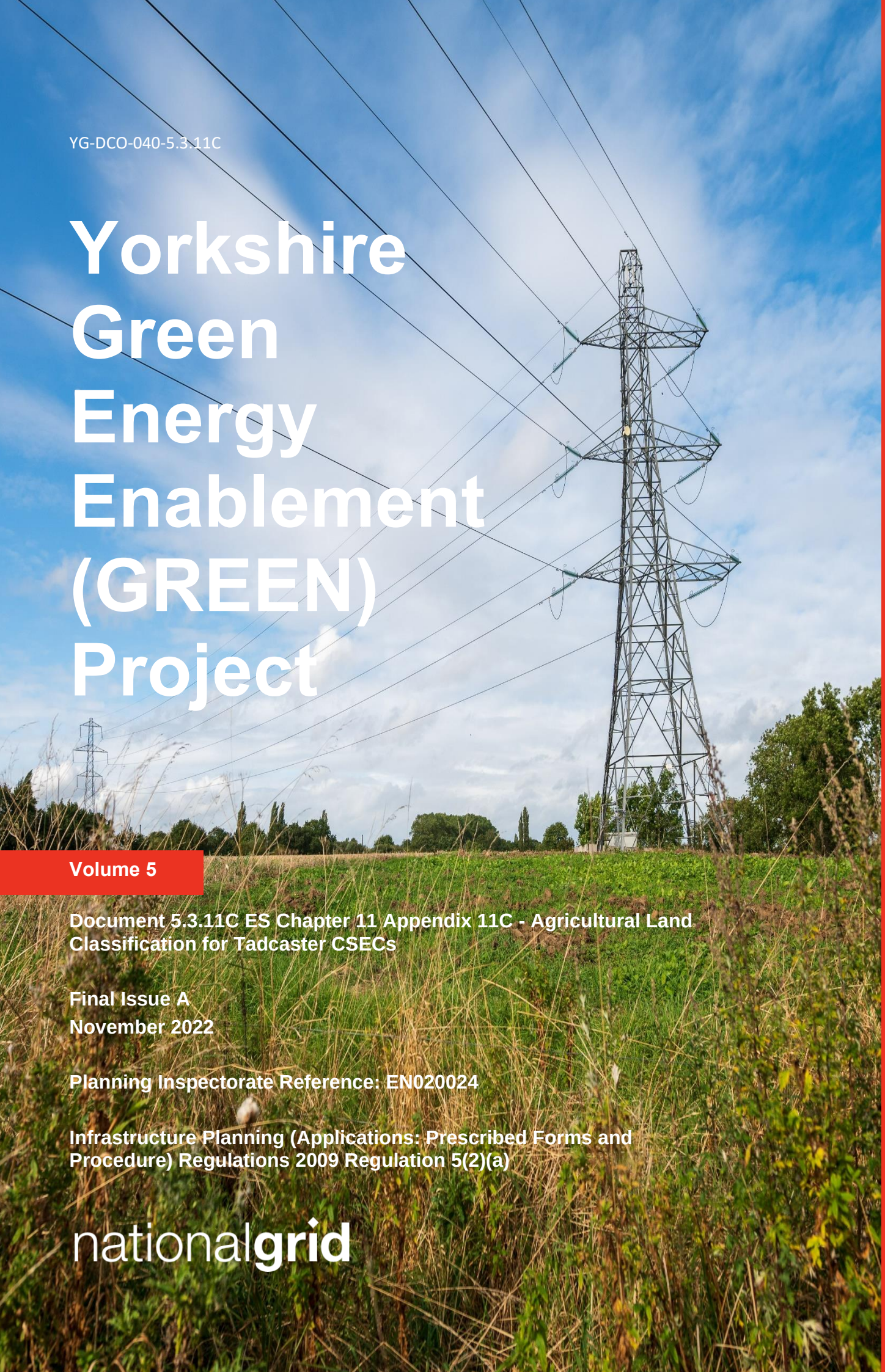
YG-DCO-040-5.3.11C

Yorkshire Green Energy Enablement (GREEN) Project



Volume 5

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1. Agricultural Land Classification for the Tadcaster CSEC Area

1.1 Introduction

Background

1.1.1 Agricultural Land Classification studies have been undertaken to provide an accurate baseline for areas of permanent development or where long-term soil disturbance is likely to take place as part of the Yorkshire Green Energy Enablement Project (referred to as the Project or Yorkshire GREEN). These survey locations were agreed through consultation with Natural England and have informed the Environmental Impact Assessment for **Chapter 11 Agriculture and Soils (Volume 5, Document 5.2.11).**

Site description

1.1.2 This appendix covers the areas where the Tadcaster Cable Sealing End Compounds (CSEC) are proposed; the survey boundary can be seen on **Figure 11.6, Volume 5, Document 5.4.11.**

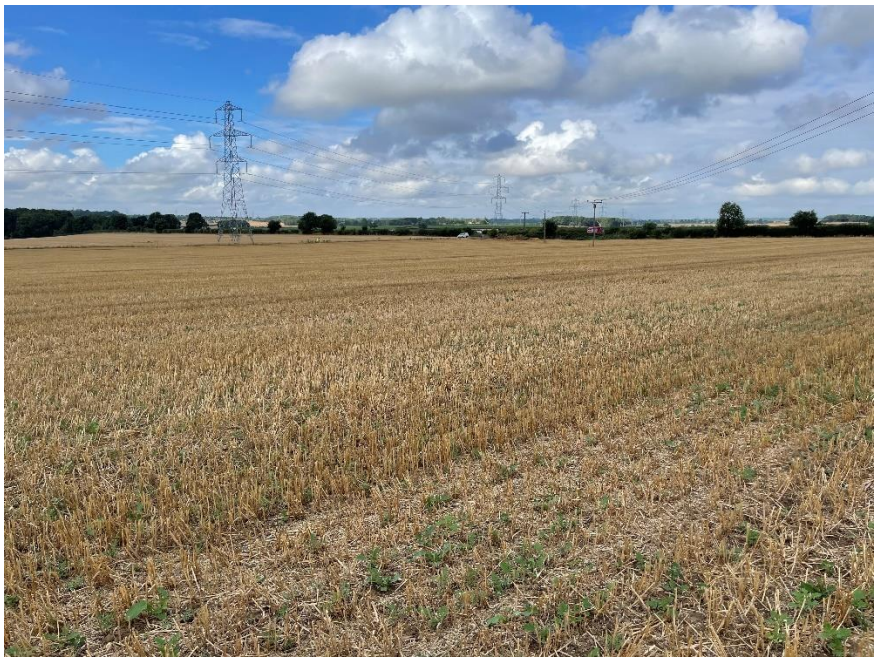
1.1.3 The Site is located within the administrative area of North Yorkshire County Council, and lies to approximately 17 km south west of York, approximate central grid reference SE 459 416.

1.1.4 The Site comprises two agricultural fields, and a small woodland plantation covering an area of approximately 21 ha. Surrounding land use includes further agricultural fields to the north, south, east and west of the Site, with the town of Tadcaster approximately 3km north east of the Site.

1.1.5 The entire site is typically flat lying, with gentle slopes to the south and east, the elevation ranges from 43 to 52 m ASL.

1.1.6 Photograph 1 shows a view of the Site conditions on the day of the survey. The weather was overcast with sunny intervals and one short rain shower.

Plate 1: Site condition on the day of the survey (northern field looking east)



Definitions

1.1.7 The **Agricultural Land Classification** (ALC) system was devised by the Ministry of Agriculture, Fisheries and Food (MAFF) (1988)[1] and is the standard method for determining the quality of agricultural land in England and Wales according to its versatility, productivity and workability, based upon inter-related parameters including climate, relief, soil characteristics and drainage; i.e. ALC assesses land quality based upon the type and level of agricultural production the land can potentially support. The ALC grade is based on the most limiting factor to agricultural production, this may be a climatic limitation, site limitation (climate, gradient, risk of flooding, microrelief), soil limitation (texture and structure, depth, stoniness, chemical), or an interactive limitation (soil wetness, droughtiness, erosion). The ALC places land into one of five grades: Grade 1 (excellent); Grade 2 (very good); Grade 3 (good to moderate) which is divided into Subgrades 3a (good) and 3b (moderate); Grade 4 (poor); and Grade 5 (very poor).

1.1.8 **Best and Most Versatile** (BMV) agricultural land is defined as land of excellent to good agricultural quality (ALC Grades 1, 2 and Subgrade 3a) and is afforded a degree of protection in the National Planning Policy Framework (NPPF), 2021[2].

1.1.9 **Soil series** are the lowest category in the soil classification system and are precisely defined based upon particle-size distribution, parent material (substrate) type, colour, and mineralogical characteristics. **Soil Associations** are groupings of related soil series.

[1] MAFF, October 1988, Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land (ALC011)

[2] Ministry of Housing, Communities and Local Government, 2021, National Planning Policy Framework, https://www.gov.uk/government/publications/national-planning-policy-framework--2

1.2 Desk study

Information Sources

1.2.1 Information about the soils and agricultural land present on the Site was obtained from the published sources outlined in **Table 1.1**. This information assists in preparing the surveyor on likely site conditions prior to commencement of the survey.

Table 1.1 - Data sources used to inform the agriculture and soils assessment

Organisation	Data Source	Data Provided
The Soil Survey of England and Wales	Soils and their Use in Northern England and accompanying 1:250,000 map Sheet 1[3] .	Mapped soil associations and details of soil characteristics.
MAFF (now DEFRA)	Provisional ALC 1:250,000 mapping Yorkshire and The Humber (ALC003) [4].	Mapped ALC distributions - agricultural land quality data.
Natural England	Likelihood of Best and Most Versatile (BMV) Agricultural Land - Strategic scale map Yorkshire and The Humber (ALC015)[5].	1:250,000 scale mapping predicting the likelihood of BMV agricultural land.
Google	Google Maps incorporating Streetview[6] and Google Earth Pro[7].	Aerial and street level imaging of the Project.
Department of the Environment, Farming and Rural Affairs (Defra)	The Government's geographic information website: Multi-Agency Geographical Information for the Countryside MAGIC.gov.uk [8.]	Administrative area boundaries, Provisional and Post-1988 ALC data, and aerial imaging available to view digitally and overlay.
Cranfield University (Knox *et al.)*	Report: Research to develop the evidence base on soil	Soil erosion criteria to inform soil sensitivity classifications.

[3] Soil Survey of England and Wales (1984). Soils and their Use in Northern England and accompanying 1:250,000 map Sheet 1. National Soil Resources Institute; Cranfield.
[4] MAFF (1993). 1:250,000 Provisional Agricultural Land Classification Sheet, Yorkshire and the Humber (ALC003) (online). Available at: https://data.gov.uk/dataset/952421ec-da63-4569-817d-4d6399df40a1/provisional-agricultural-land-classification-alc (Accessed 30 June 2021).
[5] Natural England (2017) Likelihood of Best and Most Versatile (BMV) Agricultural Land - Strategic scale map Strategic scale map Yorkshire and The Humber (ALC015). Natural England; York.
[6] Google (2021). Google Maps incorporating Google Streetview. (online) (Accessed 30 June 2021).
[7] Google (2022). Google Earth Pro. (online). (Accessed April 2022).
[8] Defra (2021). Multi-Agency Geographical Information for the Countryside (MAGIC). (online) Available at https://magic.defra.gov.uk/magicmap.aspx (Accessed 30 June 2021).

Organisation	Data Source	Data Provided
	erosion and water use in agriculture[9].	
Cranfield University	Climatological Data for Agricultural Land Classification[10]	Agroclimatic data to inform ALC.

Soils

1.2.2 The scale of the Soil Survey of England and Wales (1984) mapping is such that it is not accurate to the field level and does not pick up small-scale local variations in soil type. It does however provide a general indication of the soil types within the Site and the wider Borough. The Site lies in an area of Aberford (511a) association.

1.2.3 A summary of the characteristics of this soil association is provided in **Table 1.2**.

Table 1.2 – Summary of soil types and soil erodibility risk for the soil within the study area

Soil Association	Description	Erodability
Aberford (511a)	Shallow, locally brashy well drained calcareous fine loamy soils over limestone. Some deeper calcareous soils in colluvium. Soils are permeable and well drained (Wetness Class I) although minor drainage is required where thin mudstones or clay shales outcrop.	Small Risk (Water).

Agricultural land classification

1.2.4 The Provisional 1:250,000 ALC mapping indicates that agricultural land within the Site is ALC Grade 2 (very good). However, as with the soils data, the scale of the mapping is not accurate at the field level as it does not pick up variations in ALC grade for areas less than approximately 80 ha. However, it does provide an indication of the predominant ALC grading in the wider area.

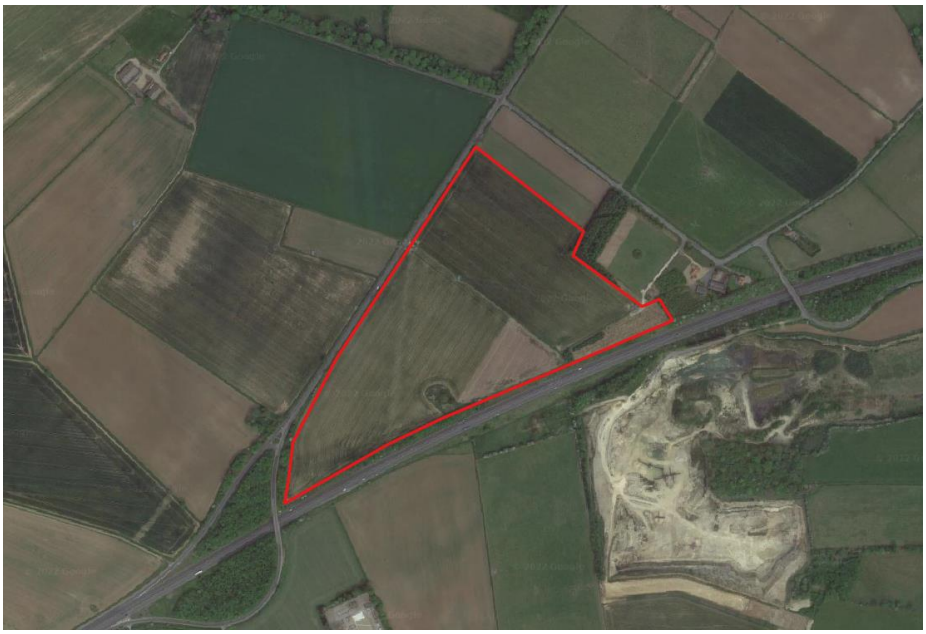
1.2.5 The BMV Likelihood mapping indicates that agricultural land within the Site is of high likelihood of BMV land (20 – 60 % area of BMV).

Aerial imagery

1.2.6 Satellite imagery of the Site, shown in Plate 1, which shows some signs of soil variability in the central and southern field, and no obvious changes in the northern field.

[9] Cranfield University, Knox *et al*. (2015). 'Research to develop the evidence base on soil erosion and water use in agriculture: Final Technical Report. pp147'. (online) (Accessed 30 June 2021).
[10]Cranfield University (2013). Climatological Data for Agricultural Land Classification (online). (Accessed 30 June 2021).

Plate 2: Satellite imagery of the Site (© Google Earth)



1.3 Site Survey

Methodology

1.3.1 A soil survey was undertaken from 30 and 31 August 2022 by experienced soil surveyors using augered soil cores and soil profile pits. A detailed soil survey was undertaken with 1 point per ha.

1.3.2 Auger cores were taken using a 70 mm diameter hand-held Edelman auger, capable of sampling to a maximum depth of 100 cm; the soil profile pit was excavated, using a spade to a maximum depth of 75 cm, sufficient to evaluate the *in situ* structure of the soil profile.

1.3.3 A total of 22 points, 19 cores and 3 pits were inspected. As shown on **Figure 11.6, Volume 5, Document 5.4.11**, the survey points were distributed across the Site, giving a survey density of more than one point per hectare in the areas of agricultural land for detailed ALC survey, and a less densely distributed to verify the existing ALC survey. This includes all of the conditions present on Site, above the recommendations set out in standard survey and ALC guidance and methodology. The purpose of the survey was to provide details of soil profile characteristics and to inform the ALC assessment.

1.3.4 To confirm the soil texture across the Site, ten soil samples were sent for analysis of particle size distribution by NRM Laboratories, accredited by UKAS to the internationally recognised standard for competence; ISO/IEC 17025.

Site description

1.3.5 The northern and central field were under a cereal crop which appeared to be wheat. The southern field was under a cover crop or oil seed rape.

1.3.6 A large hedgerow separates the southern field form the northern two, with smaller hedgerows between the roads and surrounding fields.

Soils

1.3.7 Soils from the Aberford (511a) association were identified during the site survey, the main variation on the site was soil depth, which varied from 30 to 100 cm. A description and image of the Aberford soil association is provided below.

Aberford (511a) Association

1.3.8 The topsoil, depth averaged 34 cm, with a range of clay loam textures from heavy to sandy, dark brown colour (10YR 3/3), with no mottling and a granular to subangular blocky structure. The soil was moderately developed with fine to medium ped sizes and a very friable to firm consistency. The stone content varied from 5 to 10 %of stoned larger than 2cm, with no stones larger than 6cm.

1.3.9 The subsoil depth averaged 62 cm, and ranged in texture from sandy silt loams to heavy silty clay loams, colours ranged from brown (7.5YR 4/4) to red in (5YR 4/6) and no mottling was observed. Biopores were observed in most areas within the subsoil and the structure was granular to subangular blocky with weak to moderate development. The ped size was fine to medium ped size and the consistence was very friable to friable. The stone content varied from 5 to 10 % of stones larger than 2 cm, with no stones larger than 6cm.

1.3.10 The soils in this series are all of Wetness Class 1, with no signs of waterlogging in any soil horizons.

1.3.11 Example photographs of this soil association are shown below.

Plate 3: Point 16 – Aberford Association – Wetness Class 1

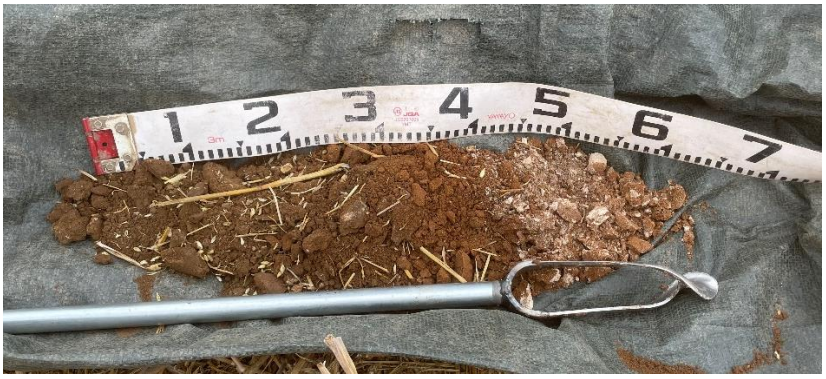
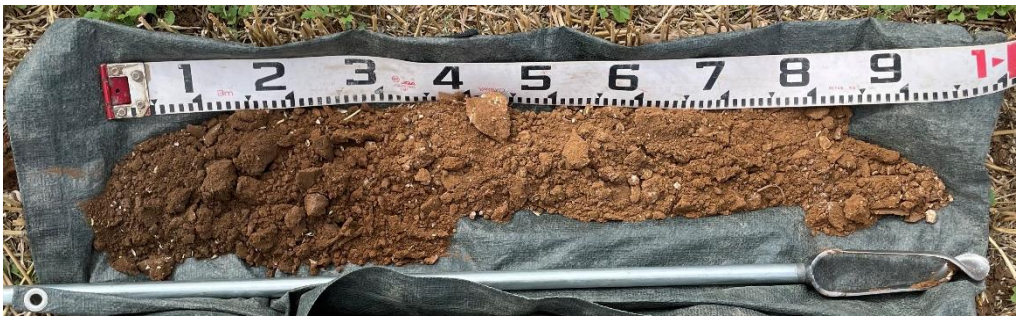


Plate 4: Point 9 – Aberford Association – Wetness Class 1



Agroclimatic data

1.3.12 Agroclimatic data was taken from the nearest meteorological stations and interpolated to obtain site-specific values, see **Table 1.3**.This was then used to establish whether the agricultural land quality of the Site is limited by climate and, in conjunction with soil profile characteristics, wetness and droughtiness.

1.3.13 It was found that the climate did not poses a limitation to the ALC on Site.

Table 1.3 – Interpolated agroclimatic data for the Site

Measure (units)	Value
Average annual rainfall (mm)	664
Accumulated Temperature (0C)	1354
Field Capacity Duration (FCD) (days)	154
Moisture Deficit Wheat (mm)	99.4
Moisture Deficit Potatoes (mm)	88.2

Direct limitations to ALC grade

1.3.14 This section summarises the direct limitations to ALC grade at the Site (for detailed assessment of each Survey Point refer to **Annex 11C.1**).

1.3.15 There were direct limitations to ALC Grade from soil depth at points 2, 18, 19, which limited the ALC grade to Grade 2 with a soil depth between 45 and 60 cm, and at points 7, 11a, 13, 15, 20, 25, and 27 which limited the ALC to Subgrade 3a with a soil depth between 30 and 45 cm.

1.3.16 There was a direct limitation to ALC grade at the site where topsoil stoniness was 10% of stones greater than 2cm, which limited the ALC Grade to Grade 2.

1.3.17 There were no limitation to ALC grade due to site limitations (climate, gradient, risk of flooding, microrelief) or soil limitations (texture and structure, chemical).

Interactive limitations to ALC grade

1.3.18 This section summarises the interactive limitations (soil wetness, droughtiness, erosion) to ALC grade at the Site (for detailed assessment of each Survey Point refer to Appendix 1).

1.3.19 The combination of 154 Field Capacity Days, heavy silty clay loam texture with a weak development cause a limitation in the ALC grade at point 21 to Grade 2 for wetness. Wetness did not pose a limitation elsewhere on the site.

1.3.20 Droughtiness poses a limitation to the ALC grade for some points where the soil depth and heavy textured soil limits the available water for plants throughout the growing season. Calculations indicate that the droughtiness will be moderate for potatoes and moderate to high for wheat, resulting in a limitation to ALC Grade 2, Subgrade 3a and 3b at many points within the Site

1.4 Overall agricultural land classification

1.4.1 Grade boundaries were drawn based on field observations and ALC calculations from individual points, to create the final ALC mapping units. The ALC map comprises Grade 2, Subgrade 3a and Subgrade 3b agricultural land, with some areas of non-agricultural land. The main differentiation between gradings at the Site was the soil depth and droughtiness.

1.4.2 A description of each grade is provided below, a summary of the ALC gradings for the site is shown in **Table 1.4**, and geographically in **Figure 11.6, Volume 5, Document 5.4.11**.

Grade 2

1.4.3 Areas of land showing only slight limitations to agricultural production due to droughtiness primarily for wheat, and topsoil stoniness of 10% greater than 2 cm.

Subgrade 3a

1.4.4 Areas of land with some limitations to agricultural production due to droughtiness for wheat and potatoes.

Subgrade 3b

1.4.5 Areas of land with moderate limitations to agricultural production due to droughtiness, for wheat and potatoes, primarily as a limitation due to reduced soil depth.

Non-agricultural

1.4.6 Land not used for agricultural production. A portion of the land within the survey boundary in the eastern field is now used for conifer plantation and is not in agricultural use. There is also a portion of the Survey area along the southern boundary thar is mixed woodland and is not used for agriculture.

Table 1.4 – Summary of Agricultural Land Classification at the Site

ALC or other land category	Area (ha)	Percentage (%)
Grade 1 (excellent)	0.0	0.0
Grade 2 (very good)	**2.31**	**10.98**
Subgrade 3a (good)	**10.41**	**49.50**
Subgrade 3b (moderate)	**7.09**	**33.71**
Grade 4 (poor)	0.0	0.0
Grade 5 (very poor)	0.0	0.0
Non-agricultural	**1.22**	**5.80**
Total	**21.03**	**100**

1.5 Summary and Conclusions

1.5.1 The agricultural land within the survey boundary is made up of Grade 2 (very good quality, 2.31 ha, 10.98 %), Subgrade 3a (good quality, 10.41 ha, 49.50%) and Subgrade 3b (moderate quality, 7.09 ha, 33.71 %) agricultural land. The main differentiation between gradings at the Site was the degree of droughtiness for wheat and potatoes due to soil depth. A small area of non-agricultural land (1.22 ha, 5.80 %) is present where conifer plantation is present within the eastern field, and woodland in an area along the southern boundary.

1.5.2 The proposed location of the CSEC and access roads for the Project would be located on an area of Grade 2, Subgrade 3a and Subgrade 3b agricultural land.

1.5.3 The soils in the survey boundary are of a medium to heavy clay loam texture where occasional sandy loams are present with heavy clays and silty clays of the Aberford (511a) soil association.

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Annex 11C.1
Soil Survey Record and ALC Breakdown

Survey point number corresponds with the numbers on **Figure 11.1, Volume 5, Document 5.4.11** and in the other Annexes.

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Soil Survey Record and ALC Calculations

Legend for non-self-explanatory terms:

Horizons - number of different horizons identified within the profile
Type - type of sample, auger core or soil profile pit dug using a spade
Depth - depth to the bottom of the (horizon number) horizon in cm
Texture - C - clay, ZC - silty clay, SC - sandy clay, CL - clay loam, SCL - sandy clay loam, ZCL - silty clay loam, SL - sandy loam, LS - loamy sand, S - sand;
CL and ZCL textures are subdivided into medium (M) and heavy (H) classes according to clay content, as follows: M medium (less than 27 % clay), H heavy (27-35 % clay); F, M and C refer to fine, medium and coarse, respectively, and are subdivisions of S, LS, SL, and SZL textures; O - organic, P - peat or peaty, HP - humified (highly decomposed peat), FP - fibrous peat, SFP - semi-fibrous peat; MZ - marine light silts
Matrix (main) colour - dominant colour of the soil; **Hue** - Munsell colour hue; **Value** - Munsell colour value; **Chroma** - Munsell colour chroma
Mottling - spots and blotches of different colour than the dominant matrix colour
Ped faces - surfaces of the primary soil fragments into which the soil naturally breaks up upon excavating
FeMn - ferri-manganifeours concertions
Biopores - 'yes' if >0.5 % biopores greater than 0.5 mm diameter present (by area)
Stones > 2 cm up to % - maximum percentage of 2 - 6 cm diameter stones
Stones > 6 cm up to % - maximum percentage of > 6 cm diameter stones
Type - H - All hard rocks or stones (those which cannot be scratched with a finger nail); SS - Soft, medium or coarse grained sandstones; SIM - Soft 'weathered' igneous or metamorphic rocks or stones; SL - Soft oolitic or dolomitic limestones; SFS - Soft fine-grained sandstones; SAZ - Soft, argillaceous or silty rocks or stones; CH - Chalk or chalk stones; GRH - Gravel[1] with non-porous (hard) stones; GRS - Gravel[1] with porous stones (mainly soft stone types listed);1 - Gravel with at least 70% rounded stones by volume
Structure type - SG - single grain; GR - granular; SAB - subangular blocky; AB - angular blocky; PR - prismatic; PL - platy; MAS - massive
Dev - Development, how well the structure is developed; W - weak; M - moderate; S - strong
Consistence - Soil consistence (strength); L - loose; VFR - very friable; FR - friable; FIR - firm; VFIR - very firm; EXFIR - extremely firm; EXHD - extremely hard
Gley - depth to gleying
SPL - depth to slowly permeable layer
Wetness Class - classification of the soil according to the depth and duration of waterlogging in the soil profile, the higher the class, the longer and at the shallower depth the soil is wet

Overall ALC - this part of the table combines results of the classification for each of the limitations

Soil profile descriptions

Survey point	Type	Grad-ient	Soil distur-bed or resto-red	Horizon	Depth	Texture	Matrix (main) colour			Peat-specific properties					Mottling			
							Hue	Value	Chroma	Von Post	Water content (B)	Fine fibre content (F)	Coarse fibre content (R)	Wood remains (W)	Abundan-ce up to %	Hue	Value	Chroma
2	Core	1	no	1 2 3 4 5	45	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
3	Core	7	no	1 2 3 4 5	53 91	MCL HZCL	10YR 7.5YR	3 4	3 4	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
4	Core	0	no	1 2 3 4 5	30 60	MCL MZCL	10YR 7.5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
5	Core	2	no	1 2 3 4 5	30 95	SCL MSL	10YR 5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
7	Core	0	no	1 2 3 4 5	30 40	MCL LMS	10YR 7.5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
9a	Pit	0	no	1 2 3 4 5	30 80	MZCL MCL	10YR 5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
9	Core	0	no	1 2 3 4 5	50 90	SCL MSL	10YR 5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
10	Pit	0	no	1 2 3 4 5	30 60	SCL MSZL	10YR 5YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
11a	Pit	0	no	1 2 3 4 5	30	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
11	Core	0	no	1 2 3 4 5	35 65	MCL SCL	10YR 10YR	3 4	3 6	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
13	Core	0	no	1 2 3 4 5	35	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
15	Core	1	no	1 2 3 4 5	25 42	MCL MCL	10YR 10YR	3 3	3 4	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
16	Core	0	no	1 2 3 4 5	28 63	MCL MCL	10YR 10YR	3 6	3 4	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
18	Core	0	no	1 2 3 4 5	32 47	MCL MCL	10YR 7.5YR	3 6	3 4	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0
19	Core	0	no	1 2 3 4 5	43 54	MCL MCL	10YR 10YR	3 3	3 4	n/a n/a	n/a n/a	n/a n/a	n/a n/a	n/a n/a	0 0	0 0	0 0	0 0

Soil profile descriptions continued

Survey point	Ped faces				FeMn	Biopo-	Stones and rocks			Structure			Consis-	Calca-	Gley-	SPL	Notes
	Colour different to matrix	Hue	Value	Chroma	up to %	res	> 2 cm up to %	> 6 cm up to %	Type	Type	Deve- lop- ment	Ped size	tence	reous	ing		
2	no	n/a	n/a	n/a	0	yes	10	0	H	SAB	M	F	VFR	no	NO	NO	Refused on stone.
3	no no	n/a n/a	n/a n/a	n/a n/a	0 2	yes yes	5 5	0 0	H H	SAB SAB	M W	F F	FIR FR	no no	NO NO	NO NO	-
4	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes no	10 10	0 0	H H	SAB GR	M W	F F	FR VFR	no no	NO NO	NO NO	Weathered bedrock at base.
5	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes yes	10 5	0 0	H H	SAB SAB	M W	F M	VFR VFR	no no	NO NO	NO NO	Rock at base.
7	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes yes	10 5	0 0	H H	SAB SAB	M W	F F	VFR FR	no no	NO NO	NO NO	Parent material from 40cm.
9a	no no	n/a n/a	n/a n/a	n/a n/a	0 2	yes yes	10 5	0 0	H H	SAB SAB	M M	M M	FR FIR	no no	NO NO	NO NO	Weathered bedrock from 80cm to 1.20cm.
9	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes no	10 5	0 0	H H	SAB GR	M W	F F	FR VFR	no no	NO NO	NO NO	Clay layer from 85-90cm, firm.
10	no no	n/a n/a	n/a n/a	n/a n/a	0 2	yes yes	10 5	0 0	H H	SAB SAB	M M	M M	FR FIR	no no	NO NO	NO NO	Weathered bedrock 60cm to 120cm, chalk.
11a	no	n/a	n/a	n/a	0	yes	10	0	H	SAB	M	M	VFR	no	NO	NO	Shallow topsoil very thin layer of subsoil in some locations but limited.
11	no no	n/a n/a	n/a n/a	n/a n/a	0 2	yes yes	5 5	0 0	H H	SAB SAB	M W	M F	VFR VFR	no no	NO NO	NO NO	50-60cm subsoil and white wesathered bedrock,calcerous.
13	no	n/a	n/a	n/a	0	yes	10	5	H	SAB	M	F	VFR	no	NO	NO	Parent material at base.
15	no no	n/a n/a	n/a n/a	n/a n/a	2 0	yes yes	5 5	0 0	H H	SAB SAB	M M	M F	FR FR	no no	NO NO	NO NO	Parent material from 40cm.
16	no no	n/a n/a	n/a n/a	n/a n/a	2 2	yes yes	5 5	0 0	H H	SAB SAB	M M	F F	FR FR	no no	NO NO	NO NO	Bedrock at 63cm.
18	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes yes	5 0	0 0	H n/a	SAB GR	M W	F F	FR VFR	no no	NO NO	NO NO	Refused on rock.
19	no no	n/a n/a	n/a n/a	n/a n/a	0 0	yes yes	5 5	0 0	SL H	GR SAB	M W	F F	FR FR	no no	NO NO	NO NO	-

ALC for areas represented by individual survey points													
Survey point	**Wetness class**	**Climate**	**Gradient**	**Summer flood risk**	**Winter flood risk**	**Topsoil texture**	**Soil Depth**	**Topsoil stoniness**	**Wetness**	**Droughti-ness**	**Other (see "Limited by" column)**	**ALC Grade**	**Limited by**
2	1	1	1	1	1	1	2	2	1	3b	1	**3b**	Droughti-ness
3	1	1	1	1	1	1	1	1	1	2	1	**3b**	Pattern
4	1	1	1	1	1	1	1	2	1	3a	1	**3a**	Droughti-ness
5	1	1	1	1	1	1	1	2	1	1	1	**3a**	Pattern
7	1	1	1	1	1	1	3a	2	1	3b	1	**3a**	Pattern
9a	1	1	1	1	1	1	1	2	1	1	1	**2**	Topsoil stoniness
9	1	1	1	1	1	1	1	2	1	2	1	**2**	Topsoil stoniness Droughti-ness
10	1	1	1	1	1	1	1	2	1	3a	1	**3a**	Droughti-ness
11a	1	1	1	1	1	1	3a	2	1	4	1	**3b**	Pattern
11	1	1	1	1	1	1	1	1	1	2	1	**2**	Droughti-ness
13	1	1	1	1	1	1	3a	2	1	3b	1	**3b**	Droughti-ness
15	1	1	1	1	1	1	3a	1	1	3b	1	**3b**	Droughti-ness
16	1	1	1	1	1	1	1	1	1	2	1	**2**	Droughti-ness
18	1	1	1	1	1	1	2	1	1	3a	1	**3a**	Droughti-ness
19	1	1	1	1	1	1	2	1	1	3a	1	**3a**	Droughti-ness

Soil profile descriptions

Survey point	Type	Grad-ient	Soil distur-bed or resto-red	Horizon	Depth	Texture	Matrix (main) colour			Peat-specific properties					Mottling			
							Hue	Value	Chroma	Von Post	Water content (B)	Fine fibre content (F)	Coarse fibre content (R)	Wood remains (W)	Abundan-ce up to %	Hue	Value	Chroma
20	**Core**	0	no	1	28	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2	42	MCL	7.5YR	6	4	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				3														
				4														
				5														
21	**Core**	0	no	1	32	HCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2	67	HZCL	7.5YR	6	6	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				3														
				4														
				5														
22	**Core**	0	no	1	20	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2	33	MCL	5YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				3	100	MCL	10YR	4	6	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				4														
				5														
23	**Core**	0	no	1	34	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2														
				3														
				4														
				5														
25	**Core**	0	no	1	40	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2														
				3														
				4														
				5														
27	**Core**	0	no	1	25	MCL	10YR	3	3	n/a	n/a	n/a	n/a	n/a	0	0	0	0
				2														
				3														
				4														
				5														

Soil profile descriptions continued

Survey point	Ped faces				FeMn up to %	Biopo-res	Stones and rocks			Structure			Consis-tence	Calca-reous	Gley-ing	SPL	Notes
	Colour different to matrix	Hue	Value	Chroma			> 2 cm up to %	> 6 cm up to %	Type	Type	Deve-lop-ment	Ped size					
20	no	n/a	n/a	n/a	0	yes	5	0	H	SAB	M	F	VFR	no	NO	NO	Refused on rock.
	no	n/a	n/a	n/a	0	yes	5	0	H	SAB	W	F	VFR	no	NO	NO	
21	no	n/a	n/a	n/a	0	yes	5	0	SL	SAB	M	F	FR	no	NO	NO	Refused on bedrock.
	no	n/a	n/a	n/a	2	yes	5	0	H	GR	W	F	VFR	no	NO	NO	
22	no	n/a	n/a	n/a	0	yes	5	0	H	SAB	M	F	FR	no	NO	NO	-
	no	n/a	n/a	n/a	0	yes	0	0	n/a	GR	W	F	VFR	no	NO	NO	
	no	n/a	n/a	n/a	0	yes	5	0	H	GR	W	F	VFR	no	NO	NO	
23	no	n/a	n/a	n/a	0	yes	5	0	SL	SAB	M	F	FIR	no	NO	NO	Refused on rock.
25	no	n/a	n/a	n/a	0	yes	10	0	H	GR	M	F	VFR	no	NO	NO	Subsoil just coming in at base, refused on rock.
27	no	n/a	n/a	n/a	0	yes	5	0	H	GR	M	F	VFR	no	NO	NO	Very stony at base.

ALC for areas represented by individual survey points													
Survey point	**Wetness class**	**Climate**	**Gradient**	**Summer flood risk**	**Winter flood risk**	**Topsoil texture**	**Soil Depth**	**Topsoil stoniness**	**Wetness**	**Droughti-ness**	**Other (see "Limited by" column)**	**ALC Grade**	**Limited by**
20	1	1	1	1	1	1	3a	1	1	3b	1	**3b**	Droughti-ness
21	1	1	1	1	1	1	1	1	2	2	1	**3a**	Pattern
22	1	1	1	1	1	1	1	1	1	1	1	**3a**	Pattern
23	1	1	1	1	1	1	3a	1	1	3b	1	**3b**	Droughti-ness
25	1	1	1	1	1	1	3a	2	1	3b	1	**3b**	Droughti-ness
27	1	1	1	1	1	1	3b	1	1	4	1	**3b**	Pattern

Annex 11C.2
Droughtiness Calculations

Survey point number corresponds with the numbers on **Figure 11.1, Volume 5, Document 5.4.11,** and in the other Annexes.

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Droughtiness Calculations

Abbreviations for non self-explanatory terms:

TAv – Total amount of soil water available to plants, considered to be the volumetric soil water content between 0.05 and 15 bar suction or, in case of sands and loamy sands, 0.10 and 15 bar suction. These suctions approximate to the conditions of field capacity and wilting point (when the plants can extract no more moisture from the soil).

EAv – Easily available water, held in the soil between 0.05 and 2.0 bar suction, used for calculating cereal available water below 50 cm depth where root systems are less well developed, and the plant's ability to extract water is diminished.

Values of TAv and EAv are estimated for each horizon based on soil texture and structural condition according to the ALC guidelines (MAFF, 1988).

AP – crop adjusted available water capacity, a measure of the quantity of water held in the soil profile which can be taken up by a specific crop.

MD – the moisture deficit term used in the ALC droughtiness assessment is a crop-related meteorological variable which represents the balance between rainfall and potential evapotranspiration calculated over a critical portion of the growing season.

MB – moisture balance: MB=AP-MD, MB for wheat and potatoes determines limitation by droughtiness

Data inputs										Droughtiness calculations																												
						Av. water (soil)		Av. water (stones)		AP wheat													AP potatoes																Limited to ALC grade
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	
2	1	45	MCL	10	GOOD	18		1.0	0.5	TAv	0	45	45	18	90	1	10	734	73	-26	0	45	45	18	90	1	10	734	73	-15	3b
										EAv	0	45	0	0	90	1	10	0													
	2									TAv	45	45	0	0	100	0	0	0			45	45	0	0	100	0	0	0			
										EAv	45	45	0	0	100	0	0	0													
	3									TAv	45	45	0	0	100	0	0	0			45	45	0	0	100	0	0	0			
										EAv	45	45	0	0	100	0	0	0													
	4									TAv	45	45	0	0	100	0	0	0			45	45	25	0	100	0	0	0			
										EAv	45	45	0	0	100	0	0	0													
	5									TAv	45	45	0	0	100	0	0	0			45	45	0	0	100	0	0	0			
										EAv	45	45	0	0	100	0	0	0													
3	1	53	MCL	5	GOOD	18		1.0	0.5	TAv	0	53	50	18	95	1	5	858	129	30	0	53	53	18	95	1	5	909	125	37	2
										EAv	0	53	3	0	95	1	5	0													
	2	38	HZCL	5	GOOD	21	12	1.0	0.5	TAv	53	91	0	21	95	1	5	0			53	91	17	21	95	1	5	340			
										EAv	53	91	38	12	95	1	5	434													
	3									TAv	91	91	0	0	100	0	0	0			91	91	0	0	100	0	0	0			
										EAv	91	91	0	0	100	0	0	0													
	4									TAv	91	91	0	0	100	0	0	0			91	91	0	0	100	0	0	0			
										EAv	91	91	0	0	100	0	0	0													
	5									TAv	91	91	0	0	100	0	0	0			91	91	0	0	100	0	0	0			
										EAv	91	91	0	0	100	0	0	0													
4	1	30	MCL	10	GOOD	18		1.0	0.5	TAv	0	30	30	18	90	1	10	489	98	-2	0	30	30	18	90	1	10	489	106	18	3a
										EAv	0	30	0	0	90	1	10	0													
	2	30	MZCL	10	GOOD	21	12	1.0	0.5	TAv	30	60	20	21	90	1	10	380			30	60	30	21	90	1	10	570			
										EAv	30	60	10	12	90	1	10	109													
	3									TAv	60	60	0	0	100	0	0	0			60	60	0	0	100	0	0	0			
										EAv	60	60	0	0	100	0	0	0													
	4									TAv	60	60	0	0	100	0	0	0			60	60	10	0	100	0	0	0			
										EAv	60	60	0	0	100	0	0	0													
	5									TAv	60	60	0	0	100	0	0	0			60	60	0	0	100	0	0	0			
										EAv	60	60	0	0	100	0	0	0													
5	1	30	SCL	10	GOOD	17		1.0	0.5	TAv	0	30	30	17	90	1	10	462	134	35	0	30	30	17	90	1	10	462	111	23	1
										EAv	0	30	0	0	90	1	10	0													
	2	65	MSL	5	GOOD	17	13	1.0	0.5	TAv	30	95	20	17	95	1	5	324			30	95	40	17	95	1	5	648			
										EAv	30	95	45	13	95	1	5	557													
	3									TAv	95	95	0	0	100	0	0	0			95	95	0	0	100	0	0	0			
										EAv	95	95	0	0	100	0	0	0													
	4									TAv	95	95	0	0	100	0	0	0			95	95	0	0	100	0	0	0			
										EAv	95	95	0	0	100	0	0	0													
	5									TAv	95	95	0	0	100	0	0	0			95	95	0	0	100	0	0	0			
										EAv	95	95	0	0	100	0	0	0													
7	1	30	MCL	10	GOOD	18		1.0	0.5	TAv	0	30	30	18	90	1	10	489	60	-39	0	30	30	18	90	1	10	489	60	-28	3b
										EAv	0	30	0	0	90	1	10	0													
	2	10	LMS	5	GOOD	12	9	1.0	0.5	TAv	30	40	10	12	95	1	5	115			30	40	10	12	95	1	5	115			
										EAv	30	40	0	9	95	1	5	0													
	3									TAv	40	40	0	0	100	0	0	0			40	40	0	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0													
	4									TAv	40	40	0	0	100	0	0	0			40	40	30	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0													
	5									TAv	40	40	0	0	100	0	0	0			40	40	0	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0													
9a	1	30	MZCL	10	GOOD	19		1.0	0.5	TAv	0	30	30	19	90	1	10	516	132	32	0	30	30	19	90	1	10	516	132	43	1
										EAv	0	30	0	0	90	1	10	0													
	2	50	MCL	5	GOOD	21	14	1.0	0.5	TAv	30	80	20	21	95	1	5	400			30	80	40	21	95	1	5	800			
										EAv	30	80	30	14	95	1	5	400													
	3									TAv	80	80	0	0	100	0	0	0			80	80	0	0	100	0	0	0			
										EAv	80	80	0	0	100	0	0	0													
	4									TAv	80	80	0	0	100	0	0	0			80	80	0	0	100	0	0	0			
										EAv	80	80	0	0	100	0	0	0													
	5									TAv	80	80	0	0	100	0	0	0			80	80	0	0	100	0	0	0			
										EAv	80	80	0	0	100	0	0	0													
9	1	50	SCL	10	GOOD	17		1.0	0.5	TAv	0	50	50	17	90	1	10	770	127	27	0	50	50	17	90	1	10	770	109	21	2
										EAv	0	50	0	0	90	1	10	0													
	2	40	MSL	5	GOOD	17	13	1.0	0.5	TAv	50	90	0	17	95	1	5	0			50	90	20	17	95	1	5	324			
										EAv	50	90	40	13	95	1	5	495													
	3									TAv	90	90	0	0	100	0	0	0			90	90	0	0	100	0	0	0			
										EAv	90	90	0	0	100	0	0	0													
	4									TAv	90	90	0	0	100	0	0	0			90	90	0	0	100	0	0	0			
										EAv	90	90	0	0	100	0	0	0													
	5									TAv	90	90	0	0	100	0	0	0			90	90	0	0	100	0	0	0			
										EAv	90	90	0	0	100	0	0	0													

Data inputs									Droughtiness calculations																								
					Av. water (soil)		Av. water (stones)		AP wheat													AP potatoes												Limited to ALC grade
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	
10	1	30	SCL	10	GOOD	17		1.0	0.5	TAv	0	30	30	17	90	1	10	462			0	30	30	17	90	1	10	462			
										EAv	0	30	0	0	90	1	10	0													
	2	30	MSZL	5	MODERATE	17	11	1.0	0.5	TAv	30	60	20	17	95	1	5	324			30	60	30	17	95	1	5	486			
										EAv	30	60	10	11	95	1	5	105													
	3									TAv	60	60	0	0	100	0	0	0	89	-10	60	60	0	0	100	0	0	0	95	7	3a
										EAv	60	60	0	0	100	0	0	0													
	4									TAv	60	60	0	0	100	0	0	0			60	60	10	0	100	0	0	0			
										EAv	60	60	0	0	100	0	0	0													
	5									TAv	60	60	0	0	100	0	0	0			60	60	0	0	100	0	0	0			
										EAv	60	60	0	0	100	0	0	0													
11a	1	30	MCL	10	GOOD	18		1.0	0.5	TAv	0	30	30	18	90	1	10	489			0	30	30	18	90	1	10	489			
										EAv	0	30	0	0	90	1	10	0													
	2									TAv	30	30	0	0	100	0	0	0			30	30	0	0	100	0	0	0			
										EAv	30	30	0	0	100	0	0	0													
	3									TAv	30	30	0	0	100	0	0	0			30	30	0	0	100	0	0	0			
										EAv	30	30	0	0	100	0	0	0	49	-51									49	-39	4
	4									TAv	30	30	0	0	100	0	0	0			30	30	40	0	100	0	0	0			
										EAv	30	30	0	0	100	0	0	0													
	5									TAv	30	30	0	0	100	0	0	0			30	30	0	0	100	0	0	0			
										EAv	30	30	0	0	100	0	0	0													
11	1	35	MCL	5	GOOD	18		1.0	0.5	TAv	0	35	35	18	95	1	5	600			0	35	35	18	95	1	5	600			
										EAv	0	35	0	0	95	1	5	0													
	2	30	SCL	5	GOOD	19	14	1.0	0.5	TAv	35	65	15	19	95	1	5	272			35	65	30	19	95	1	5	543			
										EAv	35	65	15	14	95	1	5	200													
	3									TAv	65	65	0	0	100	0	0	0			65	65	0	0	100	0	0	0			
										EAv	65	65	0	0	100	0	0	0	107	8									114	26	2
	4									TAv	65	65	0	0	100	0	0	0			65	65	5	0	100	0	0	0			
										EAv	65	65	0	0	100	0	0	0													
	5									TAv	65	65	0	0	100	0	0	0			65	65	0	0	100	0	0	0			
										EAv	65	65	0	0	100	0	0	0													
13	1	35	MCL	15	GOOD	18		1.0	0.5	TAv	0	35	35	18	85	1	15	541			0	35	35	18	85	1	15	541			
										EAv	0	35	0	0	85	1	15	0													
	2									TAv	35	35	0	0	100	0	0	0			35	35	0	0	100	0	0	0			
										EAv	35	35	0	0	100	0	0	0													
	3									TAv	35	35	0	0	100	0	0	0			35	35	0	0	100	0	0	0			
										EAv	35	35	0	0	100	0	0	0	54	-45									54	-34	3b
	4									TAv	35	35	0	0	100	0	0	0			35	35	35	0	100	0	0	0			
										EAv	35	35	0	0	100	0	0	0													
	5									TAv	35	35	0	0	100	0	0	0			35	35	0	0	100	0	0	0			
										EAv	35	35	0	0	100	0	0	0													
15	1	25	MCL	5	GOOD	18		1.0	0.5	TAv	0	25	25	18	95	1	5	429			0	25	25	18	95	1	5	429			
										EAv	0	25	0	0	95	1	5	0													
	2	17	MCL	5	GOOD	21	14	1.0	0.5	TAv	25	42	17	21	95	1	5	340			25	42	17	21	95	1	5	340			
										EAv	25	42	0	14	95	1	5	0													
	3									TAv	42	42	0	0	100	0	0	0			42	42	0	0	100	0	0	0			
										EAv	42	42	0	0	100	0	0	0	77	-23									77	-11	3b
	4									TAv	42	42	0	0	100	0	0	0			42	42	28	0	100	0	0	0			
										EAv	42	42	0	0	100	0	0	0													
	5									TAv	42	42	0	0	100	0	0	0			42	42	0	0	100	0	0	0			
										EAv	42	42	0	0	100	0	0	0													
16	1	28	MCL	5	GOOD	18		1.0	0.5	TAv	0	28	28	18	95	1	5	480			0	28	28	18	95	1	5	480			
										EAv	0	28	0	0	95	1	5	0													
	2	35	MCL	5	GOOD	21	14	1.0	0.5	TAv	28	63	22	21	95	1	5	440			28	63	35	21	95	1	5	700			
										EAv	28	63	13	14	95	1	5	173													
	3									TAv	63	63	0	0	100	0	0	0			63	63	0	0	100	0	0	0			
										EAv	63	63	0	0	100	0	0	0	109	10									118	30	2
	4									TAv	63	63	0	0	100	0	0	0			63	63	7	0	100	0	0	0			
										EAv	63	63	0	0	100	0	0	0													
	5									TAv	63	63	0	0	100	0	0	0			63	63	0	0	100	0	0	0			
										EAv	63	63	0	0	100	0	0	0													
18	1	32	MCL	5	GOOD	18		1.0	0.5	TAv	0	32	32	18	95	1	5	549			0	32	32	18	95	1	5	549			
										EAv	0	32	0	0	95	1	5	0													
	2	15	MCL	0	GOOD	21	14			TAv	32	47	15	21	100	0	0	315			32	47	15	21	100	0	0	315			
										EAv	32	47	0	14	100	0	0	0													
	3									TAv	47	47	0	0	100	0	0	0			47	47	0	0	100	0	0	0			
										EAv	47	47	0	0	100	0	0	0	86	-13									86	-2	3a
	4									TAv	47	47	0	0	100	0	0	0			47	47	23	0	100	0	0	0			
										EAv	47	47	0	0	100	0	0	0													
	5									TAv	47	47	0	0	100	0	0	0			47	47	0	0	100	0	0	0			
										EAv	47	47	0	0	100	0	0	0													

Data inputs										Droughtiness calculations																												
						Av. water (soil)		Av. water (stones)		AP wheat													AP potatoes																
Survey Point	Horizon	Horizon thickness	Texture	Stones %	Structural condition	TAv %	EAv %	TAv %	EAv %	TAv/EAv	Start depth	End depth	Horiz. thickn.	TAv/EAv soil	% non stone	TAv/EAv stones	Stones %	AP wheat		AP(wheat) -MD(wheat)	Start depth	End depth	Horiz. thickn.	TAv top/sub soil	non-stone %	TAv stones	Stone %	AP potatoes		AP(potato) -MD(potato)	Limited to ALC grade
19	1	43	MCL	5	GOOD	18		4.0	3.0	TAv	0	43	43	18	95	4	5	744			0	43	43	18	95	4	5	744			
										EAv	0	43	0	0	95	3	5	0												
	2	11	MCL	5	GOOD	21	14	1.0	0.5	TAv	43	54	7	21	95	1	5	140			43	54	11	21	95	1	5	220			
										EAv	43	54	4	14	95	1	5	53												
	3									TAv	54	54	0	0	100	0	0	0	94	-6	54	54	0	0	100	0	0	0	96	8	3a
										EAv	54	54	0	0	100	0	0	0												
	4									TAv	54	54	0	0	100	0	0	0			54	54	16	0	100	0	0	0			
										EAv	54	54	0	0	100	0	0	0												
	5									TAv	54	54	0	0	100	0	0	0			54	54	0	0	100	0	0	0			
										EAv	54	54	0	0	100	0	0	0												
20	1	28	MCL	5	GOOD	18		1.0	0.5	TAv	0	28	28	18	95	1	5	480			0	28	28	18	95	1	5	480			
										EAv	0	28	0	0	95	1	5	0												
	2	14	MCL	5	GOOD	21	14	1.0	0.5	TAv	28	42	14	21	95	1	5	280			28	42	14	21	95	1	5	280			
										EAv	28	42	0	14	95	1	5	0												
	3									TAv	42	42	0	0	100	0	0	0	76	-23	42	42	0	0	100	0	0	0	76	-12	3b
										EAv	42	42	0	0	100	0	0	0												
	4									TAv	42	42	0	0	100	0	0	0			42	42	28	0	100	0	0	0			
										EAv	42	42	0	0	100	0	0	0												
	5									TAv	42	42	0	0	100	0	0	0			42	42	0	0	100	0	0	0			
										EAv	42	42	0	0	100	0	0	0												
21	1	32	HCL	5	GOOD	18		4.0	3.0	TAv	0	32	32	18	95	4	5	554			0	32	32	18	95	4	5	554			
										EAv	0	32	0	0	95	3	5	0												
	2	35	HZCL	5	GOOD	21	12	1.0	0.5	TAv	32	67	18	21	95	1	5	360			32	67	35	21	95	1	5	700			
										EAv	32	67	17	12	95	1	5	194												
	3									TAv	67	67	0	0	100	0	0	0	111	11	67	67	0	0	100	0	0	0	125	37	2
										EAv	67	67	0	0	100	0	0	0												
	4									TAv	67	67	0	0	100	0	0	0			67	67	3	0	100	0	0	0			
										EAv	67	67	0	0	100	0	0	0												
	5									TAv	67	67	0	0	100	0	0	0			67	67	0	0	100	0	0	0			
										EAv	67	67	0	0	100	0	0	0												
22	1	20	MCL	5	GOOD	18		1.0	0.5	TAv	0	20	20	18	95	1	5	343			0	20	20	18	95	1	5	343			
										EAv	0	20	0	0	95	1	5	0												
	2	13	MCL	0	GOOD	21	14			TAv	20	33	13	21	100	0	0	273			20	33	13	21	100	0	0	273			
										EAv	20	33	0	14	100	0	0	0												
	3	67	MCL	5	GOOD	21	14	1.0	0.5	TAv	33	100	17	21	95	1	5	340	162	63	33	100	37	21	95	1	5	740	136	47	1
										EAv	33	100	50	14	95	1	5	666												
	4									TAv	100	100	0	0	100	0	0	0			100	100	0	0	100	0	0	0			
										EAv	100	100	0	0	100	0	0	0												
	5									TAv	100	100	0	0	100	0	0	0			100	100	0	0	100	0	0	0			
										EAv	100	100	0	0	100	0	0	0												
23	1	34	MCL	5	GOOD	18		4.0	3.0	TAv	0	34	34	18	95	4	5	588			0	34	34	18	95	4	5	588			
										EAv	0	34	0	0	95	3	5	0												
	2									TAv	34	34	0	0	100	0	0	0			34	34	0	0	100	0	0	0			
										EAv	34	34	0	0	100	0	0	0												
	3									TAv	34	34	0	0	100	0	0	0	59	-41	34	34	0	0	100	0	0	0	59	-29	3b
										EAv	34	34	0	0	100	0	0	0												
	4									TAv	34	34	0	0	100	0	0	0			34	34	36	0	100	0	0	0			
										EAv	34	34	0	0	100	0	0	0												
	5									TAv	34	34	0	0	100	0	0	0			34	34	0	0	100	0	0	0			
										EAv	34	34	0	0	100	0	0	0												
25	1	40	MCL	10	GOOD	18		1.0	0.5	TAv	0	40	40	18	90	1	10	652			0	40	40	18	90	1	10	652			
										EAv	0	40	0	0	90	1	10	0												
	2									TAv	40	40	0	0	100	0	0	0			40	40	0	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0												
	3									TAv	40	40	0	0	100	0	0	0	65	-34	40	40	0	0	100	0	0	0	65	-23	3b
										EAv	40	40	0	0	100	0	0	0												
	4									TAv	40	40	0	0	100	0	0	0			40	40	30	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0												
	5									TAv	40	40	0	0	100	0	0	0			40	40	0	0	100	0	0	0			
										EAv	40	40	0	0	100	0	0	0												
27	1	25	MCL	5	GOOD	18		1.0	0.5	TAv	0	25	25	18	95	1	5	429			0	25	25	18	95	1	5	429			
										EAv	0	25	0	0	95	1	5	0												
	2									TAv	25	25	0	0	100	0	0	0			25	25	0	0	100	0	0	0			
										EAv	25	25	0	0	100	0	0	0												
	3									TAv	25	25	0	0	100	0	0	0	43	-57	25	25	0	0	100	0	0	0	43	-45	4
										EAv	25	25	0	0	100	0	0	0												
	4									TAv	25	25	0	0	100	0	0	0			25	25	45	0	100	0	0	0			
										EAv	25	25	0	0	100	0	0	0												
	5									TAv	25	25	0	0	100	0	0	0			25	25	0	0	100	0	0	0			
										EAv	25	25	0	0	100	0	0	0												

Annex 11C.3
Laboratory Results

Sample nomenclature:

NG-YG-SNS “survey point no” “Horizon number”

Survey point number corresponds with the numbers on **Figure 11.1, Volume 5, Document 5.4.11,** and in the other Annexes.

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ANALYSIS REPORT

Contact : WARDELL ARMSTRONG LLP
CITY QUADRANT
11 WATERLOO SQUARE
NEWCASTLE UPON TYNE
NE1 4DP
Tel. : [redacted]

H448

Please quote the above code for all enquiries

Client : YORKSHIRE GREEN

Distributor : CA10496

Local Rep : B THOMAS

Telephone : [redacted]

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 71907/22

Date Received 06-Sep-22
Date Reported 16-Sep-22

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
[redacted]									
381759/22	2	**P10 H2 TADCASTER** *No cropping details given*	**8.0**	**0**	**0**	**5**	**<2.5**	**48**	**318**
381760/22	3	**P10 H1 TADCASTER** *No cropping details given*	**8.0**	**2**	**1**	**5**	**15.8**	**99**	**290**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron On behalf of NRM Date 16/09/22

ANALYSIS REPORT

MICRO NUTRIENT REPORT

DATE **16th September 2022**

SAMPLES FROM **YORKSHIRE GREEN**

WARDELL ARMSTRONG LLP
CITY QUADRANT
11 WATERLOO SQUARE
NEWCASTLE UPON TYNE
NE1 4DP

Tel: [redacted]

[redacted]

Reference: **71907/381759/22** Field Name: **P10 H2 TADCASTER**	**Result**	(*)	**Deficient**	**Marginal**	**Target**	**Marginal**	**Excessive**
Organic matter (LOI) %	2.8	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	42						
Silt (0.063 - 0.002mm) %	41						
Clay (< 0.002mm) %	17						
Textural Classification	Sandy Silt Loam	2					

Reference: **71907/381760/22** Field Name: **P10 H1 TADCASTER**	**Result**	(*)	**Deficient**	**Marginal**	**Target**	**Marginal**	**Excessive**
Organic matter (LOI) %	3.6	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	53						
Silt (0.063 - 0.002mm) %	28						
Clay (< 0.002mm) %	19						
Textural Classification	Sandy Clay Loam	2					

Notes (*)

(1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

(2) In calcareous soils the sand, silt and clay sized fractions are likely to contain particles of carbonate which may result in the incorrect classification of soil type.

ANALYSIS REPORT

DATE 16th September 2022
SAMPLES FROM YORKSHIRE GREEN

SAMPLED BY B THOMAS
CA10496
Report reference 71907/22

WARDELL ARMSTRONG LLP
CITY QUADRANT
11 WATERLOO SQUARE
NEWCASTLE UPON TYNE
NE1 4DP

Tel: [redacted]
Fax:

Fertiliser Recommendations

The phosphate and potash recommendations shown below, are those required to replace the offtake and maintain target soil indices. The larger recommended applications for soils below target index will allow the soil to build up to this target index over a number of years. Not applying fertiliser to soils which are above target index will allow the soil to run down over a number of years to the target index.
The recommendation should be increased or decreased where yields are substantially more or less than that specified. The amount to apply can be calculated using the expected yield and values for the offtake of phosphate and potash per tonne of yield given in the RB209 9th edition.
All recommendations are given for the mid-point of each Index.
Where a soil analysis value (as given by the laboratory) is close to the range of an adjacent Index, the recommendation may be reduced or increased slightly taking account of the recommendation given for the adjacent Index. Small adjustments of less than 10 kg/ha are generally not justified.
Efficient use of P and K is most likely to be achieved on soils that are well structured and enable good rooting.
For visual evaluation of soil structure (VESS), a score on 1 or 2 would be considered adequate.
Don't forget to deduct nutrients applied as organic manures.
For Nitrogen recommendations please refer to the RB209 9th edition or seek advice from an FACTS qualified adviser.
Target Indices:
Arable, Forage, Grassland and Potato Crops: P Index 2, K Index 2-
(In rotations where most crops are Autumn-sown, soils are in good condition and P is applied annually, high index 1 can be an adequate target.)
Vegetables and Bulbs: P Index 3, K Index 2+
(If vegetables are only grown occasionally as part of an arable rotation, it would be most economic to target index 2 for arable and forage crops.)
Fruit Vines and Hops: P Index 2, K Index 2, Mg Index 2
(Note: Cider apples respond to K Index 3, Mg Index 3)
A lime recommendation is usually for a 20cm depth of cultivated soil or a 15cm depth of grassland soil. Where soil is acid below 20 cm and soils are ploughed for arable crops, a proportionately larger quantity of lime should be applied. However, if more than 10 t/ha is needed, half should be deeply cultivated into the soil and ploughed down, with the remainder applied to the surface and worked in.
For established grassland or other situations where there is no, or only minimal soil cultivation, no more than 7.5 t/ha of lime should be applied in one application.
In these situations, applications of lime change the pH below the surface very slowly. Consequently, the underlying soil should not be allowed to become too acidic because this will affect the root growth and thus limit nutrient and water uptake, which will adversely affect yield.

[redacted]

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*	*Lime (Arable)*	*(Grass)*
P10 H2 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac* **0**	**0**
381759 / Medium		*Kg/Ha*				*Te/Ha* **0**	**0**

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*	*Lime (Arable)*	*(Grass)*
P10 H1 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac* **0**	**0**
381760 / Medium		*Kg/Ha*				*Te/Ha* **0**	**0**

Fertiliser recommendations are based on **AHDB RB209 (Ninth Edition).** If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.
NRM is a UKAS accredited laboratory to ISO/IEC 17025

ANALYSIS REPORT

Contact : WARDELL ARMSTRONG LLP
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NE1 4DP
Tel. : [redacted]

H448

Please quote the above code for all enquiries

Client : YORKSHIRE GREEN

Distributor : CA10796

Local Rep : B THOMAS

Telephone : [redacted]

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 71923/22

Date Received 06-Sep-22
Date Reported 16-Sep-22

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
[redacted]									
381846/22	5	**21 H2 TADCASTER** *No cropping details given*	**8.2**	**0**	**1**	**5**	**5.6**	**80**	**267**
381847/22	6	**21 H1 TADCASTER** *No cropping details given*	**7.9**	**2**	**3**	**6**	**19.8**	**275**	**411**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron On behalf of NRM Date 16/09/22

ANALYSIS REPORT

Contact : WARDELL ARMSTRONG LLP
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Tel. : [redacted]

H448

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Client : YORKSHIRE GREEN

Distributor : CA10796

Local Rep : B THOMAS

Telephone : [redacted]

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 71923/22

Date Received 06-Sep-22
Date Reported 16-Sep-22

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details			Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details	Soil pH	P	K	Mg	P	K	Mg
381848/22	7	**3 H2 TADCASTER** *No cropping details given*	**7.9**	**0**	**1**	**6**	**4.8**	**86**	**491**
381849/22	8	**3 H1 TADCASTER** *No cropping details given*	**7.8**	**2**	**2-**	**6**	**18.2**	**179**	**427**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by Sandy Cameron On behalf of NRM Date 16/09/22

MICRO NUTRIENT REPORT

DATE **16th September 2022**

SAMPLES FROM **YORKSHIRE GREEN**

WARDELL ARMSTRONG LLP
CITY QUADRANT
11 WATERLOO SQUARE
NEWCASTLE UPON TYNE
NE1 4DP

Tel: [redacted]

[redacted]

Reference: **71923/381846/22** Field Name: **21 H2 TADCASTER**	**Result**	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	2.0	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	16						
Silt (0.063 - 0.002mm) %	53						
Clay (< 0.002mm) %	31						
Textural Classification	Silty Clay Loam	2					

Reference: **71923/381847/22** Field Name: **21 H1 TADCASTER**	**Result**	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	4.8	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	32						
Silt (0.063 - 0.002mm) %	39						
Clay (< 0.002mm) %	29						
Textural Classification	Clay Loam	2					

Reference: **71923/381848/22** Field Name: **3 H2 TADCASTER**	**Result**	(*)	Deficient	Marginal	Target	Marginal	Excessive

Report continued.....

ANALYSIS REPORT

MICRO NUTRIENT REPORT

DATE **16th September 2022**

SAMPLES FROM **YORKSHIRE GREEN**

WARDELL ARMSTRONG LLP
CITY QUADRANT
11 WATERLOO SQUARE
NEWCASTLE UPON TYNE
NE1 4DP

Tel: [redacted]

Reference: **71923/381848/22** Field Name: **3 H2 TADCASTER**	**Result**	**(*)**	**Deficient**	**Marginal**	**Target**	**Marginal**	**Excessive**
Organic matter (LOI) %	4.4	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	13						
Silt (0.063 - 0.002mm) %	53						
Clay (< 0.002mm) %	34						
Textural Classification	Silty Clay Loam	2					

Reference: **71923/381849/22** Field Name: **3 H1 TADCASTER**	**Result**	**(*)**	**Deficient**	**Marginal**	**Target**	**Marginal**	**Excessive**
Organic matter (LOI) %	4.6	1	*OM level data not available for this crop*				
Sand (2.00 - 0.063mm) %	33						
Silt (0.063 - 0.002mm) %	40						
Clay (< 0.002mm) %	27						
Textural Classification	Clay Loam	2					

Notes (*)

(1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

(2) In calcareous soils the sand, silt and clay sized fractions are likely to contain particles of carbonate which may result in the incorrect classification of soil type.

ANALYSIS REPORT

DATE	16th September 2022
SAMPLES FROM	YORKSHIRE GREEN
SAMPLED BY	B THOMAS CA10796
Report reference	71923/22

WARDELL ARMSTRONG LLP
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Fertiliser Recommendations

The phosphate and potash recommendations shown below, are those required to replace the offtake and maintain target soil indices. The larger recommended applications for soils below target index will allow the soil to build up to this target index over a number of years. Not applying fertiliser to soils which are above target index will allow the soil to run down over a number of years to the target index.
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(In rotations where most crops are Autumn-sown, soils are in good condition and P is applied annually, high index 1 can be an adequate target.)
Vegetables and Bulbs: P Index 3, K Index 2+
(If vegetables are only grown occasionally as part of an arable rotation, it would be most economic to target index 2 for arable and forage crops.)
Fruit Vines and Hops: P Index 2, K Index 2, Mg Index 2
(Note: Cider apples respond to K Index 3, Mg Index 3)
A lime recommendation is usually for a 20cm depth of cultivated soil or a 15cm depth of grassland soil. Where soil is acid below 20 cm and soils are ploughed for arable crops, a proportionately larger quantity of lime should be applied. However, if more than 10 t/ha is needed, half should be deeply cultivated into the soil and ploughed down, with the remainder applied to the surface and worked in.
For established grassland or other situations where there is no, or only minimal soil cultivation, no more than 7.5 t/ha of lime should be applied in one application.
In these situations, applications of lime change the pH below the surface very slowly. Consequently, the underlying soil should not be allowed to become too acidic because this will affect the root growth and thus limit nutrient and water uptake, which will adversely affect yield.

[redacted]

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*		*Lime (Arable)*	*(Grass)*
21 H2 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac*	**0**	**0**
381846 / Medium		*Kg/Ha*				*Te/Ha*	**0**	**0**

Fertiliser recommendations are based on **AHDB RB209 (Ninth Edition).** If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.
NRM is a UKAS accredited laboratory to ISO/IEC 17025

Report continued.....

ANALYSIS REPORT

DATE 16th September 2022
SAMPLES FROM YORKSHIRE GREEN

SAMPLED BY B THOMAS
CA10796

Report reference 71923/22

WARDELL ARMSTRONG LLP
CITY QUADRANT
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NE1 4DP

Tel: [redacted]

Fertiliser Recommendations

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*	*Lime (Arable)*	*(Grass)*
21 H1 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac* **0**	**0**
381847 / Medium		*Kg/Ha*				*Te/Ha* **0**	**0**

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*	*Lime (Arable)*	*(Grass)*
3 H2 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac* **0**	**0**
381848 / Medium		*Kg/Ha*				*Te/Ha* **0**	**0**

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*	*Lime (Arable)*	*(Grass)*
3 H1 TADCASTER	**Not Given / Not Given**	*Units/Acre*				*T/Ac* **0**	**0**
381849 / Medium		*Kg/Ha*				*Te/Ha* **0**	**0**

Fertiliser recommendations are based on **AHDB RB209 (Ninth Edition).** If a nutrient is deficient and no recommendation is given, either no recommendation is given in RB209 or we have insufficient data to give a recommendation. Apply Lime to the nearest half Ton / Tonne.
NRM is a UKAS accredited laboratory to ISO/IEC 17025

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