Soil Environment Services Ltd

AGRICULTURAL LAND CLASSIFICATION

Jones Peckover

Land at Highmere Drive
Connah's Quay

Soil Environment Services Ltd
February 2019

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Client:

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Land at Highmere Drive
Connah's Quay

A report prepared on behalf of ***Soil Environment Services*** by:

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Attended the *Agricultural Land Classification England and Wales Soil Training Event* (November 2018) and the *Introduction to Soil Classification Training Event* (June 2016) organised by BSSS.

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1. INTRODUCTION

An Agricultural Land Classification (ALC)[1] has been carried out on 5.26 ha of land located at Highmere Drive, Connah's Quay (Drawing ALC/1). The site is centred on OS Grid Ref. 328152, 369481.

Agricultural land is classified into the following grades according to the 1988 guidelines[1].

Grade	Description
1	**Excellent quality agricultural land** with no or very minor limitations to agricultural use.
2	**Very good quality agricultural land** with minor limitations which affect crop yield, cultivation or harvesting.
3a	**Good quality agricultural land** capable of producing moderate to high yields of a narrow range of arable crops or moderate yields of a wider range of crops.
3b	**Moderate quality agricultural land** capable of producing moderate yields of a narrow range of crops or lower yields of a wider range of crops.
4	**Poor quality agricultural land** with severe limitations which significantly restrict the range of crops and/or level of yields.
5	**Very poor quality agricultural land** with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

The survey was conducted on the 30th January 2019 and classifies the land into one or more of the above grades.

On the survey date the site was mainly sown with an arable crop.

Statement of competence

The survey was undertaken by Rebecca Jordan BSc MSc, an Environmental Consultant who is a member of BSSS with 3 years ALC survey experience and has attended the *Agricultural Land Classification: England and Wales Training Event* (November 2018) and the *Introduction to Soil Classification Training Event* (June 2016) organised by BSSS. The report was checked by Dr Robin Davies who has been a member of the BSSS for over 30 years, the IPSS since it was formed in 1991 and has been undertaking ALC surveys for 25 years.

2. METHODOLOGY

The classification includes an initial desktop investigation to examine previously mapped soil types and to note the drift and solid geology. This included consultation from:

Soil Survey of England and Wales 1:250 000[4]
British Geological Survey 1:50 000 solid and drift map[8]

The field survey consisted of pit excavations to examine soil profiles on a 100 m grid (1 per hectare) using standard soil survey methods[2]. This data was used to map the principal soil types for determining the ALC. The soil removed during augering and pit excavations was examined in accordance with:

Soil Survey Field Handbook[2]
Describing and Sampling Soil Profiles
Soil Survey of England and Wales, Technical Monograph No. 5, 1976

Soil Classification for Soil Survey[9]
Monographs on Soil Survey
Butler, B E (1980) Clarendon Press, Oxford

Climatological data[3] was used to determine the overriding site limitation and for interaction with soil parameters (Appendix A). The above information was cross referenced with geological surveys[8], previous soil surveys[10] and the national 1:250 000 series ALC survey[4] relevant for this site to substantiate the findings. The ALC grade was then determined for this site and for the current survey and is detailed in Drawing ALC/1.

3. BASELINE CONDITIONS

3.1. Climate and flooding

The climatological data (Table 1) indicates slightly below average temperature, average rainfall and an average number of field capacity days for the region.

Table 1
Climatological information[3]

Factor	Units	Value
Altitude AOD	m	45
Accumulated temperature	day°C (Jan-June)	1418.7
Average Annual Rainfall	mm	766.6
Field Capacity Days	days	179.0
Moisture Deficit Wheat	mm	95.5
Moisture Deficit Potatoes	mm	84.0

The site is not mapped within a flood risk area[7].

3.2. Soils, geology and topography

3.2.1. Soils

The site has previously been mapped as having soils of the *Salop and Clifton Associations* [4,5].

Two general soil types were noted for the purposes of ALC grading.

This study has identified the soils to be clay loams over clays to depth. In some areas of the site the topsoil and subsoil 1 have been disturbed, with an area in the centre of the site an infilled pond (post-1988).

3.2.2. Geology[8]

Superficial Geology

Majority of the site
1:50 000 scale superficial deposits description: *Till, Devensian - Diamicton. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions (U).*

North and south of the site
None recorded

Bedrock Geology

1:50 000 scale bedrock geology description: *Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone. Sedimentary Bedrock formed approximately 318 to 319 million years ago in the Carboniferous Period. Local environment previously dominated by swamps, estuaries and deltas.*

1:50 000 scale bedrock geology description: *Bowland Shale Formation - Mudstone. Sedimentary Bedrock formed approximately 319 to 337 million years ago in the Carboniferous Period. Local environment previously dominated by open seas with pelagite deposits.*

1:50 000 scale bedrock geology description: *Gwespyr Sandstone - Sandstone And [subequal/subordinate] Argillaceous Rocks, Interbedded. Sedimentary Bedrock formed approximately 318 to 320 million years ago in the Carboniferous Period. Local environment previously dominated by swamps, estuaries and deltas.*

3.2.3. Topography

The site was identified as having a slope towards the north east. The gradient measured on site had a maximum of 6° and hence gradient will not limit the ALC Grade. No variation in microrelief was noted on the site.

4. FIELDWORK RESULTS

4.1. Descriptions of soil types

The soils across the site were noted as clay loams over clay. Full profile data is listed in Appendix B.

A summary of the features of the soil type/s are listed in Table 2 and locations are shown within Drawing ALC/1.

Table 2. Soil Type descriptions

Profile Description	Soil types		
	Type 1	**Type 2**	
Horizon 1 (topsoil)	0-30 cm Very dark greyish brown (2.5Y 3/2) very slightly stony medium clay loam, no roots or mottles. Distinct boundary. Friable weak medium angular blocky structure.	0-40 cm Very dark greyish brown (2.5Y 3/2) very slightly stony disturbed medium clay loam, no roots or mottles. Coal and wood pieces. Distinct boundary. Friable weak medium angular blocky structure.	
Horizon 2 (subsoil 1)	30-60 cm Light yellowish brown (10YR 6/4) very slightly stony clay loam, many medium ochreous mottles (10YR 5/6) Firm moderate coarse prismatic structure.	40-60 cm Light yellowish brown (10YR 6/4) very slightly stony clay loam, many medium ochreous mottles (10YR 5/6) Firm moderate coarse prismatic structure.	
Horizon 3 (subsoil 2)	60-120 cm Yellowish brown (10YR 5/4) stoneless clay, many large ochreous mottles (10YR 5/6). Firm moderate massive structure.	60-120 cm Yellowish brown (10YR 5/4) stoneless clay, many large ochreous mottles (10YR 5/6). Firm moderate massive structure.	
Survey points (Drawing ALC/1) and soil types: Borings/ Trial Pits Type 1 soil = 1, 3, 4, 5 Type 2 soil = 2 Notes:			

4.2. Field study photographs

Photo 1. Pit 3 – Soil Type 1

Photo 2. Subsoil 1 of Pit 3 - Soil Type 1

Photo 3. Pit 4 – Soil Type 1

Photo 4. Pit 2 - Soil Type 2

4.3. In-field wetness class assessment

An in-field wetness assessment was conducted for the soil types (Table 3).

Table 3. In-field Wetness Class Assessment

Soil Type	Feature	Parameters	Findings	WC
1	Site conditions	Undisturbed/ disturbed	Undisturbed	IV
		FCD	179.0	
	Potential Slowly Permeable Layer (SPL)	Horizon depth (cm)	30-60	
		Texture	CL	
		Structure	FMCP	
		Biopores > 0.5 mm (%)	< 0.5	
		Evidence of wetness	Mottles	
	Potential Gleyed Horizon	Matrix colour	Pale – 10YR 6/4	
		Ped faces colour	Pale – 10YR 6/4	
		Mottles	Ochreous – 10YR 5/6	
		Depth to gleying (cm)	30	
	Figure reference in ALC guidelines – 7			
2	Site conditions	Undisturbed/ disturbed	Disturbed	IV
		FCD	179.0	
	Potential Slowly Permeable Layer (SPL)	Horizon depth (cm)	40-60	
		Texture	CL	
		Structure	FMCP	
		Biopores > 0.5 mm (%)	< 0.5	
		Evidence of wetness	Mottles	

Key
FCD – Field Capacity Days
CL – Clay Loam
WC – Wetness Class
FMCP – Firm Moderate Coarse Prismatic
Notes:

5. AGRICULTURAL LAND CLASSIFICATION

5.1. National 1:250 000 map grading

Grading on the MAFF (1983) 1: 250 000 map[7] indicated the site was mapped as **Grade 3**.

5.2. Current grading

This survey has resulted in an Agricultural Land Classification of the following grades (Drawing ALC/1):

Table 4. ALC gradings and limitations

Grade	Area (ha)	Area (%)	Limitation
1			
2			
3a			
3b	5.6	100	Type 1 Soils – Wetness Limitation Type 2 Soils – Wetness Limitation
4			
5			
Non-agricultural land			
Total	5.6 ha	100%	

Type 1 Soils - Wetness Limitation

The combination of the topsoil texture (medium clay loam), Wetness Class (IV) and the number of Field Capacity Days (179.0) results in **ALC Grade 3b** for Type 1 soils.

Type 2 Soils - Wetness Limitation

The combination of the topsoil texture (medium clay loam), Wetness Class (IV) and the number of Field Capacity Days (179.0) results in **ALC Grade 3b** for Type 2 soils.

DRAWING ALC/1

Boring Locations and Soil Types

Key

- Soil Type 1
- Soil Type 2
- Pit Location

Soil Environment Services

Drawing Title: Boring Locations and Soil Types	Drawing No.: ALC/1
Scale: 1: 2887	Date: 30/01/2019

N

DRAWING ALC/2

ALC Grade

Key

- Moderate quality – 3b
- Pit Location

Soil Environment Services

Drawing Title: ALC Grade	Drawing No.: ALC/2
Scale: 1: 2835	Date: 30/01/2019

N

APPENDIX A

Climatological data for

Agricultural Land Classification

Agricultural Land Classification - Met. Information & droughtiness

Data and adjustment calculations from: The Met. Office, *Climatological Data for Agricultural Land Classification* 1989.
Input data in box cells only, results in shaded cells.

Site name	Land at Highmere Drive, Connah's Quay	
Site altitude =	45	m
Site GR	3281	3694

Meteorological information for surrounding national grid reference points

	Easting	Northing	ALT	AAR	LR_AAR	ATO	MDMWHT	MDMPOT	FCD
NW	3250	3700	80	786	0.5	1379	89	75	187
NE	3300	3700	3	740	0.6	1466	103	94	172
SW	3250	3650	139	833	0.4	1314	80	64	198
SE	3300	3650	103	788	0.7	1354	87	72	181

Altitude adjustment of surrounding meteorological information with respect to site.

Adjusted surounding points

	AAR	ATO	FCD
NW	768.5	1418.9	184.5
NE	765.2	1418.1	175.6
SW	795.4	1421.2	192.6
SE	747.4	1420.1	175.1

Site adjusted meteorological information

	1 Dsg	2 Wg	Wp
NW	31.57531	0.001003	0.233126
NE	19.92486	0.002519	0.585457
SW	53.82379	0.000345	0.080230
SE	47.92703	0.000435	0.101187
Sum		0.004302	

Site	**AAR**	**ATO**	**FCD**
	766.6	1418.7	179.0

ALC according to climate

Grade: **1**

Soil wetness class (drained)

Type 1	**IV**
Type 2	**IV**
Type 3	

ALC according to wetness/climate texture

Type 1	**3b**
Type 2	**3b**
Type 3	

Soil moisture deficit of surrounding points

	Cw	Cp	Adjusted	
NW	12.2764	16.2432	92.2764	80.24
NE	-6.073	-8.0136	96.9268	85.99
SW	4.816	6.363	93.8160	81.36
SE	8.7928	11.5884	95.7928	83.59

Site results for soil moisture deficit

MDMW	MDMPOT
95.5	84.0

Adjustment data for stone type and content

	Soil Type 1			Soil Type 2			Soil Type 3		
	Top	Sub1	Sub2	Top	Sub1	Sub2	Top	Sub1	Sub2
% volume	5	5	0	5	5	0	na	na	na
TAv for stone type	1	1	1	1	1	1	na	na	na
EAv for stone type	0.5	0.5	0.5	0.5	0.5	0.5	na	na	na
	Sub 3	Sub4		Sub 3			Sub 3		
% volume	na	na	na	na	na	na	na	na	na
TAv for stone type	na	na	na	na	na	na	na	na	na
EAv for stone type	na	na	na	na	na	na	na	na	na

Droughtiness (moisture balance) determination for each soil type and restored profile

Moisture availability data for each texture from MAFF ALC Guidelines 1988

Moisture Balance (MB) = AP - MD for wheat and potatoes (adjusted for stones)

		Type 1		Type 2		Type 3	
Horizon		texture	water	texture	water	texture	water
TAvt - Topsoil water available (mm)		CL	16.20	CL	16.20	0	0.00
LTt - Topsoil thickness (cm)		0	30.00	0	30.00	0	0.00
TAvs - Subsoil total available	1	CL	11.45	CL	11.45	0	0.00
	2	C	13.00	C	13.00	0	0.00
	3	0	0.00	0	0.00	0	0.00
	4	0	0.00	0	0.00	0	0.00
EAvs -	1	CL	6.68	CL	6.68	0	0.00
Subsoil (SS) easily available	2	C	7.00	C	7.00	0	0.00
	3	0	0.00	0	0.00	0	0.00
	4	0	0.00	0	0.00	0	0.00
LT50 -	1	CL	20.00	CL	20.00	0	0.00
Thickness ss layers to 50cm	2	C	0.00	C	0.00	0	0.00
	3	0	0.00	0	0.00	0	0.00
	4	0	0.00	0	0.00	0	0.00
LT120 -	1	CL	10.00	CL	10.00	0	0.00
Thickness ss layers 50 to 120cm	2	C	60.00	C	60.00	0	0.00
	3	0	0.00	0	0.00	0	0.00
	4	0	0.00	0	0.00	0	0.00
LT0 -	1	CL	30.00	CL	30.00	0	0.00
Thickness ss layers to 70cm	2	C	10.00	C	10.00	0	0.00
	3	0	0.00	0	0.00	0	0.00
	4	0	0.00	0	0.00	0	0.00
Total profile thickness for soil type cm		0	120		120	0	0

SOIL **Droughtiness** (moisture balance) results

Type 1

		Grade
Results		
AP wheat =	120.2	
Moisture balance wheat =	24.7	2
AP potatoes =	94.4	
Moisture balance potatoes =	10.4	1

Type 2

Results		
AP wheat =	120.2	
Moisture balance wheat =	24.7	2
AP potatoes =	94.4	
Moisture balance potatoes =	10.4	1

Notes

ALC Grade	Moisture Balance Limits wheat	potatoes
1	30	10
2	5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

APPENDIX B

Site Survey Field Notes

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ALC Survey Profile Data Sheet **Site:** **Land at Highmere Drive**

	Topsoil						Subsoil 1						Subsoil 2					
Pit no.	Depth (cm)	Texture	Colour (Munsell)	Stoniness (%)	Mottles	Structure	Depth (cm)	Texture	Colour (Munsell)	Stoniness (%)	Mottles	Structure	Depth (cm)	Texture	Colour (Munsell)	Stoniness (%)	Mottles	Structure
1	0-30	MCL	2.5Y 3/2	3	No	FWMAB	30-60	CL	10YR 6/4	2	MMO	FMCP	60-120	C	10YR 5/4	0	MLO	FMM
2	0-40	MCL+	2.5Y 3/2	5	No	FWMAB	40-60	CL	10YR 6/4	5	MMO	FMCP	60-120	C	10YR 5/4	0	MLO	FMM
3	0-30	MCL	2.5Y 3/2	5	No	FWMAB	30-60	CL	10YR 6/4	5	MMO	FMCP	60-120	C	10YR 5/4	1	MLO	FMM
4	0-30	MCL	2.5Y 3/2	2	No	FWMAB	30-60	CL	10YR 6/4	2	MMO	FMCP	60-120	C	10YR 5/4	0	MLO	FMM
5	0-30	MCL	2.5Y 3/2	5	No	FWMAB	30-60	CL	10YR 6/4	3	MMO	FMCP	60-120	C	10YR 5/4	1	MLO	FMM

Key:

MCL - Medium Clay Loam
C - Clay
+ - disturbed

MMO - Many Medium Ochreous
MLO - Many Large Ochreous

FWMAB - Friable Weak Medium Angular Blocky
FMCP - Firm Moderate Coarse Prismatic
FMM - Firm Moderate Massive

INFORMATION SOURCES

1. ***Agricultural Land Classification of England and Wales***. Guidance and criteria for grading the quality of agricultural land. MAFF. 1988.

2. ***Soil Survey Field Handbook.*** Technical Monograph No.5. Soil Survey of England and Wales.1976.

3. ***Climatological Data for Agricultural Land Classification***, The Met. Office 1989

4. ***Soil Map of England and Wales: 1:250 000***. Soil Survey of England and Wales, Harpenden.

5. ***Soils and Their Use in Midland and Western England.*** Soil Survey of England and Wales, Harpenden.

6. ***Agricultural Land Classification Map*** 1:250 000. MAFF 1983.

7. ***Risk of Flooding from Rivers and Sea: 1:15 000.*** Environment Agency

8. ***Geology of Britain Viewer.*** *Reproduced with the permission of the British Geological Survey ©NERC. All rights Reserved*

9. ***Butler, B E.*** *Soil Classification for Soil Survey Monographs on Soil Survey (1980) Clarendon Press, Oxford*

10. ***Natural England.*** *Agricultural Land Classification detailed Post 1988 ALC surveys (Available at: http://publications.naturalengland.org.uk/category/6249382855835648)*