/C	<5	25-42	HCL	xxx	42-55+	C(waterlogged)	xxx	1	III	3b	W
41	0-31	HCL	0	31-90+	C	xxx				2	IV/III	3b	W
42	0-30	HCL/C	0	30-90+	C	xxx				0	IV/III	3b	W
43	0-29	HCL	5-10	29+	LST					0	I	3b	D/De
44	0-27	HCL/Cslca	5-10	27+	LST					1	I	3b	D/De
45	0-27	HCL	<5	27-46	HCL	xxx	46-90+	HCL	xxx	2	III	3b	W
46	0-28	HCL/C	0	28-90+	C	xxx				0	IV	3b	W
47	0-31	C/HCLvslca	<5	31-52	Cslca	xxx	52+	LST		0	III?	3a/3b?	W(D)
48	0-18	C	0	18-50+	C(dist TS/SS)	-				0	IV	3b	W
49	0-31	C	0	31-80+	C	xxx				0	IV	3b	W
50	0-25	C	0	25-90+	C	xxx				0	IV	3b	W
51	0-26	C	0	26-90+	C	xxx				0	IV	3b	W
52	0-26	C	0	26-74	C	xxx	74-90+	Cca	xxx	0	IV	3b	W
53	0-26	C	0	26-57	C	xxx	57-90+	Cca	xxx	0	IV	3b	W
54	0-30	C	0	30-56	C	xxx	56-90+	Cca	xxx	0	IV	3b	W
55	0-31	C	0	31-58	C	xxx	58-90+	Cca	xxx	0	IV	3b	W
56	0-29	C	0	29-58	C	xxx	58-90+	Cca	xxx	0	IV	3b	W
57	0-26	C	0	26-58	C	xxx	58-90+	Cca	xxx	0	IV	3b	W
58	0-28	C	0	28-47	C	xxx	47-90+	Cca	xxx	0	IV	3b	W
59	0-23	C	0	23-60	C	xxx	60-90+	Cca	xxx	0	IV	3b	W
60	0-28	C	0	28-45	C	xxx	45+	Waterlogged (stopped)		0	IV	3b	W
61	0-27	C	0	27-90+	C	xxx				0	IV	3b	W
62	0-22	C	0	22-68	C(r)	xx	68-90+	C	xxx	0	III/II	3b/3a	W
63	0-26	HCLslca	15-20	26+	LST					2	I	3b	De/St/D

Key to table

Mottle intensity:

- o unmottled
- x few to common rusty root mottles (topsoils)
or a few ochreous mottles (subsoils)
- xx common to many ochreous mottles and/or dull structure faces
- xxx common to many greyish or pale mottles (gleyed horizon)
- xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

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

Texture:

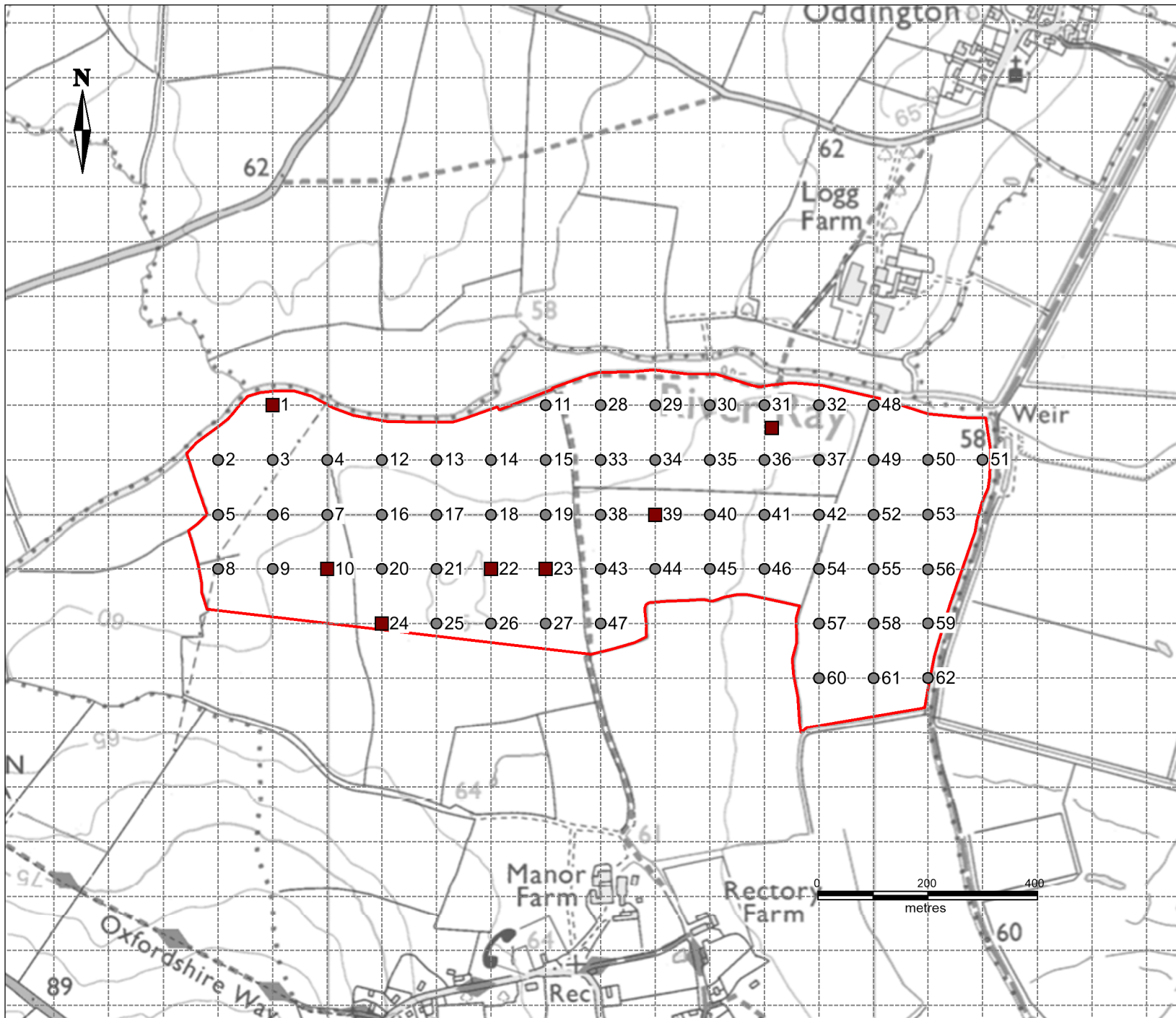
- C - clay
- ZC - silty clay
- SC - sandy clay
- CL - clay loam (H-heavy, M-medium)
- ZCL - silty clay loam (H-heavy, M-medium)
- SCL - sandy clay loam
- SZL - sandy silt loam (F-fine, M-medium, C-coarse)
- SL - sandy loam (F-fine, M-medium, C-coarse)
- LS - loamy sand (F-fine, M-medium, C-coarse)
-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

Limitations:

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

Texture suffixes & prefixes:

- ca - calcareous: x-extremely, v-very, sl-slightly
- (ca) marginally calcareous
- mn - ferrimanganiferous concentrations
- gn - greenish, yb - yellowish brown, rb - reddish brown
- r - reddish; (v)st - (very) stony; sdst - sandstone; lst - limestone
- dist - disturbed soil layer; mdst - mudstone



KEY

- Observation point
- Soil description pit
- Survey area

Site:

**Manor Farm
Noke**

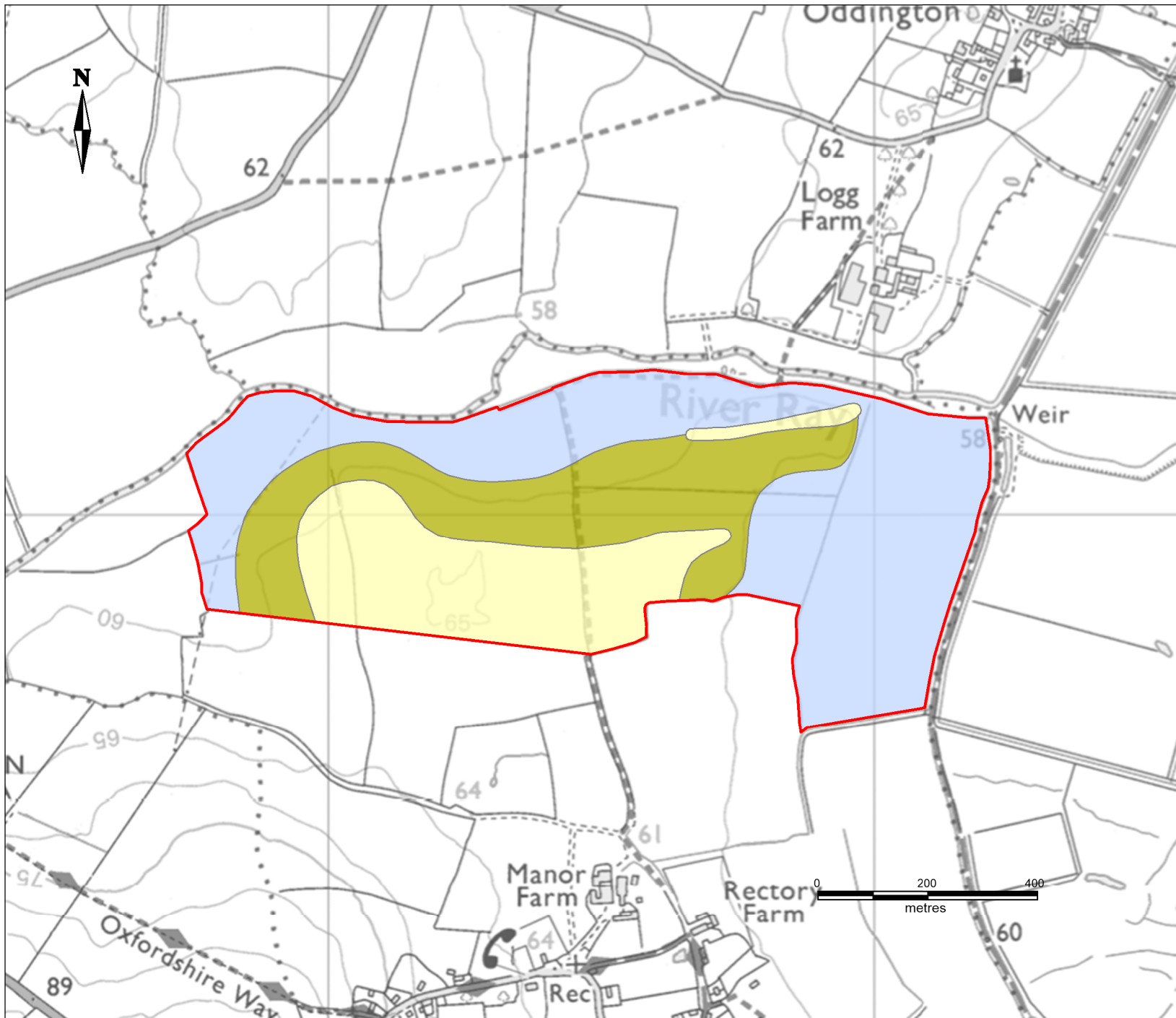
Map title:

**Map 1
Observations**

**Land
Research**
ASSOCIATES
Land Research Associates
Lockington Hall
Lockington
Derby DE74 2RH
01509 670570

Scale: 1:10,000

Date: 13/01/2020



KEY

- Shallow soils
- Fine loams and fine loams over clay
- Deep clay soils
- Survey area

Site:

**Manor Farm
Noke**

Map title:

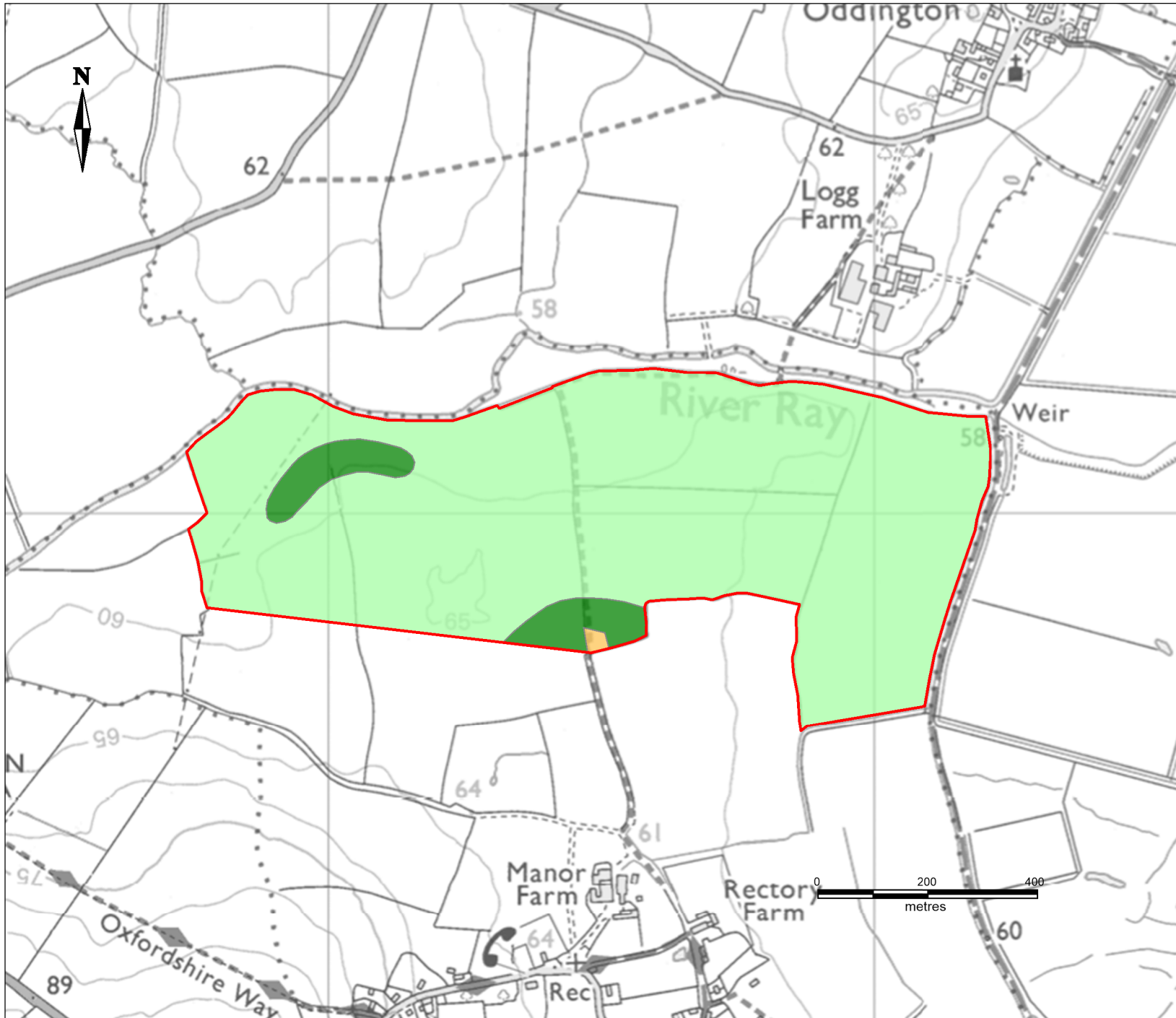
**Map 2
Soil Types**

**Land
Research**
ASSOCIATES

Land Research Associates
Lockington Hall
Lockington
Derby DE74 2RH
01509 670570

Scale: 1:10,000

Date: 13/01/2020



KEY

- Subgrade 3a
- Subgrade 3b
- Other land
- Survey area

Site:

**Manor Farm
Noke**

Map title:

**Map 3
Agricultural Land
Classification**

**Land
Research**
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Land Research Associates
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Scale: 1:10,000

Date: 13/01/2020