



January 2019

Edenstone Homes Ltd

Agricultural Land Classification and Soil Resources

at

Land at Penlanlas Farm, Abergavenny

**Beechwood Court,
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RG8 0RR**

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1 Introduction

- 1.1 Reading Agricultural Consultants Ltd (RAC) is instructed by Edenstone Homes Ltd to investigate the Agricultural Land Classification (ALC) and soil resources of land at Penlanlas Farm, Abergavenny, 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 land (1988)¹.
- 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 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, and Grade 5 is very poor quality land, with severe limitations due to adverse soil, relief, climate or a combination of these. Grade 3 land is subdivided into Subgrade 3a (good quality land) and Subgrade 3b (moderate quality land). Land which is classified as Grades 1, 2 and 3a in the ALC system is defined as best and most versatile agricultural land.
- 1.5 The Welsh Government's Predictive Agricultural Land Classification Map² indicates land at the site to be of Grade 2 quality, with a very small area of Subgrade 3a in the north-east. 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 established guidelines.

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

² **Welsh Government (2017)**. *Predictive Agricultural Land Classification (ALC) Map*

2 Site and climatic conditions

General features, land form and drainage

- 2.1 The site comprises 5.9ha of agricultural grassland, used for grazing sheep at the time of survey. The site is bounded to the east and south by residential properties of Mardy, Abergavenny, to the west by Old Hereford Road and to the north by an electricity substation and other agricultural grassland.
- 2.2 Topography across the site slopes downward from north-west to south-east, falling in altitude from around 150m above Ordnance Datum (AOD) to 120m AOD. In the south, the slope is fairly uniform and measured at around 6°, but is more variable in the north.

Agro-climatic conditions

- 2.3 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 140m AOD, and are given in Table 1. The site is moderately cool and very wet, with moderately small moisture deficits. The number of Field Capacity Days is very large and is unfavourable for providing opportunities for agricultural field work. There is an overriding climatic limitation to Grade 2.

Table 1: Local agro-climatic conditions

Parameter	Value
Average Annual Rainfall	1,115mm
Accumulated Temperatures >0°C	1,378 day°
Field Capacity Days	234 days
Average Moisture Deficit, wheat	74mm
Average Moisture Deficit, potatoes	57mm

Soil parent material and soil type

- 2.4 The underlying geology mapped by the British Geological Survey³ is the St Maughans Formation, which includes interbedded purple, brown and green sandstones and red mudstones. Superficial deposits of glacial till overlie the bedrock and may include clay, sand, gravel and boulders.
- 2.5 The Soil Survey of England and Wales soil association mapping⁴ (1:250,000 scale) shows the Oglethorpe association across the site. Oglethorpe soils are characterised by reddish brown

³ **British Geological Survey (2019).** *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ **Soil Survey of England and Wales (1984).** *Soils of Wales* (1:250,000), Sheet 2

sandy loam throughout, although a medium clay loam variant is also common. Sandstones may increase in abundance with depth. The soils are well drained, of Wetness Class (WC) I⁵.

3 Agricultural land quality

Soil survey methods

- 3.1 Six soil profiles were examined using an Edelman (Dutch) auger at an observation density of one per hectare in accordance with the established recommendations for ALC surveys. Two observation pits were also excavated to examine subsoil structures and stone contents. The locations of observations are indicated on Figure RAC8269-1. 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;
 - 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 inferred 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.

⁵ Rudeforth et al (1984). *Soils and their Use in Wales*, Soil Survey of England and Wales, Bulletin No.11

Agricultural land classification and site limitations

- 3.5 Assessment of land quality has been carried out according to the MAFF revised ALC guidelines (1988)¹. Soil profiles have been described according to Hodgson (1997)⁶ which is the recognised source for describing soil profiles and characteristics according to the revised ALC guidelines.
- 3.6 There are two main soil types present at the site. Agricultural land quality is subject to multiple limitations, including wetness, workability, topsoil stone and microtopography. The south of the site is slightly limited to Grade 2 but more than half of the site is more severely limited to Subgrade 3b.
- 3.7 In the south of the site, the topsoil is consistently of non-calcareous, dark reddish grey (5YR4/2 in the Munsell soil colour charts⁷) medium sandy loam which is deep, averaging 40cm thickness. The topsoil is slightly stony, including 5 to 8% by volume mostly comprising small stones, and has a fine angular blocky structure. Roots are common. The topsoil is adequately aerated.
- 3.8 Upper subsoil is of medium sandy loam or occasionally sandy clay loam which is weak red to reddish brown (2.5YR4/2, 5YR4/2 or 4/3). Stone content is around 15% by volume in total. The upper subsoil is of friable consistency and has a fine subangular blocky structure. Few to common ochreous mottles are present, indicating slight wetness. Lower subsoil is of similar characteristic although with an increasing stone content, estimated at 20 to 30%. As the mottling occurs at depths greater than 40cm, the profiles are assessed as WC I. Due to the large number of Field Capacity Days (234), profiles of WC I are limited slightly by workability to Grade 2.
- 3.9 The second soil variant found in the north of the site includes dark reddish grey (5YR4/2) sandy clay loam or occasionally sandy loam topsoil of 35cm average thickness. The topsoil has a fine angular or subangular blocky structure. Stone content is generally greater than in the south of the site and is up to 20% by volume, including higher proportions of stones larger than 2cm and 6cm. Higher contents of larger stones can increase wear and tear on agricultural machinery and also potentially affect crop quality.
- 3.10 Observation of the soil profile in the north-east of the site was hindered at very shallow depth by stones. A small pit excavated in the area showed the proportion of stone larger than 6cm in the

⁶ **Hodgson, J. M. (Ed.) (1997).** *Soil survey field handbook*. Soil Survey Technical Monograph No. 5, Silsoe.

⁷ **Munsell Color (2009).** *Munsell Soil Color Book*. Grand Rapids, MI, USA

topsoil to be greater than 10% by volume (shown in Appendix 3), resulting in a limitation to Subgrade 3b.

- 3.11 Upper subsoil is of sandy clay loam which is mostly brown (7.5YR4/2) and is commonly mottled. Particularly in the north and north-west, stone content increases significantly in the subsoil and is estimated at 25 to 30% volume.
- 3.12 Roughly central to the site, at Observation 4, a lower subsoil horizon of reddish brown (5YR4/3) clay is identified. The clay is firm with a coarse structure and is of reduced permeability, although overlies stony sandy clay loam from around 80cm depth. The subsoil in each profile is gleyed within 40cm, or within 70cm where a slowly permeable clay is at 60cm, reducing these profiles to WC III. When combined with sandy clay loam or sandy loam topsoil textures under the climatic conditions of the site, there exists a wetness limitation to Subgrade 3b.
- 3.13 In the north of the site, the landform is typically only moderately sloping, however the steepness and direction of the slopes are not uniform, and are considered likely to hinder the use of some agricultural machinery.
- 3.14 The ALC guidelines describe land of Subgrade 3a as being able to produce moderate yields of some horticultural crops, as well as moderate to high yields of other crops. Land of Subgrade 3b is described as *“Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.”* The site was being grazed when surveyed in December 2018: Subgrade 3b is considered an appropriate grade for this portion of the site.
- 3.15 The areas of each ALC grade of land on the site are given in Table 2 and are shown in Figure RAC8269-2.

Table 2: Agricultural land classification

Grade	Description	Area (ha)	% of agri land
2	Very good quality	2.2	37
3b	Moderate quality	3.7	63
	Total Agricultural	5.9	100

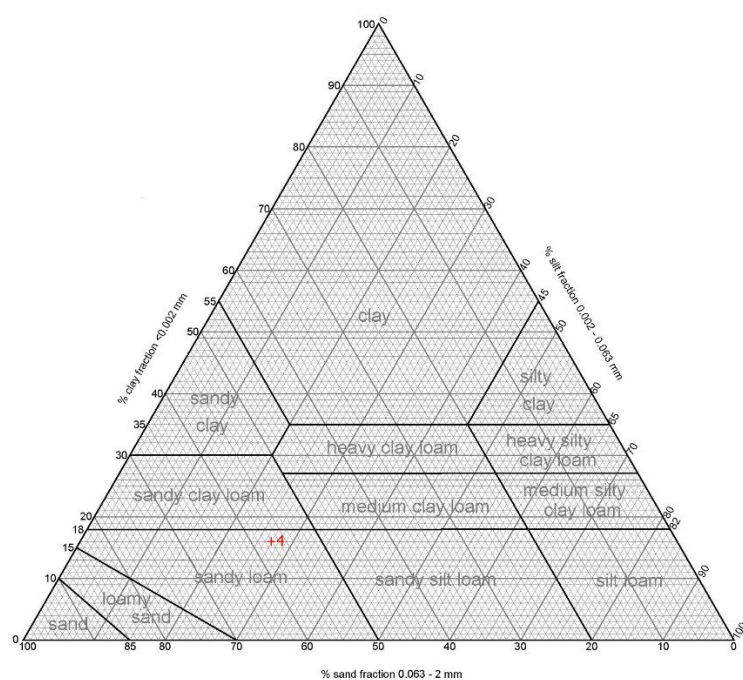
Appendix 1: Laboratory Data

Determinand	Site 4	Units
Sand 2.00-0.063 mm	57	% w/w
Silt 0.063-0.002 mm	27	% w/w
Clay <0.002 mm	16	% w/w
Organic Matter	4.2	% w/w
Texture	Sandy Loam	

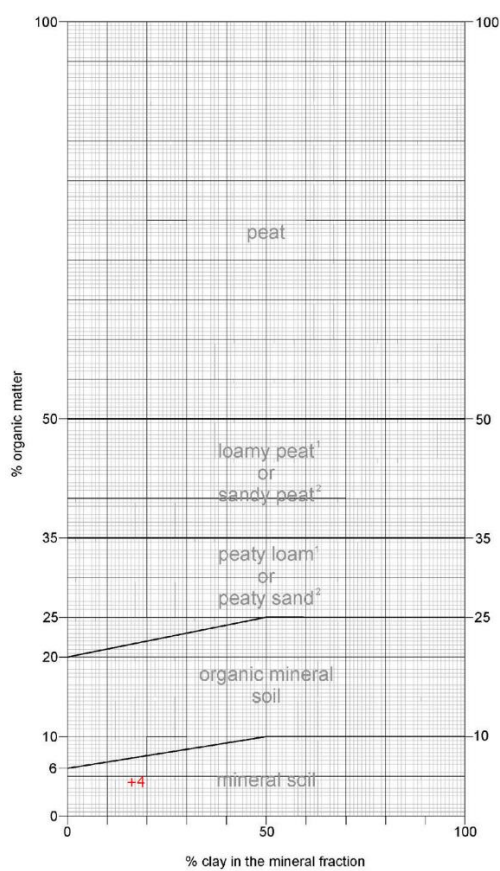
Determinand	Site 4	Units
Soil pH	5.4	
Phosphorus (P)	24.6	Mg/l (av)
Potassium (K)	33.8	Mg/l (av)
Magnesium (Mg)	78.2	Mg/l (av)

Determinand	Site 4	Units
Phosphorus (P)	2	ADAS Index
Potassium (K)	0	ADAS Index
Magnesium (Mg)	2	ADAS Index

Soil Texture by Particle Size Analysis



Organic Matter Class



¹Less than 50% sand in the mineral fraction

² 50% sand or more in the mineral fraction

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									
%	TAv	Eav		MDwheat	74												
hard	1	0.5		MDpotato	57												
mSston	3	2		FCD	234												
hard				flint & pebble				Maximum depth of auger penetration is <u>underlined</u>									
Site No.	Depth cm	Texture	CaCO ₃	Colour	Mottle colour	abund- ance	stone% hard	stone% mSston	Struct- ure	APwheat mm	AP potato mm	Gley	SPL	WC	Wetness grade WE	Final Grade	Limiting Factor(s)
1	T	0	40	mSL	5YR4/2		5			65	65			I	2	2	WK
		40	90	mSL	5YR4/3	Fe	15			51	39						
		90	120	mSL	5YR5/2		20			27	0						
									Total	142	104						
									MD	68	47						
									Droughtiness grade (DR)	1	1						
2	T	0	35	fSL	5YR4/2		5			60	60			I	2	2	WK
		35	90	SCL	5YR4/2	Fe	15			54	45						
		90	120	mSL	5YR4/3	Mn	30			24	0	y					
									Total	137	105						
									MD	63	48						
Droughtiness grade(DR)										1	1						
3	T	0	44	mSL	5YR4/2		5		-	71	71			I	2	2	WK
		44	80	mSL	2.5YR4/2	Fe	15			36	34	y					
		<u>80</u>	120	mSL	2.5YR4/2	Fe	25			34	0	y					
									Total	141	105						
									MD	67	48						
Droughtiness grade(DR)										1	1						
4	T	0	40	mSL	5YR4/2		8		-	63	63			III	3b	3b	WE MR

		40	60	SCL	5YR4/3	Fe	com.	10		25	29	y				
		60	80	C	5YR4/3	Fe	com.	2	poor	14	13	y	y			
		80	120	SCL	5YR4/3	Fe	few	20		32	0					
									Total	134	105					
									MD	60	48					
									Droughtiness grade(DR)	1	1					
5	T	0	35	SCL	5YR4/2			12	-	53	53		///	3b	3b	WE
		35	50	SCL	7.5YR4/2	Fe	com.	25		17	17	y				
		50	80	SCL	7.5YR4/2	Fe	com.	30		21	22	y				
		80	120	SCL	5YR4/3	Fe	few	30		29	0		ST	>5% >2cm	2	
									Total	120	92					
									MD	46	35					
									Droughtiness grade(DR)	1	1					
6	T	0	30	SCL	5YR4/2			20	-	41	41		///	3b	3b	WE ST MR
		30	50	SCL	7.5YR4/2	Fe	com.	25		23	23	y				
		50	80	SCL	7.5YR4/2	Fe	com.	30		21	22	y				
		80	120	SCL	5YR4/3	Fe	few	30		29	0					
									Total	114	86		ST	>10% >6cm	3b	
									MD	40	29					
									Droughtiness grade(DR)	1	1					

Appendix 3: Site Photographs



Pit 1



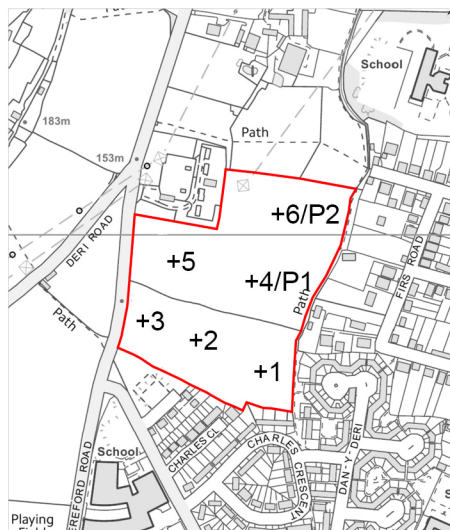
Pit 1 Topsoil



Reddish brown clay subsoil



Large stones in topsoil



- Survey Area
- +1 Auger Observation
- .P1 Pit Observation



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Figure RAC8269-1: Observations

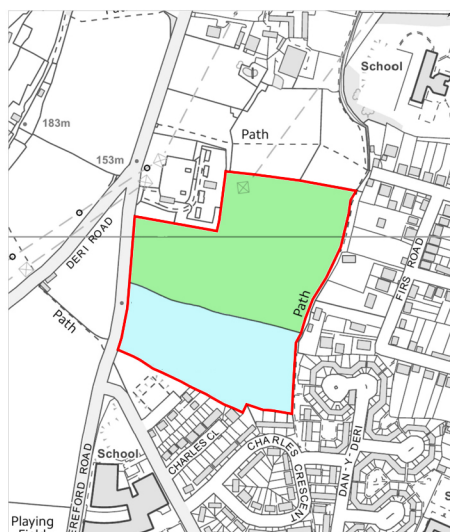
Site: Penlanlas Farm, Abergavenny

Client: Edenstone Homes Ltd

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Figure RAC8269-2: Agricultural Land Classification

Site: Penlanlas Farm, Abergavenny

Client: Edenstone Homes Ltd

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