Agricultural Land Classification Survey Report

Kingston Solar Farm

21/12/2021

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Renewable Energy Systems Ltd

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Contents

SUMMARY

9.1. An agricultural land quality survey has been undertaken of 80.65 hectares (ha) of lands circa 1.3km south of Gotham and c. 0.75km northwest of East Leake, Nottinghamshire in February 2021.

9.2. The Application Site has fine loamy or clayey topsoils over dense clay subsoil with significant drainage restrictions, giving subgrade 3b quality agricultural land. Small areas of the Application Site are also limited to this subgrade by steep slope gradient.

INTRODUCTION

Background

9.3. Land Research Associates (LRA) has been appointed by Neo Environmental Ltd on behalf of Renewable Energy Systems (RES) Ltd (the "Applicant") to complete an Agricultural Land Classification (ALC) survey and report for a proposed 49.9MW solar farm and associated infrastructure (the "Proposed Development") on lands circa 1.3km south of Gotham and c. 0.75km northwest of East Leake, Nottinghamshire (the "Application Site").

9.4. Please see **Figure 4 of Volume 2: Planning Application Drawings** for the layout of the Proposed Development.

Development Description

9.5. The Proposed Development will consist of the construction of a 49.9MW solar farm with bi-facial solar photovoltaic (PV) panels mounted on metal frames, new access tracks, underground cabling, perimeter fencing with CCTV cameras and access gates, two temporary construction compounds, substation and all ancillary grid infrastructure and associated works.

9.6. The Proposed Development will result in the production of clean energy from a renewable energy resource (daylight) and will also involve additional landscaping including hedgerow planting and improved biodiversity management.

Site Description

9.7. The Application Site is located on lands circa 1.3km south of Gotham and c. 0.75km northwest of East Leake, Nottinghamshire; the approximate centre point of which is Grid Reference E453185, N328739. Comprising 16 agricultural fields and additional ancillary areas, the Application Site measures c. 80.65 hectares (ha) in total, with only c. 55.65 hectares accommodating the solar arrays themselves. See **Figure 1 of Volume 2: Planning Application Drawings** for details.

9.8. The Proposed Development Site is split into two sections, north and south, by an area of woodland, Leake New Wood. Both sections lie on elevated, gently undulating land ranging between 87 – 96m AOD. The northern section extends across several rectilinear agricultural fields largely contained by existing mixed woodland providing good screening for the wider area. These include Gotham Wood to the north, Cuckoo Bush to the east, Leake New Wood to the south and Crownend Wood to the west. The southern section is also surrounded by pockets of woodland including Oak Wood, Crow Wood and Ash Spinney.

9.9. The Application Site is in an area with an existing industrial presence with a telecoms mast located on the southwestern boundary of Field 7, a wood pole line along the boundary between Fields 7 and 8 and within the southern section of Fields 4 and 5 and overhead lines

located along the southern boundary of Field 16 and the eastern boundary of Field 15 (See **Figure 3 of Volume 2: Planning Application Drawings** for field numbers).

9.10. The surrounding area is semi-rural in nature with the site being surrounded by agricultural fields and woodland in most directions. The area is however punctuated by individual farmsteads and Rushcliffe Golf Club is located on the eastern boundary of Field 15 in the southern section of the site. There are also various industrial brownfield sites within the locality including Charnwood Truck Services located directly southwest of Field 4. Additionally, there is a large-scale power station located beyond the A453, circa 1.58km north of the site which can currently be seen from Bridleway 12.

9.11. Recreational routes include a number of Bridleways (BW) which cross or abut the Site providing connectivity to the wider Kingston Estate. These include Gotham BW No. 10, 11 and 12 and West Leake BW's No. 5 and 13. West Leake BW No. 5, also known as the Midshires Way, is also a Long-Distance Walking Association (LDWA) Route bordering the southern boundary of Fields 15 and 16. While there are several field drains throughout the Application Site, it lies entirely within Flood Zone 1, an area described as having a "Low probability" of flooding.

9.12. The Application Site will be accessed from Wood Lane, which is an unadopted road. Delivery vehicles will exit the M1 at junction 24, signposted A453 Nottingham (S), onto the A453 and travel in a northeast direction for approximately 4.3km, before taking the exit onto West Leake Lane. This road will be travelled on in a southern direction for approximately 1.5km, before turning left onto Kegworth Road. Vehicles will travel northeast along this road for approximately 1.3km before turning right into Wood Lane.

Published Information

9.13. 1:50,000 scale BGS information records the geology of the land to be mainly Barnstone Member inter-bedded mudstone and limestone. Areas of the site on steep slopes are recorded to be Westbury Formation mudstone and siltstone. The solid geology of the southern block of the site is recorded to be overlain by superficial deposits of glacial till.

9.14. The National Soil Map[1] (published at 1:250,000 scale) records most of the land as Evesham 2 Association: typically slowly permeable calcareous clayey soils, with some slowly permeable non-calcareous clayey and fine loamy or fine silty over clayey soils.

[1] Ragg, J.M.*et al*., 1984.*Soils and Their Use in Midland and Western England: Soil Survey Bulletin No. 12,* Harpenden.

SOILS

9.15. A detailed soils and agricultural quality survey was carried out in February 2021 in strict accordance with MAFF (1988) guidelines[2].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 a combination of pits and augerings to a maximum depth of 1.2 m. A log of the sampling points and a map showing their location can be found in **Figure 9.1 of Appendix 9A.**

9.16. The site was found to comprise heavy slowly permeable soils, typically heavy clay loam or clay topsoil that directly overlies dense clay subsoil. The subsoils show evidence of seasonal waterlogging (greyish colours with ochreous mottles) to shallow depth. In places across the site, the subsoils are calcareous.

9.17. An example of a profile is described below from a pit at observation 60 (**Figure 9.1 of Appendix 9A**).

Table 9-1: Example of a Soil Profile

0-28cm	Dark greyish brown (10YR 4/2) heavy clay loam; slightly stony (10% small and medium sub-rounded hard stones); weakly developed coarse sub-angular blocky structure; non-calcareous; smooth clear boundary to;
28-78cm	Yellowish brown (10YR 5/6) clay with abundant 25% grey (10YR 6/4) and reddish yellow (7.5YR 6/8) mottles; slightly stony (5% small and medium sub-rounded hard stones); weakly developed coarse prismatic structure; very firm; high packing density; non-calcareous; smooth gradual boundary to;
78-110cm+	Light brownish grey (10YR 6/2) clay with abundant 40% large distinct light grey (10YR 7/1) and yellow (10YR 7/6) mottles; slightly stony (5% small sub-rounded hard stones); common small rounded chalk stones; weakly developed very coarse prismatic structure to structureless (massive); very calcareous.

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

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

AGRICULTURAL LAND QUALITY

9.19. 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.

9.20. 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[3]. The relevant site data for an average elevation of 90 m is given below:

• Average annual rainfall:	618 mm
• January-June accumulated temperature >0°C	1356 day°
• Field capacity period (when the soils are fully replete with water)	129 days late Nov-early Apr
• Summer moisture deficits for:	wheat: 105 mm potatoes: 95 mm

Survey Results

9.21. The agricultural quality of the land is primarily determined by wetness and slope gradient. Land of grade 3 has been identified

Subgrade 3b

9.22. All of the agricultural land in the site is limited by significant wetness constraints to subgrade 3b quality. The combination of high topsoil clay content and imperfect drainage (Soil Wetness Class III) means this land is likely to be too wet to cultivate in spring in most years, meaning arable cropping is mainly limited to autumn-sowings

9.23. Areas in the north and south-west of the site are also limited by steep slope gradient of between 8-11°. The steep slope reduces land quality by restricting the safe and efficient use of machinery for cultivation and cropping.

Other land (non-agricultural)

9.24. This land comprises farm tracks, property, hedgerows and ditches.

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

Grade areas

9.25. **Figure 9.2 of Appendix 9A** and **Table 9-2** below shows the areas of land that have been graded within the final Application Site boundary.

Table 9-2: Areas occupied by the different land grades

Grade/Subgrade	Area (ha)	% of the land
Subgrade 3b	77.19	95.5
Non agricultural	1.40	1.5
Not surveyed	2.06	3.0
Total	**80.65**	**100**

APPENDICES

Appendix 9A: Figures

- Figure 9.1: ALC Grade Map

Appendix 9B: Details of Observations

Appendix 9A: Figures

Kingston Solar Farm
ALC Grade
Figure 9.1

N

Key

- Development Boundary
- Non Agricultural
- Not Surveyed
- Subgrade 3b

0 0.25 0.5 1 Kilometers

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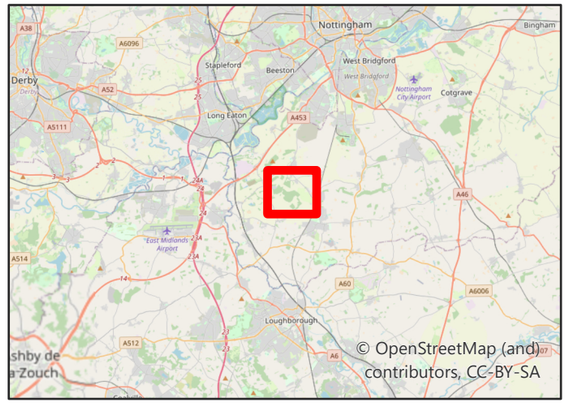

Date: 30/08/2021
Drawn By: Jamie McGhee
Scale (A3): 1:11,024
Drawing No: NEO00763/035I/A

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Appendix 9B: Details of Observations

Land at Kingston on Soar: Soils and ALC 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	0-30	C	0	30-95+	C	xxx				5	III	3b	W
2	0-30	C	0	30-91+	C	xxx				0	III	3b	W
3	0-31	C	0	31-90+	Cr	xxx				0	III	3b	W
4	0-34	C	<5	34-60	C	xxx	60-90+	Cca	xxx	1	III	3b	W
5	0-30	C	<5	30-65+	C	xxx				4	III	3b	W
6	0-32	C	<5	32-91+	C	xxx				1	III	3b	W
7	0-29	C	<5	29-98+	C	xxx				0	III	3b	W
8	0-30	C	0	30-90+	C	xxx				2	III	3b	W
9	0-31	C	0	31-50	C	xxx	50-78+	C ca	xxx	0	III	3b	W
10	0-28	C	<5	28-100+	C	xxx				0	III	3b	W
11	0-28	C/HCL	<5	28-100+	C	xxx				0	III	3b	W
12	0-31	C	0	31-90+	C	xxx				0	III	3b	W
13	0-30	C	0	30-60+	C	xxx				4	III	3b	W
14	0-26	C	<5	26-78+	C	xxx				8	III	3b	W/Sl
15	0-27	C	0	27-45	C	xxx	45-70+	C ca	xxx	8	III	3b	W/Sl
16	0-33	C	0	33-91+	C	xxx				8	III	3b	W/Sl
17	0-31	C	<5	31-87+	C	xxx				6	III	3b	W
18	0-30	C	<5	30-90+	C	xxx				11	III	3b	W/Sl
19	0-34	C	0	34-91+	C	xxx				5	III	3b	W
20	0-30	C	0	30-50+	C	xxx	50+	Stopped on stone		2	III	3b	W
21	0-29	C	0	29-95+	C	xxx				0	III	3b	W
22	0-30	C	<5	30-80+	C	xxx				2	III	3b	W
23	0-30	C	<5	30-72+	C	xxx				3	III	3b	W
24	0-29	C	0	29-74	C	xxx	74+	Stopped on stone		0	III	3b	W
25	0-30	C	<5	30-60+	C	xxx				1	III	3b	W
26	0-31	C	0	31-90+	C	xxx				8	III	3b	W
27	0-28	C/HCL	<5	28-60+	C wet	xxx				0	III	3b	W
28	0-33	C	<5	33-70+	C	xxx				0	III	3b	W
29	0-28	C	<5	28-70+	C	xxx				0	III	3b	W
30	0-32	C	<5	32-60+	C	xxx				0	III	3b	W
31	0-22	HCL	<5	22-38	LMS + brick	xxx	38-60+	C	xxx	1	III	3b	W
32	0-31	C	<5	31-91+	C	xxx				1	III	3b	W
33	0-32	C	0	32-66	C	xxx	66-90+	C ca	xxx	0	III	3b	W
34	0-29	C	0	29-58	C	xxx	58-70+	C ca	xxx	0	III	3b	W
35	0-33	HCL/C	<5	33-56	C	xxx	56-70+	SCL bricks dist.	xxx	1	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
36	0-31	HCL	<5	31-90+	C	xxx				1	III	3b	W
37	0-31	HCL	0	31-51	HCL	xxx	51-90+	C	xxx	0	III	3b	W
38	0-30	C	0	30-45	Cr	xxx	45-50 50-80+	C Cr	xxx xxx	1	III	3b	W
39	0-30	C	0	30-75+	C	xxx				0	III	3b	W
40	0-20	C	0	20-60	C	xxx	60-90+	C ca	xxx	1	III	3b	W
41	0-26	HCL	<5	26-34	HCL/C	xxx	34-70+	C	xxx	0	III	3b	W
42	0-30	C	0	30-50+	C	xxx	50+	Stopped on stone		1	III	3b	W
43	0-30	HCL	<5	30-90+	C	xxx				1	III	3b	W
44	0-29	HCL	<5	29-50+	C ca	xxx	50+	Stopped on stone		0	III	3b	W
45	0-30	HCL	<5	30-90+	C	xxx				1	III	3b	W
46	0-31	C v sl ca	5-10	31-65	C + S incl ca	xxx	65+	Stopped on stone		0	III	3b	W
47	0-31	C ca	5-10	31-80+	C ca	xxx				1	III	3a/b	W
48	0-30	HCL	5-10	30-64	HCL	xxxx	64-98+	MSL/MCL	xxx	2	II	3a	W
49	0-32	HCL	<5	32-51	HCL	xxx	51-100+	C	xxx	2	III	3b	W
50	0-33	HCL/C	5-10	33-70+	C	xxx				1	III	3b	W
51	0-30	HCL	5-10	30-90	C +S incl	xxx				2	III	3b	W
52	Hedge									0	-	-	-
53	0-31	C	5-10	31-95+	C	xxx				1	III	3b	W
54	0-29	HCL	5-10	29-62+	C	xxx				0	III	3b	W
55	0-29	C	<5	29-71+	C ca	xxx				0	III	3b	W
56	0-30	C	5-10	30-90+	C ca	xxx				7	III	3b	W
57	0-32	HCL	5-10	32-54	SCr	xxx	54-90+	SCLr	xxx	4	III	3b	W
58	0-31	HCL/C	5-10	31-60+	C	xxx				1	III	3b	W
59	Non agricultural - garden									0			
60	0-28	HCL	5-10	28-80	C	xxx	80-100+	C ca	xxx	0	III	3b	W
61	0-31	HCL	10-15	31-74+	C	xxx				1	III	3b	W
62	0-30	C	5-10	32-80+	C	xxx				9	III	3b	W/Sl
63	0-32	HCL	5-10	32-100+	C + S incl	xxx				1	III	3b	W
64	0-28	HCL/C	10-15	28-87+	Cr	xxx				0	III	3b	W
65	0-30	HCL/C	5-10	30-94+	C	xxx				1	III	3b	W
66	0-28	HCL	<5	28-90+	HCL/C	xxx				0	III	3b	W
67	0-29	H/SCL	10-15	29-91+	Cr	xxx				0	III	3b	W
68	0-30	HCL/C	5-10	30-90+	C	xxx				0	III	3b	W
69	0-27	HCL/C	10-15	29-91+	C	xxx				0	III	3b	W
70	0-30	C	10-15	30-40+	C	xxx	40+	Stopped on stone		0	III	3b	W
71	0-25	C sl ca	5-10	25-90+	C ca	xxx				11	III	3b	W/Sl

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
72	0-26	HCL	5-10	26-41	HCL	xxx	41-75+	Cr	xxx	0	III	3b	W
73	0-32	HCL	5-10	32-95+	C	xxx				0	III	3b	W
74	0-31	HCL	5-10	31-65+	Cr	xxx				1	III	3b	W
75	0-30	HCL	5-10	30-60	SC/C	xxx	60+	Stopped on stone		1	III	3b	W
76	0-30	C	5-10	30-90+	C	xxx				0	III	3b	W
77	0-30	HCL	5-10	30-94	Cr	o				1	III	3b	W
78	0-29	HCL	5-10	29-91+	Cr	xxx				3	III	3b	W
79	0-31	HCL	5-10	31-75	C	xxx	75-100+	SCLr	xxx	0	III	3b	W
80	0-30	C	5-10	30-95+	C	xxx				0	III	3b	W
81	0-25	C	<5	25-90+	C	xxx				6	III	3b	W
82	0-29	C	5-10	29-71+	Cr	xxx				6	III	3b	W
83	0-30	HCL	5-10	30-50+	C	xxx	50+	Stopped on stone		2	III	3b	W
84	0-31	HCL	5-10	31-81+	C	xxx				2	III	3b	W
85	0-34	C/SC	5-10	34-90+	C	xxx				2	III	3b	W
86	0-30	HCL	5-10	30-91+	C wet	xxx				3	III	3b	W
87	0-30	HCL	5-10	30-65+	C	xxx				1	III	3b	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 (CH – chalk, SST – sandstone LST – limestone, MST - Mudstone

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
- dist - disturbed soil layer;chky-chalky

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