

Heckington Fen Solar Park

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Environmental Statement | Volume 3: Technical Appendices Appendix 16.3: Semi Detailed and Detailed Agricultural Land Classification

Applicant: Ecotricity (Heck Fen Solar) Limited

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APPENDIX 16.3: SEMI DETAILED AND DETAILED AGRICULTURAL LAND CLASSIFICATION

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**HECKINGTON FEN
ENERGY PARK**

**SEMI-DETAILED
AND DETAILED
AGRICULTURAL LAND
CLASSIFICATION**

January 2023





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1 INTRODUCTION

- 1.1 This report sets out the results of an Agricultural Land Classification (ALC) survey across a site of approximately 524 hectares of land at Heckington Fen, which forms a proposed Energy Park.
- 1.2 The site comprises a series of agricultural fields, currently in arable use, with the A17 forming the southern boundary and Head Dike the northern boundary. The eastern boundary is shaped by Holland Dike and further arable land extends beyond the western boundary.
- 1.3 The site was surveyed at a semi-detailed level of survey, in September and October 2021, with much of the site surveyed at a detailed level in August and September 2022. The report makes clear which parts have been surveyed at which scale of survey.
- 1.4 This report:
- describes the methodology in section 2;
 - describes the factors affecting agricultural land quality in section 3;
 - and sets out the ALC grades in section 4.
- 1.5 As described in this report, a wider area was surveyed which is not included within the proposed Energy Park. This ALC report considers the land quality of the 524 ha of the Energy Park only.

2 METHODOLOGY

- 2.1 This report sets out the results of an Agricultural Land Classification (ALC). It is based on a desktop study of relevant published information on climate, topography, geology and soil, in conjunction with a soil survey. The ALC study area covers approximately 524 hectares (ha) in area.
- 2.2 The work has been carried out by a Chartered Scientist (CSci), who is a Fellow (F. I. Soil Sci) of the British Society of Soil Science (BSSS), and a team of highly experienced ALC surveyors. This ALC survey has been carried out by soil scientists who meet the requirements of the BSSS Professional Competency Standard (PSC) scheme for ALC (see BSSS PCS Document 2 'Agricultural Land Classification of England and Wales'. The BSSS PSC scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).
- 2.3 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a site soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF) 'Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October 1988 (henceforth referred to as the 'the ALC Guidelines'). In total 451 auger points were examined over the site
- 2.4 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the '*best and most versatile*' category in Paragraphs 174 and 175 of the National Planning Policy Framework (NPPF), revised on the 20th of July 2021. Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049¹.
- 2.5 A semi-detailed ALC survey was initially carried out in September 2021 over a wider area of 590 ha. For ease of surveying and reporting, the Site was divided into seven survey areas labelled A-G. The survey involved examination of the soil's physical properties at

¹ Natural England (December, 2012). 'Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)'. Available online @ [REDACTED] Last accessed October 2021

138 auger bore locations on a 200m by 200m grid. Two soil pits (Pit 1 and Pit 2, **Plan KCC3076/06**) were excavated with a spade to examine certain soil physical properties, such as stone content and subsoil structure, in more detail. The survey areas, auger-bore locations (as black dots), and soil pits are shown on **Plan KCC3076/06**.

- 2.6 A sample of topsoil was collected at three auger-bore (AB) locations, i.e., Area C AB1, Area D AB4, and Area F AB21. The samples were sent to an accredited laboratory for particle size analysis, i.e., the proportions of sand, silt and clay. This is to determine the definitive texture class of the topsoil.
- 2.7 The sample locations were located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary.
- 2.8 The soil profile was examined at each sample location to a maximum depth of approximately 1.2m by hand with the use of a 5 cm diameter Dutch (Edleman) soil auger. The soil profile at each sample location was described using the '*Soil Survey Field Handbook: Describing and Sampling Soil Profiles*' (Ed. J.M. Hodgson, Cranfield University, 1997). Each soil profile was ascribed a grade following the ALC Guidelines.
- 2.9 Following discussions with Natural England, a further 313 samples were examined in August and September 2022, also over a wider area. The location of all the sample points is shown on **Plan KCC3076/06**.
- 2.10 In addition there was extensive archaeological investigation underway in August 2022, and many soil profiles from the archaeological excavation were examined to inform understanding of the soils.
- 2.11 Following review of the results, the Proposed Development was amended. This ALC report now covers only the area within the proposed Energy Park.

3 FACTORS AFFECTING LAND QUALITY

- 3.1 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:
- climate;
 - site;
 - soil; and
 - interactive limitations.

3.2 These factors are considered in turn below.

Climate

- 3.3 Interpolated climate data relevant to the determination of the ALC grade of land at the Site is given in Table 1 below.

Table 1: ALC Climate Data for Heckington Fen, Lincolnshire

Climate Parameter	Grid Ref: TF 199 454
Average Altitude (m)	3
Average Annual Rainfall (mm)	577
Accumulated Temperature above 0°C (January – June)	1433
Moisture Deficit (mm) Wheat	118
Moisture Deficit (mm) Potatoes	113
Field Capacity Days (FCD)	107
Grade according to climate	1

- 3.4 Agricultural land quality at the Site is not limited by climate with reference to Figure 1 'Grade according to climate' on page 6 of the ALC Guidelines. In this case, agricultural land at the Site would be Grade 1 without any additional limitations.
- 3.5 The soil profiles across the Site are predicted to be at field capacity (i.e., the amount of soil moisture or water content held in the soil after excess water has drained away) for approximately 107 Field Capacity Days (FCD) per year, mainly over the late autumn, winter and early spring. The climate interacts with soil physical properties, i.e., soil texture and wetness class, and can limit agricultural land quality due to soil wetness as per Table 6 of the ALC Guideline 'Grade according to soil wetness'.

Site

- 3.6 The 524 ha Site is located to the north-east of Heckington, south Lincolnshire. The approximate centre of the Site is located at British National Grid (BNG) reference TF 19970 45431.

3.7 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- gradient;
- micro-relief (i.e., complex change in slope angle over short distances); and
- risk of flooding.

3.8 **Gradient and Micro Relief.** The land at the Site is broadly level to slightly undulated at an elevation of between 1-4 metres (m) Above Ordnance Datum (AOD). The quality of agricultural land over the Site is not limited by gradient, which does not exceed 7°. No part of the Site is limited by micro-relief (i.e., complex changes in slope angle and direction over short distances).

3.9 **Risk of Flooding.** From the Government Flood Map for Planning website², the Site is mainly located in Flood Zone 3 (high probability of flooding), with smaller regions of Flood Zone 1 and Flood Zone 2 in the south. However, there are no records (data) to show that agricultural land in any part of the Site is limited by flooding, according to the criteria for frequency and/or duration in Table 2 ‘Grade according to flood risk in summer’ and/or Table 3 ‘Grade according to flood risk in winter’ of the ALC Guidelines.

Soil

3.10 **Geology/Soil Parent Material.** From British Geological Survey (BGS) maps at 1:50,000 scale, the land at the Site is underlain by Amphill Clay Formation (mudstone) in the eastern region and West Walton Formation (mudstone and siltstone) in the west. The bedrock is entirely covered by Tidal Flat Deposits (clay and silt).

3.11 **Published Information on Soil.** Soil information is available only at a small scale (1:250,000) on the National Soil Map published by the Soil Survey of England and Wales (SSEW) in 1983. This provisional soil map indicates that land at the entire Site is covered soils grouped in the Wallasea 2 Association.

3.12 As described by the SSEW, the Wallasea 2 Association is extensive on reclaimed marine alluvium in the marshlands of Lincolnshire. These soils are clayey with a greyish brown topsoil over greyish or grey and ochreous mottled subsurface horizons. These soils are slightly permeable and respond to underdrainage; drained soils are occasionally waterlogged (Wetness Class II) but undrained soils are waterlogged for long periods in winter (Wetness Class III or IV).

² Government Flood Map for Planning website. Available online @ <https://flood-map-for-planning.service.gov.uk/> Last accessed October 2021

- 3.13 **Soil Survey.** The detailed soil survey carried out in September 2021 and August/September 2022 determined soils which are comparable with those described by the SSEW as belonging to the Wallasea 2 Association. All the soils are non-calcareous. There is a complex variety of soil textures and drainage status (Wetness Class) over the Site, which reflects the variety of Tidal Flats Deposits (see 'Geology' above) deposited by the sea in the past. The texture of the topsoil ranges from medium silty clay loam, through heavy clay loams to silty clay. The soil profiles range from well-drained (Wetness Class I) where the subsoil is sandy (i.e., fine sandy loam to loamy fine sand), to slightly seasonally waterlogged (Wetness Class II) where the subsoil is slowly permeable, gleyed and mottled, silty clay. Where the depth of the slowly permeable silty clay is closer to the surface, the soil profiles are seasonally waterlogged and placed in Wetness Class III.
- 3.14 A log of all the soil profiles recorded on site can be provided on request, together with descriptions of the soil pits.
- 3.15 In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, three samples of topsoil were collected over the Site (i.e., Area C AB2, Area D AB4, and Area F AB 21). The topsoil sample was sent to an accredited laboratory for analysis of particle size distribution (PSD), based on the British Standard Institution particle size grades. The certificate of analysis can be provided on request. The findings of the PSD analysis are shown in Table 2 below.

Table 2: Topsoil Texture (re Table 10, ALC Guidelines)

Topsoil Sample Location (See Plan KCC3076/01)	% sand 0.063-2.0 mm*	% silt 0.002- 0.063 mm	% clay <0.002 mm	ALC Soil Texture Class
Area C, AB1	22	48	30	Heavy Clay Loam
Area D, AB4	4	51	45	Silty Clay
Area F, AB21	19	61	20	Medium Silty Clay Loam

Interactive Limitations

- 3.16 From the information above, together with the findings of the detailed soil survey, it has been determined that the quality of agricultural land is mainly limited by soil wetness during the wettest months of the year during the late autumn, winter and early spring, and by a shortage of water in the soil (soil droughtiness) during the growing season, as described below.
- 3.17 **Soil Wetness.** From the ALC Guidelines, a soil wetness limitation exists where *'the soil water regime adversely affects plant growth or imposes restrictions on cultivations or*

grazing by livestock'. Agricultural land quality at the Site is limited by soil wetness as per Table 3 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines).

Table 3: ALC Grade According to Soil Wetness

Wetness Class	Texture of the Top 25 cm	<126 Field Capacity Days
I	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	1
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	1
	Heavy Silty Clay Loam/Heavy Clay Loam**	2
	Sandy Clay/Silty Clay/Clay	3a
II	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	1
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	2
	Heavy Silty Clay Loam/Heavy Clay Loam**	3a
	Sandy Clay/Silty Clay/Clay	3a
III	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam	2
	Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam*	3a
	Heavy Silty Clay Loam/Heavy Clay Loam**	3b
	Sandy Clay/Silty Clay/Clay	3b
Key * 18% to <27% clay; and ** 27% to 35% clay		

- 3.18 In a climate area with 107 FCD, slightly seasonally waterlogged profiles in Wetness Class II are limited by soil wetness to Grade 2 where the topsoil texture is medium silty clay loam, or to Subgrade 3a where the topsoil is heavy clay loam.
- 3.19 Where the soil profiles are slowly permeable and seasonally waterlogged (Wetness Class III), they are limited by soil wetness to Subgrade 3a where the topsoil is medium silty clay loam, or Subgrade 3b where the topsoil is heavy clay loam, or silty clay.
- 3.20 **Soil Droughtiness.** From the ALC Guidelines, a soil droughtiness limitation exists 'in areas with relatively low rainfall or high evapotranspiration, or where the soil holds only small reserves of moisture available to plant roots.' The ALC grade according to soil droughtiness is shown in Table 4 below (based on Table 8 'Grade According to Droughtiness' in the ALC Guidelines). To be eligible for Grades 1 to 3b the moisture balances (MBs) must be equal to, or exceed, the stated minimum values for both wheat and potatoes. If the MB for either crop is less (i.e., more negative) than that shown for Subgrade 3b, the soil is Grade 4 on droughtiness).

Table 4: ALC Grade According to Soil Droughtiness

Grade/Subgrade	Moisture Balance (MB) Limits (mm)	
	Wheat	Potatoes
1	+30	+10
2	+5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

3.21 Many soil profiles are limited by soil droughtiness to Grade 2.

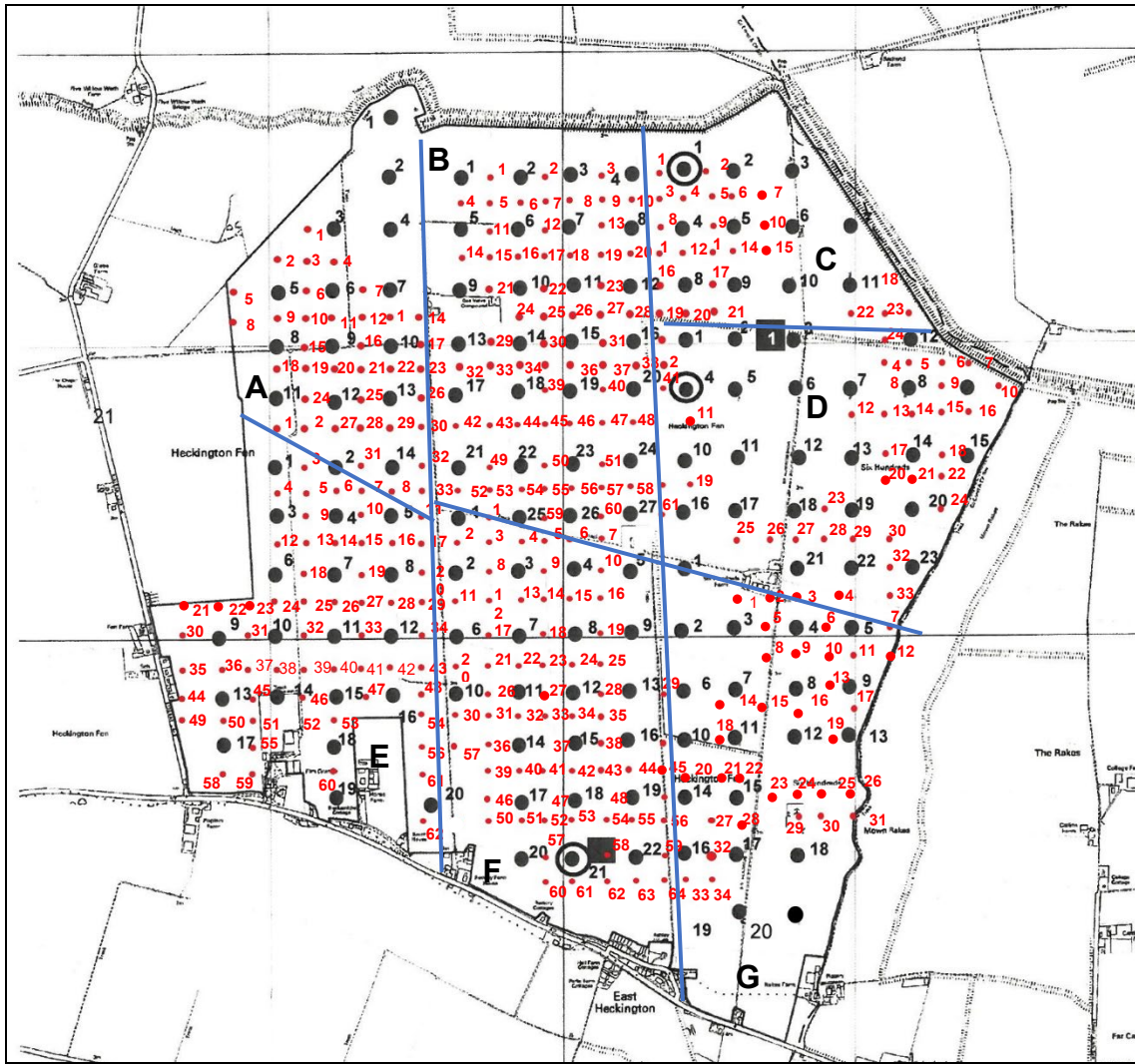
4 ALC GRADING OF THE SITE

- 4.1 The area and proportion of agricultural land in each ALC grade has been measured from an ALC map. The findings are reported in Table 5 below.
- 4.2 It has been determined that the quality of agricultural land at the Site is classified as a mixture of Grade 1, Grade 2, Subgrade 3a, and Subgrade 3b. As described in the ALC Guidelines, i.e., paragraph 5 on page 7, ‘a degree of variability in physical characteristics within a discrete area is to be expected. If the area includes a small proportion of land of different quality, the variability can be considered as a function of the mapping scale’. Therefore, it should be noted that some parcels of land in a particular ALC grade may contain single, isolated auger-bores of a different grade (i.e., of a higher or lower grade). Following the ALC Guidelines, these outliers have not been mapped out separately from the predominant, surrounding ALC grade at this scale of mapping.
- 4.3 There are small areas of woodland and non-agricultural land mapped within the site.
- 4.4 The Energy Park includes 524 ha of the area surveyed. The distribution of ALC across that 524 ha is shown on **Plan KCC3076/07**. The results are set out in Table 5. The results are rounded to the nearest whole hectare, which reflects the limitations of the ALC methodology generally. Where land changes over short distances, as here, it can only be a best-estimate of where one grade changes to another grade.

Table 5: Agricultural Land Classification

ALC Grade	Area (Ha)	Area (% of Total Site)
Grade 1 (Excellent)	58	11.1
Grade 2 (Very Good)	39	7.4
Subgrade 3a (Good)	160	30.5
Subgrade 3b (Moderate)	265	50.6
Grade 4 (Poor)	0	0
Grade 5 (Very Poor)	0	0
Non-agricultural / Other land	2	0.4
Total	524	100

Plan KCC3076/06
Auger Points Plan



KEY

- Auger sample location
- Auger sample location
- Topsoil texture sample
- Soil Pit

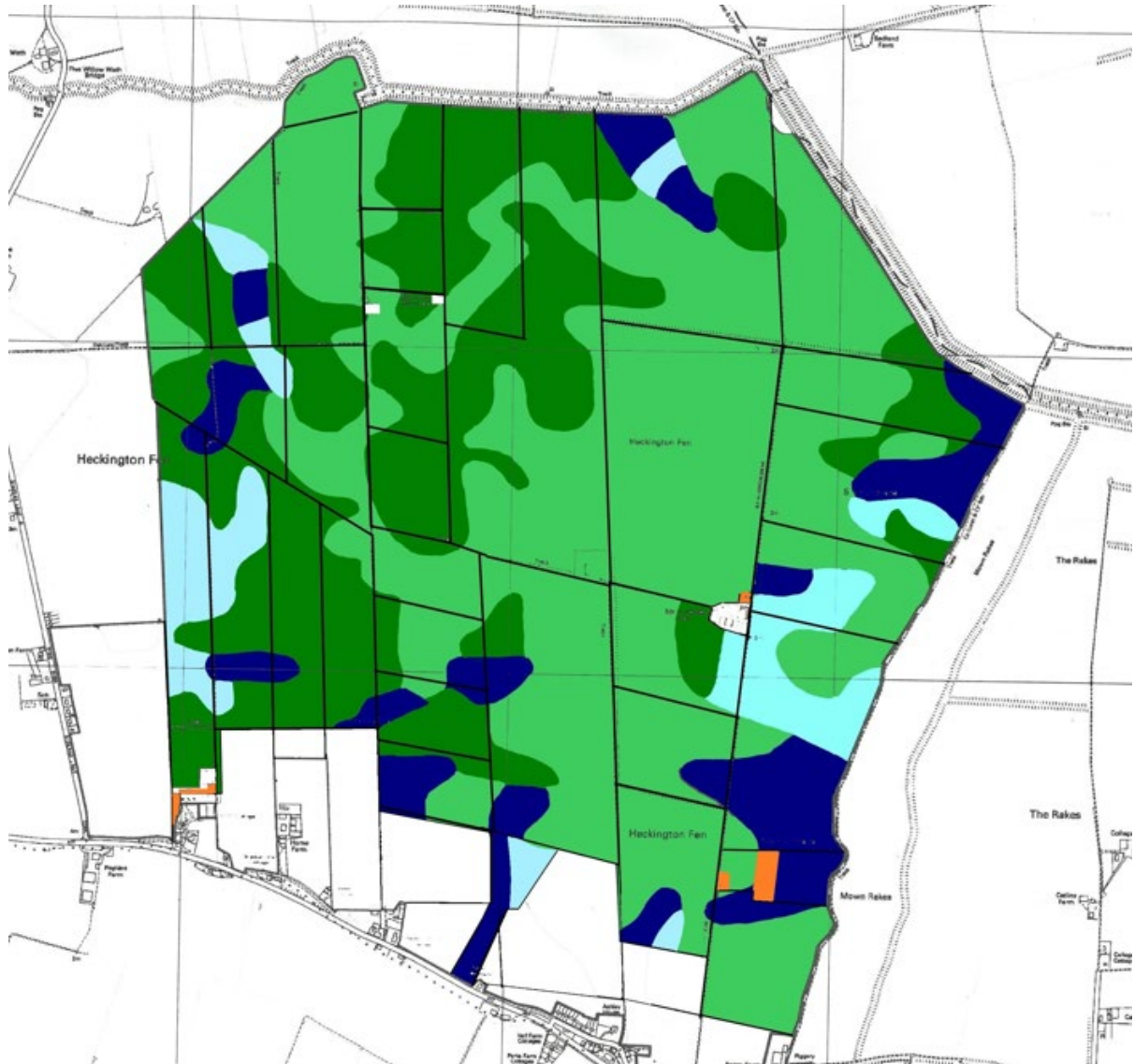
PLAN	KCC3076/06		
TITLE	Auger Points Plan		
SITE	Heckington Fen		
CLIENT	Ecotricity Group Ltd		
NUMBER	KCC3076/06 10/22hr		
DATE	October 2022	SCALE	NTS


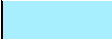







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Plan KCC3076/05
Agricultural Land Classification Plan



KEY	Ha	%	PLAN	KCC3076/07		
	Grade 1	58	11.1	TITLE	Agricultural Land Classification	
	Grade 2	39	7.4	SITE	Heckington Fen	
	Grade 3a	160	30.5	CLIENT	Ecotricity Group	
	Grade 3b	265	50.6	NUMBER	KCC3076/07 01/23hr	
	Grade 4			DATE	January 2023	SCALE NTS
	Grade 5			<p>KERNON COUNTRYSIDE CONSULTANTS LTD GREENACRES BARN, PURTON STOKE, SWINDON, WILTSHIRE, SN5 4LL Tel 01793 771 333 Email: info@kernon.co.uk This plan is reproduced from the Ordnance Survey under copyright license 100015226</p>		
	Non-agricultural	2	0.4			
	Urban					
	Not surveyed					



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