



Agricultural Land Use Statement

Of

Land at Ashtree Farm

Gorefield

Lincolnshire

PE13 4PL

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Appendix I – Location Plan

Appendix II – Site Plan

Appendix III – Agricultural Land Classification Report

1. Executive Summary

This report is an assessment of the current and potential uses of the land forming part of Land forming part of Ashtree Farm and the proposal for a solar energy farm. The report assesses the land in a local and national context and the impact the agricultural business.

A visit and inspection of the site, along with an interview with the Landowner was undertaken on 28th August 2024.

The main conclusions are:

- The proposed development will not result in the permanent loss of a finite national resource (BMV land), as agricultural production can be resumed following the expiry of a temporary planning consent and the reinstatement and remediation of the land.
- Grade 1 and Grade 2 agricultural land are prevalent in area so, if it is accepted that development must take place to facilitate sustainable growth of the area, utilising a Site where the land is comprised of comparatively poorly performing grade 2 and mostly grade 3a (87%) is an efficient solution.
- Crop choice, which is limited by the versatility of the poorest soil on the Site, is restricted to conventional combinable commodity crops, for which the UK fluctuates in and out of a trade deficit/surplus position year on year. The land cannot viably produce specialist niche crops for which the UK is consistently a net importer, so the implications of its temporary loss are not material at a national or regional scale.
- Solar energy is one of the most effective and efficient forms of renewable energy production for the Site. Alternatives, such as growing maize for anaerobic digestion, have negative impacts for soils structure, soil erosion and wider environmental impacts, while delivering lower energy yields per unit area of land.
- The proposed development has the potential to deliver wider environmental benefits such as improvements to soil structure and health, carbon sequestration and habitat and biodiversity improvements.
- The proposed development would generate a consistent income and help to protect the business against inherent volatility associated with global commodity markets and seasonal weather patterns, as well as the significant risks associated with the withdrawal of agricultural support following the UK's departure from the EU.

2. Introduction

2.1 Situation

The Land is situated approximately 1 mile to the east of the village of Sutton St Edmund and approximately 5 miles to the north west of Wisbech, as shown on the attached plan appended to this report at Appendix I.

The land proposed to be incorporated within the solar farm, comprises approximately 317 acres (128ha), which is approximately 1m above sea level. The land is split between the parish of Sutton St. Edmund, within South Holland Planning authority and the parish of Tydd St. Giles, within Fenland planning authority.

The land proposed for the solar farm is shown edged in red and shaded green for the land within South Holland Planning authority and shaded blue for the land within Fenland planning authority, as shown on the attached plan appended to this report at Appendix II.

2.2 Scope

This report explores the issues relating to the use of the Site for a renewable energy development. It presents a structured and objective assessment, focusing on the impact of the development on agriculture and soils within the development area, at farm level, and nationally.

It covers the following principal areas in considering the impact of development:

- An overview of the findings of previous soils surveys, detailing their wider implications;
- The importance of the existing agricultural use in the context of the current UK market. This section focuses on the UK's net exportable surplus of many cereal crops and the relative importance of this parcel to the UK's overall production levels;
- The ability of the remaining agricultural holding and farming business to remain viable should the proposed development be consented;
- The temporary removal of agricultural land from its current production regime;
- The potential for continued agricultural use (grazing) in conjunction with the proposed development and the associated environmental benefits.

3. Physical Characteristics and Land Grade

3.1 Agricultural Land Classification (ALC)

The Agricultural Land Classification (ALC) provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can operate in one or more of four principal ways by affecting: the range of crops which can be grown; yield potential; yield consistency; and the cost of obtaining that yield. The classification system gives considerable weight to flexibility of cropping, albeit the cropping potential and not its current or historic use.

Land is classified into 5 grades based on the principal factors of soil type, climate and location. Grades 1, 2 and subgrade 3a signify the most productive land and make up approximately one-third of agricultural land in England and Wales. Approximately half of agricultural land in England and Wales is classified as subgrade 3b and grade 4 of moderate to poor quality. While less significant at a national scale, subgrade 3b and grade 4 land can be locally important in areas with generally poor-quality land¹. The remaining poorest quality grade 5 land occurs mainly in upland areas.

The initial survey of agricultural land occurred between 1967 and 1974 using Ordinate Survey maps on a 1-inch to 1-mile scale. These are broad scale maps meaning that they only serve as a guide without the accuracy to classify individual fields. Detailed field level analysis has been carried out in line with the Ministry for Agriculture, Fisheries and Food (MAFF)² guidelines to establish the agricultural land classification and productive performance of the two fields that make up the Site.

As a result, land at the Site is classified as:

- Grade 2 (11%) - Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown, but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.
- Subgrade 3a (87%) - Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

The Agricultural Land Classification report is annexed at Appendix III

3.2 Best and Most Versatile (BMV) Land

As can be seen, 83% of the Site is classified as grade 2 and subgrade 3a so falls into the category of 'Best and Most Versatile' (BMV) Land. BMV land is a finite national resource, with the National Planning NPPF 2019 requiring Local Planning Authorities to take account of the economic and productive impact of developments. The main policy objective around the preservation of BMV land is to protect national food security and ensure the efficient use of resources with a preference for development on poor quality agricultural land.

3.3 Soil Series

With a relatively homogenous climate across much of the UK, soil type (along with topography) heavily influences the natural plant and microbe communities found on any site and thus dictates the productive capacity, versatility and resilience of land which is in agricultural production. Soil is also a fragile resource which can be irreversibly degraded if it is not managed appropriately, particularly through intensive agricultural regimes.

Wallasea and Newchurch soils are less permeable but respond to underdrainage; drained soils are occasionally waterlogged (Wetness Class II) (www.landis.org.uk). Numerous ditches and reed channels were noted on site. Profiles are stone free or very slightly stony and typically non or only very slightly calcareous throughout. The critical variation noted across the site was whether the topsoil heavy or medium silty clay loam.

The site has previously been mapped as having soils of the following Associations:

The Normoor Association soils over the majority of the site are mapped as: Deep stoneless clayey soils in places with humose surface horizon, often very acid. Flat land crossed by low ridges with deep calcareous silty soils. Groundwater controlled by ditches and pumps. Slight risk of wind erosion (www.landis.org.uk).

The Wallasea 2 Association soils over the north-west of the site are mapped as: Deep stoneless clayey soils. Calcareous in places. Some deep calcareous silty soils. Flat land often with low ridges giving a complex soil pattern. Groundwater controlled by ditches and pumps (www.landis.org.uk).

¹ Natural England (2012). *Technical Information Note 049 - Agricultural Land Classification: protecting the best and most versatile agricultural land, Second Edition*.

² MAFF (1988). *Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land*. MAFF Publications.

3.4 Drainage and Wetness

In addition to other factors, soil type is a crucial factor in determining the wetness of soil which results in the efficiency of drainage. The soils on the site have a Wetness class II with Field Capacity Days of 97.0 and a topsoil texture of non-calcareous heavy silty clay loam or silty clay results in an ALC Grade of 3a and a topsoil texture of non-calcareous medium loamy soils results in an ALC Grade 2 for a small area of land to the west.

3.5 Texture and Structure

Soil texture and structure have a major influence on water retention, water movement and aeration in soils and therefore its suitability as a medium for plant growth. Texture class is determined by the relative proportions of sand, silt and clay particles and the amount of organic matter in a soil horizon and thus can be indicative of the soil's fertility.

Over the majority of the site, clayey soils predominate. The textures noted across the site were mainly heavy silty clay loam over silty clay or clay subsoils. Subsoil structure was moderate coarse angular blocky and moderate coarse prismatic.

3.6 Practical Implications

The most recent site visit was undertaken on a dry and sunny day, allowing harvesting to continue. It was evident from the crops and stubble, that significant drowning and failure of the sown crop has occurred across individual areas, but this was across relatively large areas of the site.

It was noted that the site was predominately flat and level, but the areas of crop loss were in areas of the fields which were slightly lower than the surrounding land.

As the entirety of the site is approximately 1m above sea level the land is reliant on the Internal Drainage Board, to monitor and control water levels across the area. With the relatively slight changes in level, this has resulted in significant and total crop losses where these areas have laid wet and the crop has drowned. It is understood that these areas are under drained, but this has not been successful to keep the crop viable. Immediately surrounding these areas of failures, it would be expected to have reduced yield.

3.7 Summary

The Site on the whole has reasonable quality soils with few workability limitations, despite the high clay content in some areas, which makes it well suited to arable production. The main limiting factors are climatic conditions and susceptibility to wetness and drought – an issue which is expected to be exacerbated by climate change over the coming decades.

4.0 Soil Versatility and Productivity

4.1 Versatility of Cropping

Crop choice is limited by the potential of the poorest quality soil on the Site. The Site has historically been used to grow a rotation of conventional combinable arable crops, including winter wheat, winter barley, and winter beans. Oilseed rape was previously included in the rotation but ceased to be economically viable on the farm following the noenicitinoid ban in 2013. Oilseed rape crops has been established on the site in several year since, but has mostly failed due to the pest burden.

The current cropping regime of wheat, barley and beans therefore represents the financially optimal form of conventional agricultural land use that the Site can viably sustain. The production of high value root, vegetable or horticultural crops is not economically viable on the Site and unlikely to become so in the foreseeable future.

4.2 Productivity

While the current rotation is the most economically viable, the lack of a viable break crop and susceptibility to wetness and drought mean that the Site comprises two of the poorest performing fields on the farm in terms of average yields. Average yields over the past decade have been below both national and farm averages for all crops in the rotation. On average 1st Winter Wheats have yielded below the national average.⁴

4.3 Renewable Energy from Agriculture

Producing energy from arable land is not a new concept. Currently the straw from the harvested cereal crops is sold to a energy plant which burns the straw to produce energy. Growing crops for energy has seen significant growth in the last decade as AD plants have sprung up around the country using crops, food waste and slurry from dairy to produce biogas. In 2023 73,000ha⁴ of the UK maize crop went to bioenergy production. Key findings indicate that in 2023 the UK grew 133,000 hectares (equivalent to 2.2% UK arable land) of crops used for bioenergy. Of these, 11% were dedicated biomass crops (Miscanthus and SRC willow), the remainder were annual food crops (wheat, maize, and sugar beet). Of the total grown, 36% were used for road transport fuels (134 million litres of fuel were generated from wheat crops). This figure has doubled since 2018.

While growing energy crops for AD has the potential to generate reasonable returns, distance to any of these plants is a limiting factor.

The main consideration, is still the soil and wetness limitation, which ultimately limit what can be grown and also whether it will grow to maturity and not fail.

³ DEFRA - Cereal and oilseed production in the United Kingdom 2023 - <https://www.gov.uk/government/statistics/cereal-and-oilseed-rape-production/cereal-and-oilseed-production-in-the-united-kingdom-2023#:~:text=Wheat%20is%20still%20the%20predominant,decrease%20of%205.7%25%20on%202022>

5. Local and National Importance

This section considers the relative importance of the Site in a local and national context to establish whether it is an appropriate location for the proposed development. The two main questions to be answered are:

- a) Does the land on the Site represent an exceptional agricultural resource locally or nationally?
- b) Does the Site have the potential to viably produce products for which the UK is deficient, or which cannot be produced elsewhere?

5.1 National Economy

It is common amongst developed western economies for agriculture to make a minimal contribution to gross value and employment. In the UK, between 2018 and 2019 Gross Value Added (GVA) from agriculture rose by 6.5% to £10.4 billion⁵ but this still only represents 0.53% of the national economy. This is due to a multitude of factors such as a level and type of growth in the wider economy; agriculture's value position within the supply chain; government policy and changing behaviours. This is not to say that agriculture has been static. There has been continual advancement in total productivity resulting in increases of 60%⁶ between 1973 and 2018. However, over a much longer period the national economy has seen greater growth in higher value sectors, with higher levels of employment outweighing the productivity gains in agriculture (hence agriculture's proportional contribution has declined). Therefore, significant changes in the agricultural sector, such as large-scale land use change, have limited impact on the national economy.

UK agriculture is highly advanced and mechanized. At June 2023 the Utilised Agricultural Area (UAA) was 17 million hectares, covering 70% of the total UK land area⁵. UAA is made up of arable and horticultural crops, uncropped arable land, common rough grazing, temporary and permanent grassland and land used for outdoor pigs. It does not include woodland and other non-agricultural land.

The total croppable area remained broadly unchanged between 2022 and 2023, however some categories within this total had greater changes than others (see Table 2.1).

Cereal crops accounted for the majority (68%) of the cropped area. Wheat and barley are the predominant cereal crops. In 2023, the area of wheat decreased by 5.1% and was 1.7 million hectares. The area of barley increased by 1.9% and was 1.1 million hectares. Plantings continued to follow a more typical pattern following disruption due to weather in recent years. However in 2023, wheat plantings have possibly reduced in favour of farmers planting barley and oilseed.

The area of oilseed rape increased by 7.2% in 2023 and was 391 thousand hectares.

Potatoes decreased by 9.9% to 115 thousand hectares in 2023, continuing the downward trend seen in recent years. In 2023, the area recorded was the lowest in the last 40 years.

The remaining arable crops covered 750 thousand hectares. Peas for harvesting dry, field beans and maize together account for 69% of this area. The area of peas and field beans increased by 2.3% whilst the area of maize increased by 8.5%.

⁴ DEFRA report on Bioenergy crops in England and the UK 2008-2023

⁵ DEFRA report(2024) on Agriculture in the United Kingdom 2023

Table 2.1 Agricultural land use at June of each year (thousand hectares)

Category	2021	2022	2023
UAA (Utilised Agricultural Area)	17,227	17,426	17,022
UAA as a proportion of total UK area	71%	71%	70%
Total agricultural land	18,631	18,757	18,334
Common rough grazing	1,194	1,194	1,194
Total area on agricultural holdings	17,436	17,562	17,140
Total croppable area	6,056	6,084	6,086
Total crops	4,574	4,571	4,515
Arable crops	4,413	4,418	4,370
Cereals	3,211	3,173	3,088
Oilseeds	352	399	418
Potatoes	137	127	115
Other arable crops	713	718	750
Horticultural crops	161	153	145
Uncropped arable land	265	274	311
Temporary grass under 5 years old	1,217	1,240	1,260
Total permanent grassland	9,965	10,136	9,730
Grass over 5 years old	6,071	6,158	6,074
Sole right rough grazing	3,894	3,978	3,655
Other land on agricultural holdings	1,416	1,342	1,324
Woodland	1,076	996	948
Land used for outdoor pigs	12	12	12
All other non-agricultural land	328	334	364

5.2 Local Economy

More so than the rest of the country, agriculture has had an historically important role in the local economy because the East of England is one of the most productive areas of the country. This has meant that while much of the country industrialised, the East has continued to be dominated by agriculture.

However, over the last century this has ceased to be the case. Agriculture now makes a small part of the local economy. Agriculture in the East of England only contributes 1.1% of the Economic output of industries in the regions and countries of the UK⁶.

As a result, the removal of the Site from agriculture will not have a detrimental effect on the local economy.

5.3 Production and Supply

Produce from the Site enters major commodity markets. The primary influences on the total UK production of agricultural commodities are the weather and long-term market trends. For example, the excessive rainfall of autumn 2019 resulted in wheat production decreasing by 38% in 2020 and the ban on neonicotinoids in 2013 has greatly reduced oilseed rape production resulting in an increase in spring cropping.

The crops grown at the Site are winter wheat, winter barley and winter beans. Winter wheat, winter barley are classed as major UK crops, grown in arable regions across the country and are less limited to specific soil types like specialist crops (e.g. root vegetables, potatoes, salads, brassica vegetables).

The total UK production of these crops in 2023⁵ was 13.89 million tonnes, 6.9 million tonnes

and 6.8 million tonnes respectively. The removal of the Site which perform below national and farm averages, would not therefore have a significant effect on the UK's total production of these crops.

International trade is similarly affected by weather and long-term market trends. Despite significant annual variation, the UK does have an approximate long-term average net trade balance. The bulk of exports are made up of the raw commodities produced at the Site (wheat and barley), but this fluctuates greatly due to growing conditions in both domestic and foreign markets as well as the quality demands of millers and processors.

5.4 Summary of Local and National Importance

The Site is located in a region where BMV land is prevalent. However, it performs comparatively poorly in a local and national context, consistently delivering below average yields for the range of crops grown (when compared on a farm level, locally and internationally). The Site can only viably produce commodity crops for which the UK's trade balance is continually fluctuating in and out of a surplus position.

As the proposed renewable energy development must be sited near the source of energy demand, it cannot be located on lower quality land in another region to limit the cumulative impact on BMV at a national scale. That being the case, we conclude that the Site can more appropriately accommodate non-agricultural uses of this nature than better performing and more versatile land elsewhere in the region.

6. Impact on the Farming Business

The Current farming business comprises a holding of approximately 900 acres, split between 3 locations.

The land which forms the Site is the poorer and more difficult land to farm on the holding. As the land is all low lying and reliant on the Internal Drainage Board (IDB), to manage the water, along with the under drainage, makes the land susceptible to waterlogging and the resultant drowning of the crops.

During difficult autumn cultivation periods due to weather conditions, such as last year, meant that the majority of the Site couldn't be planted with the normal autumn sown crops and as such Spring Wheat was sown on a large proportion of the Site. This is less than ideal, as the Winter Wheat is generally a better yielding crop and is harvested earlier, allowing more preparation for the next crop to be completed.

The farm suffers particularly from Blackgrass, which with limited herbicide treatments available, is becoming an increasing problem for the farm. Control of blackgrass is difficult to complete effectively and is reliant on stale seedbeds and Glyphosate.

The Site has areas of “hollows” within the individual fields, which makes the practical farming of these areas challenging. During challenging times, where wetness is an issue, these areas lie wetter and restrict cultivation and sowing.

The Site produces crops at below national average yields and with potentially difficult autumn sowing conditions, the removal of the Site from arable production, would not affect the agricultural business significantly and would benefit the timeliness of operations on the more productive remainder of the agricultural holding.

7. Wider environmental Benefits

The primary purpose of this development is renewable energy generation but in addition there are wider and more long-term, environmental benefits. These include reductions in soil erosion, carbon sequestration and habitat and biodiversity enhancements.

7.1 Soil Erosion and Health

Soil erosion and reductions in organic matter are a serious concern for UK agriculture. Heavy cultivation practices have meant soil is consistently turned year on year breaking up the natural structure and degrading the organic matter. Organic matter is one of the key components of topsoil that makes it a usable resource as without it, topsoil cannot host habitats and produce food. In 2006, around 18% of organic matter present in topsoil in 1980 had been lost⁷.

The main benefit of the development with regard to soil carbon comes from averted loss. As land is no longer subject to intensive heavy cultivation, soil erosion and reduction in organic matter is immediately reduced. If the development takes place in conjunction with complimentary management practices, such as low intensity grazing, long-term improvements to soil health can be achieved that will increase levels of organic matter and soil fertility.

7.2 Habitat and Biodiversity

Intensive arable farming has been held partly responsible for widespread reductions in biodiversity within our countryside, especially in farmland species. This is acutely apparent when considering farmland birds and invertebrates. Since the 1970s farmland bird populations have decreased by 56%⁸ and species previously prevalent in Cambridgeshire such as the Corn Bunting have decreased by 90%⁹. The development will have a positive impact on habitat and biodiversity, due to reducing synthetic fertilisers and agrichemicals inputs and conversion of the land between and under the solar arrays to botanically diverse grassland which can support several rare farmland species.

7 *Parliamentary Office of Science and Technology (2006), UK Soil Degradation.*
<https://www.parliament.uk/globalassets/documents/post/postpn265.pdf>

8 *S.J. Harris, D. Massimino, S. Gillings, M.A. Eaton, D.G. Noble, D.E. Balmer, D. Proctor, J.W. Pearce-Higgins, P. Woodcock (2018), The Breeding Bird Survey 2017, BTO Research Report 706. British Trust for Ornithology, Thetford*

9 *I.J. Bateman and B. Balmford (2018), Public Funding for Public Goods: A post brexit perspective on principles for agricultural policy.*

10 *H. Montag, G. Parker, T. Clarkson, (2016), The effects of solar farms on local biodiversity: a comparative study. Clarkson, Woods & Wuchford Biodiversity*

A study carried out in 2016¹⁰ across 11 solar farms in the south of the UK showed that, where a diverse grassland mix was established, there were significant biodiversity gains within one growing season when compared with intensive arable and grazing on the same farm. There is therefore within the proposed development the potential to directly target species that are in decline benefitting both the immediate local area and national populations of these species.

7.3 Carbon Sequestration and Averted Loss

As well as changing behaviours within society, a key tool to tackling the climate crisis is developing areas that can sequester carbon.

Academic literature suggests that grasslands in general have the potential to sequester between 0.2 and 0.4 tonnes of CO₂ or equivalent per hectare per year, with some specific forms of habitat and management exceeding this range. Therefore the habitat underneath and between the solar arrays has the potential sequester carbon. Furthermore, there is also the additional benefit of averted loss resulting from the cessation of arable operations. Soil carbon is inherently vulnerable as any form of disturbance results in a carbon release. As the land would be removed from arable production there would be an immediate reduction in soil disturbance thereby averting the carbon loss that would otherwise occur if arable farming continued on the Site.

8. Future Agricultural Production at the Site

8.1 Temporary Loss of Current Use

Increasingly degraded soils will present a considerable challenge to UK agriculture in the coming decades. This degradation has occurred not only due to historic mismanagement and misdirection of farm policy, but also production methods and crop rotations that over stress the soil which in some cases has led to decreases in soil productivity and soil erosion which occurs due to heavy cultivation and, for certain crops leaving land bare between sowing and harvesting. Therefore, one of the added benefits of the proposed development is that it will reduce the incremental long-term impact of soil erosion as the soil will have continuous vegetative cover.

In the context of BMV land the proposed development is only a temporary removal from agricultural production. Unlike a housing development, farming can resume at the end of the planning consent, so the proposed development would not bring about the permanent loss of agricultural land. Instead, the proposed development acts a long-term break without intensive arable production and soils can regenerate bringing about improvements in soil health, structure and levels of organic matter. The extent to which soils could be regenerated will be contingent on management and the habitat type that is developed on the Site. Nonetheless it is a fact that when the land returns to agricultural use the soils will be at least as productive as they were prior to the proposed development and potentially improved.

8.2 Continued Agricultural Use

Land used for solar energy generation will cease to be used for arable production but can still be used for grazing. The majority of the Site once constructed will be able to be used for grazing by sheep which is compatible with both the soil type and solar developments. The land will not therefore be wholly lost to agriculture during the period.

Grazing sheep will not only contribute to the UK's food production and offset in part the UK's reliance on imports but also locally produced high-quality meat is more sustainable than imports. Low intensity grazing is also a valuable management tool for achieving wider environmental benefits, for example a natural contribution to improving soil fertility.

9. Soil Protection Measures

Soil is the most valuable asset for agricultural business. As such the protection of this asset is crucial. This is required for day to day farming operations and even more important where the soil is disturbed, cultivated or excavated.

9.1 Soil Protection during Construction

Prior to entry on to site a detailed photographic record of condition should be undertaken, to include broad spectrum soil analysis and average top soil depth. This will give a reference to the condition of the soil prior to any construction.

Where possible the Landowner will provide a plan of any known land drainage systems. Where damage is caused to any land drainage system this should be immediately marked on site and on a plan and at the first available opportunity, the drain should be repaired.

Any areas of land which are to be used as permanent access road, or permanent structure, the top soil should be immediately stripped to subsoil level, removed and stored on site and protected, from any access or disturbance. This topsoil should be stored by making a heap, which is then compacted on the surface to prevent erosion from wind or rain. No topsoil should be removed from the Site.

During construction, any excavations should be undertaken, so the topsoil is removed and stored separately to the subsoil excavated. When any excavations are backfilled, the soil should be replaced in the same order as it was removed, with the subsoil placed and compacted into the bottom of the excavation, with the topsoil replaced on top of the subsoil.

Temporary construction access should be along defined routes, which should be trafficked only by tracked or low ground pressure vehicles during dry weather conditions. If the weather deteriorates and ground conditions become wet, then access should be suspended or temporary trackways used to protect the top soil.

9.2 Soil protection post construction

Once construction has been completed the soil should be left or cultivated into level and fine seed bed with no or limited small stones on the surface. Either in the spring or late summer/autumn, the soil is to be established with a long term grass mixture, suitable for grazing of sheep. Once established, this will provide a root structure, which will benefit the soil protecting it from erosion and allowing agricultural grazing with sheep to commence.

Grazing should be controlled by the grazier, so that over and under grazing does not occur. Grazing should not occur when the fields are saturated as this will lead to compaction and damage to the soil structure.

Any mechanical operations should only be taken when ground conditions are suitable without damage being caused to the soil.

10. Conclusions

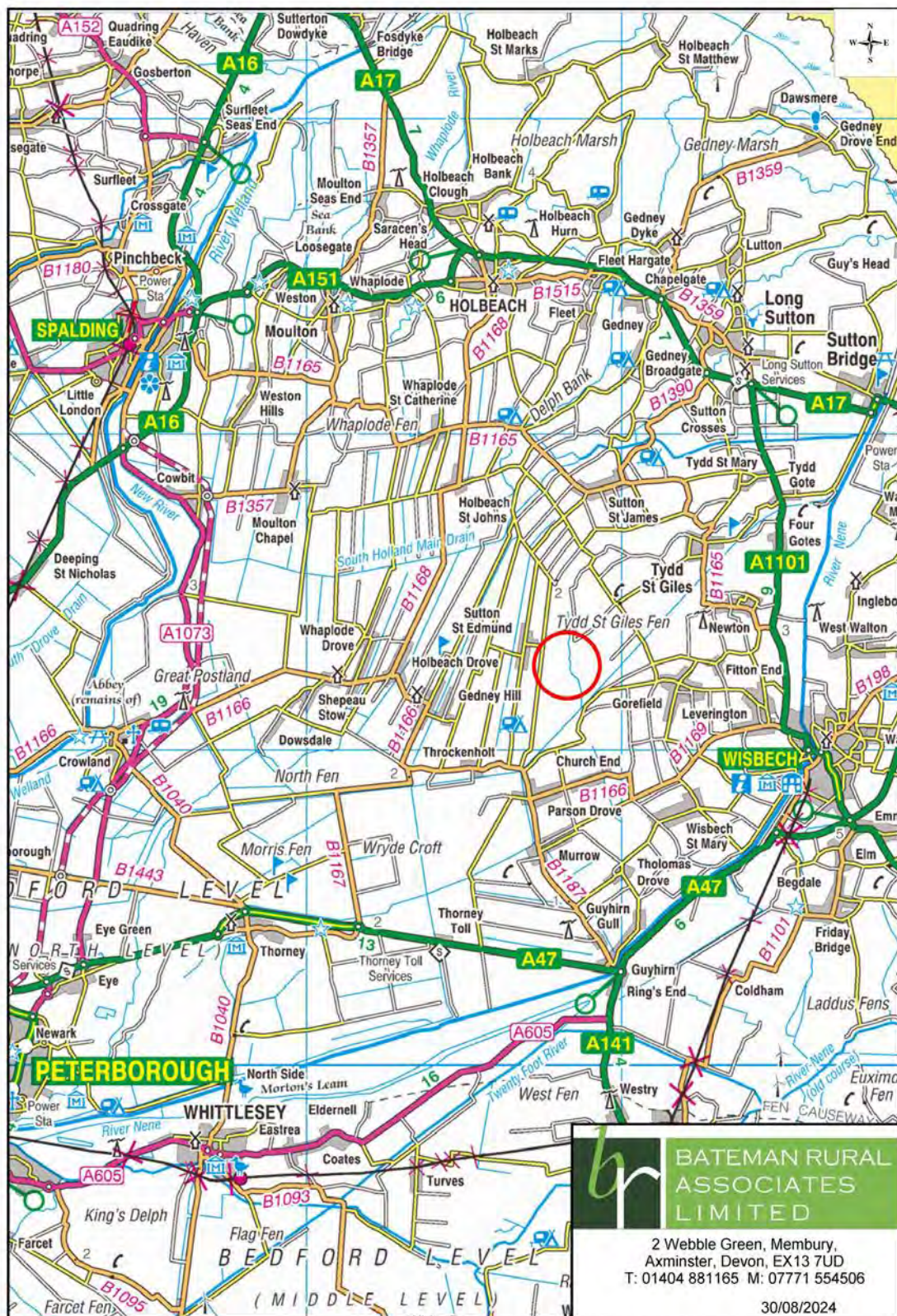
While the quality of land at the Site is important in a national context, it is not at local level. With land grades 1 (shaded red) and grade 2 (shaded blue) predominating in region, as shown on the plan annexed to this report at Appendix IV, it is likely that some development will necessarily need to occur on BMV land in the region.

The Site's potential is limited to the growing of combinable commodity crops for which the UK fluctuates in and out of a net trade surplus and for which the yields are consistently below farm and national averages for those crop types. The proposed location of the development is therefore consistent with the key policy objective, in that it represents an efficient use of some of the poorer, less versatile and less resilient land in the region.

The proposed development will only result in the temporary cessation of arable production on the farm's land poorer land, but agricultural production can continue in the form of grazing. The proposed development also has the potential to deliver significant wider environmental benefits, such as improvements to soil structure and health, carbon sequestration and habitat and biodiversity enhancements.

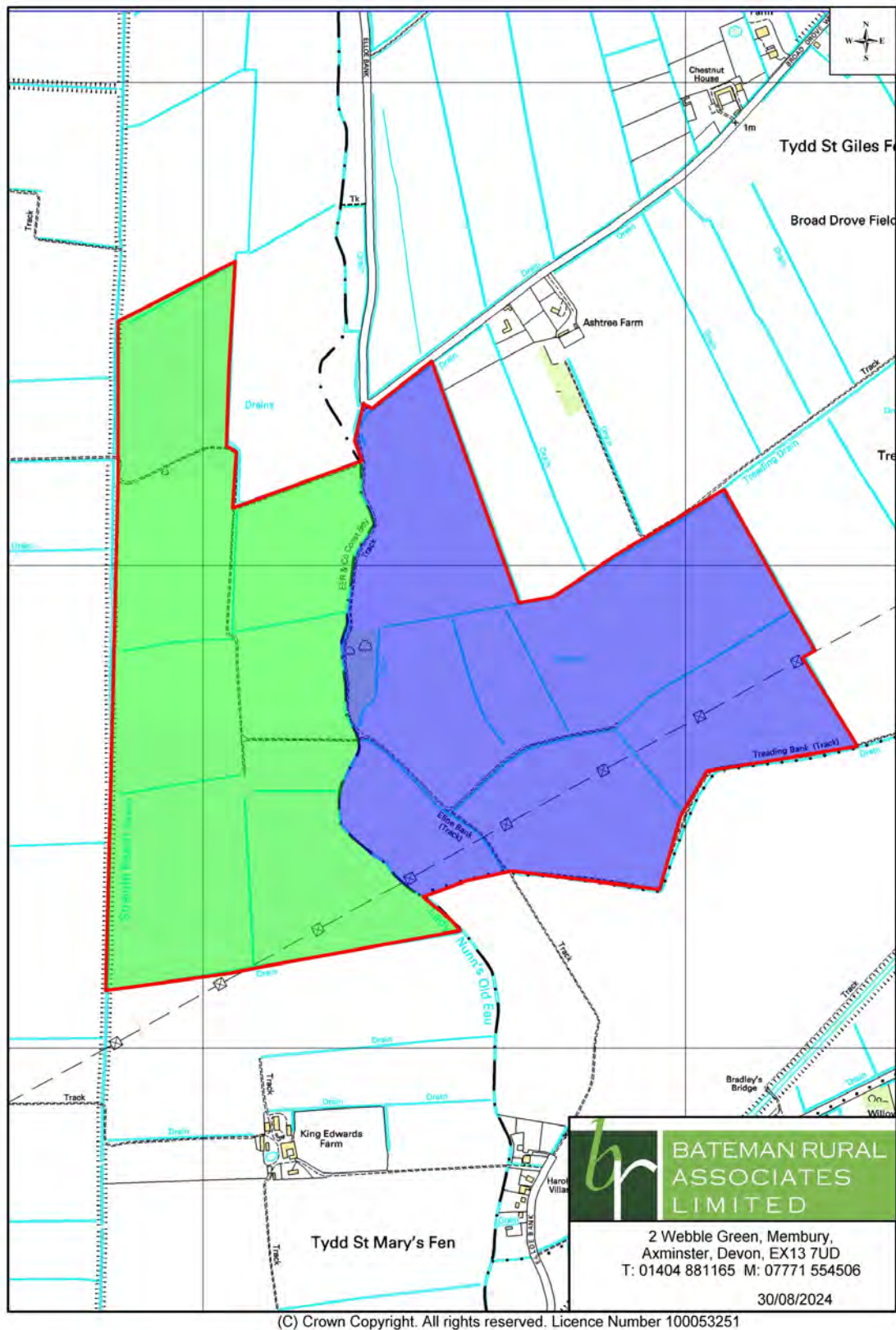
The leasing of agricultural land for non-agricultural purposes is recognised as an important form of income diversification for the farm business which will support the agricultural activities on the rest of the farm thereby helping to mitigate the risks associated with volatile commodity prices, weather patterns and the pressures associated with the changes to the EU and UK agricultural support regime.

Appendix I



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Appendix II



Appendix III

Agricultural Land Classification

of

Land at Ashtree Farm
Gorefield
Lincolnshire
PE13 4PL

For

Pathfinder Clean Energy

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DRAWING 1 **ALC Grade and survey points**

APPENDIX A **Survey profile data sheet**

GENERAL INFORMATION SOURCES

GLOSSARY

1. INTRODUCTION

An Agricultural Land Classification (ALC) has been carried out on 132 ha of land at Gorefield (Drawing 1). The site is centred on OS Grid Ref. 538416, 312822.

The survey was conducted on the 21st and 22nd June 2022 and classified the land into one or more of the below grades (see Drawing 1). On the survey date, the site was in agricultural use.

1.1 Methodology

Agricultural land is classified into the following grades according to the 1988 guidelines¹.

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 classification includes an initial desktop investigation to examine previously mapped soil types and to note the drift and solid geology followed by the field survey consisting of auger borings at one every 100 m in general and a pit excavated in each of the main soil types to confirm the structures and stone content if needed. Laboratory analysis of soil textures is undertaken if needed in order to confirm textures such the *heavy/medium* clay and *medium/fine* sand categories or stone content. All site survey profile data is listed in Appendix A.

All of the potential limitations are assessed and then the most limiting factor dictating the ALC grade was determined for this site and is detailed in Table 2.

1.2 Previous ALC gradings

Grading on the MAFF (1983) 1: 250 000 provisional map indicated the site is mapped as Grade 2 land. No former detailed surveys have been undertaken for the site.

2. CLIMATIC LIMITATIONS

2.1 Overall climate

The climatological data for the site centre is detailed in Table 1.

Table 1		
Climatological information³		
Factor	Units	Value
Altitude AOD	m	0
Accumulated temperature	day°C (Jan-June)	1446.2
Average Annual Rainfall	mm	559.6
Field Capacity Days	days	97.0
Moisture Deficit Wheat	mm	122.4
Moisture Deficit Potatoes	mm	118.8
Overall climate ALC Grade	Grade 1	

Climate will not result in the most significant limiting factor for the site.

2.2. Local climate

Local climate will not result in a significant limiting factor for this site.

3 SITE LIMITATIONS

3.1 Gradient

The gradient will not result in a significant limiting factor for this site.

3.2 Microrelief

The microrelief will not result in a significant limiting factor for this site.

3.3 Flooding

A low risk of flooding from surface waters and rivers has been identified for the site (<https://flood-warning-information.service.gov.uk/long-term-flood-risk>).

4 SOIL LIMITATIONS

4.1 Texture and structure

Over the majority of the site, clayey soils predominate. The textures noted across the site were mainly heavy silty clay loam over silty clay or clay subsoils. Subsoil structure was moderate coarse angular blocky and moderate coarse prismatic.

Wallasea and Newchurch soils are less permeable but respond to underdrainage; drained soils are occasionally waterlogged (Wetness Class II) (www.landis.org.uk). Numerous ditches and reed channels were noted on site. Profiles are stone free or very slightly stony and typically non or only very slightly calcareous throughout. The critical variation noted across the site was whether the topsoil heavy or medium silty clay loam.

The site has previously been mapped as having soils of the following Associations:

The Normoor Association soils over the majority of the site are mapped as: *Deep stoneless clayey soils in places with humose surface horizon, often very acid. Flat land crossed by low ridges with deep calcareous silty soils. Groundwater controlled by ditches and pumps. Slight risk of wind erosion* (www.landis.org.uk).

The Wallasea 2 Association soils over the north-west of the site are mapped as: *Deep stoneless clayey soils. Calcareous in places. Some deep calcareous silty soils. Flat land often with low ridges giving a complex soil pattern. Groundwater controlled by ditches and pumps* (www.landis.org.uk).

Superficial Geology 1:50 000 scale superficial deposits description:

Tidal Flat Deposits, 1 - Clay and Silt.

Bedrock Geology 1:50 000 scale bedrock geology description:

West Walton Formation and Ampthill Clay Formation (undifferentiated) - Mudstone.

Table 1a - PSD Results

No	Percentages				Textural Class	
	Sand	Silt	Clay	Total		
83	5.28	68.25	26.47	100.00	MZCL	
36	4.62	61.46	33.92	100.00	HZCL	

Method: BS1377 Pipette Method

4.2 Depth

Soil depth will not result in a significant limiting factor for this site.

4.3 Stoniness

Stoniness is not a direct significant limiting factor for soils noted on site.

4.4 Chemical

Chemical contamination will not result in a significant limiting factor for this site.

5. INTERACTIVE LIMITATIONS

5.1 Wetness

Mottling and gleying was noted within the soils from around 25 cm depth in the clayey soils.

The combination of a Wetness Class of II for the soils (see Appendix A) with Field Capacity Days of 97.0 and a topsoil texture of non-calcareous heavy silty clay loam or silty clay results in an ALC Grade of 3a. A small area of land to the west with light loamy soils resulted in an ALC Grading of 2.

5.2. Droughtiness

The Available Water Capacity which subsequently when considered with respect to the Moisture Deficit for wheat and potatoes resulted in a slight droughtiness limitation for soils on the site.

5.3 Erosion

Erosion will not result in a significant limiting factor for this site.

6. AGRICULTURAL LAND CLASSIFICATION

6.1 Most limiting factors

Grade 3a land – Wetness Limitation

The combination of a Wetness Class of II for the soils (see Appendix A) with Field Capacity Days of 97.0 and a topsoil texture of non-calcareous heavy silty clay loam or silty clay results in an ALC Grade of 3a.

Grade 2 land – Wetness and Droughtiness Limitation

The combination of a Wetness Class of II for the soils (see Appendix A) with Field Capacity Days of 97.0 and a topsoil texture of non-calcareous medium loamy soils results in an ALC Grade 2 for a small area of land to the west.

6.2 Current grading

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

Table 2. ALC gradings and limitations			
Grade	ha	%	Limitation
1			
2	15	11.36	Wetness and droughtiness
3a	117	86.66	Wetness
3b			
4			
5			
Non-agricultural land			
Total	132	100%	

DRAWING 1

ALC Grade

Key

ALC Grades

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Non agricultural land

- Boring
- Pit



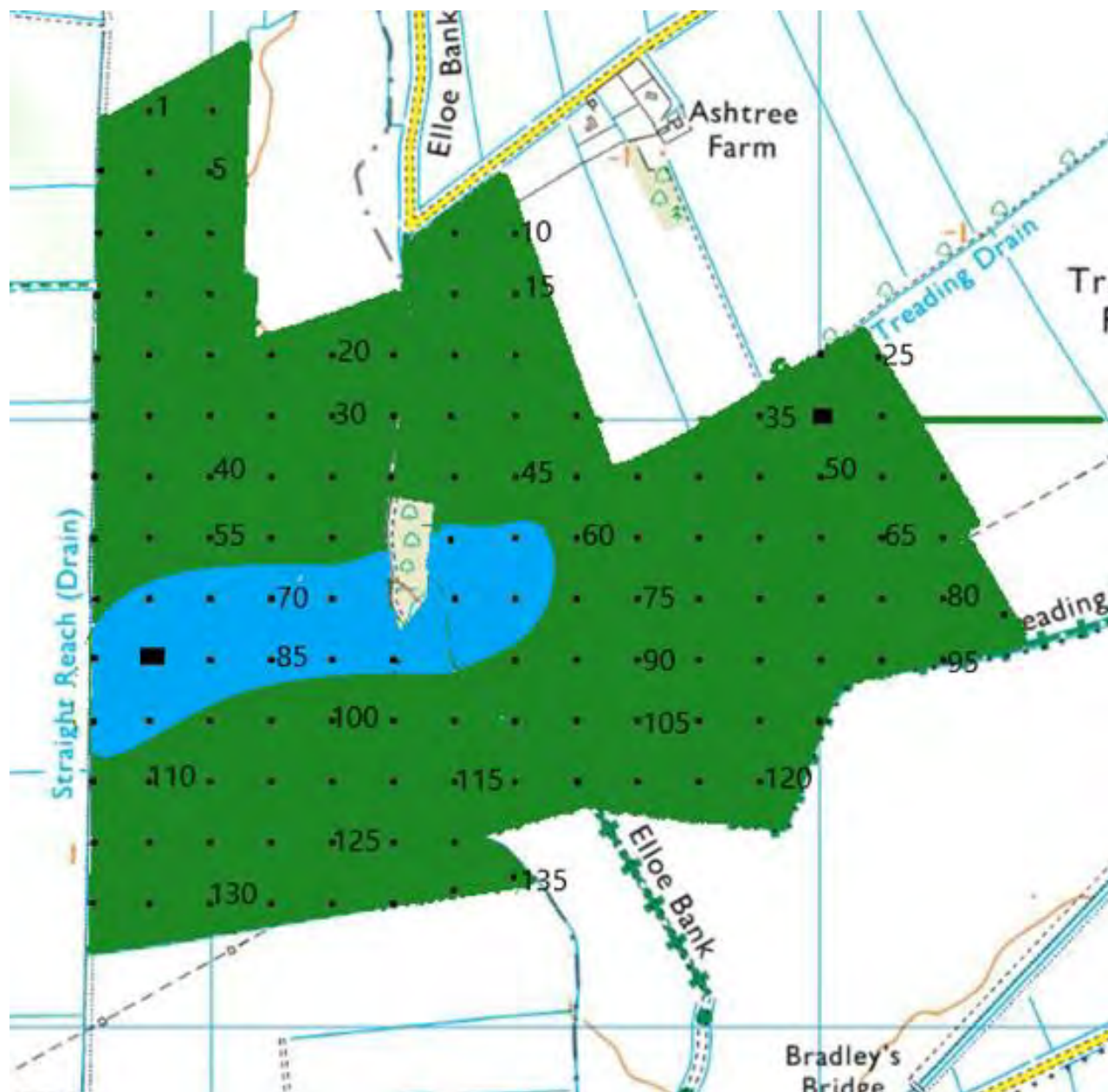
**BATEMAN RURAL
ASSOCIATES
LIMITED**

Drawing Title: ALC Grade

Drawing No.: 1

Scale: 1:10000

Date:14/07/2022



APPENDIX A

Soil profile data

Notes

1. All abbreviations relating to soil parameters are standard and derived from the guidance documents:

Agricultural Land Classification of England and Wales. Revised guidelines and criteria for grading the quality of agricultural land. MAFF. 1988.
Soil Survey Field Handbook. Technical Monograph No.5. Soil Survey of England and Wales. 1976.
2. The pit data is detailed in this table and information on structure and stone content copied to the appropriate boring profiles.
3. Any blanks or zeros in the cells indicate the data is not needed or appropriate for that cell.
4. If 'NA' is inserted in a cell the information is not appropriate on this occasion.
5. Boring or pit locations are directly (within 2 m accuracy) on the grid reference corresponding to the points on the map unless otherwise stated.
6. A point directly marked on a track, boundary or other feature will be moved 2-3 m off the point or omitted if surrounding points and soil types allow.
7. Borings that are potentially within 15 m of a gas pipeline are limited to 0.4 m depth and the strata description in the data table below this depth will be extrapolated from nearby borings and upper strata characteristics.
8. The *Observation Density* is 1 per ha on a 100 m grid using a semi *Free Survey* method if appropriate*. The letter 'B' in the second column of the data table refers to an observation point at which a boring may have been undertaken. In some situations it is not possible to visit the location due to for example crop status or animals in a field. In some cases the location is visited and observation of the soils at the surface is sufficient. In all cases the soil, geology, topography, flood risk and aerial crop patterns are assessed from published sources and the soils will be subject to a full 120 cm depth boring either side of a non-visited or non-bored point. If all data sources are agreeable, a soil pattern can be established.

* British Society of Soil Science. Working With Soil – The Professional Competency Scheme. Agricultural Land Classification: England and Wales. How2 sheet 4.2.4. 2018.
9. For moisture balance calculations, *strongly*, *moderately* and *well developed* structure will equate to *good*, *moderate* or *poor* structure terms respectively in Table 14 of the guidelines.
10. Pit information in addition to that listed in the table below will be detailed in Section 4.1 and 4.3 if needed.

Obs point	Grid ref. if off intersection	Boring or Pit	Grad. (deg)	Base Depth (cm)	Text.	Calc	Matrix colour	Mott's / black ferro. conc. %/ depth	Mott colour or FC if ferro. conc.	Ped face colour	Stns %	Stns type	Porosity	Struct (if F-fern consistence)	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (wetness)	TAv	EAv	StTAv	StEAv	MBW	Grain Drought Wt(%)	MBP	Grain Drought POT(ATES)
21		B	≤7	28	ZC	N	10YR42				0	HR				28	28	II	3a	17		1		14.23	2	-8.17	2
				120	ZC		10YR53	20/28	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
22		B	≤7	28	C	N	10YR31				0	HR				28	28	II	3a	17		1		9.33	2	-13.57	3a
				55	C		10YR31	20/28	10YR56		0	HR	P	CAB	MD					13	7	1	0.5				
				120	ZC		10YR42	25/55	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																							
23		B	≤7	30	C	N	10YR31				0	HR				30	30	II	3a	17		1		9.63	2	-13.77	3a
				60	C		10YR42	25/30	10YR56		0	HR	P	CAB	MD					13	7	1	0.5				
				120	ZC		10YR41	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																							
24		B	≤7	35	ZC	N	10YR31				0	HR				35	35	II	3a	17		1		15.63	2	-6.77	2
				120	ZC		10YR41	25/35	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
25		B	≤7	30	ZC	N	10YR31				0	HR				30	30	II	3a	17		1		14.63	2	-7.77	2
				120	ZC		10YR41	20/30	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
26		B	≤7	30	HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		38.63	1	6.23	2
				120	MZCL		10YR43	15/30	10YR56		0	HR	P	CPR	MD					17	10	1	0.5				
				120																0	0	0	0				
				120																							
27		B	≤7	30	HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		38.63	1	6.23	2
				120	MZCL		10YR43	20/30	10YR56		0	HR	P	CPR	MD					17	10	1	0.5				
				120																0	0	0	0				
				120																							
28		B	≤7	30	HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		38.63	1	6.23	2
				120	MZCL		10YR43	20/30	10YR56		0	HR	P	CPR	MD					17	10	1	0.5				
				120																0	0	0	0				
				120																							
29		B	≤7	25	ZC	N	10YR42				0	HR				25	25	II	3a	17		1		13.63	2	-8.77	2
				120	ZC		10YR53	20/25	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
30		B	≤7	25	ZC	N	10YR42				0	HR				25	25	II	3a	17		1		13.63	2	-8.77	2
				120	ZC		10YR53	25/25	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
31		B	≤7	28	ZC	N	10YR42				5	HR				28	28	II	3a	17		1		9.92	2	-9.36	2
				120	C		10YR53	25/28	10YR56		5	HR	P	CPR	MD					16	8	1	0.5				
				120																0	0	0	0				
				120																							
32		B	≤7	25	ZC	N	10YR42				5	HR				25	25	II	3a	17		1		5.06	2	-9.64	2
				120	C		10YR53	25/28	10YR56		5	HR	P	CPR	MD					16	8	1	0.5				
				120																0	0	0	0				
				120																							
33		B	≤7	28	HZCL	N	10YR31				5	HR				28	28	II	3a	19		1		30.63	1	-0.05	2
				120	HZCL		10YR41	20/28	10YR56		5	HR	P	CPR	MD					17	10	1	0.5				
				120																0	0	0	0				
				120																							
34		B	≤7	25	HZCL	N	10YR31				5	HR				28	28	II	3a	19		1		30.06	1	-0.62	2
				120	HZCL		10YR41	20/28	10YR56		5	HR	P	CPR	MD					17	10	1	0.5				
				120																0	0	0	0				
				120																							
35		B	≤7	35	HZCL	N	10YR31				0	HR				35	35	II	3a	19		1		22.63	2	0.23	2
				120	ZC		10YR41	25/35	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
36		P	≤7	35	HZCL	N	10YR31				0	HR				35	35	II	3a	19		1		22.63	2	0.23	2
				120	ZC		10YR41	25/35	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
37		B	≤7	30	HZCL	N	10YR31				5	HR				30	30	II	3a	19		1		17.93	2	-4.47	2
				120	ZC		10YR41	20/30	10YR56		0	HR	P	CPR	MD					15	8	1	0.5				
				120																0	0	0	0				
				120																							
38		B	≤7	28	C	N	10YR42				0	HR				28	28	II	3a	17		1		9.43	2	-11.97	3a
				50	C		10YR41	20/28	10YR56		0	HR	P	CAB	MD					16	8	1	0.5				
				120	ZC		10YR41	25/50	10YR56		0	HR	P	CPR	WK					12	7	1	0.5				
				120																							
39		B	≤7	28	C	N	10YR42				0	HR				28	28	II	3a	17		1		9.43	2	-11.97	3a
				50	C		10YR41	20/28	10YR56		0	HR	P	CAB	MD					16	8	1	0.5				
				120	ZC		10YR41	25/50	10YR56		0	HR	P	CPR	WK					12	7	1	0.5				
				120																							
40		B	≤7	25	C	N	10YR42				5	HR				25	25	II	3a	17		1		5.26	2	-16.14	3a
				50	C		10YR41	25/25	10YR56		5	HR	P	CAB	MD					16	8	1	0.5				
				120	ZC		10YR41	25/50	10YR56		0	HR	P	CPR	WK					12	7	1	0.5				
				120																							

[illegible]

Obs point	Grid ref. if off intersection	Boring or Pit	Grad. (deg)	Base Depth (cm)		Text.	Calc	Matrix colour	Mott's/black ferro. conc. %/ depth	Mott colour or FC if ferro. conc.	Ped face colour	Stns %	Stns type	Porosity	Struct (if F=firm consist enc)	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (twiness)	TAv	EAv	StTAv	StEAv	MBW	Grade (Drought, WHEAT)	MBP	Grade (Drought, POTATOES)	
61		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				ZC		10YR31	20/28	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	25/55	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
62		B	≤7	25		HZCL	N	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	25/25	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	25/55	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
63		B	≤7	25		HZCL	N	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	25/25	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	25/55	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
64		B	≤7	25		HZCL	N	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	15/25	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
GAS PIPE																													
66		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				ZC		10YR31	20/28	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	25/55	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
67		B	≤7	25		HZCL	N	10YR31				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	25/25	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	20/50	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
68		B	≤7	45		MZCL	N	10YR31				5	HR				45	45	II	2	19		1		41.22	1	9.13	2	
				ZL		10YR53	15/45	10YR56	5	HR	P	M/F	MD	22	14	1					0.5								
				MZCL		10YR53	15/55	10YR56	0	HR	P	CAB	MD	17	10	1					0.5								
69		B	≤7	25		MZCL	N	10YR32				0	HR				25	25	II	2	17		1		45.13	1	8.73	2	
				ZL		10YR52	10/25	10YR56	0	HR	P	M/F	MD	22	14	1					0.5								
				SCL		10YR42	15/50	10YR56	0	HR	P	CPR	MD	15	10	1					0.5								
70		B	≤7	25		MZCL	N	10YR32				0	HR				25	25	II	2	17		1		45.13	1	8.73	2	
				ZL		10YR52	5/25	10YR56	0	HR	P	M/F	MD	22	14	1					0.5								
				SCL		10YR42	15/50	10YR56	0	HR	P	CPR	MD	15	10	1					0.5								
71		B	≤7	28		MZCL	N	10YR31				0	HR				40	40	II	2	19		1		46.73	1	14.33	1	
				ZL		10YR31			0	HR	P	M/F		22	14	1					0.5								
				MZCL		10YR41	10/45	10YR56	0	HR	P	CPR	MD	17	10	1					0.5								
72		B	≤7	28		MZCL	N	10YR31				0	HR				40	40	II	2	19		1		55.23	1	11.83	1	
				ZL		10YR31			0	HR	P	M/F		22	14	1					0.5								
				MZCL		10YR41	10/40	10YR56	0	HR	P	CPR	MD	17	10	1					0.5								
73		B	≤7	30		HZCL	N	10YR31				10	HR				30	30	II	3a	19		1		13.11	2	-6.17	2	
				C		10YR42	10/28	10YR56	5	HR	P	CPR	MD	16	8	1					0.5								
74		B	≤7	28		HZCL	N	10YR31				10	HR				28	28	II	3a	19		1		12.72	2	-6.56	2	
				C		10YR42	25/28	10YR56	5	HR	P	CPR	MD	16	8	1					0.5								
75		B	≤7	25		HZCL	N	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	25/25	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
76		B	≤7	25		HZCL	N	10YR32				5	HR				25	25	II	3a	19		1		16.38	2	-6.02	2	
				ZC		10YR31	20/25	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
GAS PIPE																													
78		B	≤7	30		HZCL	N	10YR32				0	HR				30	30	II	3a	19		1		20.63	2	-1.77	2	
				ZC		10YR41	15/30	10YR56	0	HR	P	CAB	MD	15	8	1					0.5								
				ZC		10YR42	25/60	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
79		B	≤7	25		HZCL	Y	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	25/25	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								
80		B	≤7	25		HZCL	Y	10YR42				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				ZC		10YR31	15/25	10YR56	0	HR	P	CPR	MD	15	8	1					0.5								

Obs point	Grid ref. if off intersection	Boring or Pit	Grad. (deg)	Base Depth (cm)		Text.	Calc	Matrix colour	Mott's / black ferro. conc. %/ depth	Mott colour or FC if ferro. conc.	Ped face colour	Stns %	Stns type	Porosity	Struct (if F=firm consist ence)	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (wetness)	TAv	EAv	StTAv	StEAv	MBW	Grade (Drought WHEAT)	MBP	Grade (Drought POTATOES)	
81		B	≤7	25		HZCL	N	10YR42				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				120		ZC		10YR31	15/25	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																	0	0	0	0					
				120																									
82		B	≤7	25		MZCL	N	10YR32				0	HR				25	25	II	2	17		1		45.13	1	8.73	2	
				50		ZL		10YR52	10/25	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		SCL		10YR42	15/50	10YR56		0	HR	P	CPR	MD					15	10	1	0.5					
				120																									
83		P	≤7	25		MZCL	N	10YR32				0	HR				25	25	II	2	17		1		45.13	1	8.73	2	
				50		ZL		10YR52	10/25	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		SCL		10YR42	15/50	10YR56		0	HR	P	CPR	MD					15	10	1	0.5					
				120																									
84		B	≤7	25		MZCL	N	10YR32				5	HR				25	25	II	2	17		1		45.13	1	10.23	1	
				55		ZL		10YR52	5/25	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		SCL		10YR42	15/55	10YR56		0	HR	P	CPR	MD					15	10	1	0.5					
				120																									
85		B	≤7	25		MZCL	N	10YR32				0	HR				25	25	II	2	17		1		45.13	1	8.73	2	
				50		ZL		10YR52	5/25	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		SCL		10YR42	15/50	10YR56		0	HR	P	CPR	MD					15	10	1	0.5					
				120																									
86		B	≤7	45		MZCL	N	10YR31				0	HR				45	45	II	2	19		1		46.13	1	14.23	1	
				55		ZL		10YR53	15/45	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		MZCL		10YR53	15/55	10YR56		0	HR	P	CAB	MD					17	10	1	0.5					
				120																									
87		B	≤7	35		HZCL	N	10YR31				5	HR				35	35	II	3a	19		1		17.23	2	-2.04	2	
				120		C		10YR42	10/35	10YR56		5	HR	P	CPR	MD					16	8	1	0.5					
				120																	0	0	0	0					
				120																									
88		B	≤7	30		HZCL	N	10YR32				0	HR				30	30	II	3a	19		1		20.63	2	-1.77	2	
				60		ZC		10YR41	15/30	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
89		B	≤7	30		HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		22.63	2	2.23	2	
				120		C		10YR42	20/28	10YR56		0	HR	P	CPR	MD					16	8	1	0.5					
				120																	0	0	0	0					
				120																									
GAS PIPE																													
91		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				55		ZC		10YR31	20/28	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/55	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
92		B	≤7	30		HZCL	N	10YR41				0	HR				30	30	II	3a	19		1		19.63	2	-1.77	2	
				60		ZC		10YR41	15/30	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
93		B	≤7	28		HZCL	N	10YR41				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60		ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
94		B	≤7	28		HZCL	N	10YR41				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60		ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
95		B	≤7	25		HZCL	N	10YR32				0	HR				25	25	II	3a	19		1		18.63	2	-3.77	2	
				60		ZC		10YR41	20/25	10YR56		0	HR	P	CAB	MD					15	8	1	0.5					
				120		ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD					15	8	1	0.5					
				120																									
96		B	≤7	30		MZCL	N	10YR32				0	HR				30	30	II	2	17		1		42.63	1	6.23	2	
				50		ZL		10YR52	5/30	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		SCL		10YR42	15/50	10YR56		0	HR	P	CPR	MD					15	10	1	0.5					
				120																									
97		B	≤7	35		MZCL	N	10YR31				0	HR				35	35	II	2	19		1		57.13	1	24.73	1	
				75		ZL		10YR53	15/35	10YR56		0	HR	P	M/F	MD					22	14	1	0.5					
				120		MZCL		10YR42	20/75	10YR56		0	HR	P	CAB	MD					17	10	1	0.5					
				120																									
98		B	≤7	25		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		16.13	2	-4.27	2	
				45		C		10YR41				0	HR	P	CAB	MD					16	8	1	0.5					
				120		C		10YR42	20/45	10YR56		0	HR	P	CPR	MD					16	8	1	0.5					
				120																									
99		B	≤7	25		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		16.13	2	-4.27	2	
				45		C		10YR41				0	HR	P	CAB	MD					16	8	1	0.5					
				120		C		10YR42	20/45	10YR56		0	HR	P	CPR	MD					16	8	1	0.5					
				120																									
100		B	≤7	25		HZCL	N	10YR41				0	HR				45	45	II	3a	17		1		14.63	2	-5.77	2	
				45		C		10YR41				5	HR	P	CAB	MD					16	8	1	0.5					
				120		C		10YR42	20/45	10YR56		0	HR	P	CPR	MD					16	8	1	0.5					
				120																									

Obs point	Grid ref. if off intersection	Boring or Pit	Grad. (deg)	Base Depth (cm)		Text.	Calc	Matrix colour	Mott's/ black ferro. conc. %/ depth	Mott colour or FC if ferro. conc.	Ped face colour	Stns %	Stns type	Porosity	Struct (F=Firm consist ence)	Degree of development	SPL depth (cm)	Gleying depth (cm)	SWC	Grade (witness)	TAv	EAv	StTAv	StEAv	MBW	Grade (Draught WHEAT)	MBP	Grade (Draught POTATOES)	
101		B	≤7	20		HCL	N	10YR32				5	HR				20	20	II	3a	18		1		14.86	2	-6.32	2	
				55	HZCL		10YR53	20/28	10YR56		5	HR	P	CAB	MD	17					10	1	0.5						
				120	ZC		10YR42	20/55	10YR56		5	HR	P	CPR	MD	15					8	1	0.5						
				120																									
102		B	≤7	20		HCL	N	10YR32				5	HR				20	20	II	3a	18		1		15.81	2	-5.37	2	
				60	HZCL		10YR53	20/28	10YR56		5	HR	P	CAB	MD	17					10	1	0.5						
				120	ZC		10YR42	25/50	10YR56		5	HR	P	CPR	MD	15					8	1	0.5						
				120																									
GAS PIPE																													
104		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
105		B	≤7	30		HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		20.63	2	-1.77	2	
				60	ZC		10YR41	15/30	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
106		B	≤7	30		HZCL	N	10YR31				0	HR				30	30	II	3a	19		1		20.63	2	-1.77	2	
				60	ZC		10YR41	15/30	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
107		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
108		B	≤7	25		HZCL	N	10YR32				5	HR				25	25	II	3a	19		1		12.01	2	-9.17	2	
				120	ZC		10YR42	15/25	10YR56		5	HR	P	CPR	MD	15					8	1	0.5						
				120												0					0	0	0						
				120																									
109		B	≤7	25		HZCL	NN	10YR32				5	HR				25	25	II	3a	19		1		16.38	2	-6.02	2	
				120	ZC		10YR42	15/25	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120												0					0	0	0						
				120																									
110		B	≤7	20		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		13.76	2	-6.64	2	
				45	C		10YR41				5	HR	P	CAB	MD	16					8	1	0.5						
				120	C		10YR42	25/45	10YR56		0	HR	P	CPR	MD	16					8	1	0.5						
				120																									
111		B	≤7	20		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		15.63	2	-4.77	2	
				45	C		10YR41				0	HR	P	CAB	MD	16					8	1	0.5						
				120	C		10YR42	25/45	10YR56		0	HR	P	CPR	MD	16					8	1	0.5						
				120																									
112		B	≤7	25		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		24.13	2	-5.77	2	
				45	C		10YR41				5	HR	P	CAB	MD	16					8	1	0.5						
				120	C		10YR42	20/45	10YR56		0	HR	P	CPR	MD	16					8	1	0.5						
				120																									
113		B	≤7	25		HZCL	N	10YR42				0	HR				45	45	II	3a	17		1		14.63	2	-5.77	2	
				45	C		10YR41				5	HR	P	CAB	MD	16					8	1	0.5						
				120	C		10YR42	25/45	10YR56		0	HR	P	CPR	MD	16					8	1	0.5						
				120																									
GAS PIPE																													
GAS PIPE																													
116		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
117		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
118		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
119		B	≤7	28		HZCL	N	10YR31				0	HR				28	28	II	3a	19		1		19.83	2	-2.57	2	
				60	ZC		10YR41	20/28	10YR56		0	HR	P	CAB	MD	15					8	1	0.5						
				120	ZC		10YR42	25/60	10YR56		0	HR	P	CPR	MD	15					8	1	0.5						
				120																									
120		B	≤7	25		HZCL	N	10YR42				5	HR				25	25	II	3a	19		1		12.01	2	-9.17	2	
				120	ZC		10YR53	20/25	10YR56		5	HR	P	CPR	MD	15					8	1	0.5						
				120																									
				120																									

GAS PIPE

GENERAL INFORMATION SOURCES

1. ***Agricultural Land Classification of England and Wales***. Revised guidelines 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 Midlands and Western England***. Soil Survey of England and Wales,
6. ***Agricultural Land Classification Map*** 1:250 000. MAFF 1983.
7. ***Risk of Flooding***: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>
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. ***Munsell Soil Colour Charts***, Munsell Colour, Grand Rapids 1994.

GLOSSARY

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1997).

1. Terms used on computer database, in order of occurrence.

GRID REF: National 100 km grid square and 8 figure grid reference.

LAND USE: At the time of survey

WHT:	Wheat	SBT:	Sugar Beet	HTH:	Heathland
BAR:	Barley	BRA:	Brassicas	BOG:	Bog or Marsh
OAT:	Oats	FCD:	Fodder Crops	DCW:	Deciduous Wood
CER:	Cereals	FRT:	Soft and Top Fruit	CFW:	Coniferous Woodland
MZE:	Maize	HRT:	Horticultural Crops	PLO:	Ploughed
OSR:	Oilseed Rape	LEY:	Ley Grass	FLW:	Fallow (inc. Set aside)
POT:	Potatoes	PGR:	Permanent Pasture	SAS:	Set Aside (where known)
LIN:	Linseed	RGR:	Rough Grazing	OTH:	Other
BEN:	Field Beans	SCR:	Scrub		

GRDNT: Gradient as estimated or measured by hand-held optical clinometer.

GLEY, SPL: Depth in centimetres to gleying or slowly permeable layer.

AP (WHEAT/POTS): Crop-adjusted available water capacity.

MB (WHEAT/POTS): Moisture Balance. (Crop adjusted AP - crop potential MD)

DRT: Best grade according to soil droughtiness.

If any of the following factors are considered significant, 'Y' will be entered in the relevant column.

MREL:	Microrelief limitation	FLOOD:	Flood risk	EROSN:	Soil erosion risk
EXP:	Exposure limitation	FROST:	Frost prone	DIST:	Disturbed land
CHEM:	Chemical limitation				

LIMIT: The main limitation to land quality: The following abbreviations are used.

OC:	Overall Climate	AE:	Aspect	EX:	Exposure
FR:	Frost Risk	GR:	Gradient	MR:	Microrelief
FL:	Flood Risk	TX:	Topsoil Texture	DP:	Soil Depth
CH:	Chemical	WE:	Wetness	WK:	Workability
DR:	Drought	ER:	Erosion Risk	WD:	Soil Wetness/Droughtiness

ST: Topsoil Stoniness

TEXTURE: Soil texture classes are denoted by the following abbreviations:-

S: Sand	LS: Loamy Sand	SL: Sandy Loam
SZL: Sandy Silt Loam	CL: Clay Loam	ZCL: Silty Clay Loam
ZL: Silt Loam	SCL: Sandy Clay Loam	C: Clay
SC: Sandy clay	ZC: Silty clay	OL: Organic Loam
P: Peat	SP: Sandy Peat	LP: Loamy Peat
PL: Peaty Loam	PS: Peaty Sand	MZ: Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes:-

F: Fine (more than 66% of the sand less than 0.2mm)
M: Medium (less than 66% fine sand and less than 33% coarse sand)
C: Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content: **M:** Medium (< 27% clay) **H:** heavy (27 - 35% clay)

MOTTLE COL: Mottle colour using Munsell notation.

MOTTLE ABUN: Mottle abundance, expressed as a percentage of the matrix or surface described.

F: few <2% **C:** common 2 - 20% **M:** many 20 - 40% **VM:** very many 40%+

MOTTLE CONT: Mottle contrast

F: faint - indistinct mottles, evident only on close inspection
D: distinct - mottles are readily seen
P: Prominent - mottling is conspicuous and one of the outstanding features of the horizon.

PED. COL: Ped face colour using Munsell notation.

GLEYS: If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

STONE LITH: Stone Lithology - One of the following is used.

HR: All hard rocks and stones	SLST: Soft oolitic or dolimitic limestone
CH: Chalk	FSST: Soft, fine grained sandstone
ZR: Soft, argillaceous, or silty rocks	GH: Gravel with non-porous (hard) stones
MSST: Soft, medium grained sandstone	GS: Gravel with porous (soft) stones
SI: Soft weathered igneous or metamorphic rock	

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm.

STRUCT: The degree of development, size and shape of soil peds are described using the following notation

<u>Degree of development</u>	WA: Weakly developed Adherent	WK: Weakly developed
	MD: Moderately developed	ST: Strongly developed
<u>Ped size</u>	F: Fine	M: Medium
	C: Coarse	VC: Very coarse
<u>Ped Shape</u>	S: Single grain	M: Massive
	GR: Granular	AB: Angular blocky
	SAB: Sub-angular blocky	PR: Prismatic
	PL: Platy	

CONSIST: Soil consistence is described using the following notation:

L: Loose	VF: Very Friable	FR: Friable	FM: Firm
VM: Very firm	EM: Extremely firm	EH: Extremely Hard	

SUBS STR: Subsoil structural condition recorded for the purpose of calculating profile droughtiness: **G:** Good **M:** Moderate **P:** Poor

POR: Soil porosity. If a soil horizon has poor porosity with less than 0.5% biopores >0.5mm, a 'Y' will appear in this column.

IMP: If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropriate horizon.

SPL: Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

CALC: If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a 'Y' will appear this column.

2. Additional terms and abbreviations used mainly in soil pit descriptions.

STONE ASSESSMENT:

V: Visual	S: Sieved	D: Displacement
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MOTTLE SIZE:

EF:	Extremely fine <1mm	M:	Medium 5-15mm
VF:	Very fine 1-2mm>	C:	Coarse >15mm
F:	Fine 2-5mm		

MOTTLE COLOUR: May be described by Munsell notation or as ochreous (OM) or grey (GM).

ROOT CHANNELS: In topsoil the presence of 'rusty root channels' might also be noted as RRC.

MANGANESE CONCRETIONS: Assessed by volume

N:	None	M:	Many	20-40%
F:	Few <2%	VM:	Very Many	>40%
C:	Common 2-20%			

POROSITY:

P:	Poor - less than 0.5% biopores at least 0.5mm in diameter
G:	Good - more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE:

The number of roots per 100cm ² :		Very Fine and Fine	Medium and Coarse
F:	Few	1-10	1 or 2
C:	Common	10.25	2 - 5
M:	Many	25-200	>5
A:	Abundant	>200	

ROOT SIZE

VF:	Very fine <1mm	M:	Medium 2 - 5mm
F:	Fine 1-2mm	C:	Coarse >5mm

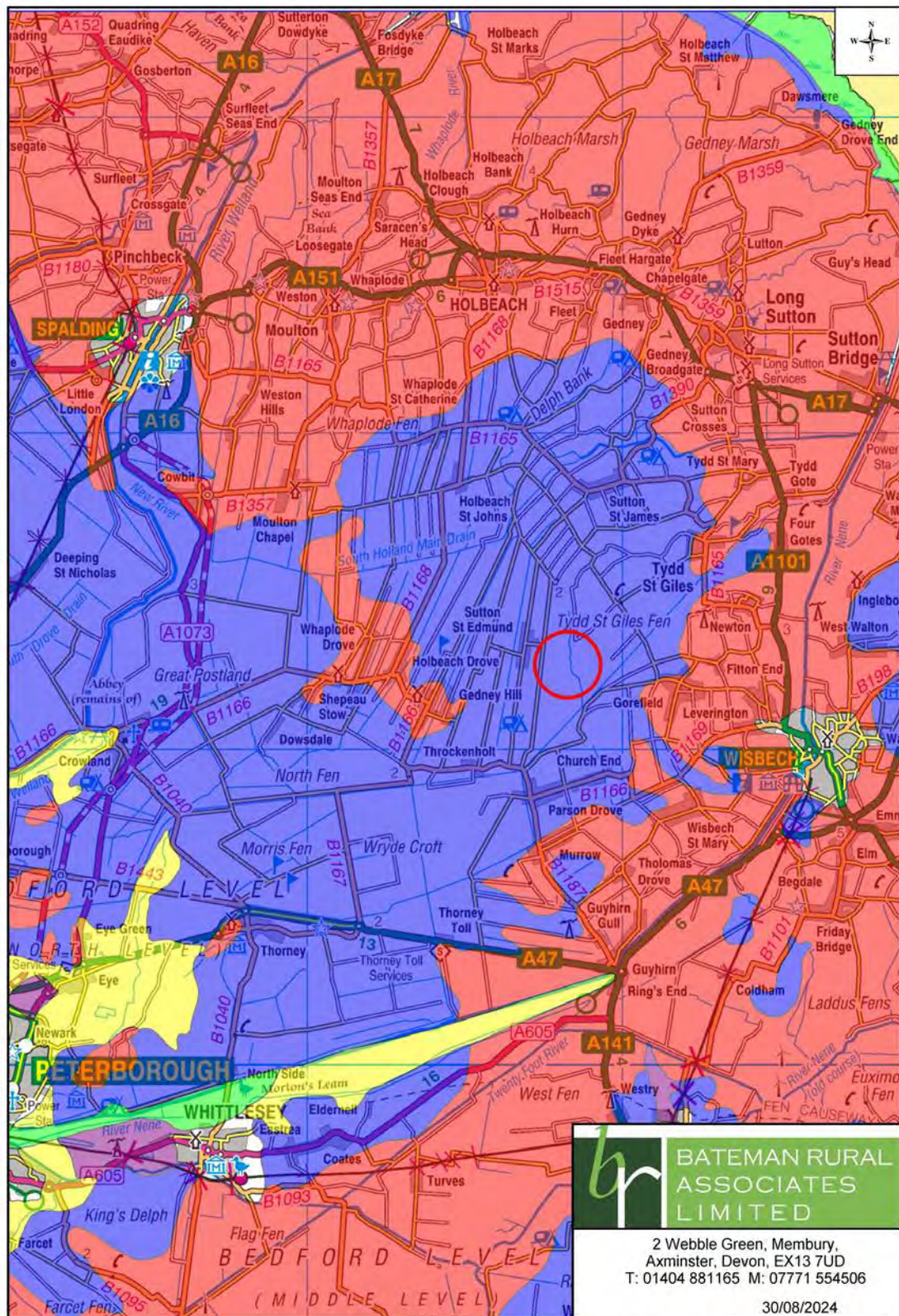
HORIZON BOUNDARY DISTINCTNESS:

Sharp:	<0.5cm	Gradual:	6 - 13cm
Abrupt:	0.5 - 2.5cm	Diffuse:	>13cm
Clear:	2.5 - 6cm		

HORIZON BOUNDARY FORM: Smooth, wavy, irregular or broken.*

* See Soil Survey Field Handbook (Hodgson, 1997) for details.

Appendix IV



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