

**Barratt Homes South Wales
Land at Boverton,
The Vale of Glamorgan**



**Agricultural Land Classification
and
Soil Resources**

April 2015

Reading Agricultural Consultants Ltd
Beechwood Court, Long Toll, Woodcote, RG8 0RR

www.readingagricultural.co.uk

1. Introduction

1.1. Instruction

- 1.1.1. Reading Agricultural Consultants Ltd (RAC) is instructed by Barratt Homes South Wales to investigate the Agricultural Land Classification (ALC) and soil resources of a site at Boverton, Vale of Glamorgan, by means of a detailed survey of soil and site characteristics.

2. Site and Climatic Conditions

2.1. General Features, Land Form and Drainage

- 2.1.1. The allocated site extends to around 2.4ha of agricultural land in total, as outlined in Figure RAC6367-1, comprising Phase 1 (1.8ha) and Phase 2 (0.6ha). The site is bounded to the north by the Vale of Glamorgan railway line, to the east by Llantwit Road, and to the south by the B4265.
- 2.1.2. Topography is very gently sloping, falling from almost 50m above Ordnance Datum (AOD) in the east to around 35m AOD in the west.

2.2. Agro-Climatic Conditions

- 2.2.1. 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 45m AOD. The data are given in Table 1. The site is warm and very wet with moderate to moderately small crop moisture deficits. The number of Field Capacity Days is higher than is typical for lowland England and Wales, and is considered to be unfavourable for providing opportunities for agricultural field work.

Table 1: Local climatic factors

Average Annual Rainfall	1004mm
Accumulated Temperature >0°C	1513 day°
Field Capacity Days	206 days
Average Moisture Deficit, wheat	85mm
Average Moisture Deficit, potatoes	73mm

2.3. Soil Parent Material and Soil Types

- 2.3.1. The principal underlying geology mapped by the British Geological Survey¹ is that of the Porthkerry Member which comprises interbedded limestone and calcareous mudstone or siltstone.
- 2.3.2. The Soil Survey of England and Wales soil series mapping of Bridgend (Sheets 261 and 262, 1:63,360 scale)² shows the Ston Easton series to be present at this site. These soils are characterised by well drained silty clay loam profiles of limited depth, with clay content increasing in the subsoils. Inclusions of more clayey profiles are common to the east of the Vale of Glamorgan³.

3. Agricultural Land Quality

3.1. Soil Survey Methods

- 3.1.1. Four soil profiles were examined using an Edelman (Dutch) auger at an observation density of one per hectare. Two observation pits were also excavated with a spade to examine subsoil structures. The locations of observations are indicated on Figure RAC6367-1. 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 local gley and mottle colours);
- consistency;
- structural condition;
- free carbonate; and
- depth.

- 3.1.2. Two soil samples were submitted for laboratory determination of particle size distribution, pH, organic matter content and nutrient contents (P, K, Mg). Results are given in Appendix 1.

¹ **British Geological Survey (2015)**. *Geology of Britain viewer*, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

² **Crampton (1972)** *Soils of the Vale of Glamorgan, 1:63,360 coloured map (Bridgend) 261/2*. Harpenden

³ **Rudeforth et al. (1984)**. *Soils and Their Use in Wales, Soil Survey of England and Wales Bulletin 11*, Harpenden

- 3.1.3. Soil Wetness Class (WC) was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick.
- 3.1.4. 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. When a profile is found with significant stoniness, sufficient to prevent penetration of a hand auger, then it is assumed, for the purposes of calculating droughtiness, that similar levels of stoniness continues to the full 1.2m depth considered.

3.2. Agricultural Land Classification and Site Limitations

- 3.2.1. Assessment of quality has been carried out according to the MAFF revised guidelines (1988⁴). Soil profiles have been described according to Hodgson (1997⁵) which is the recognised source for describing soil profiles and characteristics according to the ALC guidelines.
- 3.1.2. The main limitation to land quality at this site is soil wetness and workability due to the interaction of climate and clay textured topsoil. The limitation is moderate, to Subgrade 3b, as shown in Appendix 3.

Phase 1

- 3.1.3. Soil profiles comprise brown (10YR4/3 in the Munsell colour chart⁶) clay topsoil of 33cm average thickness. The structure is well developed with fine subangular blocky to crumb-like peds, which promotes aeration through high pore density, root growth and worm activity.
- 3.1.4. Subsoil is of slightly stony dark yellowish brown (10YR4/4 or 5/4) clay which is moderately well developed, forming fine subangular blocky peds and is therefore permeable, of WC I. The profiles are of restricted depth, averaging 51cm in total.

Phase 2

- 3.1.5. The excavated soil pit shows soils to be consistent with those of Phase 1. Topsoil is of brown clay which has a fine angular blocky structure and is freely draining.
- 3.1.6. Subsoil is also of clay which is yellowish brown (10YR5/4). The structure is moderately well developed with medium angular blocky peds and continues to be permeable. Similar to the Phase 1 area, the total profile depth in Phase 2 was restricted to 40cm, below which is fractured rock as shown in Appendix 4.

⁴ **MAFF (1988)** *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.* MAFF Publications.

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

⁶ **Munsell Color (2009).** *Munsell Soil Color Book,* Grand Rapids, MI, USA

- 3.1.7. Although this results in the profiles being slightly droughty, the main limitation to agricultural land quality remains to be wetness and workability caused by clay topsoils subject to 206 Field Capacity Days (see Appendix 3). The resulting agricultural land quality of the site is shown in Figure RAC6367-2.

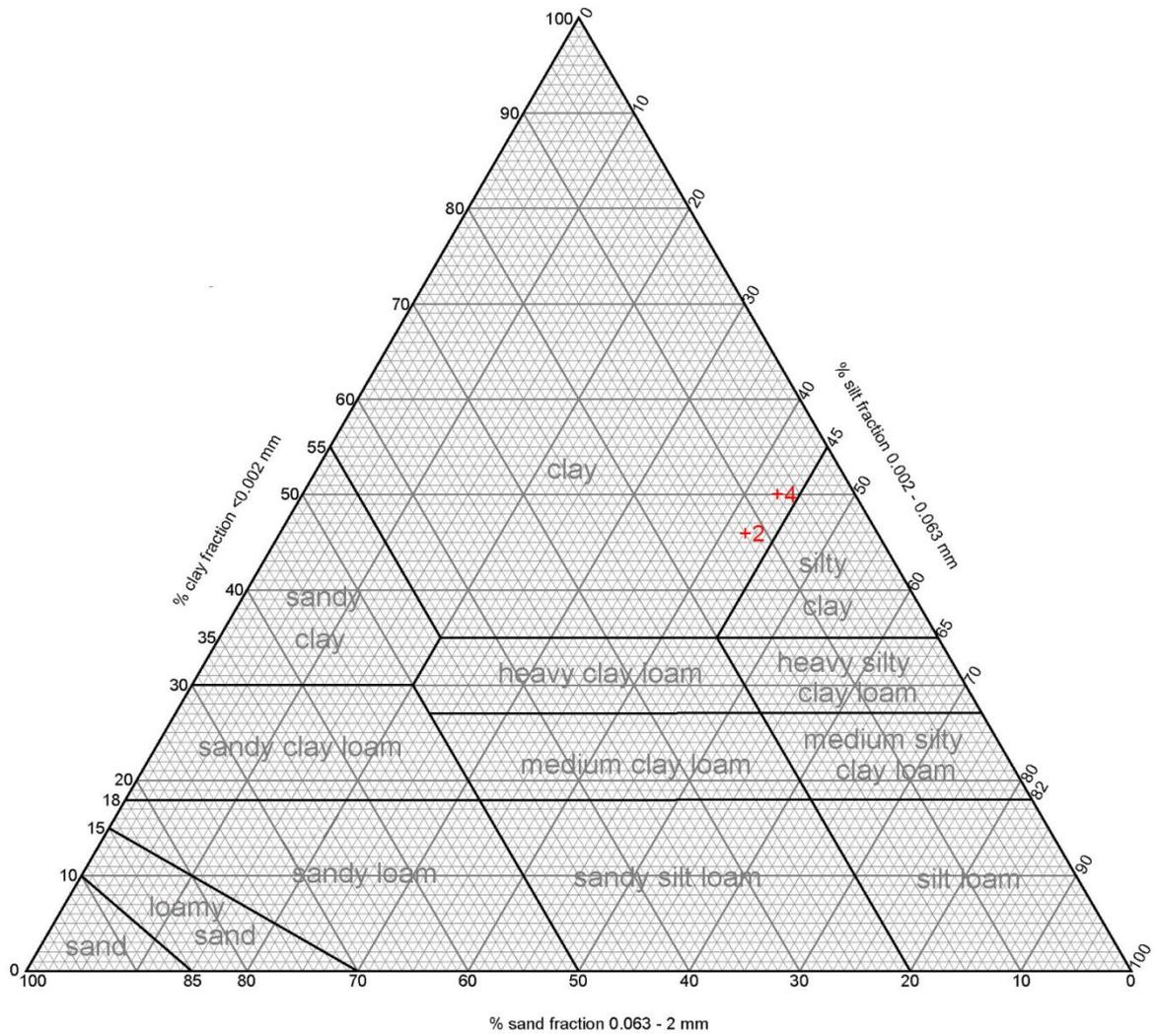
Appendix 1: Laboratory Data

Determinand	Site 2	Site 4	Units
Sand 2.00-0.063 mm	12	7	% w/w
Silt 0.063-0.002 mm	42	43	%w/w
Clay <0.002 mm	46	50	% w/w
Organic Matter WB	8.4	3.5	% w/w
Texture	Clay	Clay	% w/w

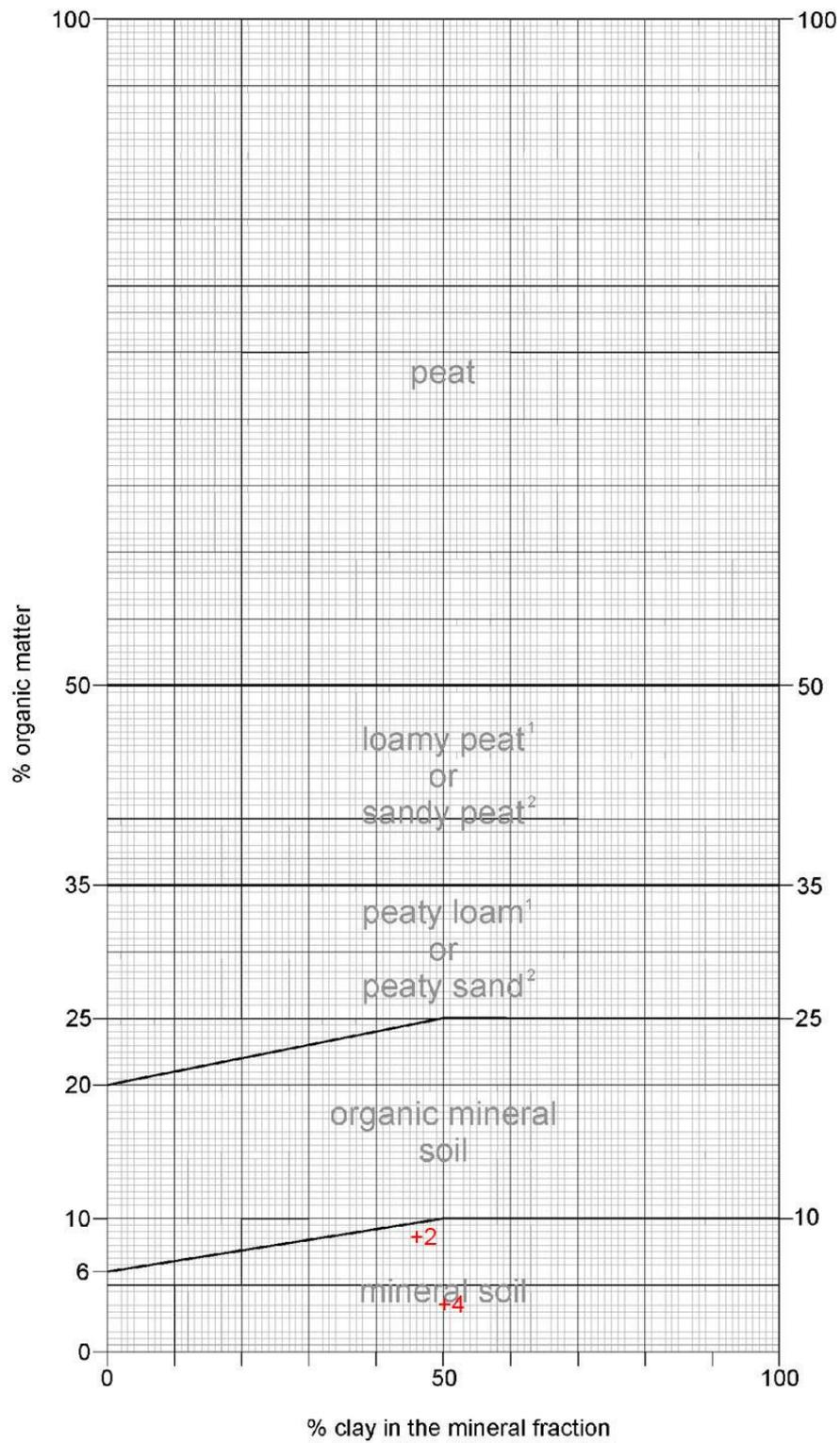
Determinand	Site 2	Site 4	Units
Soil pH	6.1	6.0	
Phosphorus (P)	4.6	2.8	mg/l (av)
Potassium (K)	84.8	90.3	mg/l (av)
Magnesium (Mg)	181	88.3	mg/l (av)

Determinand	Site 2	Site 4	Units
Phosphorus (P)	0	0	ADAS Index
Potassium (K)	1	1	ADAS Index
Magnesium (Mg)	4	2	ADAS Index

Soil Texture by Particle Size Distribution



Organic Matter Class



¹ Less than 50% sand in the mineral fraction

² 50% sand or more in the mineral fraction

Appendix 2: Soil Profile Summaries and Droughtiness Calculations

Droughtiness calculations are made according to the methodology given in Appendix 4 of the ALC guidelines, MAFF 1988.
The following grades represent the extent of the limitation posed by droughtiness only. Other factors will also influence the final grading.

MDw= 85

MDp= 73

Site No.	Depth (cm)	Texture	Colour	Mottle	stones %	Wheat Calculation			Potato Calculation			Gley	SP	WC	Grade	
						TAv or EAv (stones) %	TAv or EAv (soil) %	AP (wheat) mm	TAv (stones) %	TAv (soil) %	AP (potatoes) mm					
1	0	36	C	10YR4/3	0	1	17	61.2	1	17	61.2	n	n	I	3b	
	36	50	C	10YR4/4 and 5/4	0	0.5	16	22.4	0.5	16	22.4	n	n			
	50	<u>66</u>	C	10YR4/4 and 5/4	0	0.5	8	12.8	0.5	16	25.6	n	n			
								Total (mm) =	96.4	Total (mm) =		109.2				
								MBw=	11.4	MBp=		36.2				
								Grade =	2	Grade =		1				

Site No.	Depth (cm)	Texture	Colour	Mottle	stones %	Wheat Calculation			Potato Calculation			Gley	SP	WC	Grade	
						TAv or EAv (stones) %	TAv or EAv (soil) %	AP (wheat) mm	TAv (stones) %	TAv (soil) %	AP (potatoes) mm					
2	0	32	C	10YR4/3	0	1	17	54.4	1	17	54.4	n	n	I	3b	
	32	<u>45</u>	C	10YR4/4	7	0.5	16	19.4	0.5	16	19.4	n	n			
								Total (mm) =	73.8	Total (mm) =		73.8				
								MBw=	-11.2	MBp=		0.8				
								Grade =	3a	Grade =		2				

Site No.	Depth (cm)	Texture	Colour	Mottle	stones %	Wheat Calculation			Potato Calculation			Gley	SP	WC	Grade
						TAv or EAv (stones) %	TAv or EAv (soil) %	AP (wheat) mm	TAv (stones) %	TAv (soil) %	AP (potatoes) mm				
3	0	32	C	10YR4/3	0	1	17	54.4	1	17	54.4	n	n	I	3b
	32	<u>42</u>	C	10YR4/4	7	0.5	16	14.9	0.5	16	14.9	n	n		
								Total (mm) =	69.3	Total (mm) =		69.3			
								MBw=	-15.7	MBp=		-3.7			
								Grade =	3a	Grade =		2			

Site No.	Depth (cm)	Texture	Colour	Mottle	stones %	Wheat Calculation			Potato Calculation			Gley	SP	WC	Grade
						TAv or EAv (stones) %	TAv or EAv (soil) %	AP (wheat) mm	TAv (stones) %	TAv (soil) %	AP (potatoes) mm				
4	0	23	C	10YR4/3	0	1	17	39.1	1	17	39.1	n	n	I	3b
	23	<u>40</u>	C	10YR5/4	5	0.5	16	25.9	0.5	16	25.9	n	n		
								Total (mm) =	65.0	Total (mm) =		65.0			
								MBw=	-20.0	MBp=		-8.0			
								Grade =	3b	Grade =		2			

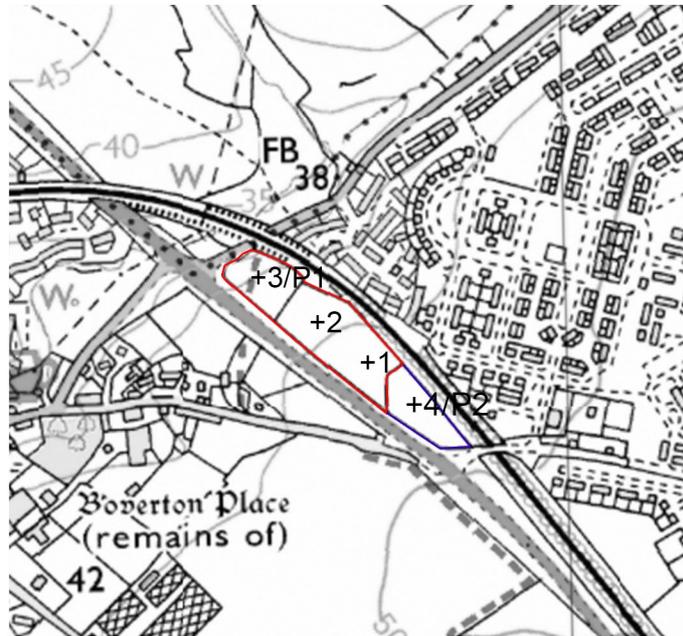
Appendix 3: Grade According to Soil Wetness

Wetness Class	Texture ¹ of the top 25 cm	Field Capacity Days				
		<126	126-150	151-175	176-225	>225
I	S ² LS ³ SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S ² LS ³ SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S ² LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S ² LS SL SZL	3a	3a	3a	3b	3b
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5
Soils in Wetness Class VI - Grade 5						

(MAFF ALC Guidelines, Table 6)

Appendix 4: Pit Photograph





- Survey Area - Phase 1
- Survey Area - Phase 2
- +1 Observation
- +P1 Pit Observation



Plan reproduced from Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright Reserved. Ordnance Survey Copyright License Number: 100005584

Scale 1:10,000@A4 Apr/2015

Figure RAC6367-1: Observations

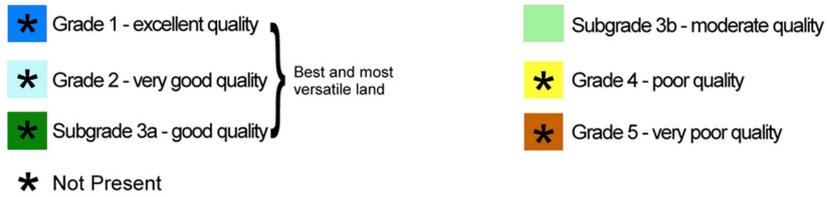
Site: Land at Boverton, Vale of Glamorgan

Client: Barratt Homes South Wales

**Reading
Agricultural
Consultants**



© Copyright Reading Agricultural Consultants, 2010, Beechwood Court, Long Toll, Woodcote, Reading, RG8 0RR Tel: 01491 367001 Fax: 01491 680800 www.readingagricultural.co.uk



Plan reproduced from Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright Reserved.
Ordnance Survey Copyright License Number: 100005584

Scale 1:10,000@A4 Apr/2015

Figure RAC6367-2: Agricultural Land Classification

Site: Land at Boverton, Vale of Glamorgan

Client: Barratt Homes South Wales

**Reading
Agricultural
Consultants**



© Copyright Reading Agricultural Consultants, 2010, Beechwood Court, Long Toll, Woodcote, Reading, RG8 0RR Tel: 01491 367001 Fax: 01491 680800 www.readingagricultural.co.uk