



August 2023

Locogen Consulting Ltd

Agricultural Land Classification and Soil Resources

at

Allington Lane Solar Farm, Eastleigh, Hampshire

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Locogen Consulting Ltd to investigate the Agricultural Land Classification (ALC) and soil resources of land for the proposed Allington Lane Solar Farm at Eastleigh, Hampshire, by means of a detailed survey of soil and site characteristics.
- 1.2 Guidance for assessing the quality of agricultural land in England and Wales is set out in the Ministry of Agriculture, Fisheries and Food (MAFF) revised guidelines and criteria for grading the quality of agricultural land¹, and summarised in Natural England's Technical Information Note (TIN) 049².
- 1.3 Agricultural land in England and Wales is graded between 1 and 5, depending on the extent to which physical or chemical characteristics impose long-term limitations on agricultural use. The principal physical factors influencing grading are climate, site conditions and soil which, together with interactions between them, form the basis for classifying land into one of the five grades.
- 1.4 Grade 1 land is excellent quality agricultural land with very minor or no limitations to agricultural use. Grade 2 is very good quality agricultural land, with minor limitations which affect crop yield, cultivations or harvesting. Grade 3 land has moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield, and is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Grade 4 land is poor quality agricultural land with severe limitations which significantly restrict the range of crops and/or level of yields. Grade 5 is very poor quality land, with very severe limitations which restrict use to permanent pasture or rough grazing.
- 1.5 Land which is classified as Grades 1, 2 and 3a in the ALC system is defined as best and most versatile (BMV) agricultural land.
- 1.6 As explained in Natural England's TIN049, the whole of England and Wales was mapped from reconnaissance field surveys in the late 1960s and early 1970s, to provide general strategic guidance on agricultural land quality for planners. This Provisional Series of maps was published

¹ **MAFF (1988).** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* MAFF Publications.

² **Natural England (2012).** *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land,* Second Edition.

on an Ordnance Survey base at a scale of One Inch to One Mile (1:63,360). The Provisional ALC map shows the site as Grade 3 in the centre and east, and Grade 4 in the west. However, TIN049 explains that:

"These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended ..."

- 1.7 TIN049 goes on to explain that a definitive ALC grading should be obtained by undertaking a detailed survey according to the published guidelines, at an observation density of one boring per hectare. This survey follows the detailed methodology set out in the ALC guidelines.
- 1.8 The eastern and central parts of the site have been surveyed previously by ADAS on behalf of MAFF as part of a wider reconnaissance survey³. The survey classified these areas within the site as predominantly Subgrade 3b with a small area of Grade 4. Although the survey was undertaken in 1995, the results are still valid as the ALC is concerned with the long-term inherent physical characteristics of land and soil, rather than with current use or management. TIN049 indicates that:

"Since 1976, selected areas have been re-surveyed in greater detail and to revised guidelines and criteria. Information based on detailed ALC field surveys in accordance with current guidelines (MAFF, 1988) is the most definitive source. Data from the former Ministry of Agriculture, Fisheries and Food (MAFF) archive of more detailed ALC survey information (from 1988) is also available on <http://magic.defra.gov.uk/>."

³ **ADAS (1995).** Hampshire Structure Plan Review, Land North of the A27, Bishopstoke to West End. Agricultural Land Classification Reconnaissance Survey. ADAS Ref.: 1503/247/94; MAFF Ref.: EL 15/518

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The site extends to approximately 40.9ha. The land is characterised by rough grassland with some scrub areas and established hedgerow and tree belts between field parcels. The site is divided by Allington Lane and by the railway line running between Eastleigh and Hedge End. Hogwood Lane is to the south, Hog Wood to the west and Allington Manor Farm Business Centre to the north. Other agricultural land is also to the north and to the east, as well as an existing solar farm.
- 2.2 Most of the site is gently sloping, falling from a high altitude of 22m above Ordnance Datum (AOD) north of Hearts Copse in the east to 10m AOD in the west. The eastern side of the site slopes down to around 15m AOD. In the south, there are localised areas in which the ground surface is notably hummocky.
- 2.3 Drainage of the site is via the slopes which direct water into a network of ditches within and beyond the site, primarily carrying water westward to the River Itchen.

Agro-climatic conditions

- 2.4 Agro-climatic data for the site have been interpolated from the Meteorological Office's standard 5km grid point data set at a representative altitude of 15m AOD, and are given in Table 1. The climate at the site is warm and wet. Moisture deficits are moderately large. The number of Field Capacity Days is larger than is average for lowland England (150) and is slightly unfavourable for providing opportunities for agricultural field work. There is no overriding climatic limitation to agricultural land quality.

Table 1: Local agro-climatic conditions

Parameter	Value
Grid Reference	SU 47600 16900
Average Annual Rainfall	803mm
Accumulated Temperatures >0°C	1,536 day°
Field Capacity Days	168 days
Average Moisture Deficit, wheat	110mm
Average Moisture Deficit, potatoes	105mm

Soil parent material and soil type

- 2.5 The underlying geology mapped by the British Geological Survey⁴ across the site is the Wittering Formation, comprising greyish brown laminated clay, interbedded sand with clay or fine- to medium-grained sand.
- 2.6 Superficial deposits of alluvium are in the west of the site and in the small valley in the east, and mainly include compressible silty clay. A small area in the east adjacent to the valley is overlain by river terrace deposits of sand and gravel.
- 2.7 The Soil Survey of England and Wales soil association mapping⁵ (1:250,000 scale) shows the Wickham 4 association across the site. The main soils in this association include fine loamy or fine silty textures over slowly permeable clay. Profiles are in Wetness Class (WC) IV. The west of the site borders on peat of the Adventurers' 3 association, found in the valley of the River Itchen. These soils are severely waterlogged throughout the year (WC V and VI)⁶.

3 Agricultural land quality

Soil survey methods

- 3.1 In total, 14 soil profiles have been examined within the site using an Edelman (Dutch) auger: four by ADAS on behalf of MAFF as part of a wider reconnaissance survey³ and ten by RAC in 2023. One soil pit was also excavated in 2023 to examine subsoil structures and stone content. The locations of observations are indicated on Figure RAC/10043/1. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm or any impenetrable layer:
- soil texture;
 - significant stoniness;
 - colour (including localised mottling);
 - consistency;
 - structural condition;

⁴ **British Geological Survey (2023).** *BGS Geology Viewer*, <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/>

⁵ **Soil Survey of England and Wales (1984).** *Soils of South East England* (1:250,000), Sheet 6

⁶ **Jarvis et al (1984).** *Soils and Their Use in South East England*. Soil Survey of England and Wales Bulletin 15, Harpenden.

- free carbonate; and
- depth.

- 3.2 One topsoil sample was submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are presented in Appendix 1.
- 3.3 Soil Wetness Class (WC) was determined from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling, and slowly permeable subsoil layers at least 15cm thick, in relation to the number of Field Capacity Days at the location.
- 3.4 Soil droughtiness was investigated by the calculation of moisture balance equations (given in Appendix 2). Crop-adjusted Available Profile Water (AP) is estimated from texture, stoniness and depth, and then compared to a calculated moisture deficit (MD) for the standard crops wheat and potatoes. The MD is a function of potential evapotranspiration and rainfall. Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs.

Agricultural land classification and site limitations

- 3.5 Assessment of agricultural land quality has been carried out according to the revised ALC guidelines¹. Soil profiles have been described according to Hodgson⁷ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 Agricultural land quality within the site is limited by soil wetness to Subgrade 3b with a small area of Grade 4. There are minor differences in the topsoil texture identified between the surveys but broadly there is one consistent soil type present across the site, as shown in the photographs contained in Appendix 3.
- 3.7 The topsoil in the north of the site, identified by ADAS, comprises dark grey or dark greyish brown (10YR4/1 or 10YR4/2 in the Munsell soil colour charts⁸) medium clay loam of 27cm average depth. In the south of the site, the topsoil is heavy clay loam or clay of 31cm average depth and of similar colour to the north, or otherwise dark brown, greyish brown or brown (10YR3/3, 10YR5/2 or 10YR5/3). The topsoil across the survey area is stoneless or slightly stony, non-calcareous, and is often gleyed. The topsoil is firm and has a medium to fine angular blocky structure.

⁷ **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁸ **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

- 3.8 One of the profiles in the north was found to have an upper subsoil horizon of permeable, greyish brown (10YR5/2) heavy clay loam but across the remainder of the site the topsoil passes directly onto clay or silty clay. The upper subsoil colours include grey (10YR5/1 or 2.5Y6/1), brown (10YR5/3), light olive brown (2.5Y5/3) and light yellowish brown (2.5Y6/3). The profiles continue to be stoneless or slightly stony, mottled and gleyed. In the pit location, the upper subsoil forms firm clods that were able to be broken to medium angular blocks once excavated. In the south-west of the site, the silty clay upper subsoil was firm but more plastic and compressible.
- 3.9 The lower subsoil horizons are clay or silty clay which is grey, light brownish grey or greyish brown (2.5Y5/1, 2.5Y6/1, 10YR6/2, 2.5Y6/2 or 2.5Y5/2). The lower subsoil is firm, with a weak, medium prismatic structure.
- 3.10 The soil profiles identified in both surveys are typically slowly permeable immediately beneath the topsoil. Poorly drained soils (WC IV) with clay loam or clay topsoil textures and 168 FCD are limited by wetness to Subgrade 3b, as shown in Figure RAC/10043/2. The ADAS survey also identified an area of Grade 4 land where the soils are waterlogged for long periods of time.
- 3.11 The distribution of ALC grades is given in Table 2.

Table 2: ALC areas

Grade	Description	Area (ha)	%
Subgrade 3b	Moderate quality	36.7	90
Grade 4	Poor quality	0.6	1
Non-agricultural		3.6	9
Total		40.9	100

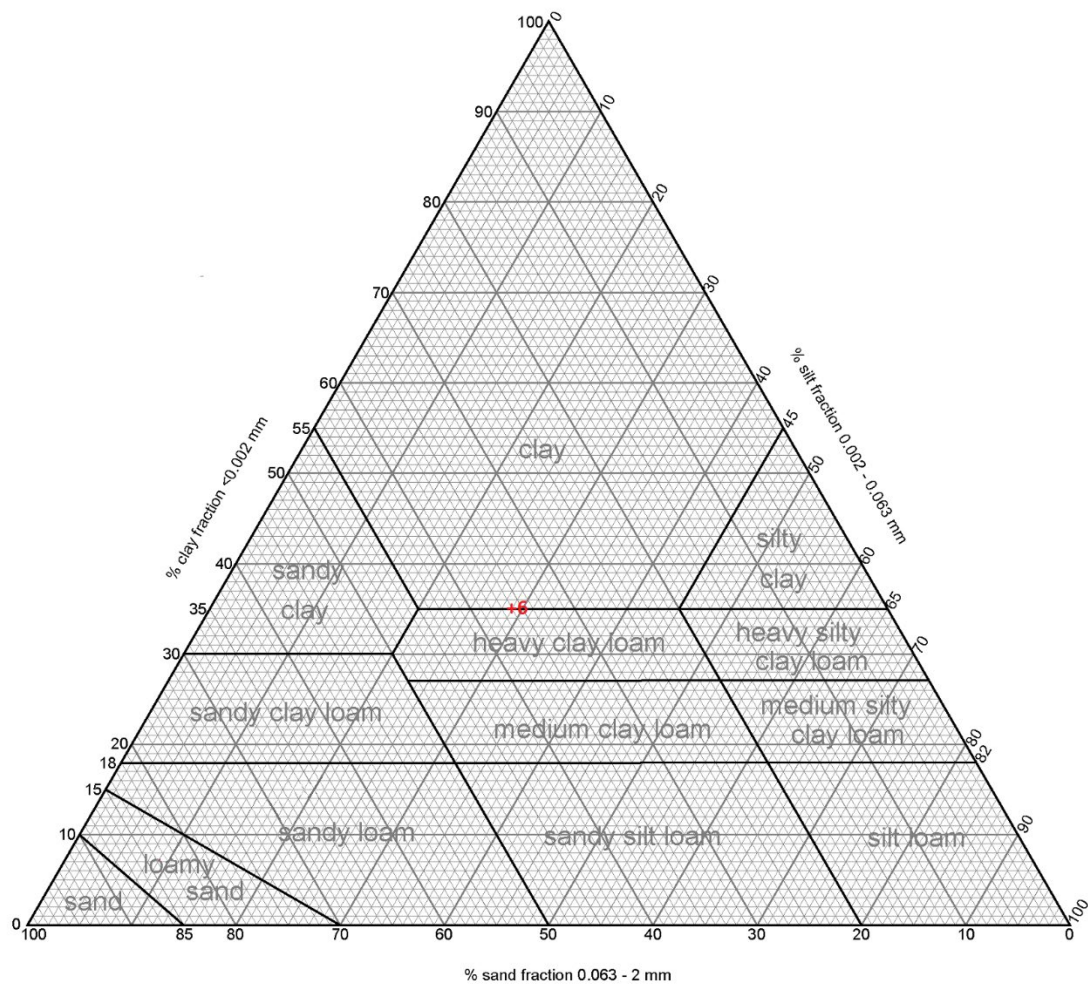
Appendix 1: Laboratory Data

Determinand	Site 6	Units
Sand 2.00-0.063 mm	36	% w/w
Silt 0.063-0.002 mm	29	% w/w
Clay <0.002 mm	35	% w/w
Organic Matter	4.5	% w/w
Texture	Clay/Heavy Clay Loam	

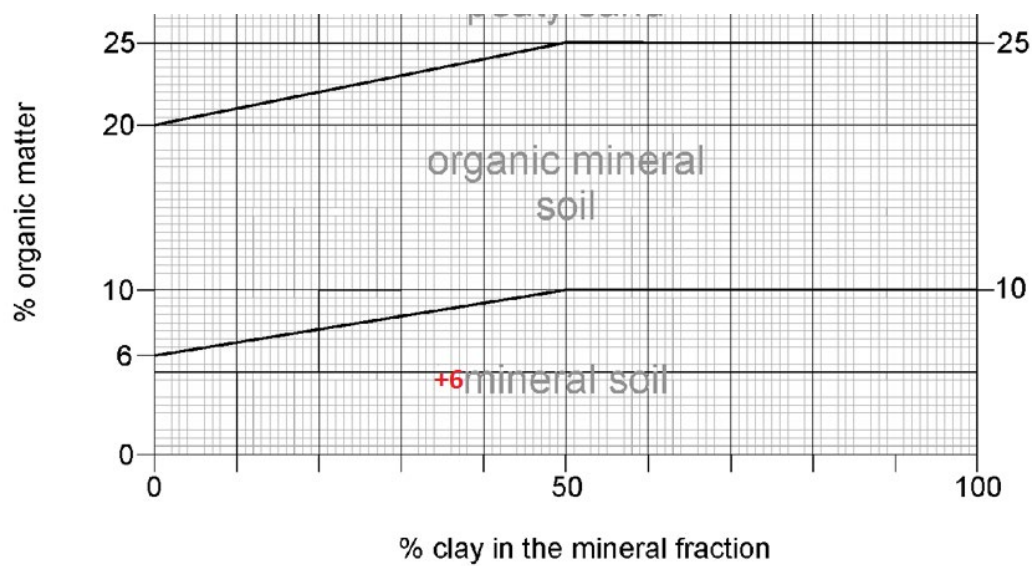
Determinand	Site 6	Units
Soil pH	6.3	
Phosphorus (P)	4.8	mg/l (av)
Potassium (K)	107	mg/l (av)
Magnesium (Mg)	175	mg/l (av)

Determinand	Site 6	Units
Phosphorus (P)	0	ADAS Index
Potassium (K)	1	ADAS Index
Magnesium (Mg)	3	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Wetness / workability limitations are determined according to the methodology given in Appendix 3 of the ALC guidelines, MAFF 1988

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.

Grades are shown for drought, wetness and any other soil or site factors which are relevant. The overall Grade is set by the most limiting factor and shown on the right.

Stone types			Climate Data		Wetness Class Guidelines					Climate	
%	TA _v	EA _v	MDwheat	110	SPL within 80cm, gleying within 40cm	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>	1536 D°	Limitation
hard	1	0.5	MDpotato	105		>73cm	45-73cm	<45cm			
chalk	10	7	FCD	168		>59cm	<59cm				
hard	flint & pebble		AAR	803	No SPL but gleying within 40cm	coarse subsoil	/	other cases	II	Grade 1	
					Maximum depth of auger penetration is <u>underlined</u>						

Site No.		Depth cm		Texture	CaCO ₃	Colour	Mottle colour	abundance	stone% hard	stone% chalk	Structure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T	0	30	C		10YR4/1	Fe	com	0	0	-	51	51	y	n	IV	3b	3b	WE
		30	50	SC		10YR5/1	Fe	many	0	0	poor	26	26	y	y				
		<u>50</u>	80	SC		10YR5/1	Fe	many	0	0	poor	24	26	y	y				
		80	120	C		2.5Y5/1	Fe	com	0	0	poor	28	0	y	y				
		Total										129	103						
		MB										19	-2						
Droughtiness grade (DR)												2	2						
2	T	0	35	C		10YR5/3	Fe	com	0	0	-	60	60	y	n	IV	3b	3b	WE
		35	60	C		2.5Y5/3	Fe	com	0	0	poor	27	33	y	y				
		60	105	ZC		2.5Y5/2	Fe	com	0	0	poor	32	12	y	y				
		<u>105</u>	120	ZC		2.5Y5/2	Fe	com	0	0	poor	11	0	y	y				
		Total										128	104						
		MB										18	-1						
Droughtiness grade (DR)												2	2						
3	T	0	35	C		10YR5/3	Fe	few	5	0	-	57	57	n	n	IV	3b	3b	WE
		35	45	C		2.5Y5/3	Fe	com	0	0	poor	13	13	y	y				
		45	86	ZC		2.5Y5/2	Fe	com	0	0	poor	31	30	y	y				
		86	120	ZC		2.5Y6/2	Fe	many	0	0	poor	24	0	y	y				
		Total										125	100						

																MB	15	-5			
																Droughtiness grade (DR)	2	2			
4	T	0	10	hCL	10YR3/3	Fe	few	5	0	-	17	17	n	n	IV	3b	3b	WE			
	T	10	30	hCL	10YR3/3	Fe	few	0	0		36	36	n	n							
		30	85	C	2.5Y5/3	Fe	com	0	0	poor	51	52	y	y							
		85	120	C	2.5Y6/2	Fe	many	0	0	poor	25	0	y	y							
											Total	128	105								
																MB	18	0			
																Droughtiness grade (DR)	2	2			
5	T	0	10	hCL	10YR3/3	Fe	few	0	0	-	18	18	n	n	IV	3b	3b	WE			
	T	10	30	hCL	10YR3/3	Fe	few	0	0		36	36	n	n							
		30	85	C	2.5Y5/3	Fe	com	0	0	poor	51	52	y	y							
		85	120	C	2.5Y6/2	Fe	many	0	0	poor	25	0	y	y							
											Total	129	106								
																MB	19	1			
																Droughtiness grade (DR)	2	2			
6	T	0	28	hCL/C	10YR5/2	Fe	few	5	0	-	48	48	n	n	IV	3b	3b	WE			
	Pit	28	40	C	10YR5/3	Fe	com	2	0	m/poor	15	15	y	y							
		40	50	C	2.5Y5/1	Fe	com	2	0	poor	13	13	y	y							
		50	120	C	2.5Y5/1	Fe	com	2	0	poor	48	26	y	y							
											Total	124	102								
																MB	14	-3			
																Droughtiness grade (DR)	2	2			
7	T	0	28	C	10YR5/2			0	0	-	48	48	n	n	IV	3b	3b	WE			
		28	55	ZC	2.5Y5/3	Fe	com	2	0	poor	29	32	y	n							
		55	80	ZC	2.5Y5/3	Fe	com	2	0	poor	17	18	y	y							
		80	120	C	2.5Y5/1	Fe	com	2	0	poor	27	0	y	y							
											Total	122	97								
																MB	12	-8			
																Droughtiness grade (DR)	2	2			

8	T	0	28	hCL/C	10YR5/2	Fe	few	5	0	-	48	48	n	n	IV	3b	3b	WE
		28	40	C	10YR5/3	Fe	com	2	0	m/poor	15	15	y	y				
		40	50	C	2.5Y5/1	Fe	com	2	0	poor	13	13	y	y				
		50	120	C	2.5Y5/1	Fe	com	2	0	poor	48	26	y	y				
	Total										124	102						
	MB										14	-3						
Droughtiness grade (DR)											2	2						
9	T	0	5	oC	10YR5/2	Fe	few	0	0	-	12	12	n	n	IV	3b	3b	WE
	T	5	30	ZC	10YR5/3	Fe	many	0	0	poor	43	43	y	n				
		30	50	ZC	2.5Y5/1	Fe	com	0	0	poor	24	24	y	y				
		50	120	C	2.5Y5/1	Fe	com	0	0	poor	49	26	y	y				
	Total										127	104	Alluvium					
	MB										17	-1						
Droughtiness grade (DR)											2	2						
10	T	0	36	C	10YR4/2			0	0	-	61	61	n	n	IV	3b	3b	WE
		36	65	ZC	10Y3/1	Fe	com/f	0	0	poor	27	35	y	n				
		65	90	ZC	10YR5/3	Fe	many	0	0	poor	18	6	y	y				
		90	120	ZC	10YR5/3	Fe	many	0	0	poor	21	0	y	y				
	Total										127	102						
	MB										17	-3						
Droughtiness grade (DR)											2	2						
ADAS 15	T	0	25	mCL	10YR4/2	Fe		2	0	-	44	44	y	n	IV	3b	3b	WE
		25	35	hCL	10YR5/2	Fe		5	0		15	15	y	n				
		35	60	C	10YR6/2	Fe		5	0	poor	25	31	y	y				
		60	120	C	10YR6/2	Fe		5	0	poor	40	12	y	y				
	Total										125	103						
	MB										15	-2						
Droughtiness grade (DR)											2	2						
ADAS 17	T	0	25	mCL	10YR4/2			5	0	-	43	43	n	n	IV	3b	3b	WE
		25	70	C	2.5Y6/3	Fe		0	0	poor	47	59	y	y				

Alluvium

		<u>70</u>	120	C	2.5Y6/3	Fe	0	0	poor	35	0	y	y				
									Total	124	101						
									MB	14	-4						
									Droughtiness grade (DR)	2	2						
ADAS 19	T	0	30	mCL	10YR4/1	Fe	0	0	-	54	54	y	n	/V	3b	3b	WE
		30	70	C	2.5Y6/1	Fe	5	0	poor	38	50	y	y				
		<u>70</u>	120	C	2.5Y6/1	Fe	5	0	poor	33	0	y	y				
									Total	126	104						
									MB	16	-1						
									Droughtiness grade (DR)	2	2						
ADAS 20	T	0	28	mCL	10YR4/2	Fe	0	0	-	50	50	y	n	/V	3b	3b	WE
		28	70	C	2.5Y6/1	Fe	0	0	poor	43	55	y	y				
		<u>70</u>	120	C	2.5Y6/1	Fe	0	0	poor	35	0	y	y				
									Total	128	105						
									MB	18	0						
									Droughtiness grade (DR)	2	2						

Appendix 3: Photographs



Pit 1



Pit topsoil



Pit upper subsoil



Upper subsoil clod



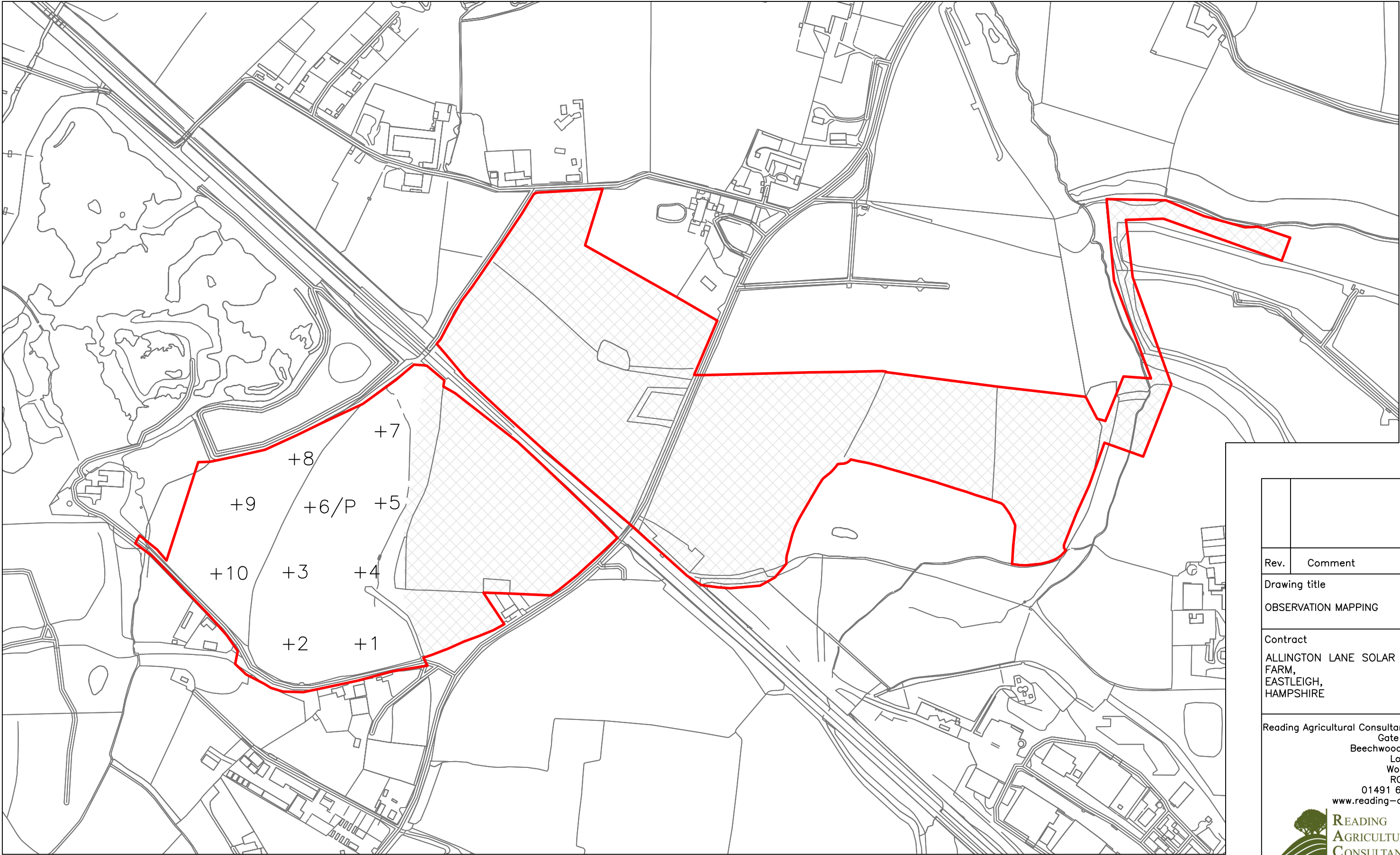
Profile 9 – organic topsoil



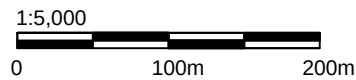
Profile 10



South-west of site

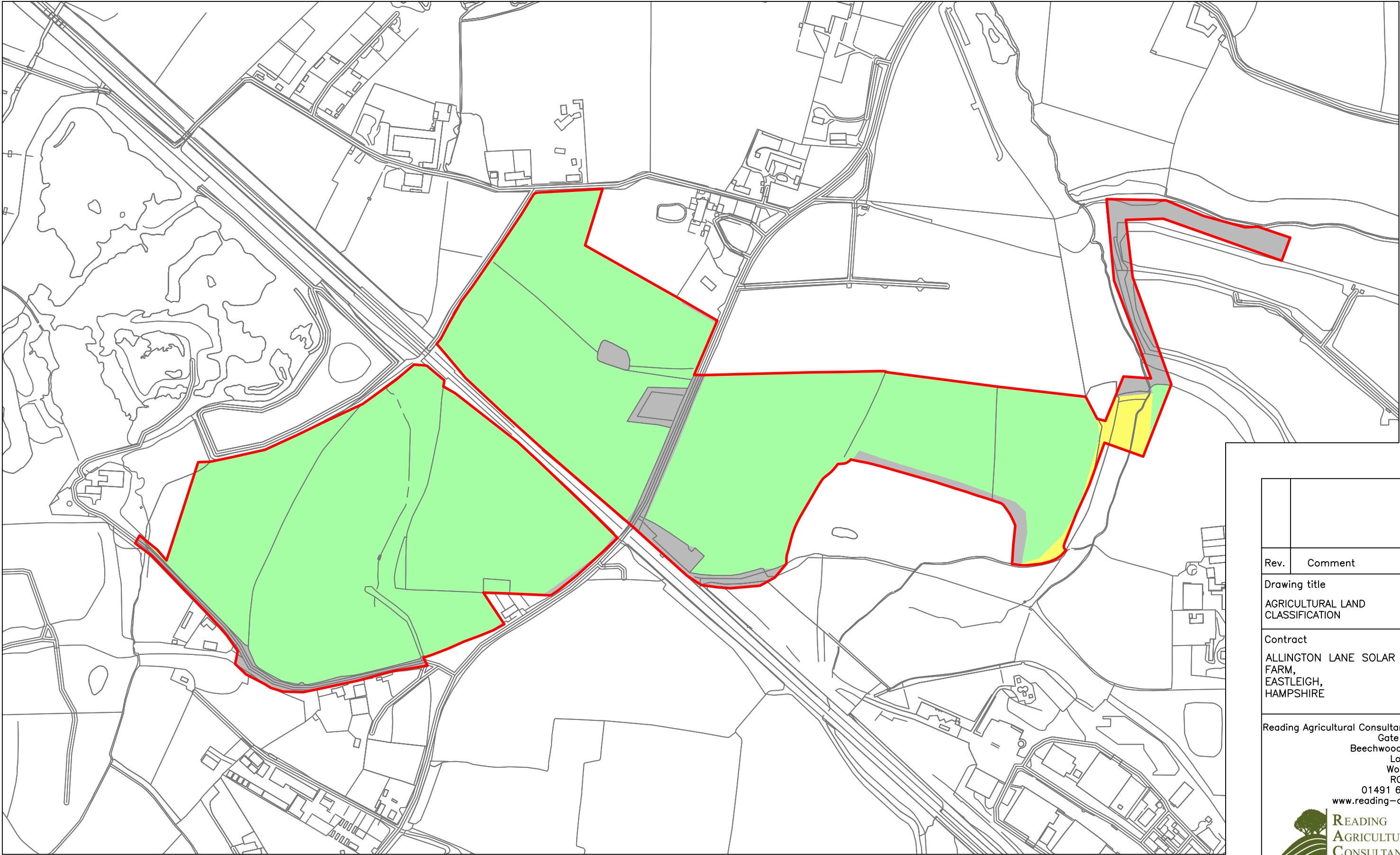


KEY			
	Survey boundary	+1	Observations
	Surveyed by ADAS	+P	Pit

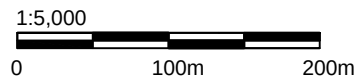


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KEY			
Grade 1		Grade 4	
Grade 2		Grade 5	
Subgrade 3a		Non-agricultural	
Subgrade 3b		Not present	



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