Water Eaton

PR6a : Land East of Oxford Road

Soils and Agricultural Land Quality

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SOILS AND AGRICULTURAL QUALITY OF LAND AT WATER EATON

Report 1385/1

26th April, 2023

Land Research ASSOCIATES
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SOILS AND AGRICULTURAL QUALITY

OF LAND AT WATER EATON

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Report 1385/1
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SUMMARY

This report provides information on the soils, land use and agricultural quality of 45.8 ha of land at Water Eaton, Oxfordshire.

The site is mainly made up of slowly permeable soils with some permeable loamy soils in the south. The majority of the site is of subgrade 3b agricultural quality limited by wetness. Small areas of grade 2 and subgrade 3a land are located in the south of the site also limited by wetness.

Were the site to be developed, the predominantly heavy clay loam topsoils would provide a moderate quality resource for reuse in landscaping.

Two agricultural businesses farm land within the site; the development of it would not have a major adverse effect on either.

1.0 Introduction

1.1 This report provides information on the soils and agricultural quality of 45.8 ha of land at Water Eaton, Oxfordshire. The report is based on a survey of the land in December 2017 and January 2018.

SITE ENVIRONMENT

1.2 The survey area comprises six arable fields. The site is bordered to the north by Water Eaton Park and Ride, to the west by adjoining agricultural land under planning permission for residential development, to the south by Cutteslowe and Sunnymead Park and to the west by Oxford Road and Oxford Parkway railway line.

1.3 The land is slopes downward from west to east with an average elevation of approximately 75 m AOD.

AGRICULTURAL USE

1.4 The two most northern fields were sown to winter cereals at the time of survey with land in the south in stubble. The land is not registered to any agri-environment schemes.

PUBLISHED INFORMATION

1.5 1:50,000 scale BGS information records the site to be underlain by Oxford Clay Formation and West Walton Formation mudstone (undifferentiated). Superficial deposits of Wolvercote sand and gravel member overlie the south of the site with an area of alluvium (clay, silt, sand and gravel) on the south-western boundary.

1.6 The National Soil Map (published at 1:250,000 scale) shows the soils to be within the Wickham 2 Association. This comprises mainly slowly permeable seasonally waterlogged fine loamy over clayey or fine silty over clayey soils with calcareous soils on steep slopes[1].

1.7 Provisional Agricultural Land Classification (ALC) mapping of the site shows the land as grade 3. No more recent survey of the site to current post-1988 guidelines has been published.

[1]Ragg, J., M., et al, 1984. *Soils and their use in Midland and Western England*. Soil Survey of England and Wales, Bulletin No. 12, Harpenden.

2.0 Soils

2.1 The National Planning Practice Guidance states that the planning system should protect and enhance valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important ecosystem services, for example as a growing medium for food, timber and other crops, as a store for carbon and water, as a reservoir of biodiversity and as a buffer against pollution.

2.2 A detailed soil resource and agricultural quality survey was carried out in December 2017 and January 2018. 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.

Permeable loamy soils

2.3 These soils occur in the south of the site where superficial deposits of sand and gravel are recorded to overlie the mudstone. They are variable in sand content and comprise either a sandy clay loam or heavy clay loam topsoil with a subsoil of the same texture that is gleyed (a sign of seasonal waterlogging).

2.4 An example profile is described below from a pit at observation 42 (Map 1).

0-30 cm	Brown (10YR 4/3) sandy clay loam; slightly stony with small and medium rounded hard pebbles; well developed fine subangular blocky structure; very friable; non calcareous; smooth clear boundary to:
30-120 cm+	Yellowish brown (10YR 5/8) sandy clay loam with common fine faint pale brown (10YR 6/3) mottles; slightly stony with medium hard rounded pebbles and few large cobbles; moderately to well developed medium subangular blocky structure; friable; non calcareous.

2.5 These soils are moderately freely-draining (Soil Wetness Class II) and have a high capacity to absorb excess winter rainfall.

Slowly permeable clayey soils

2.6 These soils make up the majority of the site and comprise a heavy clay loam topsoil directly overlying a slowly permeable gleyed clay subsoil. In places a permeable upper subsoil of heavy clay loam is encountered.

2.7 An example profile is described below from a pit at observation 23 (Map 1).

0-30 cm	Dark greyish brown (10YR 4/2) heavy clay loam; slightly stony with small rounded hard pebbles; well developed fine subangular blocky structure; friable; non calcareous; smooth clear boundary to:

30-120 cm+ Light yellowish brown (10YR 6/4) clay with common distinct reddish yellow (7.5YR 6/8) and grey (7.5YR 6/1) mottles; common fine ferrimanganiferous concretions; very slightly stony with small hard rounded stones; weakly developed coarse prismatic structure; non calcareous; firm.

2.8 These soils are imperfectly to poorly-draining (Soil Wetness Class III/IV) and have a low capacity to absorb excess winter rainfall.

3.0 Agricultural land quality

3.1 To assist in assessing land quality, the former 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 Agricultural Land Classification (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 Classification[2]. The relevant site data for an average elevation of 75 m is given below.

- Average annual rainfall: 694 mm
- January-June accumulated temperature >0°C 1426 day°
- Field capacity period (when the soils are fully replete with water) 145 days late Nov–mid Apr
- Summer moisture deficits for: wheat: 109 mm potatoes: 101 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 Agricultural Land Classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food[3]. There are no climatic limitations at this locality.

SURVEY RESULTS

3.4 The agricultural quality of the land is determined by wetness. Land of grade 2 and 3 has been identified.

Grade 2

3.5 This land grade is made up of the permeable sandy clay loam soils that are mainly located in the south of the site; they are slightly limited by wetness. The land shows evidence of periodic waterlogging which may restrict access with

[2]Meteorological Office, (1989).*Climatological Data for Agricultural Land Classification*.
[3]MAFF, (1988).*Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*.

farm machinery during wet periods although access is possible for both spring and autumn sowings.

Subgrade 3a

3.6 This land grade is made up of heavy clay loam soils that are permeable to at least 65 cm depth; often overlying slowly permeable clay. The dense lower subsoil will impede water drainage following heavy rainfall and this in combination with the high clay content of the topsoils will limit cultivation activities with farm machinery by restricting access, particularly in winter and early spring.

Subgrade 3b

3.7 This land grade makes up the majority of the site where heavy clay loams overlie slowly permeable clay subsoils. Land within this grade is limited by wetness due to the slowly permeable clay subsoil impeding drainage which, when combined with the high clay content of the topsoils, makes the land difficult to work. The restricted timing of cultivations limits land use mainly to grassland or autumn-sown combinable crops.

Grade areas

3.8 The distribution of the land grades is shown on Map 2 and the area occupied shown below.

Table 1. Area occupied by the land grade

Grade/subgrade	*Area (ha)*	*% of the agricultural land*
Grade 2	2.5	6
Subgrade 3a	2.9	7
Subgrade 3b	36.4	87
Non agricultural	4.0	-
Total	45.8	100

4.0 Soil resources and their use

4.1. As part of the Government's 'Safeguarding our Soils' Strategy, the Department for Environment, Food and Rural Affairs (Defra) published a code of practice on the sustainable use of soils on construction sites, which can be helpful in design of developments and setting planning conditions. An Environment Agency strategy Soil a Precious Resource: Our strategy for protecting, managing and restoring soil (Environment Agency, 2007) has complementary aims.

Topsoil

4.2. Due to the high clay content of the majority of topsoils they are difficult to handle with machinery and are highly susceptible to compaction damage when wet. If the site were to be developed, soil handling would be best performed between late May and early October when the soils are likely to be drier.

Subsoil

4.3. The subsoils are susceptible to compaction during construction activities which could result in restricted rooting depth, increased droughtiness and risk of localised flooding. If compacted during construction, subsoils should be loosened before any topsoil is spread on them.

Soil Handling

4.4. Areas not being built over (e.g. environmental buffers and landscape areas) should not be trafficked by construction vehicles as this will render the soils impermeable, preventing percolation of rainfall beyond the base of the topsoil, which will quickly become saturated.

4.5. Stripped topsoil should be stored in separate resource bunds no more than 3 m high and kept grassed and free from construction traffic until required for re-use. The Construction Code of Practice for Sustainable Use of Soils on Construction Sites (Defra, 2009) provides guidance on good practice in soil handling.

5.0 Agricultural Land Users

5.1 Land within the site is operated by two separate farm businesses. 13 ha in the north of the site is farmed by Tenant 1. The rest of the land within the survey area (32.8 ha) is farmed by Tenant 2 (see Map 3 in an appendix to this report).

Sensitivity of the users

5.2 The 13 ha in the north of the site is farmed by Tenant 1 on a short-term annual tenancy agreement. Tenant 1 is a low sensitivity receptor (see Table 1). Tenant 2 also operates on a short-term annual tenancy, another low sensitivity receptor of the Proposed Development.

Table 1: Sensitivity of agricultural land user

Low Sensitivity	**Medium sensitivity**	**High sensitivity**
Full time owner-occupied farm business that will gain sufficiently from sale of land to be economically unaffected OR agricultural user on a short term tenancy or licence	Mixed business farming some owned and some medium- or short- term rented land	Long-term Agricultural Holdings Act tenant

Impact of the development

5.3 Once the construction phase of the Proposed Development begins, the short-term tenancy agreements will be annulled, and agricultural use of the land will cease. Both tenants have wider holdings within their agricultural business outside the development area. The loss of the short-term tenancy agreements would result in a minor loss of net income, a small magnitude impact to Tenant 1 and 2 (Table 2).

5.4 It should be noted that the northern parcel of land contains the only access to the Water Eaton Estate from Oxford Road, this access will be maintained as part of the proposed development and will be factored into the application.

Table 2: Magnitude of impact to agricultural user

Negligible	**Small**	**Moderate**	**High**
Minimal effects, such as changed field accesses, not necessitating farm restructuring	Reduction in net farm income that only minor restructuring is necessary	Reduction in net farm income requiring such that substantial restructuring is required	Full-time farm business rendered unworkable and unviable. The farmer will have to seek alternative means of income

6.0 Conclusions

6.1 The soils at the site are predominantly slowly permeable at shallow depth with some permeable loamy soils in the south. The survey area comprises mainly subgrade 3b agricultural quality land with a small area of best and most versatile (grade 2 and subgrade 3a) land in the south where the permeable soils are found. All the land is variably limited by wetness.

6.2 The survey area was in arable cropping at the time of survey mainly sown to winter cereals. Two agricultural land users operate within the site, both are tenants on short-term annual agreements. They are low sensitivity receptors that would experience minor losses of income through the loss of the tenancy agreements. The Proposed Development would not have any major adverse effects to their wider agricultural businesses.

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land at Water Eaton: ALC and soil resources survey – Details of observations at each sampling point

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
1	0-25	HCL	<5	25-36	HCL	xxx	36-100+	C	xxx	1	IV	3b	W
2	0-23	HCL	<5	23-42	HCL	xxx	42-90+	HCL	xxx	0	III	3b	W
3	0-31	HCL	<5	31-90+	HCL	xxx				0	III/II	3b/a	W
4	0-28	C	<5	28-90+	C	xxx				0	IV	3b	W
5	0-30	HCL	<5	30-50	HCL	xxx	50-100+	C	xxx	0	III	3b	W
6	0-23	HCL	<5	23-60	HCL/C	xxx	60-100+	C	xxx	2	IV	3b	W
7	0-32	HCL	<5	32-42	HCL	xxx	42-90+	C	xxx	3	III	3b	W
8	0-30	HCL	<5	30-100+	C	xxx				1	IV	3b	W
9	0-30	HCL	<5	30-48	HCL	xxx	48-100+	C	xxx	3	IV	3b	W
10	0-27	HCL	<5	27-62	C	xxx	62-80+	HCL	xxx	3	IV	3b	W
11	0-31	HCL	<5	31-100+	C ca	xxx				1	IV	3b	W
12	0-31	HCL	5	31-50	HCL	xxx	50-110+	C	xxx	2	IV	3b	W
13	0-30	HCL	5	30-55	HCL	xxx	55-110+	C	xxx	1	IV	3b	W
14	0-31	SCL	5	31-72	SCL	xxx	72-110	SC/C	xxx	0	II	2	W
15	0-27	SCL	<5	27-100+	C	xxx				1	IV	3b	W
16	0-28	HCL	5-10	28-65	HCL	xxx	65-110+	C	xxx	1	IV	3b	W
17	0-31	HCL	5	31-40	HCL/SCL	xxx	40-80+	C	xxx	1	III	3b	W
18	0-32	SCL	5	32-100+	SCL	xxx				1	II	2	W
19	0-26	HCL	<5	26-67	HCL	xxx	67-100	C	xxx	0	II	3a	W
20	0-29	HCL	5	29-80+	HHCL/C	xxx				1	IV	3b	W
21	0-31	HCL	<5	31-45	C	xxx	45-100	C	xxx	2	IV	3b	W
22	0-30	HCL	5	30-90+	C ca	xxx				1	IV	3b	W
23	0-31	HCL	5	31-100+	C	xxx				1	IV	3b	W
24	0-29	HCL	5-10	29-43	HCL	xx	43-100+	C	xxx	3	III	3b	W
25	0-28	HCL	5	28-50	HCL	xxx	50-80+	C	xxx	1	III	3b	W
26	0-27	HCL	<5	27-80+	C ca	xxx				1	IV	3b	W
27	0-30	HCL	<5	30-40	HCL	xx	40+	Stopped on stone		0	II	3a	W
28	0-31	SCL/HCL	5	31-80	SCL	xxx	80+	Stopped on stone		0	II	2	W
29	0-27	HCL	5-10	27-80+	C	xxx				1	IV	3b	W
30	0-29	HCL	5	29-38	HCL	xxx	38-100+	C ca	xxx	2	IV	3b	W
31	0-28	HCL	5	28-80+	C ca	xxx				3	IV	3b	W
32	0-30	SCL	5	30-60+	C	xxx				1	IV	3b	W
33	0-29	HCL	5-10	29-100+	C ca	xxx				1	IV	3b	W
34	0-26	HCL	5	26-62	HCL	xxx	62-100+	C ca	xxx	1	III	3b	W
35	0-31	HCL	5	31-56	HCL	xx	56-100+	C	xxx	1	III	3b	W
36	0-30	HCL	5	30-80	SCL	xx	80-110+	SCL	xxx	0	II	3a	W
37	0-27	HCL	<5	27-80+	C	xxx				2	IV	3b	W
38	0-30	HCL	<5	30-80+	C	xx				1	IV	3b	W
39	0-30	HCL	5	30-90+	SCL	xxx				3	II	3a	W
40	0-28	HCL	5	28-50+	HCL	xxx	50-80+	HCL	xxx	0	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**
41	0-29	HCL	5	29-60	SC/C	xxx	60+	Stopped on stone		0	IV	3b	W
42	0-30	SCL	5	30-100+	SCL	xxx				1	II	2	W
43	0-30	SCL	5-10	30-110+	C	xxx				1	IV	3b	W
44	0-30	HCL	5-10	30-50	HCL	xxx	50-80+	C	xxx	1	III	3b	W
45	0-28	HCL	5-10	28-100+	C ca	xxx				1	IV	3b	W
46	0-27	SCL	5	27-100+	HCL	xxx				3	II	2	W
47	0-29	SCL	5	29-80+	SCL	xx				2	II	2	W

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:

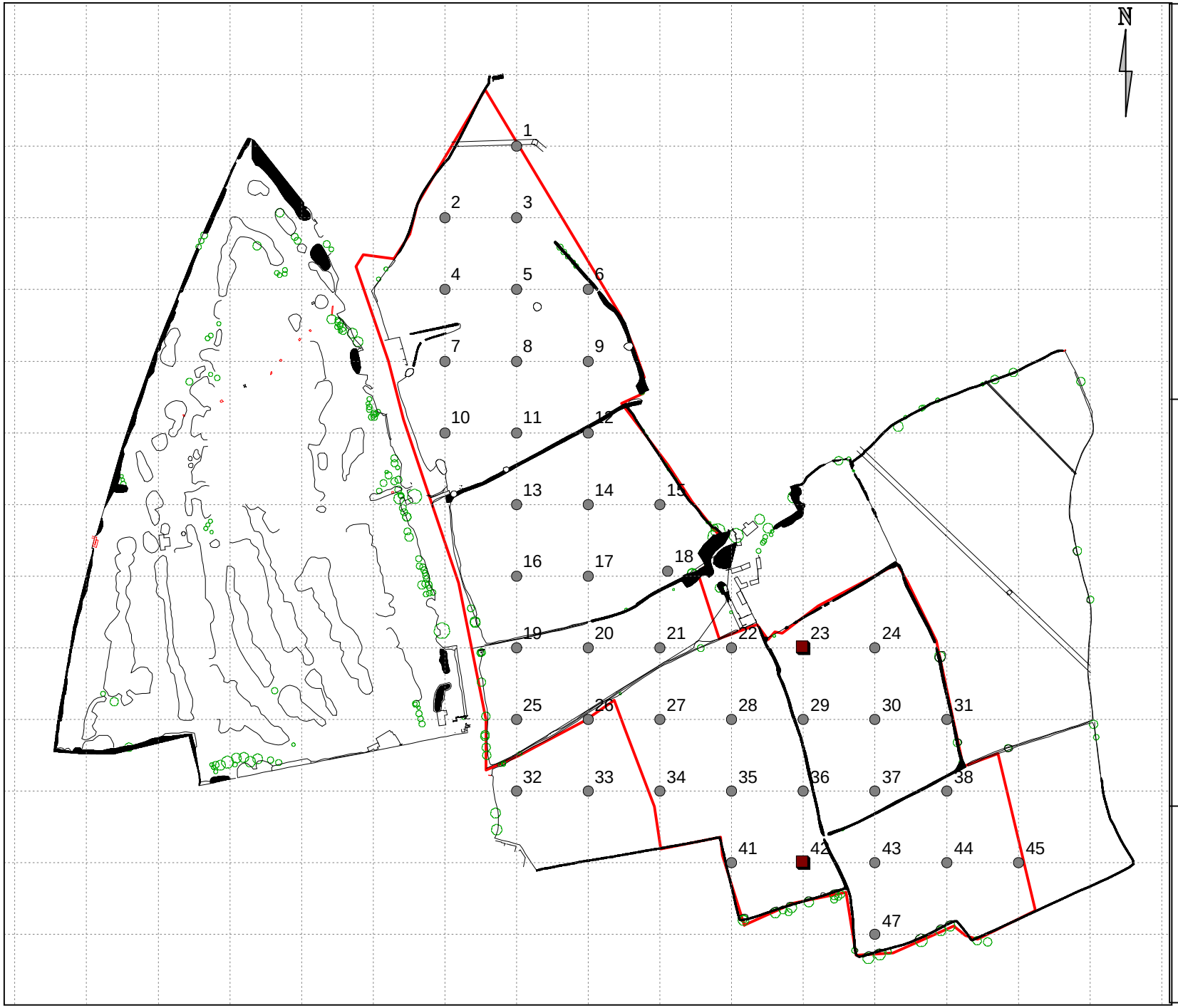
C - clay
ZC - silty clay
SC - sandy clay
CL - clay loam (H-heavy, M-medium)
ZCL - silty clay loam (H-heavy, M-medium)
SCL - sandy clay loam
SZL - sandy silt loam (F-fine, M-medium,C-coarse)
SL - sandy loam (F-fine, M-medium, C-coarse)
LS - loamy sand (F-fine, M-medium, C-coarse)
S - sand (F-fine, M-medium, 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

- Auger observation
- Soil/land grade description pit
- Survey area

Site:

Water Eaton

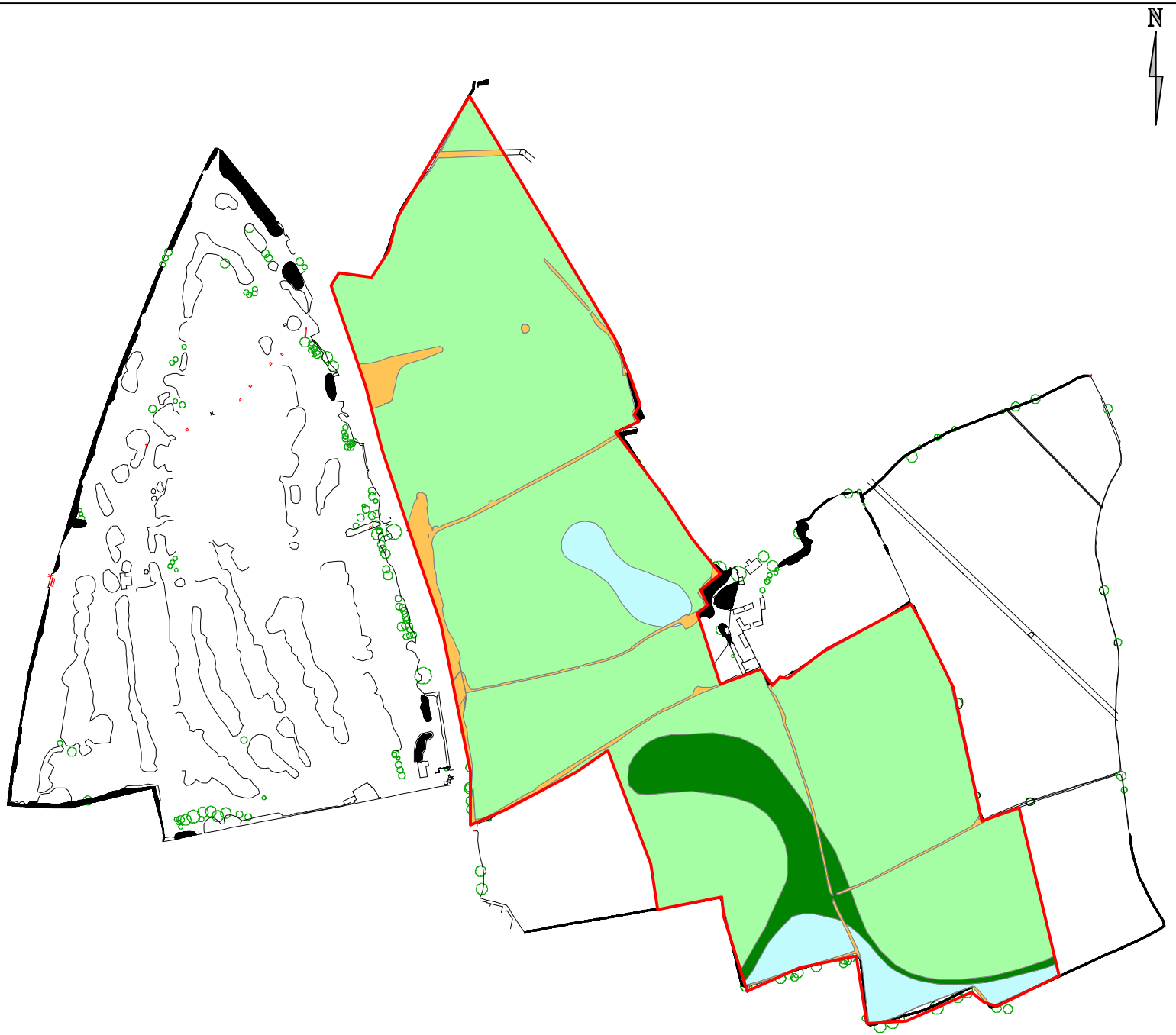
Map title:

Map 1
Survey observations

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

Scale: 1:7,500

Date: 17/01/2023



KEY

- Grade 2
- Subgrade 3a
- Subgrade 3b
- Non agricultural
- Survey area

Site:

Water Eaton

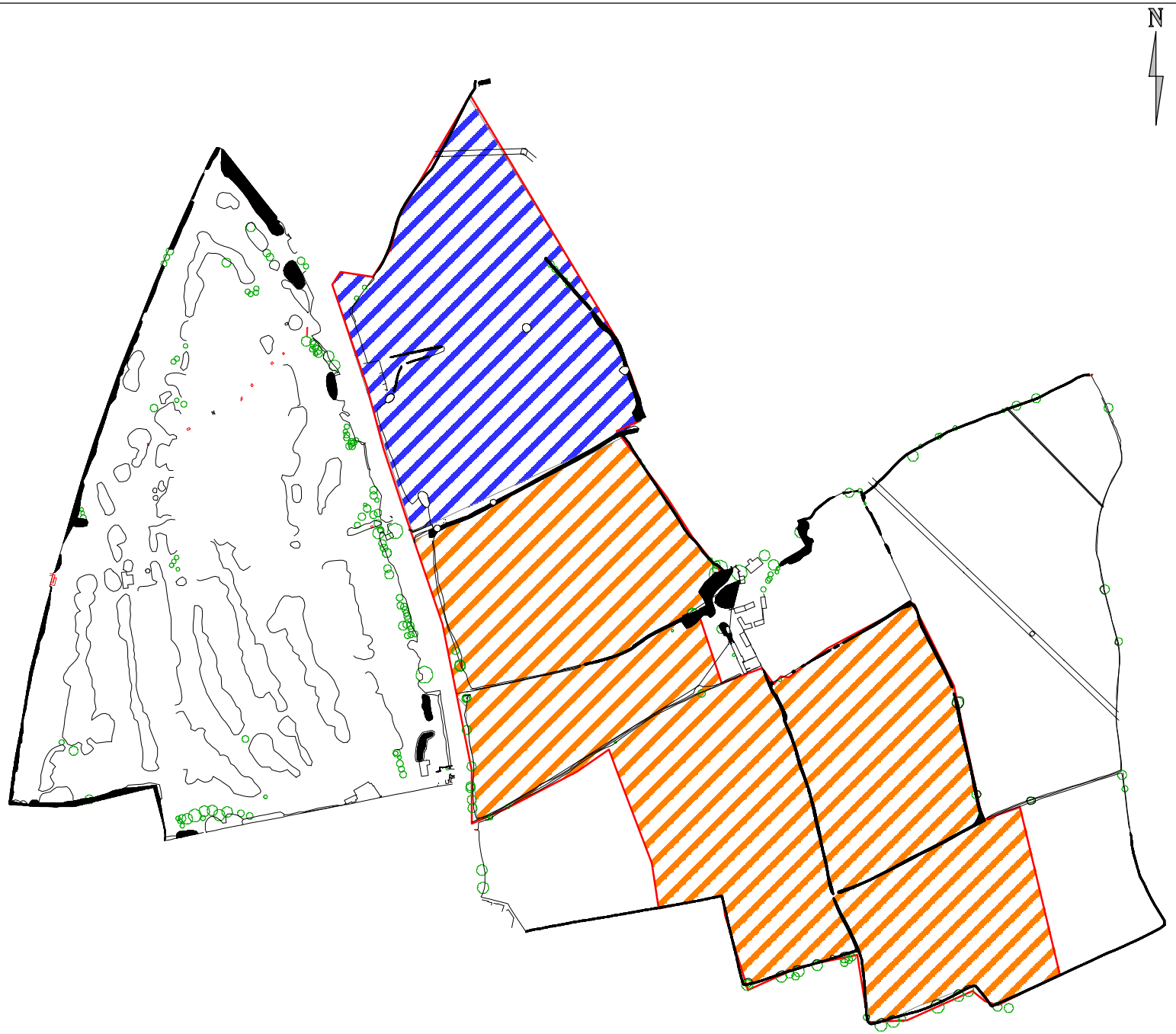
Map title:

Map 2
Agricultural Land Classification

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

Scale: 1:7,500

Date: 17/01/2023



KEY

- Tenant 1
- Tenant 2
- Application site

Site:

Water Eaton

Map title:

Map 3
Agricultural land users

Land Research Associates
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Scale: 1:7,500

Date: 26/04/2023