Agricultural Land Classification:

Pelham Spring Solar Farm, Essex

Prepared for:

Pegasus Group

On behalf of

Low Carbon Solar Park 6 Limited

Prepared by:
R W Askew BSc (Hons) MSc F. I. Soil Sci CSci
Askew Land & Soil Limited

Date:
24th September 2021

Project Number:
C770

Contract/Proposal No:	C770
Issue:	3
Author:	Rob Askew
Date:	24th September 2021

Our interpretation of the site characteristics is based on available data made during our desktop study and soil survey. This desktop study and soil survey has assessed the characteristics of the site in relation to the assessment of its Agricultural Land Classification. It should not be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of Low Carbon Solar Park 6 Limited.

Version Control Record			
Issue	**Description of Status**	**Date**	**Initials**
A	First Draft	09/04/2021	RWA
1	First issue to client	12/04/2021	RWA
2	Second issue incorporating changes to scheme	03/09/2021	RWA
3	Third issue incorporating minor edits	24/09/2021	RWA

CONTENTS

1 INTRODUCTION

1.1 Background

1.1.1 This report was commissioned by Pegasus Group on behalf of Low Carbon Solar Park 6 Limited to determine the quality of agricultural land at Pelham Spring Solar Farm, Maunden, Essex, CM23 1BQ ('the Site'). The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales (see 'Methodology' below). The approximately 79.3 hectare (ha) Site is located approximately 2km to the northwest of Maunden, as shown on **Figure 1**. The approximate centre of the Site is located at British National Grid (BNG) reference TL 47291 28205.

1.2 Competency

1.2.1 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). The soil surveyor meets the requirements of the BSSS Professional Competency Standard (PCS) scheme for ALC (see BSSS PCSS Document 2 '*Agricultural Land Classification of England and Wales*'[1]. The BSSS PCS 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).

1.3 Methodology

1.3.1 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF)[2] '*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').

1.3.2 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 Paragraph 174 and 175 of the National Planning Policy Framework (NPPF) revised in July 2021. Further details of the ALC system and national planning policy implications are set out by Natural England in Technical Information Note 049[3].

[1] British Society of Soil Science. Professional Competency Scheme Document 2 'Agricultural Land Classification of England and Wales'. Available online @ [redacted] accessed September 2021

[2] The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

[3] Natural England (December, 2012). 'Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)'.

1.3.3 A detailed soil survey and ALC of the Site was carried out in March and August 2021. The ALC survey involved examination of the soil's physical properties at auger-bore locations on an approximate 100 m grid pattern, at a sampling density of approximately 1 auger bore per 1 ha. For the ease of surveying and processing the soil data, the Site has been divided into four parcels referred to as A, B, C and D. The location of the auger bores in each of the four parcels, and the soil pits, are shown on **Figure 1**.

1.3.4 The soil profile was examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 5cm diameter Dutch (Edleman) soil auger. Two soil pits, i.e., Pit 1 and 2, were excavated by hand with a spade to examine certain soil physical properties, such as stone content and the structural condition of the subsoil, more closely.

1.3.5 The auger-bore 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. Where auger locations on a 100 m grid pattern fall on headland, tramlines, or within 3 m of a hedgerow or tree, they were relocated on agricultural land close by, i.e., to avoid compacted ground or land affected by tree roots, etc.

1.3.6 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 an Agricultural Land Classification (ALC) grade following the MAFF ALC Guidelines.

1.3.7 A sample of topsoil was collected at three auger-bore locations, i.e., 7 (Area A), 9 (Area C) and 8 (Area D), as shown on **Figure 1**. 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, especially with regard to distinguishing between medium clay loams (i.e., <27% clay) and heavy clay loams (27% to 35% clay).

1.4 Structure of the Remainder of this Report

1.4.1 The remainder of this report is structured as follows:

- Section 2 – Planning Policy Framework
- Section 3 – Agricultural Land Classification;
- Section 4 - ALC at the Site in a Wider Geographical Context;
- Section 5 – Summary and Conclusions

Available online @[redacted] Last accessed September 2021

2 PLANNING POLICY FRAMEWORK

2.1 Background

2.1.1 This section of the report sets out the national and local planning framework in which to assess the opportunities and constraints to development at the Site in agricultural land quality terms.

2.2 National Planning Policy Statement (NPPF) July 2021

2.2.1 National planning policy guidance on development involving agricultural land is set out in National Planning Policy Framework (NPPF), which was revised on the 20th of July 2021. The NPPF aims to provide a simplified planning framework which sets out the Government's economic, environmental and social planning policies for England. The NPPF includes policy guidance on '*Conserving and Enhancing the Natural Environment*' (Section 15). Paragraph 174 (a and b) (page 50) are of relevance to this assessment of agricultural land quality and soil and state that:

'174…Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;…'

2.2.2 Paragraph 175 of the NPPF (2021) goes on to describe that:

'175. Plan should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework[58] …'

2.2.3 Footnote number 58 states that:

'[58] Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.'

2.3 Development Plan Policy

2.3.1 The Uttlesford Local Plan (2005) references best and most versatile (BMV) land within 'Policy ENV5 - Protection of Agricultural Land', as shown below:

'Development of the best and most versatile agricultural land will only be permitted where opportunities have been assessed for accommodating development on previously developed

sites or within existing development limits. Where development of agricultural land is required, developers should seek to use areas of poorer quality except where other sustainability considerations suggest otherwise.'

2.4 Soil Health

2.4.1 Aims and objectives for safeguarding and, where possible, improving soil health are set out in the Government's 'Safeguarding our soils: A strategy for England'[4]. The Soil Strategy for England, which builds on Defra's 'Soil Action Plan for England (2004-2006), sets out an ambitious vision to protect and improve soil to meet an increased global demand for food and to help combat the adverse effects of climate change.

2.4.2 The Soil Strategy for England states that '…soil is a fundamental and essentially non-renewable natural resource, providing the essential link between the components that make up our environment. Soils vary hugely from region to region and even from field to field. They all perform several valuable functions or ecosystem services for society including:

- *nutrient cycling;*
- *water regulation;*
- *carbon storage;*
- *support for biodiversity and wildlife;*
- *providing a platform for food and fibre production and infrastructure'*

2.4.3 The vision of the Soil Strategy for England has been developed in the Government's 25 Year Plan for the Environment[5]. Soil is recognised as an important national resource, and the Plan states that:

'We will ensure that resources from nature, such as food, fish and timber, are used more sustainably and efficiently. We will do this (in part) by:

….improving our approach to soil management: by 2030 we want all of England's soils to be managed sustainably, and we will use natural capital thinking to develop appropriate soil metrics and management approaches…'

2.4.4 The vision of the Soil Strategy for England has been developed in the Government's 25 Year Plan for the Environment[6]. Soil is recognised as an important national resource, and the Plan states that:

[4] Department for Environment, Food and Rural Affairs (2009). Safeguarding our soils: A strategy for England'. Available online @ [redacted] Last accessed September 2021

[5] Department for Environment, Food and Rural Affairs (2009). A Green Future: Our 25 Year Plan to Improve the Environment. Available online [redacted] Last accessed September 2021

[6] Department for Environment, Food and Rural Affairs (2009). A Green Future: Our 25 Year Plan to Improve the Environment. Available

2.4.5 The maintenance, and improvement, of soil health is therefore a material consideration when deciding if a development is appropriate on agricultural land. Soil health can be defined as a soil's ability to function and sustain plants, animals, and humans as part of the ecosystem.

2.4.6 Of relevance to the proposed development at the Site, the installation of a solar photovoltaic (PV) array is a reversible, i.e., the agricultural land can be returned to its former agricultural productivity once the generation of renewable electricity has ceased, and the solar panels and associated infrastructure is removed. The agricultural land at the Site is currently used mainly for producing arable crops. In many respects, the management of the land under solar PV panels as grassland can benefit soil health, as described in detail in **Appendix 4**.

2.4.7 A healthy soil has a well-developed soil structure, where soil particles are aggregated into soil peds (structural units) separated by pores or voids. This allows the free movement of water (precipitation) through the soil and facilitates gaseous exchange between the plant roots and the air. These soils are well aerated (oxygenated), which encourages healthy plant (crop) growth and an abundance of soil fauna and aerobic microbes. These soils often have high amounts of soil organic matter (SOM), associated with an accumulation of plant and animal matter, and thus are a good store of soil organic carbon (SOC).

2.4.8 The greatest benefits in terms of increase in soil organic matter (SOM), and hence soil organic carbon (SOC), can be realised through land use change from intensive arable to grasslands. Likewise, SOM and SOC are increased when cultivation of the land for crops (tillage) is stopped and the land is uncultivated (zero tillage). Global evidence suggests that zero tillage results in more total soil carbon storage when applied for 12 years or more. Therefore, there is evidence that conversion of land from arable to grassland which is uncultivated over the long-term (>12 years), such as that under solar PV arrays, increases SOC and SOM.

2.4.9 Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms, and plants. Soil biota are strongly influenced by land management. Modern farming has led to the loss of soil biodiversity. Changes in land management practice and land use can have large effects on soil biodiversity over relatively short-time scales. Reducing the intensity of management, introducing no-tillage management, and converting arable land to pasture, such as grassland under solar PV arrays, has substantial beneficial effects.

2.4.10 In a well-structured soil, water and air can move freely through cracks and pores. However, a poor soil structure prevents water and air movement, and increases the risk of runoff. Soil structure is improved when the land is uncultivated over time (no tillage), and when soil organic matter content (SOM) is increased through the accumulation of plant material, such as roots, in the soil. The aerobic (oxygenated) decomposition of SOM helps to bind soil particles together into aggregates (peds). Therefore, the conversion of land which is tilled for arable to long-term grassland (no tillage), such as that under solar PV arrays, improves soil structure over time.

online @[redacted] Last accessed September 2021

2.5 Best Practice Guidance

2.5.1 The Department for Environment, Food and Rural Affairs (Defra) has published 'Safeguarding our Soils – A Strategy for England' (24th September 2009). The Soil Strategy was published in tandem with a 'Code of Practice for the Sustainable Use of Soils on Construction Sites'[7]. The Soil Strategy for England, which builds on Defra's 'Soil Action Plan for England (2004-2006), sets out an ambitious vision to protect and improve soil to meet an increased global demand for food and to help combat the adverse effects of climate change.

[7] Department for Environment, Food and Rural Affairs (September, 2009) '*Code of Practice for the Sustainable Use of Soils on Construction Sites*'. Available online @[redacted] accessed September 2021

3 AGRICULTURAL LAND CLASSIFICATION

3.1 Background

3.1.1 This section of the report sets out the findings of the 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.

3.1.2 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- climate;
- site;
- soil; and
- interactive limitations.

3.1.3 These factors are considered in turn below.

3.2 Climate

3.2.1 Interpolated climate data relevant to the determination of the Agricultural Land Classification (ALC) grade of land at the Site is given in the Tables below.

Table 3.1: ALC Climate Data for Pelham Spring Solar Farm, Essex

Climate Parameter	Grid Ref: TL473286 (North)	Grid Ref: TL473279 (South)
Average Altitude (m)	114	108
Average Annual Rainfall (mm)	639	640
Accumulated Temperature above 0˚C (January – June)	1351	1358
Moisture Deficit (mm) Wheat	107	107
Moisture Deficit (mm) Potatoes	98	99
Field Capacity Days (FCD)	124	125
Grade According to Climate	1	1

3.2.2 With reference to Figure 1 '*Grade according to climate*' on page 6 of the ALC Guidelines, there is a no climatic limitation to the quality of agricultural land at the Site. This means that agricultural land at the Site could be graded at ALC Grade 1 in overall climatic terms, in the absence of any other limiting factor, i.e., site, soil and/or interactive limitations.

3.2.3 Agricultural land at the Site is predicted to be at field capacity (i.e., near saturation point) for between 124 and 125 Field Capacity Days (FCD) per year, mainly over the late autumn, winter, and early spring. The combination of topsoil texture, drainage status (Wetness Class) of the profile, and number of FCD affects the degree to which agricultural land is limited by soil wetness.

3.2.4 The climate at the Site falls in the <126 FCD category for assessing the ALC grade according to soil wetness (regarding Table 6 of the ALC Guidelines), as described in more detail under 'interactive limitations' below. It should be noted that in this FCD range, there is an uplift by one grade according to soil wetness in soil profiles with naturally calcareous soils with more than 1% calcium carbonate ($CaCO_3$) and between 18% and 50% clay content. Where an uplift in grade due calcium carbonate content has been applied, this is identified in the soil profile logs, given as **Appendix 1**.

3.3 Site

3.3.1 The approximately 77.8 ha Site is located approximately 2km to the northwest of Maunden Essex. The approximate centre of the Site is located at British National Grid (BNG) reference TL 47291 28205. The location and boundaries of the Site are shown on **Figure 1**.

3.3.2 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.

I. Gradient and Micro-Relief

3.3.3 The land at the Site is moderately sloping, with the highest elevation at 120 metres (m) Above Ordnance Datum (AOD) in the north of the Site, and the lowest elevation at 95 mAOD in the south. The quality of agricultural land at the Site is not limited by gradient, as the gradient of the slope does not exceed 7° (see Table 1 of the ALC Guidelines, 1988). Likewise, the quality of agricultural land at the Site is not limited by micro-relief, i.e., complex changes in slope angle and direction over short distances.

II. Risk of Flooding

3.3.4 From the Government Flood Map for Planning website[8], the Site is located in Flood Zone 1. The land is not limited by flooding (re Table 2 '*Grade according to flood risk in summer*' and/or Table 3 '*Grade according to flood risk in winter*' of the ALC Guidelines.

3.4 Soil

I. Geology/Soil Parent Material

3.4.1 British Geological Survey (BGS) information available online[9] has been utilised to identify the Bedrock underlying the Site and any Superficial (Drift) Deposits over the Bedrock. This information helps to determine the parent material[10] from and within which a soil has formed.

3.4.2 The BGS information (1:50,000) indicates that Site is underlain by Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated; chalk). The bedrock is entirely covered by Lowestoft Formation (diamicton).

II. Published Information on Soil

3.4.3 The Soil Survey of England and Wales (SSEW) soil map of Eastern England (Sheet 4) at a scale of 1:250,000 and accompanying Bulletin No. 13[11] reports that agricultural land at the Site is covered by soils in the Hanslope Association.

3.4.4 As described by the SSEW, the Hanslope Association are developed in chalky till on low plateaux and gently to strongly sloping valley flanks. These soils have a calcareous, chalky subsurface horizon that is normally brown but can be grey mottled. It passes below into a dense mottled substrate containing chalk stones. This Association is often found on moderately or strongly sloping valley sides or convex upper slopes. When undrained, these soils are seldom seriously waterlogged (Wetness Class III), despite a slowly permeable subsurface horizon, and waterlogging at shallow depth is brief in duration.

III. Soil Survey

3.4.5 A log of the soil profiles recorded on Site (see Figure 1) is given as **Appendix 1**. A description of one soil pit (soil Pit 1) is given as **Appendix 2**.

[8] Government Flood Map for Planning. Available online @ [redacted] Last accessed September 2021

[9] British Geological Survey 'Geology of Britain Viewer'. Available online @ [redacted]_Last accessed September 2021

[10] British Geological Survey. A 'parent material' is a soil-science name for a weathered rock or deposit from and within which a soil has formed. Available online @ [redacted] Last accessed September 2021

[11] C.A.H. Hodge, R.G.O. Burton, W.M. Corbett, R. Evans, and R.S. Searle (1984) 'Soils and their use in Eastern England', Soil Survey of England and Wales Bulletin No.13, Harpenden

3.4.6 The texture of the topsoil was determined by hand-texturing, as described in Natural England's Technical Information Note 037 'Soil Texture'[12], and by laboratory particle size analysis (see below). In this way, it was determined that the topsoil is predominantly clay, with the clay content ranging between 36% to 42% (see Table 3.2 below).

3.4.7 Most of the soils are calcareous throughout and pass down into yellowish brown or greyish brown clay at depth. Often, noticeably chalky material is encountered at the base of the profiles. Many of the soils have non-calcareous topsoils and upper subsoils but are otherwise similar, as are those which are non-calcareous throughout.

3.4.8 Typically, the soils comprise dark brown, slightly calcareous, clay topsoil over a yellowish brown, calcareous, clay subsoil which passes down into similarly coloured or greyer clay containing increasing amounts of chalk fragments with depth. The upper subsoil is often unmottled, but deeper in the profile first ochreous (rusty) mottles are encountered, then greyish ones as the clay becomes stiffer and less permeable (i.e., mainly Wetness Class II or III and occasionally Wetness Class I).

3.4.9 Where the soils are non-calcareous, particularly those which are non-calcareous throughout, the profile tends to be more mottled and most such profiles are in Wetness Class III. A typical profile of this soil variety thus consists of a dark greyish brown, non-calcareous, clay topsoil over a greyish brown, clay subsoil which is usually mottled and may or may not be calcareous.

IV. Topsoil Particle Size Analysis

3.4.10 To substantiate topsoil texture determined during the ALC survey by hand-texturing, four samples of topsoil were collected over the Site (i.e., auger bore locations 7 (Site A), 9 (Site C) and 15 (Site D), as shown in **Figure 1**. The four topsoil samples were 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 is provided as **Appendix 3**. The findings of the PSD analysis are shown in Table 3.2 below:

Table 3.2: Topsoil Texture (re Table 10, ALC Guidelines)

Topsoil Sample Location (See Fig. 1)	% sand 0.063-2.0 mm	% silt 0.002-0.063 mm	% clay <0.002 mm	ALC Soil Texture Class
7 (Area A)	15	43	42	Clay
9 (Area C)	16	47	37	Silty Clay
8 (Area D)	23	41	36	Clay

[12] Natural England's Technical Information Note 037 'Soil Texture'. Available online at http://publications.naturalengland.org.uk/publication/32016

3.5 Interactive Limitations

3.5.1 From the published information above, together with the findings of the detailed soil survey, it has been determined that the quality of agricultural land at the Site is limited mainly by soil wetness during the autumn and winter, and by soil droughtiness during the growing season (spring and summer).

I. Soil Wetness

3.5.2 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 3.3 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines):

Table 3.3: ALC Grade According to Soil Wetness

Wetness Class	Texture of the Top 25 cm	<126 Field Capacity Days
I	Clay Calcareous clay	3a 2
II	Clay Calcareous clay	3a 2
III	Clay Calcareous clay	3b 3a

Key
* <27% clay; and ** >27% clay

3.5.3 Therefore, in a climate area with 124-125 field capacity days (FCD), soil profiles with calcareous clay topsoil are limited by soil wetness to Grade 2 where the profiles are in Wetness Classes I and II. Where soil profiles have calcareous clay topsoil and are in Wetness Class III, they are limited by soil wetness to Subgrade 3a.

3.5.4 Occasionally, there are slowly permeable and seasonally waterlogged soil profiles in Wetness Class III which have non-calcareous clay topsoil. The profiles are limited by soil wetness to Subgrade 3b.

II. Soil Droughtiness

3.1.1 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 3.4 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 3.4: ALC Grade According to Droughtiness (re Table 8 of the MAFF ALC Guidelines)

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

3.1.2 The moisture balance (MB) values have been calculated for the soil profile at each auger bore location and are reported in the Soil Profile Logs, given as **Appendix 2**. Soil droughtiness was determined to be sufficiently limiting to agricultural land quality to Grade 2, and in some places Subgrade 3a.

3.6 ALC Grading at the Site

3.6.1 The area of land in each ALC grade has been measured from **Figure 2** and the area (ha) and proportion (% of Site) is given in Table 3.5.

Table 3.5: Agricultural Land Classification – Pelham Spring Solar Farm, Essex

ALC Grade	Area (Ha)	Area (%)
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	42.7	53.8
Subgrade 3a (Good)	21.8	27.5
Subgrade 3b (Moderate)	13.1	16.5
Grade 4 (Poor)	0	0
Grade 5 (Very Poor)	0	0
Other Land / Non-agricultural	1.7	2.2
Total	**79.3**	**100**

4 ALC AT THE SITE IN A WIDER GEOGRAPHICAL CONTEXT

4.1 Introduction

4.1.1 The aim of this section is to examine agricultural land quality at the Site in a national, regional, county and local context.

4.2 Pre-1988 ALC Information

4.2.1 During the 1960's and 1970's MAFF produced a series of maps to show the provisional ALC grade of agricultural land over the whole of England and Wales at a scale of 1:250,000. These provisional ALC maps are suitable for strategic land use planning only, i.e., they appropriate for land areas greater than 80 ha. The provisional MAFF ALC map of Eastern England (1:250,000, 1984) indicates that the quality of agricultural land at the Site is Grade 2. The proportion of agricultural land in each of the ALC grades (derived from MAFF provisional or pre-1988 ALC information) in England, Eastern Region, Essex County, and Uttlesford District is shown for comparison in Table 4.1 below.

Table 4.1: Provisional ALC – National, Regional and Local Context (Proportion of ALC Grades as % of Total Land Area)[13]

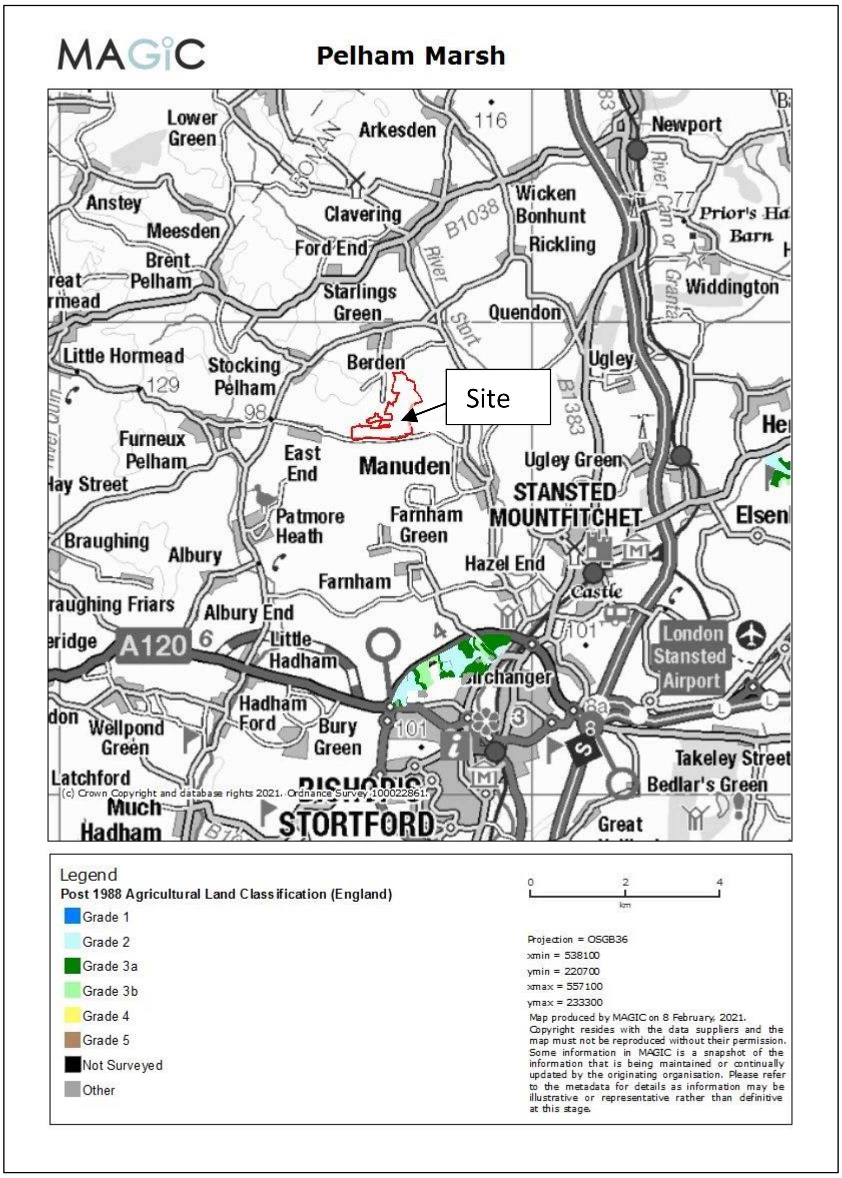
ALC Grade	England	Eastern Region	Essex County	Uttlesford District
1 (excellent)	2.7	6.7	1.8	0.0
2 (very good)	14.2	29.2	43.2	80.4
3 (good to moderate)	48.2	46.4	41.0	17.1
4 (poor)	14.1	6.1	3.3	0.0
5 (very poor)	8.4	0.1	0.4	0.0
Non-Agricultural	5.0	6.4	3.6	2.0
Urban	7.3	5.1	6.7	0.5

4.2.2 Of note, the provisional (Pre 1988) ALC information shows that Uttlesford District has a high proportion of agricultural land in Grade 2, i.e., 80.4% compared with 14.2% in England as a whole. Therefore, the presence of Grade 2 land at the Site is unsurprising, as it is widespread in the District.

[13] Ministry of Agriculture, Fisheries and Food, Land and Water Service, Technical Notes, Resource Planning (February 1983) 'Agricultural Land Classification of England and Wales – The Distribution of the Grades' (TN/RP/01 TFS 846)

4.3 Post-1988 ALC Information

4.3.1 The former MAFF has not carried a Post-1988 ALC survey of agricultural land covering the Site. An extract from the Post-1988 Agricultural Land Classification map online[14] surrounding the Site is given below.



4.3.2 As shown on the Post-1988 ALC survey above, MAFF determined that there is a mix of Grade 2, Subgrade 3a, and Subgrade 3b to the south east of the Site. The ALC grading at the Site is therefore consistent with MAFF post-1988 ALC information in the area.

[14] Multi Agency Geographic Information for the Countryside. Post 1988 Agricultural Land Classification. Available online [redacted] Last accessed September 2021

5 SUMMARY AND CONCLUSIONS

5.1.1 This report was commissioned by the Pegasus Group on behalf of Low Carbon Solar Park 6 Limited to determine the quality of agricultural land at Pelham Spring Solar Farm, Essex, CM23 1BQ ('the Site'). The assessment was made in accordance with the Agricultural Land Classification (ALC) system for England and Wales (see 'Methodology' below). The approximately 79.3 hectare (ha) Site is located to the northwest of Maunden, Essex, and the approximate centre of the Site is located at British National Grid (BNG) reference TL 47291 28205.

5.1.2 British Geological Survey (BGS) information (1:50,000) indicates that Site is underlain by Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated; chalk), which is covered glacial till in the Lowestoft Formation (diamicton).

5.1.3 The National Soil Map (1:250,000) shows the Site is covered by soils in the Hanslope Association, which consists of calcareous, chalky soils that pass below into a dense mottled substrate containing chalk stones. When undrained, these soils are seldom seriously waterlogged (Wetness Class III).

5.1.4 From a soil survey at the Site in March and August 2021, most of the soils comprise dark brown, slightly calcareous, clay topsoil over a yellowish brown, slightly calcareous, clay subsoil. The upper subsoil is often unmottled, but deeper in the profile first ochreous (rusty) mottles are encountered, then greyish ones as the clay becomes stiffer and less permeable (i.e., mainly Wetness Class II or III).

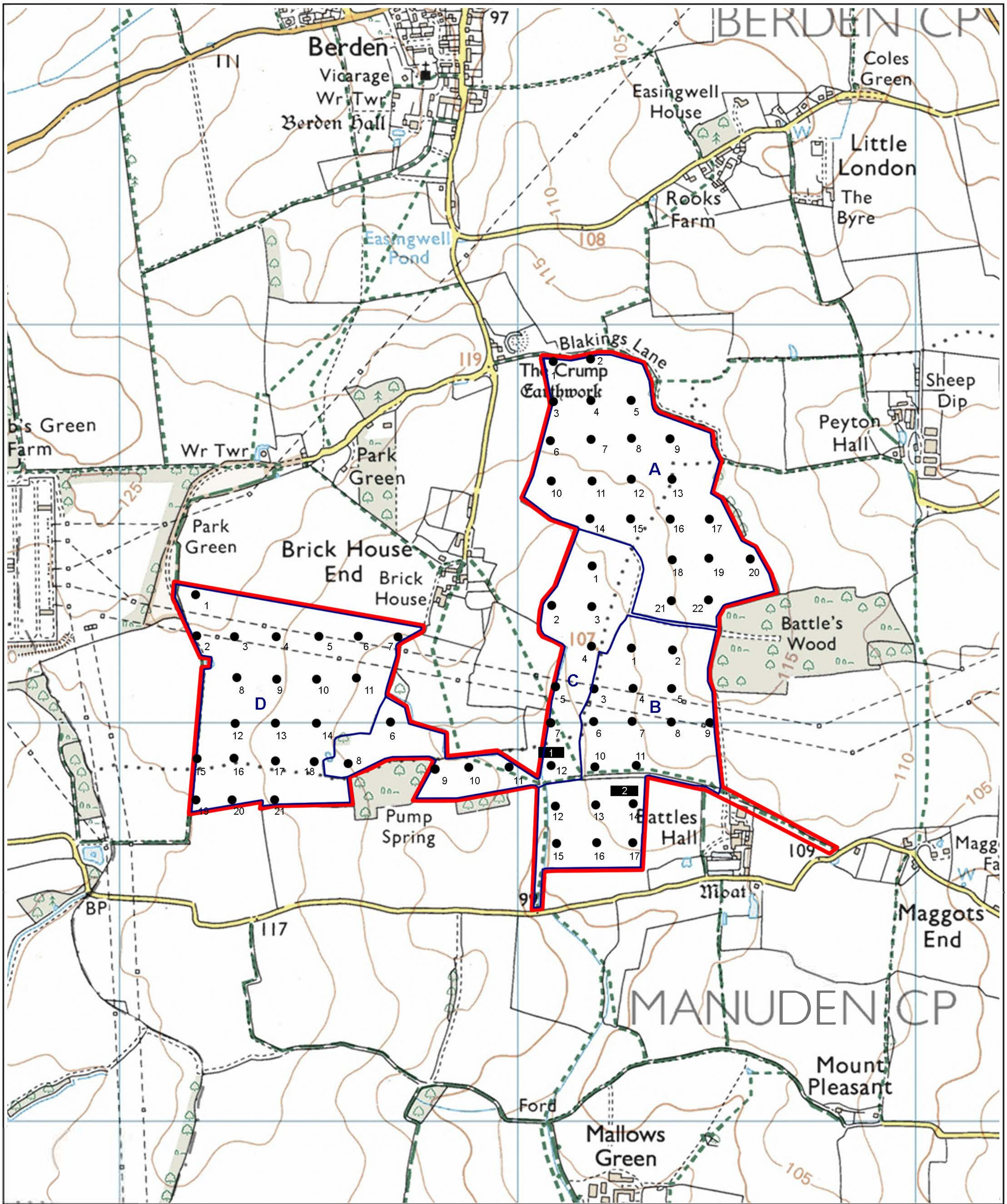
5.1.5 The detailed ALC survey determined the following grades: (i) approximately 42.7ha of Grade 2 (53.8% of the Site); (ii) approximately 21.8ha of Subgrade 3a (27.5%); (iii) approximately 13.1ha of Subgrade 3b (16.5%), and (iv) approximately 1.7ha of non-agricultural land (2.2%) along a track.

5.1.6 MAFF provisional (pre-1988) ALC information indicates shows that Uttlesford District has a high proportion of agricultural land in Grade 2, i.e., 80.4% compared with 14.2% in England as a whole. Therefore, the presence of Grade 2 land at the Site is unsurprising, as it is widespread in the District.

5.1.7 MAFF detailed (post-1988) ALC surveys have determined a mix of Grade 2, Subgrade 3a and Subgrade 3b to the south and southeast of the Site. The ALC grading at the Site is therefore consistent with MAFF post-1988 ALC information in the area.

5.1.8 In many respects, the management of the land under solar PV panels can improve soil health, such as increasing soil organic matter (SOM), and hence soil organic carbon (SOC), increasing soil biodiversity, and improving soil structure. This is consistent with aims and objectives for improving soil health in the Government's 25 Year Plan for the Environment.

Figures



Site Parcel	
Site boundary	
●	Auger location
⊙	Topsoil Sample
■	Soil Pit

N

Client

Low Carbon Solar Park 6 Ltd

Figure 1

Sample Locations

Project Name

Pelham Spring Solar Farm

Project No C770

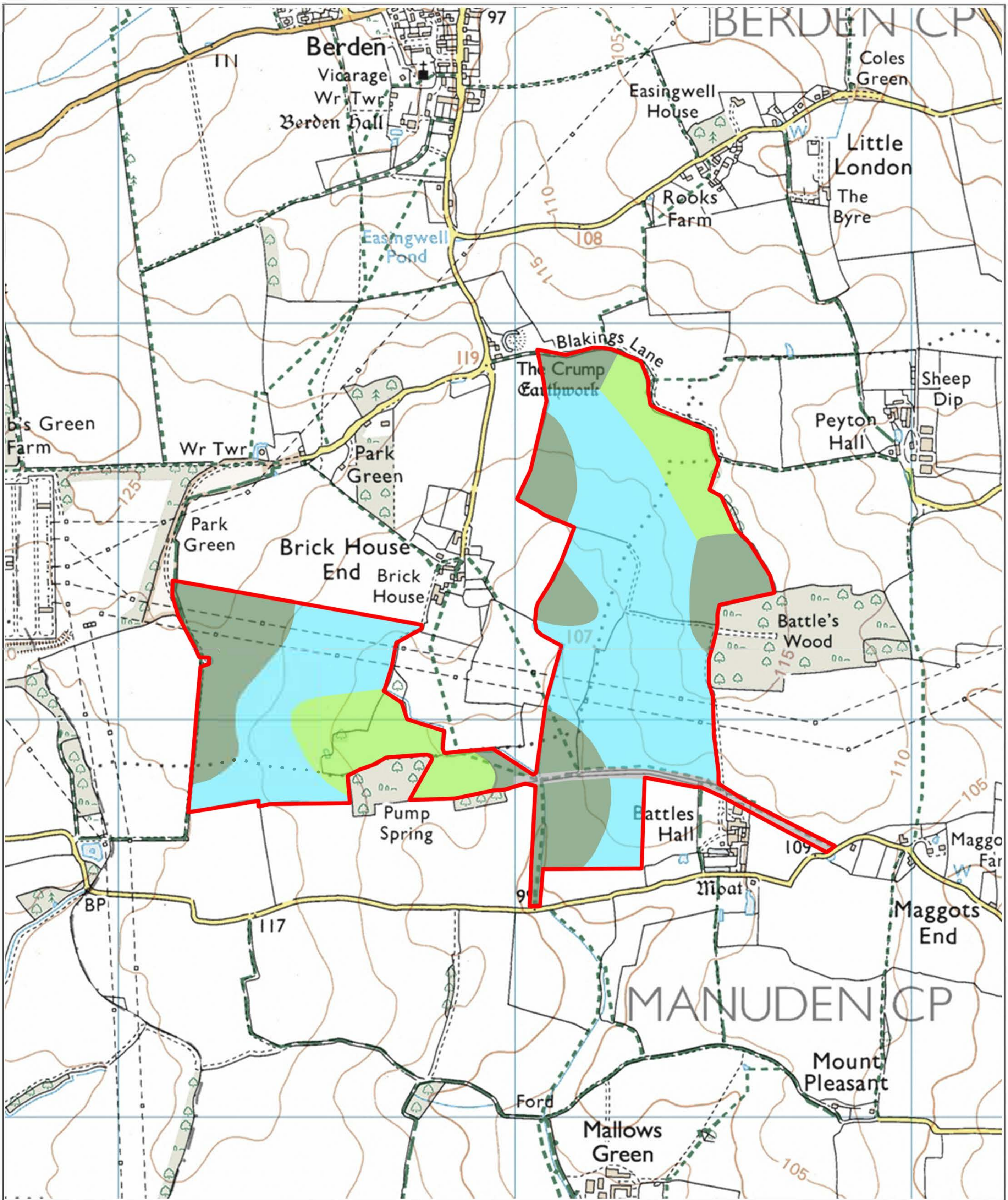
Dwg. No 01

Scale NTS

Date 01/09/2021

Drawn By ELA

R W Askew BSc(Hons) MISoilSci MSc CSCi
The Old Stables, Upexe, Exeter, EX5 5ND
Tel: 07753 227 224
Email: rw.askew@btinternet.com



ALC Grade

- Grade 1
- Grade 2
- Subgrade 3a
- Subgrade 3b
- Grade 4
- Grade 5
- Non-agricultural

Site boundary

N

Client

Low Carbon Solar Park 6 Ltd

Project No C770

Dwg. No 2

Scale NTS

Date 01/09/2021

Drawn By ELA

Figure 2:

Agricultural Land Classification

Project Name

Pelham Spring Solar Farm

R W Askew BSc(Hons) MISoilSci MSc CSCi
The Old Stables, Upexe, Exeter, EX5 5ND
Tel: 07753 227 224
Email: rw.askew@btinternet.com

Appendix 1:
Soil Profile Logs

Project Number	Project Name	Parcel
C770A	Pelham Spring Solar Farm, Essex	Area A

Date of Survey	Survey Type	Surveyor(s)	Company
Feb/Mar 2021	Detailed	RM	Askew Land and Soil

Weather	Relief	Land use and vegetation
Dry,Sunny	Level	Cereals

Grid Reference	Postcode	Altitude	Area
TL473286	CM231BQ	114	22

MAFF prov	MAFF detailed	Flooding
Grade 2/3	None	Flood Zone 1

AAR	AT0	MDw	MDp	FCD	Climate grade
639	1351	107	98	124	1

Bedrock	Superficial deposits
Lewes Nodular Chalk/Thanet Formation	Lowestoft galcial till

Soil association(s) 1:250,000	Detailed soil information
Hanslope	None

Revision Number	Date Revised
2	12/04/2021

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TL 47100 28900	547100	228900	118	≤7	N	CER	0	30	30	2.5Y4/2					Yes	C - Clay	4	4	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	MC - M	No	No	17	2	2	WC III	3a	Wetness			3a
								30	45	15	2.5Y4/2	CF - Cc	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	VC - Ver	Yes	Yes									
								45	75	30	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	Yes	Yes									
								75	85	10	10YR5/4	MD - M	10YR5/6			No	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								85	120	35	10YR5/4	MD - M	10YR5/6			No	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
2	TL 47200 28900	547200	228900	119	≤7	N	CER	0	28	28	10YR4/2					Yes	C - Clay	4	4	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	16	2	2	WC III	3a	Wetness			3a
								28	40	12	10YR5/3	CF - Cc	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								40	100	60	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								100	120	20	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
3	TL 47100 28800	547100	228800	118	≤7	N	CER	0	38	38	2.5Y4/2					Yes	C - Clay	4	4	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	VC - Ver	No	No	21	6	2	WC II	2	Droughtiness	Wetness		2
								38	43	5	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	SC - Slig	Yes	No									
								43	70	27	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	90	20	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								90	120	30	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
4	TL 47200 28800	547200	228800	119	≤7	N	CER	0	38	38	10YR4/2					Yes	C - Clay	4	4	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	SC - Slig	No	No	24	12	2	WC II	2	Droughtiness	Wetness		2
								38	60	22	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	MC - M	No	No									
								60	85	25	10YR5/3	MF - M	10YR5/6			Yes	C - Clay	5			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								85	90	5	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								90	120	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
5	TL 47300 28800	547300	228800	119	≤7	N	CER	0	38	38	10YR4/2					Yes	C - Clay	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	21	7	2	WC III	3b	Wetness			3b
								38	40	2	7.5YR4/2					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								40	80	40	7.5YR4/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								80	100	20	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	SC - Slig	Yes	Yes									
								100	120	20	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	SC - Slig	No	Yes									
6	TL 47100 28700	547100	228700	112	≤7	N	CER	0	35	35	2.5Y5/2					Yes	C - Clay	2	2	1	HR - All h	4	4	1	CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	57	8	2	WC III	3a	Wetness			3a
								35	40	5	2.5Y6/3						C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	120	80	2.5Y6/3	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								65	120	55	2.5Y6/3						C - Clay				CH - Chalk or chalk stones								Poor		Yes	Yes									
7	TL 47200 28700	547200	228700	114	≤7	N	CER	0	30	30	10YR4/2					Yes	C - Clay	2	2	1	HR - All h	4	4	1	CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	23	10	2	WC II	2	Droughtiness	Wetness		2
								30	40	10	10YR4/2					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	55	15	7.5YR4/6					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	SC - Slig	No	No									
								55	80	25	10YR5/4	MF - M	10YR5/6			No	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR5/4	MF - M	10YR5/6			No	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	No									
8	TL 47300 28700	547300	228700	114	≤7	N	CER	0	35	35	2.5Y4/2					Yes	C - Clay	2	2	1	CH - Cha	2	2	1	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	22	7	2	WC II	2	Droughtiness	Wetness		2
								35	45	10	10YR5/2					Yes	C - Clay	0			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	80	35	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	No									
9	TL 47400 28700	547400	228700	116	≤7	N	CER	0	30	30	10YR4/2					Yes	C - Clay	2	2	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	22	7	2	WC II	3a	Wetness			3a
								30	43	13	2.5Y4/2					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	MC - M	No	No									
								43	75	32	2.5Y5/3	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								75	120	45	2.5Y5/3	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
10	TL 47100 28600	547100	228600	112	≤7	N	CER	0	38	38	2.5Y4/2					Yes	C - Clay	2	2	1	CH - Cha	4	4	1	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	19	4	2	WC III	3a	Wetness			3a
								38	40	2	2.5Y5/3					Yes	C - Clay	0			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	80	40	2.5Y6/4	MF - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	2.5Y6/4	MF - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
11	TL 47200 28600	547200	228600	114	≤7	N	CER	0	30	30	10YR4/2					Yes	C - Clay	3	3	1	CH - Cha	4	4	2	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	19	2	2	WC II	2	Droughtiness	Wetness		2
								30	45	15	10YR4/2					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	70	25	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
12	TL 47300 28600	547300	228600	114	≤7	N	CER	0	30	30	10YR4/2					Yes	C - Clay	5	5	1	CH - Chalk or chalk stones								Not Applic	VC - Ver	No	No	21	6	2	WC II	2	Droughtiness	Wetness		2
								30	45	15	10YR4/3					No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	60	15	2.5Y5/3	MF - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	80	20	2.5Y5/3	MF - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	2.5Y5/3	MF - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SPL	Drought MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
13	TL 47400 28600	547400	228600	116	≤7	N	CER	0	30	30	10YR4/2					Yes	C - Clay	2	2		CH - Cha	4	4		HR - All hard rocks or stones (i.e. thos				Not Applic	NON - N	No	No	20	5	2	WC III	3b	Wetness			3b
								30	45	15	10YR4/2	CF - C	10YR5/6			Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	SC - Slig	No	No									
								45	80	35	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	2.5Y5/3						C - Clay	50			CH - Chalk or chalk stones								Poor		No	Yes									
14	TL 47200 28500	547200	228500	114	≤7	N	CER	0	35	35	10YR4/2					Yes	C - Clay	2	2	1	CH - Cha	4	4		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	23	10	2	WC II	2	Droughtiness	Wetness		2
								35	45	10	10YR4/2					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	60	15	10YR5/3					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	Yes									
								60	70	10	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
15	TL 47300 28500	547300	228500	114	≤7	N	CER	0	38	38	10YR4/2					Yes	C - Clay	2	2	1	CH - Cha	4	4		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	22	6	2	WC II	2	Droughtiness	Wetness		2
								38	48	10	10YR5/3					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								48	60	12	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	90	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								90	120	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
16	TL 47400 28500	547400	228500	116	≤7	N	CER	0	35	35	10YR4/2					Yes	C - Clay	2	2	1	CH - Cha	4	4		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	23	11	2	WC II	2	Droughtiness	Wetness		2
								35	45	10	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	70	25	10YR5/4	MF - M	10YR5/6			No	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								70	90	20	10YR6/4	MF - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								90	120	30	10YR6/4	MF - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No										
17	TL 47500 28500	547500	228500	117	≤7	N	CER	0	38	38	2.5Y4/2					Yes	C - Clay	2	2	1	CH - Cha	4	4		HR - All hard rocks or stones (i.e. thos				Not Applic	VSC - V	No	No	19	5	2	WC III	3b	Wetness			3b
								38	80	42	2.5Y5/3	MD - M	10YR5/6			Yes	C - Clay	5			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	2.5Y5/3						C - Clay	50			CH - Chalk or chalk stones								Poor		No	Yes									
18	TL 47400 28400	547400	228400	114	≤7	N	CER	0	30	30	10YR4/3					No	C - Clay	3	3	1	CH - Cha	3	3		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	20	3	2	WC II	2	Droughtiness	Wetness		2
								30	40	10	10YR5/3					Yes	C - Clay	0			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	45	5	10YR6/4					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	70	25	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
19	TL 47500 28400	547500	228400	117	≤7	N	CER	0	35	35	2.5Y4/2					Yes	C - Clay	3	3	1	CH - Cha	3	3	0	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	18	4	2	WC III	3a	Wetness			3a
								35	75	40	2.5Y5/3	CD - C	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								75	120	45	2.5Y5/3	CD - C	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
20	TL 47600 28400	547600	228400	117	≤7	N	CER	0	35	35	2.5Y4/2					Yes	C - Clay	3	3	1	CH - Cha	3	3		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	20	5	2	WC III	3a	Wetness			3a
								35	40	5	2.5Y5/3					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	Yes									
								40	70	30	2.5Y5/3	CF - C	10YR5/6			No	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	2.5Y5/3	CF - C	10YR5/6			No	C - Clay	50			CH - Chalk or chalk stones								Poor		No	Yes									
21	TL 47400 28300	547400	228300	114	≤7	N	CER	0	39	39	10YR4/2					Yes	C - Clay	4	4	2	HR - All h	2	2		CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	22	5	2	WC II	2	Droughtiness	Wetness		2
								39	50	11	10YR5/3					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								50	80	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
22	TL 47500 28300	547500	228300	117	≤7	N	CER	0	28	28	2.5Y4/2					Yes	C - Clay	4	4	1	CH - Cha	2	2	1	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	15	-1	2	WC III	3a	Wetness			3a
								28	70	42	10YR5/3	CD - C	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR5/3	CD - C	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
	END																																								

Project Number	Project Name	Parcel
C770A	Pelham Spring Solar Farm, Essex	Area A

Date of Survey	Survey Type	Surveyor(s)	Company
Feb/Mar 2021	Detailed	RM	Askew Land and Soil

Weather	Relief	Land use and vegetation
Dry,Sunny	Level	Cereals

Grid Reference	Postcode	Altitude	Area
TL473286	CM231BQ	114	22

MAFF prov	MAFF detailed	Flooding
Grade 2/3	None	Flood Zone 1

AAR	AT0	MDw	MDp	FCD	Climate grade
639	1351	107	98	124	1

Bedrock	Superficial deposits
Lewes Nodular Chalk/Thanet Formation	Lowestoft galcial till

Soil association(s) 1:250,000	Detailed soil information
Hanslope	None

Revision Number	Date Revised
2	12/04/2021

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TL 47300 28200	547300	228200	107	≤7	N	LEY	0	35	35	10YR4/2					Yes	C - Clay	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	VC - Ver	No	No	25	12	2	WC II	2	Wetness	Droughtiness		2
								35	45	10	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	MC - M	No	No									
								45	60	15	10YR5/3					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	Yes	No									
								60	80	20	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
2	TL 47400 28200	547400	228200	113	≤7	N	LEY	0	30	30	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		GS - Gravel with porous stones (main				Not Applic	MC - M	No	Yes	24	12	2	WC II	2	Wetness	Droughtiness		2
								30	40	10	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	65	25	10YR6/4					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								65	75	10	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								75	120	45	10YR6/4						C - Clay	20			CH - Chalk or chalk stones								Poor			Yes									
3	TL 47200 28100	547200	228100	107	≤7	N	LEY	0	30	30	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	MC - M	No	Yes	24	11	2	WC II	2	Wetness	Droughtiness		2
								30	45	15	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	60	15	10YR5/3					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	Yes	No									
								60	80	20	10YR6/3	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/3						C - Clay	20			CH - Chalk or chalk stones								Poor			Yes									
4	TL 47300 28100	547300	228100	107	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	25	14	2	WC II	2	Wetness	Droughtiness		2
								38	50	12	7.5YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								50	70	20	10YR6/4	CD - C	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	Yes	No									
								70	120	50	10YR6/4						C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	Yes	Yes									
5	TL 47400 28100	547400	228100	113	≤7	N	LEY	0	35	35	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	22	5	2	WC II	2	Wetness	Droughtiness		2
								35	45	10	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	50	5	10YR6/4	CD - C	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Moderate	VC - Ver	Yes	No									
								50	120	70	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	Yes	No									
6	TL 47200 28000	547200	228000	104	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	24	11	2	WC II	2	Wetness	Droughtiness		2
								38	43	5	10YR5/3					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								43	60	17	10YR5/4					No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								60	70	10	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
7	TL 47300 28000	547300	228000	108	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	23	6	2	WC II	2	Wetness	Droughtiness		2
								38	50	12	10YR6/4					Yes	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								50	60	10	10YR6/4	MD - M	10YR5/6			No	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	120	60	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
8	TL 47400 28000	547400	228000	111	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	21	4	2	WC II	2	Wetness	Droughtiness		2
								38	45	7	10YR4/3					No	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	50	5	10YR6/4	MD - M	10YR5/6			No	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								50	120	70	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
9	TL 47500 28000	547500	228000	110	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	3	3		CH - Cha	2	2	2	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	No	24	10	2	WC II	2	Wetness	Droughtiness		2
								38	45	7	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	60	15	10YR6/4					Yes	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								60	80	20	10YR6/4	CD - C	10YR5/6			Yes	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
10	TL 47200 27900	547200	227900	104	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	19	3	2	WC III	3a	Wetness			3a
								38	60	22	10YR6/3	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	120	60	10YR6/3						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
11	TL 47300 27900	547300	227900	108	≤7	N	LEY	0	38	38	10YR4/2					Yes	C - Clay	2	2		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	22	5	2	WC II	2	Wetness	Droughtiness		2
								38	45	7	10YR5/3					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	70	25	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
12	TL 47100 27800	547100	227800	104	≤7	N	LEY	0	35	35	10YR4/2					Yes	C - Clay	1	1		CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	SC - Slig	No	Yes	26	16	2	WC II	2	Wetness	Droughtiness		2
								35	70	35	10YR4/3					No	C - Clay	0			CH - Chalk or chalk stones								Moderate	NON - N	No	No									
								70	120	50	10YR4/3						C - Clay	20			CH - Chalk or chalk stones								Poor			Yes									

Point	Grid ref. NGR	X	Y	Alt (m)	Slope °	Aspect	Land use	Depth (cm) Top	Bttm	Thick	Matrix Munsell colour	Ochreous Mottles Form	Munsell colour	Grey Mottles Form	Munsell colour	Gley	Texture	Stones - type 1 %	> 2cm	> 6cm	Type	Stones - type 2 %	> 2cm	> 6cm	Type	Ped Strength	Size	Shape	SUBS STR	CaCO3	Mn C	SPL	Drought MBw	MBp	Gd	Wet WC	Gw	Final ALC Limitation 1	Limitation 2	Limitation 3	Grade
13	TL 47200 27800	547200	227800	104	≤7	N	LEY	0	28	28	2.5Y5/2					Yes	C - Clay	2	2		CH - Cha	3	3	1	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	17	1	2	WC III	3a	Wetness			3a
								28	40	12	10YR5/4					No	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	70	30	10YR6/4	CF - Co	10YR5/6			Yes	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
14	TL 47300 27800	547300	227800	108	≤7	N	LEY	0	39	39	2.5Y4/2					Yes	C - Clay	2	2		CH - Cha	3	3	1	HR - All hard rocks or stones (i.e. thos				Not Applic	VC - Ver	No	Yes	23	9	2	WC II	2	Wetness	Droughtiness		2
								39	60	21	2.5Y6/4					Yes	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								60	70	10	2.5Y6/3	CF - Co	10YR5/6			Yes	C - Clay	40			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	2.5Y6/3						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
15	TL 47100 27700	547100	227700	102	≤7	N	LEY	0	33	33	10YR4/2					Yes	C - Clay	5	5		HR - All h	2	2		CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	23	10	2	WC II	2	Wetness	Droughtiness		2
								33	60	27	7.5YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	Yes	No									
								60	120	60	7.5YR4/3						C - Clay	30			CH - Chalk or chalk stones								Poor			Yes									
16	TL 47200 27700	547200	227700	102	≤7	N	LEY	0	35	35	10YR4/2					Yes	C - Clay	2	2		HR - All h	4	4	2	CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	19	4	2	WC III	3a	Wetness			3a
								35	60	25	10YR6/3	CF - Co	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	VC - Ver	No	Yes									
								60	120	60	10YR6/3						C - Clay	30			CH - Chalk or chalk stones								Poor			Yes									
17	TL 47300 27700	547300	227700	103	≤7	N	LEY	0	33	33	10YR4/2					Yes	C - Clay	2	2		HR - All h	4	4	2	CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	23	9	2	WC II	2	Wetness	Droughtiness		2
								33	40	7	10YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	VC - Ver	No	Yes									
								40	55	15	10YR5/4	CF - Co	10YR5/6			No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								55	70	15	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor		No	Yes									
								70	120	50	10YR6/4						C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
	END																																								

Project Number	Project Name	Parcel
C770C	Pelham Spring Solar Farm, Essex	Area C

Date of Survey	Survey Type	Surveyor(s)	Company
Feb/Mar 2021	ALC	RM	Askew Land and Soil

Weather	Relief	Land use and vegetation
Dry,Sunny	Level	Cereals

Grid Reference	Postcode	Altitude	Area
TL470281	CM231BQ	114	16

MAFF prov	MAFF detailed	Flooding
Grade 2/3	None	Flood Zone 1

AAR	AT0	MDw	MDp	FCD	Climate grade
639	1360	107	99	124	1

Bedrock	Superficial deposits
Lewes Nodular Chalk Formation	Lowestoft glacial till

Soil association(s) 1:250,000	Detailed soil information
Hanslope	None

Revision Number	Date Revised
2	12/04/2021

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TL 47200 28400	547200	228400	110	≤7	S	LEY	0	38	38	10YR4/2					Yes	C - Clay	4	4	2	HR - All h	3	3		CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	22	5	2	WC II	2	Wetness	Droughtiness		2
								38	40	2	10YR5/4					No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	50	10	10YR5/4	CF - Cc	10YR5/6			No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								50	60	10	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	70	10	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
2	TL 47100 28300	547100	228300	107	≤7	S	LEY	0	38	38	10YR4/2					Yes	C - Clay	4	4	2	HR - All h	3	3		CH - Chalk or chalk stones				Not Applic	SC - Slig	No	No	19	3	2	WC III	3a	Wetness			3a
								38	40	2	10YR6/4					Yes	C - Clay	5			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								40	60	20	10YR6/4	CF - Cc	10YR5/6			No	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								60	90	30	10YR6/4	CF - Cc	10YR5/6			No	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								90	120	30	10YR6/4	CF - Cc	10YR5/6			No	C - Clay	50			CH - Chalk or chalk stones								Poor			No									
3	TL 47200 28300	547200	228300	110	≤7	S	LEY	0	38	38	10YR4/2					Yes	C - Clay	4	4	2	HR - All h	3	3		CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	18	1	2	WC III	3a	Wetness			3a
								38	70	32	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								70	120	50	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor			No									
4	TL 47000 28200	547000	228200	107	≤7	S	LEY	0	35	35	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	3	2	1	CH - Chalk or chalk stones				Not Applic	MC - M	No	No	22	4	2	WC II	2	Wetness	Droughtiness		2
								35	50	15	10YR4/4					No	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	Yes									
								50	70	20	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								70	120	50	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
5	TL 47100 28200	547100	228200	105	≤7	S	LEY	0	30	30	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	3	2	1	CH - Chalk or chalk stones				Not Applic	MC - M	No	No	23	8	2	WC II	2	Wetness	Droughtiness		2
								30	60	30	10YR4/4					No	C - Clay	10			CH - Chalk or chalk stones								Moderate	MC - M	No	No									
								60	120	60	10YR4/4					No	C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
6	TL 47200 28200	547200	228200	107	≤7	S	LEY	0	38	38	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	3	2	1	CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	20	2	2	WC II	2	Wetness	Droughtiness		2
								38	45	7	10YR6/4					Yes	C - Clay	20			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								45	55	10	10YR6/4	CD - C	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								55	120	65	10YR6/4	CD - C	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor			Yes									
7	TL 46900 28100	546900	228100	109	≤7	S	LEY	0	36	36	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	1	1	1	CH - Chalk or chalk stones				Not Applic	NON - N	No	No	24	6	2	WC II	3a	Wetness			3a
								36	50	14	10YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	60	10	10YR5/3	CF - Cc	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Very calca		Yes									
								60	120	60	10YR5/3	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones								Poor			No									
8	TL 47000 28100	547000	228100	107	≤7	S	LEY	0	28	28	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	1	1	1	CH - Chalk or chalk stones				Not Applic	SC - Slig	No	No	20	3	2	WC II	2	Wetness	Droughtiness		2
								28	50	22	10YR5/4					No	C - Clay	10			HR - All hard rocks or stones (i.e				CH - Chalk or chalk stones				Moderate	VC - Ver	No	No									
								50	70	20	10YR5/2	CF - Cc	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones				CH - Chalk or chalk stones				Poor	VC - Ver	No	Yes									
								70	120	50	10YR5/2	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones				CH - Chalk or chalk stones				Poor			Yes									
9	TL 47100 28100	547100	228100	105	≤7	S	LEY	0	38	38	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	1	1	1	CH - Chalk or chalk stones				Not Applic	SC - Slig	No	No	23	8	2	WC II	2	Wetness	Droughtiness		2
								38	60	22	10YR4/4					No	C - Clay	20			CH - Chalk or chalk stones				CH - Chalk or chalk stones				Moderate	VC - Ver	No	No									
								60	90	30	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones				CH - Chalk or chalk stones				Poor	VC - Ver	No	Yes									
								90	120	30	10YR6/4	CF - Cc	10YR5/6			Yes	C - Clay	50			CH - Chalk or chalk stones				CH - Chalk or chalk stones				Poor			Yes									
10	TL 46700 28000	546700	228000	113	≤7	S	LEY	0	25	25	2.5Y4/2					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	17	2	2	WC III	3b	Wetness			3b
								25	39	14	2.5Y4/2	CD - C	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								39	80	41	2.5Y5/3	CD - C	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								80	120	40	2.5Y5/3	CD - C	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
11	TL 47100 28000	547100	228000	104	≤7	S	LEY	0	40	40	10YR4/2					Yes	C - Clay	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	27	16	2	WC II	3a	Wetness			3a
								40	70	30	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								70	120	50	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor		No	Yes									
12	TL 46600 27900	546600	227900	113	≤7	S	LEY	0	20	20	2.5Y4/2					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	15	0	2	WC III	3b	Wetness			3b
								20	38	18	2.5Y4/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								38	50	12	2.5Y5/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								50	120	70	2.5Y5/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
13	TL 46820 27900	546820	227900	107	≤7	S	LEY	0	30	30	10YR4/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	19	4	2	WC III	3b	Wetness			3b
								30	70	40	10YR4/3	MD - M	10YR5/6			No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								70	120	50	10YR4/3	MD - M	10YR5/6			No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
14	TL 46900 27900	546900	227900	107	≤7	S	LEY	0	38	38	10YR4/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	23	8	2	WC III	3b	Wetness			3b
								38	40	2	10YR5/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	Yes									
								40	120	80	10YR5/2	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
15	TL 47000 27900	547000	227900	103	≤8	S	LEY	0	30	30	10YR4/2					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	SC - Slig	No	No	24	8	2	WC II	2	Wetness	Droughtiness		2
								30	45	15	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	SC - Slig	No	No									
								45	55	10	10YR5/3	CF - C	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	MC - M	No	Yes									
								55	120	65	10YR5/3	CF - C	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	MC - M	No	Yes									
16	TL 47100 27900	547100	227900	104	≤9	S	LEY	0	36	36	10YR4/2					Yes	C - Clay	2	2		HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	27	15	2	WC II	3a	Wetness			3a
								36	70	34	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								70	75	5	10YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	SC - Slightly ca		No									
								75	120	45	10YR4/3					No	C - Clay	5			CH - Chalk or chalk stones								Poor	SC - Slightly ca		Yes									
	END																																								

Project Number	Project Name	Parcel
C770D	Pelham Spring Solar Farm, Essex	Area D

Date of Survey	Survey Type	Surveyor(s)	Company
Feb/Mar 2021	ALC	RM	Askew Land and Soil

Weather	Relief	Land use and vegetation
Dry,Sunny	Level	Cereals

Grid Reference	Postcode	Altitude	Area
TL467276	CM231BQ	114	15

MAFF prov	MAFF detailed	Flooding
Grade 2/3	None	Flood Zone 1

AAR	AT0	MDw	MDp	FCD	Climate grade
641	1362	108	99	125	1

Bedrock	Superficial deposits
Lewes Nodular Chalk Formation	Lowestoft glacial till

Soil association(s) 1:250,000	Detailed soil information
Hanslope	None

Revision Number	Date Revised
2	12/04/2021

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade
1	TL 47000 27800	547000	227800	103	≤7	NE	LEY	0	38	38	10YR4/2					Yes	C - Clay	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	22	8	2	WC II	3a	Wetness			3a
								38	50	12	7.5YR4/3					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	120	70	7.5YR4/3						C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor			Yes									
2	TL 46400 27700	546400	227700	115	≤7	NE	LEY	0	39	39	10YR4/2					Yes	C - Clay	4	4		HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	VC - Ver	No	No	22	8	2	WC II	2	Droughtiness	Wetness		2
								39	50	11	10YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	80	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								80	120	40	10YR6/4						C - Clay	30			CH - Chalk or chalk stones								Poor			Yes									
3	TL 46500 27700	546500	227700	110	≤7	NE	LEY	0	38	38	10YR4/2					Yes	C - Clay	3	3	1	HR - All h	2	2		CH - Chalk or chalk stones				Not Applic	VC - Ver	No	No	23	11	2	WC II	2	Droughtiness	Wetness		2
								38	60	22	10YR5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								60	90	30	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								90	120	30	10YR6/4						C - Clay	30			CH - Chalk or chalk stones								Poor			Yes									
4	TL 46600 27700	546600	227700	110	≤7	NE	LEY	0	39	39	10YR4/2					Yes	C - Clay	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	VC - Ver	No	No	24	14	2	WC II	2	Droughtiness	Wetness		2
								39	75	36	10YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	VC - Ver	No	No									
								75	100	25	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	20			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
								100	120	20	10YR6/4						C - Clay	30			CH - Chalk or chalk stones								Poor			Yes									
5	TL 46700 27700	546700	227700	105	≤7	NE	LEY	0	33	33	10YR4/2					Yes	C - Clay	4	4		HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	22	8	2	WC II	3a	Wetness			3a
								33	50	17	2.5Y5/4					No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								50	80	30	2.5Y5/3	MD - M	10YR5/6			Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	VC - Ver	No	Yes									
								80	120	40	2.5Y5/1	MD - M	10YR5/6				C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
6	TL 46800 27700	546800	227700	104	≤7	NE	LEY	0	36	36	10YR4/2					Yes	C - Clay	3	3	1	CH - Cha	2	2		HR - All hard rocks or stones (i.e. thos				Not Applic	NON - N	No	No	23	8	2	WC II	3a	Wetness			3a
								36	50	14	10YR4/3					No	C - Clay	0			CH - Chalk or chalk stones								Moderate	NON - N	No	No									
								50	90	40	10YR5/3	MD - M	10YR5/6			Yes	C - Clay	10			CH - Chalk or chalk stones								Poor	MC - M	No	Yes									
								90	120	30	2.5Y5/2	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
7	TL 46900 27700	546900	227700	104	≤7	NE	LEY	0	38	38	10YR4/2					Yes	C - Clay	5	5	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	VC - Ver	No	No	21	5	2	WC II	2	Droughtiness	Wetness		2
								38	50	12	10YR5/3					Yes	C - Clay	10			CH - Chalk or chalk stones								Moderate	VC - Ver	No	No									
								50	120	70	10YR6/4	MD - M	10YR5/6			Yes	C - Clay	30			CH - Chalk or chalk stones								Poor	VC - Ver	No	Yes									
8	TL 47000 27700	547000	227700	102	≤7	NE	LEY	0	39	39	10YR4/2					Yes	C - Clay	3	3	1	HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Not Applic	NON - N	No	No	24	12	2	WC II	3a	Wetness			3a
								39	60	21	7.5YR5/3					Yes	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Moderate	NON - N	No	No									
								60	80	20	10YR4/3	FF - Fe	10YR5/4			No	C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	No	Yes									
								80	120	40	7.5YR4/4						C - Clay	0			HR - All hard rocks or stones (i.e. those which cannot be scratched wi								Poor	NON - N	Yes	Yes									
	END																																								

Mottle form
FF - Few Faint
FD - Few Distinct
FP - Few Prominent
CF - Common Faint
CD - Common Distinct
CP - Common Prominent
MF - Many Faint
MD - Many Distinct
MP - Many Prominent
VF - Very many Faint
VD - Very many Distinct
VP - Very many Prominent

Texture
C - Clay
CHK - Chalk
CS - Coarse Sand
CSL - Coarse sandy loam
CSZL - Coarse sandy silt loam
FP - Fibrous and semifibrous peats
FS - Fine Sand
FSL - Fine sandy loam
FSZL - Fine sandy silt loam
HCL - Clay loam (heavy)
HP - Humified peats
HZCL - Silty clay loam (heavy)
IMP - Impenetrable to roots
LCS - Loamy Coarse Sand
LFS - Loamy fine sand
LMS - Loamy medium sand
LP - Loamy peats
MCL - Clay loam (medium)
MS - Medium Sand
MSL - Medium sandy loam
MSZL - Medium sandy silt loam
MZ - Marine Light Silts
MZCL - Silty clay loam (medium)
OC - Organic clays
OL - Organic loams
OS - Organic sands
PL - Peaty loams
PS - Peaty sands
SC - Sandy clay
SCL - Sandy clay loam
SP - Sandy peats
ZC - Silty clay
ZL - Silt loam

Stone Type
CH - Chalk or chalk stones
FSST - Soft fine grained sandstones
GH - Gravel with non-porous (hard) stones
GS - Gravel with porous stones (mainly soft stone types listed above)
HR - All hard rocks or stones (i.e. those which cannot be scratched with a finger nail)
MSST - Soft, medium or coarse grained sandstones
SI - Soft 'weathered' igneous or metamorphic rocks or stones
SLST - Soft oolitic or dolomitic limestones
ZR - Soft, argillaceous or silty rocks or stones

Ped. Shape
SG - Single grain
GRA - Granular
SAB - Subangular Blocky
AB - Angular Blocky
PRIS - Prismatic
PLAT - Platy
MASS - Massive
NA - N/A

Subsoil Structure Condition
Not Applicable
Good
Moderate
Poor

Soil or Ped. Strength
Loose
Very friable
Friable
Firm
Very firm
Extremely firm
Extremely hard
N/A

Calcareousness
NON - Non-calcareous (<0.5% $CaCO_3$)
VSC - Very slightly calcareous (0.5 - 1% $CaCO_3$)
SC - Slightly calcareous (1 - 5% $CaCO_3$)
MC - Moderately calcareous (5 - 10% $CaCO_3$)
VC - Very calcareous (>10% $CaCO_3$)

Ped. Size
VF - Very Fine
F - Fine
M - Medium
C - Coarse
VC - Very Coarse
NA - N/A

Degree of Ped. Development
W - Weak
M - Moderate
S - Strong
NA - Not applicable

Wetness Class
WC I
WC II
WC III
WC IV
WC V
WC VI

ALC Grades
1
2
3a
3b
4
5
Non-Ag

Gley
None
Gley
N/A

Appendix 2:
Soil Pit Description

Project	Location	Date	Surveyor(s)	Company
C770	C770 Pelham Spring Solar Farm, Essex	25-Feb-21	RM	Askew Land and Soil

Pit	WC	Grade	Limitation(s)	Notes
1	II	3a	SPL assumed 70cm+	Mottling not observed with auger . Faulkborne series associated with Hanslope. A few fine roots at 50cm . Some chalk present 60cm+ and lge flint ston

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation
TL	47100	27900	104	C16	1	Southwest	Convex	Level	Ploughed	Fallow post cereal	Mild	Cloudy	Slight	None

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form	>0.5mm	
1	0	40	C	Dark greyish brown	10YR4/2												Non									
2	40	50	C	Brown	7.5YR4/3														wk	Coarse	platy breaking to wk dev CAB	Friable	Clear	Smooth	>0.5%	N
3	50	60	C	Brown	7.5YR4/2	Y	7.5YR4/1												wk	Med	Angular Blocky				>0.5%	N

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		

Project	Location	Date	Surveyor(s)	Company
C770	Pelham Spring Solar Farm, Essex	01-Mar-21	RM	Askew Land and Soil

Pit	WC	Grade	Limitation(s)	Notes
2	II	2	Droughtiness, Wetness	common roots 0-30cm ,

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation
TL	473	278	108	B14	1°	Southwest	Straight		Ploughed	Fallow post cereals	Mild	Cloudy	Slight	Dry

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form	>0.5mm	
1	0	30	C	Dark greyish brown	2.5Y4/2												Y									
2	30	45	C	Light olive brown	2.5Y5/6												Y		weak	fine	SAB	friable	Clear	Wavy	>0.5%	
3	45		C	light yellow brown	10YR6/4				MDM	Yellowish brown	10YR5/6			chalk 50%			Y		mod	Coarse	AB	friable			<0.5	Y

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest	Topography				Flora		Weather and conditions			
Square	East	North		point	Gradient	Aspect	Slope form	Surface	Culivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		

Appendix 3:
Topsoil Particle Size Distribution (PSD)

ANALYTICAL REPORT

Report Number	**43581-21**	**N717**	**ROB ASKEW**
Date Received	**04-MAR-2021**		**RW ASKEW**
Date Reported	**10-MAR-2021**		**THE OLD STABLES**
Project	**SOIL**		**UPEXE**
Reference	**C770**		**EXETER**
Order Number			**DEVON EX5 5ND**

Laboratory Reference		**SOIL506513**	**SOIL506514**	**SOIL506515**	**SOIL506516**						
Sample Reference		**A7**	**C17**	**D15**	**E9**						
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**						
Sand 2.00-0.063mm	% w/w	15	16	23	20						
Silt 0.063-0.002mm	% w/w	43	47	41	41						
Clay <0.002mm	% w/w	42	37	36	39						
Textural Class **		C	ZC	C	C						

Notes

Analysis Notes	The sample submitted was of adequate size to complete all analysis requested. The results as reported relate only to the item(s) submitted for testing. The results are presented on a dry matter basis unless otherwise stipulated.
Document Control	**This test report shall not be reproduced, except in full, without the written approval of the laboratory.**

** Please see the attached document for the definition of textural classes.

Reported by *Myles Nicholson*

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: 01344 886338
Fax: 01344 890972
email: enquiries@nrm.uk.com

ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

For the *sand, loamy sand, sandy loam* and *sandy silt loam* classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

- vf Very Fine (more than 2/3's of sand less than 0.106 mm)
- f Fine (more than 2/3's of sand less than 0.212 mm)
- c Coarse (more than 1/3 of sand greater than 0.6 mm)
- m Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam classes* according to clay content are indicated as follows:

- M medium (less than 27% clay)
- H heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

Appendix 4:
Soil Health

Soil Health

[1]Soil Health

Soil health can be defined as a soil's ability to function and sustain plants, animals and humans as part of the ecosystem. There are five main factors that impact the health of the soil and can have a large influence over its capability and resilience to function, they are:

1. Soil structure
2. Soil chemistry
3. Organic matter content
4. Soil biology
5. Water infiltration, retention and movement through the profile

A healthy soil will have a good combination of all these factors, whilst an unhealthy soil will have a problem with at least one of these. A healthy soil has plenty of air spaces (voids) within it, maintaining aerobic (oxygenated) conditions. A healthy soil will provide a buffer to extremes in temperature (as it allows movement of gases between the soil and the air above) and rainfall (as the soil is well drained). This helps to reduce the impact of extreme weather events.

When a soil has limited air spaces, anaerobic conditions (i.e. oxygen depleted) dominate, leading to waterlogging and stagnation of roots and the proliferation of anaerobic microbes and denitrification (i.e. the loss of nitrogen from the system). A healthy soil will filter water slowly, retaining the nutrients and plant protection products (PPP) applied to the crop. If rainfall moves through the soil profile too quickly, or if it is prevented from entering the soil through compaction or soil sealing, surface runoff increases, taking soil, nutrients and PPP with it. This also increases the risk of flooding.

Summary: A healthy soil has a well-developed soil structure, where soil particles are aggregated into soil peds (structural units) separated by pores or voids. This allows the free movement of water (precipitation) through the soil and facilitates gaseous exchange between the plant roots and the air. These soils are well aerated (oxygenated), which encourages healthy plant (crop) growth and an abundance of soil fauna and aerobic microbes. These soils often have high amounts of soil organic matter (SOM), associated with an accumulation of plant and animal matter, and thus are a good store of soil organic carbon (SOC).

[2]Soil Organic Matter (SOM)

Soil carbon is predominantly derived from carbon fixed by plants. This enters the soil as litter or dung, root tissue turnover, root exudates and carbon allocated to mutualistic fungi. Carbon is mixed into the soil and transformed by biological processes, but some is also carried down the profile by downward movement of rainwater. Where these biological processes are retarded, and mixing does not occur, soils can develop organic layers on their surface, and in waterlogged conditions these become deep peat deposits. Soils on limestone and chalk may also contain inorganic carbon as carbonate compounds. Some ammonia oxidising bacteria also fix carbon.

In all habitats, most carbon is stored in soils in the form of soil organic matter (SOM), and peaty soils in particular, are major stores of carbon (Natural England, 2012). Globally, soils contain more organic carbon than the vegetation and atmosphere combined (Swift, 2001). Ten billion tonnes of organic carbon are estimated to be stored in United Kingdom (UK) soils, with over half stored in peat. Soils in England and Wales store 2.4 billion tonnes of carbon of which 58% is in the top 30 cm of soil

(Department for Environment and Rural Affairs (Defra), 2011). Soil carbon is stored in fresh and decomposing litter and as longer-lasting material stored in soil particles, in a complex with clays or in anaerobic waterlogged conditions. England's deep and shallow peaty soils are estimated to contain over 580 million tonnes of carbon (Natural England, 2010), but in surface layers, denser mineral soils contain more carbon than peaty soils (Emmett et al, 2010). In peat, anaerobic conditions caused by waterlogging prevent the breakdown of phenols, which build up and inhibit other decomposition enzymes, while plants producing tannins also inhibit enzyme activity (Defra, 2010A). In lowland fens where waterlogging is due to groundwater, peat can be formed from a wide range of plants that are found in waterlogged conditions. In bogs, where water supply is derived from precipitation only, peat is predominantly formed from Sphagnum mosses and Cotton-grass (Eriophorum spp.), with minor components of other plants reflecting past drier conditions or periods (Natural England, 2013).

Cultivation of soils promotes the release of stored soil carbon by mineralisation of soil organic matter to carbon dioxide (CO^2) (Lal, 2004). The conversion of grassland to arable cropland was the largest contributor to soil carbon losses from land use change in the UK between 1990 and 2000 (Ostle et al, 2009). Carbon in the subsoil (below 15 cm for grassland or 30 cm plough layer for arable) is more stable and less influenced by surface processes (Defra, 2011A).

On mineral soils, Environmental Stewardship is estimated to have reduced England's agricultural greenhouse gas (GHG) emissions by around 11% a year (Defra, 2007), mainly through increases in soil organic carbon delivered by options such as buffer strips that take land out of cultivation.

The greatest benefits in terms of increase in soil carbon can be realised through land use change from intensive arable to grasslands (Conant et al, 2001), woodlands or some biofuels (Defra, 2003). Avoiding disturbance of undisturbed soils, and changing land use to grassland, heathland, woodland or wetland is likely to deliver carbon storage benefits (Natural England, 2012A), including on organo-mineral soils (Defra, 2011B). Conversion from arable to grassland may, however, be offset to some extent by methane emissions associated with livestock production.

There is ongoing research into how grasslands can be managed to increase carbon storage. Defra Project BD5003 (Ward et al, 2006) found that older, and particularly semi-improved grasslands are important carbon stores compared to intensively managed, improved grasslands.

Soil organic matter is a key indicator of many desirable soil functions. It helps to maintain soil structure, provides and stores nutrients, supports biological activity, increases water retention and stores carbon (Gobin et al, 2011). Early results from Natural England's project BD5001 (Natural England, 2016) indicate that grassland soils in good structural condition tend to have more organic matter than soils in moderate or poor condition. Soils with more organic matter tend to be more resistant and resilient to damage, with this effect interacting with soil texture and biological properties (Defra, 2010C).

The best opportunities to increase carbon storage come from planting perennial crops, returning crop residues to the soil and application of organic manures (Defra, 2014).

In the short to medium term (up to 10 years) zero tillage does not result in increased levels of soil carbon compared to conventional tillage (Defra, 2014), but global data suggests that zero tillage results in more total soil carbon storage when applied for 12 years or more (Steinbach and Alvarez, 2006).

Summary: The greatest benefits in terms of increase in soil organic matter (SOM), and hence soil organic carbon (SOC), can be realised through land use change from intensive arable to grasslands. Likewise, SOM and SOC are increased when cultivation of the land for crops (tillage) is stopped and the land is uncultivated (zero tillage). Global evidence suggests that zero tillage results in more total soil *carbon storage when applied for 12 years or more. Therefore, there is evidence that conversion of land from arable to grassland which is uncultivated over the long-term (>12 years), such as that under solar PV arrays, increases SOC and SOM.*

[3]**Biodiversity in the Soil**

Biological function of soils can be enhanced by simple approaches that can be integrated into real farm systems, including adapting organic matter management, cultivation approaches and cropping, with likely benefits to both farming and the environment (Natural England, 2012B).

Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms and plants. It is estimated that more than 1 in 4 of all living species in earth is a strictly soil-dwelling organism (Decaens et al, 2006).

A single gram of soil can contain a billion bacterial cells from up to 10,000 species (Torsvik et al, 1990, 2002).

Soil biota are strongly influenced by land management. Modern farming has sought to replace many soil biota functions with less sustainable technological solutions, which lead to loss of soil biodiversity (Stockdale et al, 2006; Defra 2010c). For example, changes in land management practice and land use can have large effects on soil biodiversity over relatively short-time scales. Reducing the intensity of management, introducing no-tillage management and converting arable land to pasture usually has substantial beneficial effects (Spurgeon et al, 2013).

Microbial diversity in the UK reflects soil conditions, especially pH, but also vegetation, climatic and other environmental factors. Distinct specialist communities occur in more extreme soils with low diversity (Griffiths et al, 2012).

Current levels of understanding of soil biodiversity is low. Out of approximately 11 million species of soil organisms, an estimated 1.5% have been named and classified (Turbé et al, 2010) and most ecological roles are understood only at a general level.

Summary: Soils are habitats for millions of species, ranging from bacteria, fungi, protozoa, and microscopic invertebrates to mites, springtails, ants, worms and plants. Soil biota are strongly influenced by land management. Modern farming has led to the loss of soil biodiversity. Changes in land management practice and land use can have large effects on soil biodiversity over relatively short-time scales. Reducing the intensity of management, introducing no-tillage management, and converting arable land to pasture, such as grassland under solar PV arrays, has substantial beneficial effects.

[4]**Soil Structure**

Soil structure is defined by the way individual particles of sand, silt, and clay are assembled. Single particles when assembled appear as larger particles, called aggregates or peds. Soil structure is most usefully described in terms of grade (degree of aggregation), class (average size) and type of aggregates (form), or shape. The degree of aggregation ranges from structureless, through weak and moderate structure to strong structure. The shape of soil aggregates/peds is often describes as platy, prismatic/columnar, angular/subangular, or granular/crumb structure (Farming and Agriculture Organisation, FAO).

Soil structure refers to the way that soils are bound together. In a well-structured soil, water and air can move freely through cracks and pores. But a poor soil structure prevents water and air movement, and increases the risk of runoff (Defra, 2008). Soil structure can be improved by increasing soil organic matter (SOM) (Cranfield University, 2001).

The Game and Wildlife Conservation Trust's Allerton Project (Game and Wildlife Conservation Trust, 2020) has been involved in investigating the sustainable intensification of agriculture through different experiments. Some research has focused on moving away from conventional agricultural practice, with greater emphasis on no-tillage ('no-till'). One of the fields at the Allerton Project has not been ploughed for the last 14 years and the soil structure is visibly different compared to other soils on the farm. No-till systems can help improve soil fertility, create changes to the structure and properties of the soil due to the stability of the environment, and enhance soil biology. Over time the no-till field has had the highest yields compared to the conventional field equivalent on the farm.

Summary: In a well-structured soil, water and air can move freely through cracks and pores. But a poor soil structure prevents water and air movement, and increases the risk of runoff. Soil structure is improved when the land is uncultivated over time (no tillage), and when soil organic matter content (SOM) is increased through the accumulation of plant material, such has roots, in the soil. The aerobic (oxygenated) decomposition of SOM helps to bind soil particles together into aggregates (peds). Therefore, the conversion of land which is tilled for arable to long-term grassland (no tillage), such as that under solar PV arrays, improves soil structure over time.

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