Cloughton Wellsite, Burniston, North Yorkshire

Agricultural Land Classification and Soil Resource Survey

Europa Oil and Gas Limited

October 2024

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CLOUGHTON WELLSITE, BURNISTON, NORTH YORKSHIRE: Agricultural Land Classification and Soil Resource Survey

1. INTRODUCTION

This report provides detailed information on the agricultural land quality and soil resources within the land required for the proposed drilling of an appraisal well and access track at Cloughton Wellsite, Burniston, North Yorkshire.

The survey area comprises land adjacent to a solar array. The total area of land for the proposed new well is approximately 1.5 ha in extent and the site is centred on OS Grid Reference TA 020 928.

2. SITE DESCRIPTION

2.1 Altitude & Relief

The site is gently sloping generally from the north east corner towards the south and lies at an altitude of approximately 54 mAOD. No slope exceeds 4˚ and hence gradient does not constitute a limitation to the agricultural usage of the site.

2.2 Climate

Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics. The key climatic variables used for grading this site are given in Table 1 and were obtained from the published 5 km grid dataset using the standard interpolation procedures (Meteorological Office, 1989).

Table 1: **Climatic & Altitude Data**	
Grid reference	TA 020 928
Altitude (mAOD)	54
Accumulated temperature (day °C Jan - June)	1314
Average annual rainfall (mm)	730
Field capacity days (days)	181
Moisture deficit, wheat (mm)	96
Moisture deficit, potatoes (mm)	84
Overall climatic grade	2

The climatic criteria are considered first when classifying land as climate can be overriding irrespective of favourable site or soil conditions. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall and accumulated temperature. The combination of rainfall and temperature at this site result in slight limitation restricting the agricultural quality of the land to a maximum of Grade 2 quality.

2.3 Published Soils Information

The 1:250 000 scale reconnaissance soil map of the area (Soil Survey, 1983) shows the whole of the site to be mapped as soils of the Salop Association. Salop Association soils are briefly described by the Soil Survey (1983) as ‘Slowly permeable seasonally waterlogged reddish fine loamy over clayey, fine loamy and clayey soils associated with fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging.'

2.4 Land Use

At the time of the survey the agricultural land within the proposed well area was grassland.

3. SURVEY METHODS

The survey was undertaken during October 2024. Soil profiles were examined using a hand auger and/or spade to a depth of 120 cm where possible. The fieldwork was conducted at a very detailed density of approximately six auger boring per hectare (Figure 1 & Appendix I). A soil pit was dug in the representative soil type (Appendix II) to assess subsoil structure and allow the preparation of a statement of soil physical characteristics (Appendix III).

4. SOIL PHYSICAL CHARACTERISTICS

This survey showed the site to comprise a single soil type and the full description of this soil type is given below. The statement of soil physical characteristics is given at Appendix III.

4.1 *Soil Type 1*

This soil type is found within the proposed well area and the whole length of the access route. *Soil Type 1* comprises a non-calcareous, very slightly stony, medium clay loam topsoil, which overlies dark yellowish brown, mottled, heavy clay loam upper subsoil. This upper subsoil in turn overlies a mottled and gleyed clay lower subsoil which occasionally included sandy inclusions from the weathering of sandstone fragments. Stones mostly comprised sandstone fragments with a few rounded quartzite pebbles. The upper and lower subsoils were slowly permeable and hence profiles of this soil type are poorly drained and are assessed as Wetness Class IV.

5. AGRICULTURAL LAND CLASSIFICATION

The quality of the agricultural land within the proposed site was assessed using the revised guidelines and criteria for grading the quality of agricultural land issued by the Ministry of Agriculture, Fisheries and Food (MAFF, 1988). All factors which could be limiting to land quality were assessed (flood risk, stoniness, soil depth etc.) but only the main limiting factor is described below. Auger boring information for each sample point (Figure 1) is shown at Appendix I and a soil pit profile description is given at Appendix II. The agricultural land classification and extent of each grade or subgrade is shown at Figure 2.

The limiting factor for the quality of the agricultural land within the survey area is wetness and workability.

5.1 **Subgrade 3b** (moderate quality agricultural land)

Land within the whole of the survey area is poorly drained (Wetness Class IV). With the present climatic conditions at the site and a medium clay loam topsoil result in a significant wetness and workability limitation which restricts the land to Subgrade 3b (Figure 2).

6. SOIL RESOURCES

The soil resources within the proposed well site and the access route have been separately estimated from the median thicknesses of each soil horizon and the area of that horizon. The estimates assume the full soil profile to a depth of 1.2 m is to be stripped (Table 2). All soils should be stripped and stored according to best practice as outlined in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009).

6.1 Topsoil

TS1

The medium clay loam textured topsoil from the well site may be stripped and stored as a single unit at a median thickness of 30 cm.

The similar topsoil along the access route may be stripped as a single unit at a median thickness of 28 cm.

6.2 Upper Subsoil

SS1

The heavy clay loam upper subsoil horizon from the well site may be stripped and stored as a single unit at a median thickness of 17 cm.

The similar upper subsoil along the access route may be stripped as a single unit at a median thickness of 22 cm.

6.3 Lower Subsoil

SS2

The clay lower subsoil horizon from the well site may be stripped to the maximum depth of 120 cm and stored as a single unit .

The similar lower subsoil along the access route may also be stripped to the maximum depth of 120 cm and stored as a single unit.

Table 2: Soil Resources

Material Type	Source	Predominant Texture	Thickness (m)	Area* (ha)	Volume* (m^3)
Topsoil **TS1**	Well Site	Medium clay loam	0.30	1.3	3900
Topsoil **TS1**	Access Route	Medium clay loam	0.28	0.1	280
Upper Subsoil **SS1**	Well Site	Heavy clay loam	0.17	1.3	2210
Upper Subsoil **SS1**	Access Route	Heavy clay loam	0.22	0.1	220
Lower Subsoil **SS2**	Well Site	Clay	0.73	1.3	9490
Lower Subsoil **SS2**	Access Route	Clay	0.70	0.1	700

*Areas and volumes are approximate

7. REFERENCES

Defra (2009)
Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. Defra: London

Meteorological Office (1989)
Climatological Data for Agricultural Land Classification. Meteorological Office: Bracknell.

Ministry of Agriculture, Fisheries and Food (1988)
Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land. MAFF: London.

Soil Survey of England and Wales (1983)
Sheet 4, Soils of Eastern England. 1 : 250 000 Scale. SSEW: Harpenden.

APPENDIX I

Field Data: Hand Auger Borings

Field data : Hand Auger Borings

Boring No.	Depth (cm)	Texture	Colour	Mottles	Stone content (%)	Comments
1	0 – 20	MCL	10YR4/3	-	4	Subgrade 3b Wetness Class IV Wetness
	20 - 35	HCL	10YR5/2	MDOM (10YR4/6)	5	Few FMn
	35 - 120	C	10YR5/3, 5/6	VMPOM (10YR5/6)	5	Few FMn
2	0 – 29	MCL	10YR4/3	-	5	Subgrade 3b Wetness Class IV Wetness
	29 - 40	HCL	10YR5/2	MDOM (10YR4/6)	7	Few FMn
	40 - 120	C	10YR5/3, 5/6	VMPOM (10YR5/6)	7	Few FMn
3	0 – 30	MCL	10YR4/3	-	2	Subgrade 3b Wetness Class IV Wetness
	30 - 47	HCL	10YR5/2	MDOM (10YR4/6)	5	Few FMn
	47 - 120	C	10YR5/3, 5/6	VMPOM (10YR5/6)	10	Few FMn
4	0 – 30	MCL	10YR4/3	-	2	Subgrade 3b Wetness Class IV Wetness
	30 - 60	HCL	10YR4/4	MDOM (10YR4/6)	5	Few FMn
	60 - 120	C + MS inclusions	10YR5/3	VMPOM (10YR5/6)	15	Few FMn
5	0 – 29	MCL	10YR4/3	-	2	Subgrade 3b Wetness Class IV Wetness
	29 - 54	HCL	10YR4/4	CDOM (10YR4/6)	5	Few FMn
	54 - 120	C	7.5YR5/3, 10YR4/6	VMPOM (10YR4/6)	2	Few FMn
6	0 – 30	MCL	10YR4/3	-	3	Subgrade 3b Wetness Class IV Wetness
	30 - 48	HCL	10YR4/4	CDOM (10YR4/6)	4	Few FMn
	48 - 120	C + MS + SCL inclusions	Mixed 10YR5/3, 5/2, 4/6	MPOM (10YR4/6, 5/6)	20	Few FMn
7	0 – 28	MCL	10YR3/3	FRRC	2	Subgrade 3b Wetness Class IV Wetness
	28 - 55	HCL	10YR4/4	MDOM (10YR4/6)	3	
	55 - 120	C	10YR5/3, 5/6	VMPOM (10YR5/6)	8	Few FMn

Field data : Hand Auger Borings						
Boring No.	**Depth (cm)**	**Texture**	**Colour**	**Mottles**	**Stone content (%)**	**Comments**
8	0 – 32	MCL	10YR4/3	-	3	Subgrade 3b Wetness Class IV Wetness
	32 - 120	C + SCL (weathered Sandstone)	Mixed 10YR5/3, 4/4, 5/2	MDOM (10YR4/6, 5/6)	20	Few FMn
9	0 – 10	MCL	10YR3/2	-	Stoneless	Subgrade 3b Wetness Class IV Wetness
	0 - 85	C	10YR5/2, 7.5YR5/6	VMPOM (7.5YR5/6)	Stoneless	Few FMn
	85 - 120	C	5YR5/6	MPGM (10YR5/2)	Stoneless	Few FMn
10	0 – 35	MCL	10YR3/2	-	Stoneless	Subgrade 3b Wetness Class IV Wetness
	35 - 57	HCL	10YR4/4	MDOM (10YR4/6)	2	Few FMn
	57 - 120	C	10YR5/3, 5/6	VMPOM (10YR5/6)	5	Few FMn

Appendix I: Key

Textures:

C	Clay
MCL	Medium Clay Loam
HCL	Heavy Clay Loam
SCL	Sandy Clay Loam
MS	Medium Sand

Colours: All colours are defined according to the Munsell soil colour system (Munsell Colour Company Inc. Baltimore, Maryland 21218, USA)

Mottles:

FRRC	Few Rusty Root Channels
CDOM	Common Distinct Ochreous Mottles
MDOM	Many Distinct Ochreous Mottles
MPOM	Many Prominent Ochreous Mottles
VMPOM	Very Many Prominent Ochreous Mottles
MPGM	Many Prominent Grey Mottles

Stones: Stones were mainly small to medium sub-angular sandstone fragments with occasional rounded quartzite pebbles.

FMn: This refers to the presence ferri-manganiferous concentrations.

APPENDIX II

Soil Pit Data

Soil pit data

Pit 1: Slope - 3˚ south east
Land use – Grassland

Depth (cm)	Texture	Colour	Mottles	Stone Content	Structure	Pores	Consistence	Structural Condition	Roots	Calcium Carbonate Content	Ferri-manganiferous concentrations	Horizon Boundary
0 – 30	Medium clay loam	10YR4/3 (Brown)	None	3% small to medium sub-angular sandstone fragments and few rounded quartzite pebbles	-	-	-	-	Abundant very fine and fine	Non-calcareous	-	Clear, smooth
30 - 48	Heavy clay loam	10YR4/4 (Dark yellowish brown)	Common distinct ochreous mottles (10YR4/6)	4% small to medium sub-angular sandstone fragments and few rounded quartzite pebbles	Moderately developed coarse angular blocky	<0.5% biopores	Friable	Moderate	Many very fine and fine	Non-calcareous	Few	Clear, smooth
48 – 100	Clay + little Medium sand and sandy clay loam	Mixed 10YR5/3, 5/2, 4/6 (Brown, greyish brown, dark yellowish brown)	Many prominent ochreous mottles (10YR5/6, 4/6)	20% small to medium sub-angular sandstone fragments and few rounded quartzite pebbles	Weakly developed very coarse sub-angular blocky	<0.5% biopores	Friable	Moderate	Common very fine and fine	Non-calcareous	Few	

Soil Pit 1

Wetness Class IV

ALC Grade: 3b

Main limiting factor: Wetness and workability

APPENDIX III

Statement of Soil Physical Characteristics

Statement of Soil Physical Characteristics

Soil Type 1

Topsoil

Texture	Medium clay loam
Colour	10YR3/2, 10YR4/3 very dark greyish brown, brown
Mottles	None
Stones	Median 2% (range 0 - 5%) small to medium sub-angular sandstone fragments plus a few rounded quartzite pebbles
Roots	Abundant very fine and fine
Calcium carbonate	Non-calcareous
Boundary	Clear, smooth
Depth	Median thickness: Well site = 30 cm, range 20 - 32 cm Access route = 28 cm, range 10 - 35 cm

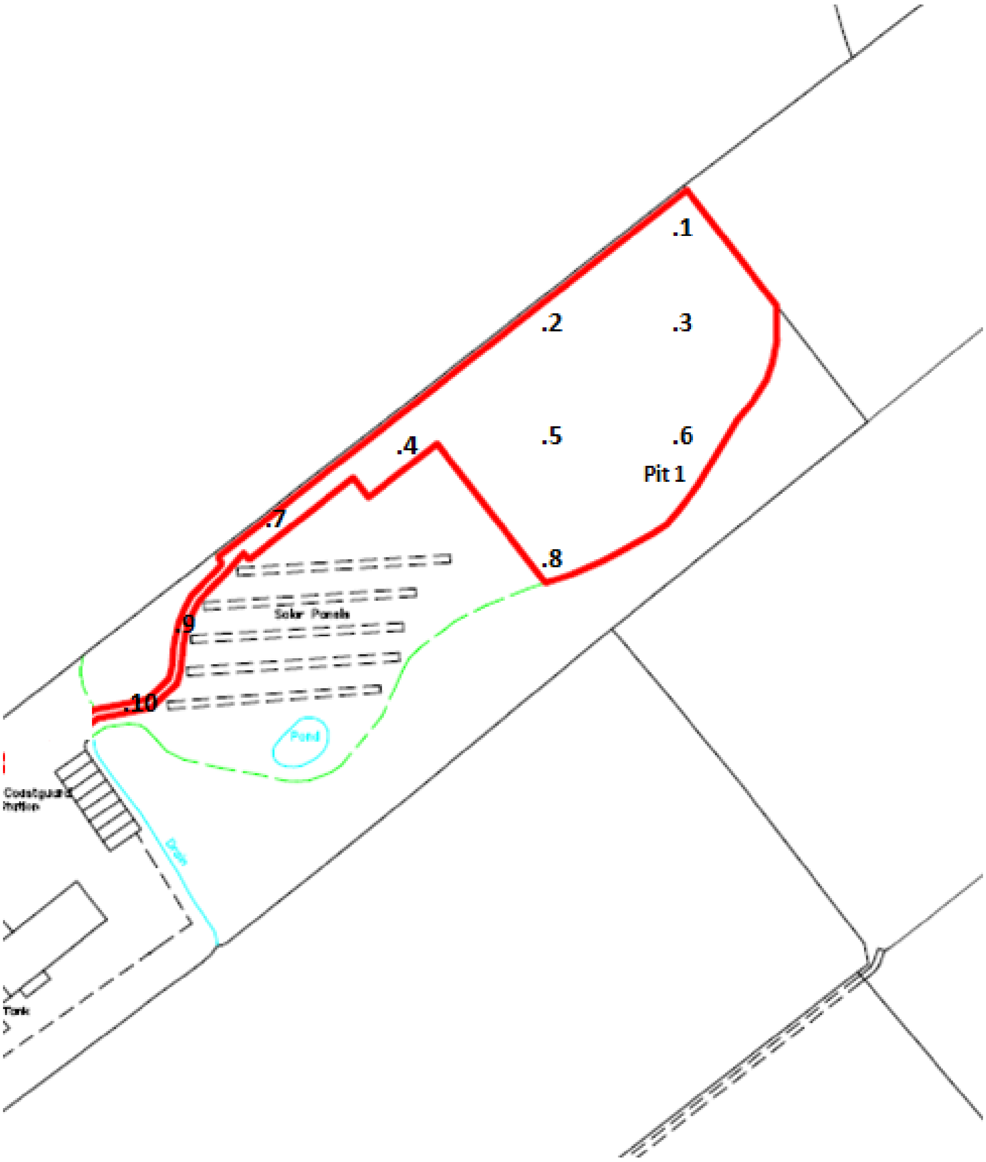
Upper Subsoil

Texture	Heavy clay loam
Colour	10YR4/4 or 10YR5/2, dark yellowish brown, greyish brown
Mottles	Many distinct ochreous mottles (10YR4/6)
Stones	Median 5% (range 0 - 7%) small to medium sub-angular sandstone fragments plus a few rounded quartzite pebbles
Structure	Moderately developed coarse angular blocky
Consistence	Friable
Structural Condition	Moderate
Roots	Many very fine and fine
Calcium carbonate	Non-calcareous
Ferri-manganiferous concentrations	Few
Depth	Median thickness: Well site = 17 cm, range 0 - 30 cm Access route = 22 cm, range 0 - 27 cm

Lower Subsoil

Texture	Clay (with occasionally weathered sandstone)
Colour	Variable but mostly 10YR5/3, brown
Mottles	Very many prominent ochreous mottles
Stones	Median 10% (range 0 - 20%) small to medium sub-angular sandstone fragments plus a few rounded quartzite pebbles
Structure	Weakly developed very coarse sub-angular blocky
Consistence	Friable
Structural Condition	Moderate
Roots	Common very fine and fine
Calcium carbonate	Non-calcareous
Ferri-manganiferous concentrations	Few
Depth	Median thickness: Well site = 73 cm Access route = 70 cm

Figure 1. Auger Boring and Soil Pit Locations



Land at Cloughton Wellsite, Burniston, North Yorkshire

Figure 1. Auger boring and Soil Pit Locations

Survey by: R Leverton BSc, PhD, MRSB, FISoil Sci

Survey Date: 14th October 2024

Key

.1	Auger boring location
Pit 1	Soil pit location
	Survey boundary

Figure 2. Agricultural Land Classification

Land at Cloughton Wellsite, Burniston, North Yorkshire **Figure 2. Agricultural Land Classification**	
Survey by: R Leverton BSc, PhD, MRSB, FISoil Sci	
Survey Date: 14th October 2024	

Key

Subgrade 3b

Survey boundary