Land Drainage Consultancy Ltd
Cowslip Offices
Fimber - Driffield
East Yorkshire - YO25 9LY

Tel: 01377 236010
Email: mail@ldcl.co.uk
Web: www.ldcl.co.uk

AGRICULTURAL LAND CLASSIFICATION
SOIL RESOURCE ASSESSMENT

WINKING HILL FARM PROPOSED BESS
WINKING HILL, NOTTS
OS GRID REFERENCE: SK 51100 29800

December 2024

Prepared for:

Emma Ridley
Pegasus Group
Pavilion Court
Green Lane
Garforth
Leeds
LS25 2AF

Prepared by:

Amy Miller MSci (Hons), FACTS, MI Soil Sci
Land Drainage Consultancy Ltd
Cowslip Offices
Fimber
Driffield
East Yorkshire
YO25 9LY

Project:	Winking Hill Farm BESS, Winking Hill, Notts
Title:	Agricultural Land Classification and Soil Resource Assessment
Status:	Rev 1
Prepared by:	Amy Miller MSci, FACTS
Verified by:	David Royle BSc (Hons), MI Soi Sci, FACTS
Date of issue:	9th December 2024

Table of Contents

Page No.

1.0 BACKGROUND 1

2.0 REPORT OBJECTIVES 1

3.0 SURVEY METHODOLOGY 2

Desk top study 2
Field survey 2
Soil sampling and analysis 2
Testing Laboratory 3
Interpretation 3
Guidance 3
Appendices 4

4.0 FINDINGS 4

Location 4
Land Use 4
Climate and relief 4
Geology 5
Soils 5
Agricultural Land Classification 6
Detailed soils description 6
Topsoil analysis results 8
Agricultural Land Classification 9

5.0 CONCLUSIONS 12

Soils 12
Agricultural Land Classification 13
Soil and vegetation management 13

APPENDICES

1.0 BACKGROUND

1.1 LDC has been asked by Pegasus Group to undertake a Soil Resource and Agricultural Land Classification assessment on 4.24 ha of land located on the south site of the A453, opposite Ratcliffe Power Station, Nottinghamshire. The extent of site and proposed red line planning boundary is shown on the plan at Appendix 1.

1.2 The site, known as Winking Hill, is proposed for development as a Battery Storage system and is centred over OS National Grid Reference SK 51100 29800. The site will impact a single field of arable use.

1.3 This report has been prepared in support of a planning application for the proposed development and is authored by Amy Miller and verified by David Royle of LDC. Both David and Amy are experienced soil scientists advising on the impacts of development on soil resources and Agricultural Land Classification. They are members of the British Institute of Soil Science, registered under the Construction Skills Certification scheme and are qualified under the Fertiliser Advisers Certification and Training Scheme (FACTS).

2.0 REPORT OBJECTIVES

2.1 The objectives of this report are to:

- Describe the distribution of Soil Types over the proposed site,
- Provide a pre-working record of soil characteristics in each enclosure, and
- Determine the Agricultural Land Classification (ALC) grading of land within the site.

3.0 SURVEY METHODOLOGY

Desktop study

3.1 LDC completed a desk study for the site to collate and review data sourced from:

- Ordnance Survey 1:10,000 mapping,
- Agroclimatic datasets from the UK Met Office (1961-1988),
- Soil Survey 1:250,000, Sheet 3 Midland and Western England,
- Cranfield's LANDIS website,
- Provisional ALC data held on Defra's MAGIC website,
- British Geological Survey (BGS) Website (1:50,000 mapping),
- Aerial photographs referenced from Google Earth, and
- Environment Agency flood risk information.

Field survey

3.2 A soil survey and land quality assessment was undertaken by LDC in January 2024. Soils were examined across the site using a hand-held Dutch auger and spade to a maximum depth of 1.20m. A total of 5 auger borings were completed, at 100m intervals, at points predetermined by the Ordnance Survey National Grid and located in the field using a handheld GPS.

3.3 Information on topsoil and subsoil depth, texture, stone content and drainage characteristics were collected at each point. A single small hand dug profile pit was excavated in the soil type identified, to record more detailed information on soil profile characteristics.

Soil sampling and analysis

3.4 Topsoil samples were collected from the field to a depth of 0-150mm, as for fields in arable use in accordance with the sampling procedures outlined in The Nutrient Management Guide, DEFRA/AHDB, 2022.

3.5 Samples were tested to provide detail on topsoil texture (particle size distribution by laser diffraction), organic matter content (by LOI) and pH status, which are factors in assessing agricultural land quality.

3.6 Topsoil samples were further tested to provide information on nutritional characteristics including available phosphorus, potassium and magnesium.

3.7 Topsoil and subsoil samples were collected from the soil pit and tested for particle size distribution (sedimentation) to verify hand texturing in the field and to inform the ALC assessment.

Testing Laboratory

3.8 Soil samples were analysed at a suitably accredited laboratory (NRM Ltd.) who are UKAS accredited for soil, sludge and sediment analyses and participate in proficiency testing schemes including CONTEST (contaminated land soils and leachates), MCERTS, Aquacheck (waters, soils and sludges), FAPAS (nitrate in leafy vegetables) and WEPAL (nutrients in agricultural soils).

Interpretation

3.9 Soil survey information has been combined with site information to grade the quality of the land in accordance with the method described in "Revised Guidelines and Criteria for Grading the Quality of Agricultural Land" (MAFF 1988).

3.10 Field survey information and analytical data has been used to characterise the soils on site into representative soil mapping units.

Guidance

3.11 The following guidance has been used in providing this report:

- Agricultural Land Classification of England and Wales. Revised guidelines and Criteria for Grading the Quality of Agricultural Land (MAFF, 1988),
- Agricultural Land Classification: protecting the best and most versatile agricultural land: Technical Information Note TIN049, (Natural England, 2012),
- Guide to Assessing Development Proposals on Agricultural Land (Natural England, 2018),
- The Code of Practice for the Sustainable Use of Soils on Construction Sites, DEFRA 2009,
- Institute of Quarrying, 'Good Practice Guide for Handling Soils in Mineral Workings', July 2021
- The Soil Survey Field Handbook, Technical Monograph No 5, Harpenden, 1974,
- Good Practice Guide for Handling Soils, MAFF, April 2000,
- Soil Texture: Technical Information Note TIN037, (Natural England, 2008),
- The Nutrient Management Guide, ADHB/Defra. 2017,
- Guidance for Successful Reclamation of Mineral and Waste Sites (Defra, 2004),
- Protecting our Water, Soil and Air, A Code of Practice, Defra, 2009, and
- Safeguarding our Soils, A Strategy for England, Defra, 2009.

Appendices

3.12 The following Appendices are included:

- The location of soil auger borings, profile pits and soil sampling areas are shown at Appendix 1,
- The distribution of Soil Types across the site is mapped at Appendix 2
- The distribution of ALC Grades is mapped at Appendix 3,
- A description of individual soil auger borings is shown at Appendix 4,
- Soil profile pits are described at Appendix 5,
- Soil sample analytical report sheets are provided at Appendix 6,
- Published ALC data are included at Appendix 7 (provisional) and Appendix 8 (detailed),
- A flood risk sensitivity map is shown at Appendix 9.

4.0 FINDINGS

Location

4.1 The site is located 2.5km west of Gotham, Nottinghamshire. The site is centered over OS National Grid Reference SK 51100 29800. The site is located opposite the Ratcliffe Power Station, bounded to the north by the A653 carriageway. The site is enclosed by mature hedgerow on three sides, adjacent to W Leak Lane to the west and existing farm track to the south.

Land use

4.2 The site is occupied by a single agricultural enclosure under cereal cropping. There is a 1m-wide grass buffer strip around the mature hedgerow and buildings to the west of the site.

4.3 At the time of survey, following a wet winter the ground was at field capacity, there was extensive areas of standing water, particularly within tramlines.

Climate and relief

4.4 This area has a mean annual rainfall of 592mm and The Accumulated Temperature Above 0°C between January and June is 1,419 day°C. This provides a relatively long and mild growing season. The land is typically at field capacity, (when the land is wet and field drains would be expected to flow), for between 127 days (or 4-5 months) in a normal year.

4.5 The site is very gently sloping, falling from a high point of 40m in the east down 34m in the very west of the site. There are no slopes that would limit ALC on the site.

Geology

4.6 Solid geology is mapped (BGS, 1:50,000 website), as the Branscombe Mudstone Formation. These rocks were formed approximately 228.4 and 201.3 million years ago in the Mid-Triassic Period. This formation occurs extensively in the geographical region, although an outcrop of the Barnstone Mudstone and limestone member lies close, on the opposite side of West Leak Lane.

4.7 The BGS website indicates that there is generally an absence of superficial drift across the site. Albeit the northeastern most corner, occupied by head deposits of clay, sand and silt laid down from the present day to 2.58 million years ago.

Soils

4.9 Soils in the area are mapped in Figure 1 and described by the Soil Survey of England and Wales as the Worcester Soil Association. These soils are typically reddish surface water gley soils with heavy textured topsoil overlying slowly permeable clay and mudstone that lead to seasonal waterlogging. They are mainly suited to growing winter combinable crops and grass. Soils are typically shallow and found on moderate to steeply sloping land and contain greenish/olive grey mudstone and siltstone. Profiles are typically imperfectly to poorly drained (Wetness Class III/IV) but, where steeper slopes encourage drainage, profiles may be Wetness Class II. To the far west of the site, the Fladbury 2 mapping unit encroaches on the site. These soils are also slowly permeable and clayey however are stoneless with some sandier subsoils. These soils are affected by groundwater and occupy lower lying flat land, at risk of flooding along the Trent Valley.

Figure 1. Winking Hill BESS Published Soils Information

Source: 1:250,000 Soils Map, Sheet 3,Midland and Western England, Soil Survey of England and Wales

Legend	Soil Association	Typical description
431	Worcester	Slowly permeable, reddish clayey soils developed in Permo-Triassic mudstone and clay shale. Found on steep slopes between 15 and 150 m AOD Seasonally waterlogged (WCIII) but on slopes greater than 11°& <150 FCD can be WC II.
813c	Fladbury 2	Stoneless clayey soils variably affected by ground water with occasional sandy subsoils.

Agricultural Land Classification

4.10 ALC grading was mapped (MAGIC website) provisionally by MAFF in 1988 at a scale of 1:250,000, an extract is shown at Appendix 7. Whilst these maps are based on an obsolete ALC grading system, they provide an indication of potential grade in this geographical area as predominantly good to moderate quality ALC Grade 3 land, but with no further definition of grades nor subdivisions.

4.11 An extract from the MAGIC website at Appendix 8 shows that a number of detailed ALC surveys have been completed by ADAS Huntington Statutory Group, Cambridge in this area, conducted as part of the West Leicestershire Local Plan in 1990's. A survey was conducted on 139 ha of land around Diseworth, approximately 3km from Winking Hill. The survey resolved predominantly ALC subgrade 3b, with isolated outcrops of subgrade 3a and rare occurrences of ALC grade 2. Limitations were imposed by soil wetness, due to heavy textured slowly permeable subsoils. Better graded land is improved by medium textured topsoil and reduced mottling and gleying in the subsoil resolved wetness Class of III or II. Other surveys

in the area show a distribution of predominantly ALC subgrade 3b (moderate quality) land together with a lesser proportion of subgrade 3a (good quality).

Detailed soils description

4.12 Information collected from the soil survey has been used to map the soils according to the soil classification for England and Wales, fully described by Avery (1980) and Clayden and Hollis (1984) and at 4.8. This is a general-purpose classification that groups soils that behave in a similar way in response to normal management practices. A group of soils, or Soil Association, has a limited and defined range of diagnostic properties that differentiate it from other Soil Types. Associations are further sub divided into component Soil Series. Detailed descriptions of individual Soil Types are outlined in 'Soils and Their Use in Midland and Western England (Harpenden 1984).

4.13 The site is occupied by a single soil type which are described below and mapped at Appendix 2

Soil Type 1: Heavy/Medium textured loamy soils overlying clay (4.24 ha or 100% of the proposed site area)

4.14 This Soil Type was found across the entirety of the site, with profiles typical of the Worcester Soil Association. It is mapped in mid-brown at Appendix 2 and a soil profile pit description is shown at Appendix 6, TP1.

4.15 Topsoil was a dark reddish brown (5YR 3/3) medium to heavy clay with a mean depth of 25cm (range 13-29cm). Topsoil to the north of the site, where land was lower lying observed heavier textured clay loam, whereas to the south of the site, topsoil was slightly lighter medium clay loam textures with appreciably sand content. Topsoil stone content was low with few (1-3%) small, subangular hard sandstone gravels and flints. Topsoil subsoil boundaries were often indistinct, particularly when strongly red in colour.

4.16 The subsoil was reddish brown (2.5YR 4/6) heavy clay or heavy silty clay loam. Subsoils contained few indistinct pale grey (5YR 7/1) and abundant manganese (5YR 2.5/1) and ochrous (7.5YR 5/6) mottles which were indicative of gleying however often masked by the red matrix. The subsoil stone content was reflective of the topsoil, containing 3-5% hard sandstone gravels. At the time of survey, wet winter conditions meant the ground was was at its plastic limit.

4.17 Soil profile drainage was naturally poor as profiles became slowly permeable directly below the topsoil. The combination of medium to heavy soil texture, the number of field capacity

days and the presence of a slowly permeable layer from 35cm, results in a Wetness Class of III across the entirety of the site.

4.18 This soil type occupied land principally of moderate quality ALC subgrade 3b and ALC subgrade 3a. Where topsoil textures were heavy clay loam, ALC grade was limited to ALC 3b. However, where medium clay loam textures were encountered to the south of the site, land quality was improved to ALC subgrade 3a.

4.19 A summary of the Soil Types found across the site is shown in Table 1.

Table 1: Winking Hill Proposed BESS: Summary of Soil Types		
Soil Type	Area (Ha)	% Site Area
1	4.24	100
Total	**4.24**	**100**

Topsoil analysis results (refer to Appendix 2 & 5)

Topsoil pH

4.20 The optimum pH for mineral soils in arable use is 6.50 and for grassland is 6.00. The pH of the topsoil is 7.80, near neutral to moderately alkaline, deemed satisfactory with no requirement for lime.

Phosphorus, potassium and magnesium

4.21 Concentration of available soil phosphorus (P), potassium (K) and magnesium (Mg) were all satisfactory (Index 3) for the field.

4.22 These results are indicative of the soils and farming system in place and typical of moderate intensity agricultural land using modest inputs of fertiliser and/or manures. Underlying mudstone parent materials are likely to be contributing to soil reserves of available potassium, calcium and magnesium.

Particle size distribution, organic matter and calcium carbonate equivalence

4.23 The trial pit, located in the area observed to be heavier textured, identified 29% clay (sedimentation technique), confirming field observation that there is an area of heavy clay loam in the field. Whereas the field sample, served to represent average texture across the site contained 21% clay, confirming observations of medium clay loam textures elsewhere on the site.

4.24 Organic matter levels measured 3.5%, considered low for heavy/medium textured topsoil in arable use. For the purpose of the ALC assessment the topsoil has been assessed as mineral, non- calcareous and not organic.

Agricultural Land Classification

General

4.25 Land quality assessments have been made using the method described in "Revised Guidelines and Criteria for Grading the Quality of Agricultural Land" (MAFF 1988). This system grades agricultural land according to the degree to which its physical characteristics impose long term limitations on agricultural use and cropping flexibility.

4.26 The principal physical factors which influence land quality and agricultural production are climate, particularly temperature and rainfall; site, including gradient, micro-relief and flood risk and soil characteristics such as texture, structure, depth, stoniness and erosion potential. These factors, including the interaction between them, form the basis of classifying land into one of five ALC grades with Grade 3 being subdivided into subgrades 3a and 3b. ALC grades 1, 2 and 3a are defined as the best and most versatile (BMV), subgrade 3b as being of moderate quality with Grade 4 land being poor and Grade 5 being of very poor quality.

Climatic limitations

4.27 Climate has an overriding influence on crop production and hence land flexibility and quality. It is assessed in the ALC system by considering rainfall and the sum of daily air temperatures above 0°C between January and June (Accumulated Temperature). The climatic regime described at 4.4-4.5 places no limitations on cropping flexibility in this area.

Site limitations

4.28 Gradients across the site are low and absent of microrelief that would impose limitations on ALC grade.

4.29 Interrogation of the Environment Agency flood risk maps, shown at Appendix 8, show that the site is situated in Flood Risk Zone 1, with a low probability of flooding. Therefore, flood risk does not moderate ALC grade at this site.

Soil limitations

4.30 Figure 1 shows the area to be covered by soil of Worcester Soil Association. Limitations to ALC grading on this soil type are typically imposed by soil wetness and workability.

4.31 Topsoil and subsoil depths across the site were good and adequate for continuous arable or grass production and pose no limitation to ALC grade.

4.32 Soil profile stone content was generally low (<3%), predominantly comprising of small to medium flint and hard sandstone gravels. Stone content was not sufficiently high to impose significant limitations on ALC grade.

4.33 Particle size distribution (PSD) analysis for field was between 21-29% clay, demonstrating the site to have medium to heavy clay loam textures. This textural class interacts with climate and drainage to form the primary moderating influence on ALC grade at this site.

4.34 Topsoil pH was near neutral, absent of calcareous rock in the topsoil and profiles were not naturally calcareous. High concentrations of calcium carbonate can have an ameliorating effect on clayey soils but in this instance the land has been graded on the basis of being a non-calcareous, mineral soil containing moderate levels (<10%) of organic matter.

4.35 The slow permeability of the clayey subsoil on this site leads to poor soil drainage and a potential for at least seasonal perched water table effects as evident at the time of survey. Seasonal wetness in the surface layers of the soil profile is an overriding limitation to plant growth reducing productivity, moderating yields and affecting the range of crops that may be grown at this site. This will affect the ability to access the land with farm machinery and the timeliness of agricultural operations. The elevated southern area of the site is likely to dry up earlier and have improved workability earlier in the season than the north of the site. However due to their distribution within the site it is unlikely that these would be practically farmed separately.

Interactive limitations

4.41 The physical limitations which result from the interactions between climate, site and soil are profile wetness, droughtiness and erosion. This area has moderately high annual rainfall, and the soils will typically be at field capacity, when land drains would normally be expected to flow, for 127 days per year, i.e. around 4 months in a typical year.

4.42 Soil wetness expresses the extent to which excess water imposes restrictions on crop growth, workability and cultivations. The slow permeability in the upper subsoil from a depth of 35cm, as a result of coarse structure and clayey textures, leads to a soil Wetness Class of III across the site. This Wetness Class has a significant moderating effect on ALC to Grade 3. Those with medium textured topsoil were classified as subgrade 3a and those with heavier textured topsoil to subgrade 3b.

4.43 Soil droughtiness indicates the degree to which a shortage of soil water influences the range of crops that may be grown, and the level of yield which may be achieved. Summer moisture deficits at this site are 111mm for wheat and 104mm for potatoes. The clayey textures in both

the topsoil and subsoil together with moisture balance calculations of +38mm for winter wheat and +9mm for potatoes indicate that drought does not form a major limiting factor to the ALC grading of this land.

4.44 The heavy soil textures and low relief mean that the risk of soil erosion through water/wind activity is low and not a primary limitation to ALC grade.

Agricultural Land Classification Grades

Subgrade 3a: Good quality agricultural land (1.29 ha or 30% of proposed site area)

4.45 This subgrade occupies the southern third of the site, on slightly elevated ground. Soil profiles are described at 4.14-4.18, however this grade is comprised of the medium clay loam textured subvariant. Soil profiles were typically mottled and gleyed between 21-29cm and slowly permeable from 35cm deep of the surface, resulting in Wetness Class III.

4.46 This land is good quality and Best and Most Versatile (BMV). It is capable of producing consistently high yields of a wide range of agricultural crops including cereals, oilseed rape, root crops and/or grass and will be suited to spring cropping. In wetter years the land is likely to be slightly less flexible than grade 2 land.

Subgrade 3b: Moderate quality agricultural land (2.95 ha or 70% of proposed site area)

4.47 This subgrade occupies the lower lying land to the north of the site. It is comprised of the heavy textured topsoil variant of Soil type 1, overlying consistently heavy clay loam subsoil as described in 4.14-4.18.

4.48 Soil profiles were typically mottled and gleyed within 13-27cm and also slowly permeable immediately below the topsoil (Wetness Class III).

4.49 This land is of moderate quality with limitations imposed by soil wetness and workability, clayey textures and, where restored, poorer subsoil structure and compaction. It will be suited to a narrow range of mainly winter sown combinable crops and grassland. The ability to grow root crops is limited by the heavy topsoil texture; poor topsoil/subsoil structure and wetness issues particularly in late autumn, overwinter and spring. In dry/average years, yields may be respectable or good for combinable crops and grass. However, during wetter years there are likely to be difficulties with arable cultivations, sowing, maintenance, harvesting, surface wetness and timeliness of access leading to increased production costs and decreasing yields.

4.50 A summary of the ALC grades found across the site is shown in Table 2.

Table 2: Winking Hill Proposed BESS: Summary of ALC grade distribution		
ALC Grade	Area (Ha)	% Site Area
Subgrade 3a	1.29	30
Subgrade 3b	2.95	70
Total	**4.24**	**100**

5.0 CONCLUSIONS

Soils

5.1 The Winking Hill proposed BESS has the potential to impact on 4.24 ha of good to moderate quality agricultural soils.

5.2 The site is occupied by a single soil type, comprised of clay loam textured topsoil overlying poorly drained slowly permeable heavy clay loam subsoil with characteristics that necessitate careful management throughout the construction. Topsoil was variably medium and heavy textured, heavier land occupying the north of the site.

5.3 Topsoil analysis indicates that the soils are fairly typical of medium to high intensity agricultural land use with a near neutral to moderately alkaline pH combined with satisfactory levels of available major nutrients. Soil analysis results are acceptable for grassland and arable use, however topsoil fertility is likely to restrict the establishment of diverse sensitive wildflower seed mixes. This analysis should be considered when selecting seed mixes for the re-instatement areas within the landscaping scheme.

5.4 The proposed development will lead to the permanent loss of up to 4.24 ha of good to moderate quality soil resources and has the potential to create short term impacts during construction, re-instatement and aftercare. However, it is unlikely that all of this are will be lost under the permanent development footprint.

5.5 Soil handling should be undertaken during drier periods of the year, usually between April and October and to an agreed plan. Compliance with legislation, guidance and the adoption of good practice guidance and techniques during construction and re-instatement of impacted land will mitigate many of the issues associated with soils handling, storage and re-instatement.

5.6 It will be important to ensure that mitigation is appropriately secured, implemented and monitored. In this instance, this might be achieved through a combination of legislative compliance supported by planning conditions, site working practices, a construction-based soil management plan and oversight by trained personnel employed by the Applicant.

Agricultural Land Classification

5.7 The development has the potential to impact on up to 4.24 ha of agricultural land, of which 1.29 ha is BMV status subgrade 3a. Landscaping plans are under development, however the overall permanent loss will be lower than the 20ha threshold regarded as significant by Natural England.

5.8 The primary limitations to ALC grade are imposed by soil wetness and workability together due to medium to heavy textured topsoil overlying poorly drained slowly permeable clay.

Soil and vegetation management

5.9 The development will require soils to be retained or to be temporarily removed and then returned during landscaping. It is recommended that a land and soil management plan be formulated and implemented for the duration of the scheme and for an agreed aftercare period after construction. This will ensure that the land/vegetation is managed in a sympathetic manner leading to suitable soil profiles and healthy plant growth in the longer term.

5.10 It is recommended that a land and soil management plan be formulated and implemented for the duration of the scheme and for a minimum of five years after decommissioning. This will ensure that the land/vegetation and soils are managed in an environmentally sympathetic manner leading to suitable soil profiles and healthy plant growth in the longer term.

PROJECT

WINKING HILL BESS

TITLE

APPENDIX 1 AUGER BORING LOCATION PLAN

CLIENT

Pegasus Group

KEY

SITE DETAIL

SITE BOUNDARY (4.24 Ha)

FIELD NUMBER (1)

PROPOSED SURVEY

AUGER BORING (0)

TRIAL PIT (TP1)

Land Drainage Consultancy Ltd
Cowslip Offices
Fimber
DRIFFIELD
East Yorkshire
YO25 9LY
Tel: 01377 236010
Email: mail@ldcl.co.uk

REV	AMENDMENT	DATE
1	Survey Information	26/02/2023

SCALE 1:2,500	ORIG SIZE A3	SHEET 1 of 3
DRAWN CP	CHECKED AM	APPROVED DR
REVISION 1	DATE 26/02/2024	

DRAWING NO. LDC_SURVEYPLANS_WINKINGHILL_060923.dwg-Appendix 1

PROJECT

WINKING HILL BESS

TITLE

APPENDIX 2 SOIL TYPE DISTRIBUTION

CLIENT

Pegasus Group

KEY

- Site Boundary
- Soil Type 1: Heavy Clay Loam over Clay (4.24 Ha)

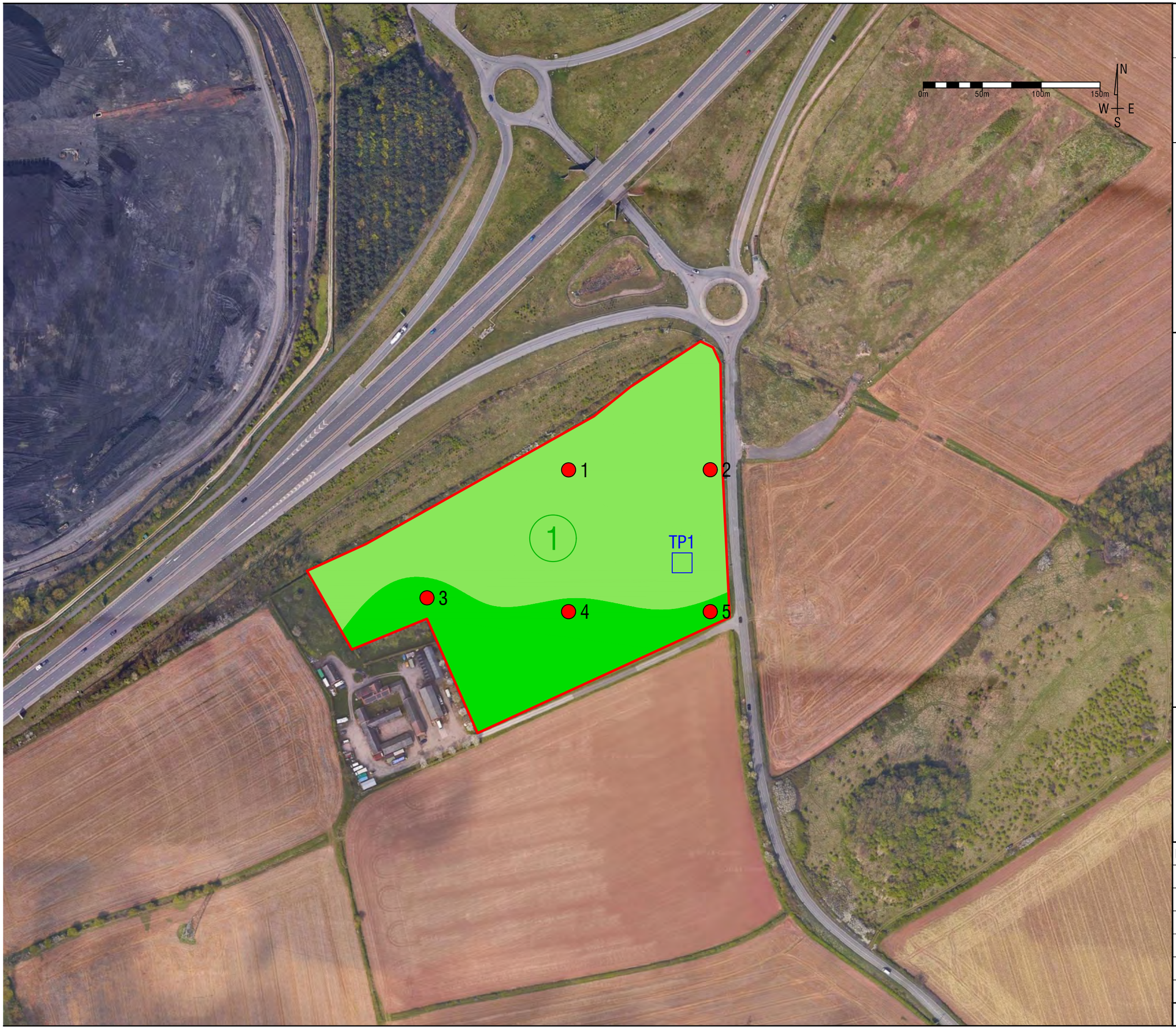
TOPSOIL ANALYSIS RESULTS

FIELD	pH	AVAILABLE P		AVAILABLE K		AVAILABLE Mg		ORGANIC MATTER	SAND	SILT	CLAY	TEXTURE
		mg/l	Index	mg/l	Index	mg/l	Index	%W/W	%	%	%	
1	7.8	35	3	320	3	119	3	3.5	57	22	21	Sandy Clay Loam
TP TS	-	-	-	-	-	-	-	-	34	37	29	Heavy Clay Loam
TP SS	-	-	-	-	-	-	-	-	21	37	42	Clay

Land Drainage Consultancy Ltd
Cowslip Offices
Fimber
DRIFFIELD
East Yorkshire
YO25 9LY
Tel: 01377 236010
Email: mail@ldcl.co.uk

REV	AMENDMENT	DATE
1	Survey Information	26/02/2023

SCALE 1:2,500	ORIG SIZE A3	SHEET 1 of 3
DRAWN CP	CHECKED AM	APPROVED DR
REVISION 1	DATE 26/02/2024	
DRAWING NO LDC_SURVEYPLANS_WINKINGHILL_060923.dwg-Appendix 2		



PROJECT

WINKING HILL BESS

TITLE

APPENDIX 3 AGRICULTURAL LAND CLASSIFICATION DISTRIBUTION

CLIENT

Pegasus Group

KEY

- ALC subgrade 3a (1.29 Ha)
- ALC subgrade 3b (2.95 Ha)

Land Drainage Consultancy Ltd
Cowslip Offices
Fimber
DRIFFIELD
East Yorkshire
YO25 9LY
Tel: 01377 236010
Email: mail@ldcl.co.uk

REV	AMENDMENT	DATE
1	Survey Information	26/02/2023

SCALE 1:2,500	ORIG SIZE A3	SHEET 1 of 3
DRAWN CP	CHECKED AM	APPROVED DR
REVISION 1	DATE 26/02/2024	

DRAWING NO LDC_SURVEYPLANS_WINKINGHILL_060923.dwg-Appendix 3

Winking Hill

Appendix 4: Description of Individual Soil Auger Borings

Updated: 27/03/2024 Survey Date: 3/1/24 Assessor: AM, CP

FCD = 127

BORE NO.	OS GRID REF	LAND USE	DEPTH (cm)	TEXTURE	Soil Colour	MOTTLES		Stones		DEPTH TO GLEYING (cm)	DEPTH TO SPL (cm)	WETNESS CLASS	ALC	ALC limitation	SOIL TYPE	COMMENTS
					Munsell	Musell	Ab.	Total	Type							
1	451100, 329900	STB	27	hzcl	drbr	pr	cm	1-3	f sst	27	35	III	3b	WETNESS	Heavy	
			120	c	strongrbr	mn pr dbr	ab fwpg	1-3	f sst							
2	451200, 329900	STB	13	hcl	drbr			1-3	f sst	13	35	III	3b	WETNESS	Heavy	Subtle colour change between topsoil and subsoil.
			120	zc	rbr	pg mn o drbr	ab	<1	f sst							
3	451000, 329800	grassland margian	29	mcl sl o	drbr	pg	cm	1-3	silt stones	29	35	III	3a	WETNESS	Heavy	Near established hedge that could aid drying out. Increasingly dry with depth. Relatively less manganese than 1 and 2 . Better drained
			120	hzcl	rbr	o mn prbr	ab fw pg	1-3	f sst							
4	451100, 329800	STB	22	mcl	drbr	pg	cm	1-3	f sst	22	35	III	3a	WETNESS	Heavy	
			120	hzcl	rbr	o mn prbr strong red	ab fw pg	1-3	f sst							
5	451200, 329800	STB	21	scl	drbr	mn o	cm	1-3	f sst	21	35	III	3a	WETNESS	Heavy	Higher area of field adjacent to tarmac farm track. Possible ALC 3a dependent on ts texture
			120	hcl apps	strong rbr	o mn prbr strong red	ab fw pg	1-3	f sst							

ANALYSIS REPORT

APPENDIX 5: LDC SOIL ANALYSISI

Contact : DAVID ROYLE
LDCL
COWSLIP OFFICES
FIMBER
DRIFFIELD
EAST YORKSHIRE
YO25 9LY
Tel. : 01977 555869

J143

Please quote the above code for all enquiries

Client : WINKING HILL
TOPSOIL 0-20MM
02-01-2024

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 63497/24

Date Received 17-Jan-24
Date Reported 26-Jan-24

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
345456/24	1	**FIELD 1 0-20CM** *Into Winter Wheat*	**7.8**	**3**	**3**	**3**	**35.2**	**320**	**119**

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 26/01/24

ANALYSIS REPORT

DATE **26th January 2024**

SAMPLES FROM **WINKING HILL, TOPSOIL 0-20MM, 02-01-2024**

Report Reference: 63497/24

DAVID ROYLE
LDCL
COWSLIP OFFICES
FIMBER
DRIFFIELD
EAST YORKSHIRE YO25 9LY
Tel: 01977 555869

Lab Ref.	Field Details		Soil Organic Matter [LOI%] Result
	No.	Field Name or Reference	
345456	1	FIELD 1 0-20CM	3.5

Your Organic Matter Results Interpretation

Land use	Rainfall	Soil type	Very Low	Low	Target	High
Arable	Low <650mm	Light	<=1.0	1.1-2.1	2.2-3.2	>=3.3
		Medium	<=1.7	1.8-3.3	3.4-5.0	>=5.1
		Heavy	<=2.2	2.3-4.4	4.5-6.5	>=6.6
	Moderate 650-800mm	Light	<=1.0	1.1-3.0	3.1-4.5	>=4.6
		Medium	<=1.9	2.0-4.0	4.1-6.0	>=6.1
		Heavy	<= 2.7	2.8-5.2	5.3-7.6	>=7.7
	High 800-1100mm	Light	<=1.3	1.4-3.7	3.8-6.1	>=6.2
		Medium	<=2.5	2.6-5.0	5.1-7.5	>=7.6
		Heavy	<=3.6	3.7-6.2	6.3-8.8	>=8.9
Grassland (Lowland)	All	Light	<=2.1	2.2-4.9	5.0-7.9	8.0-14.9
		Medium	<=3.4	3.5-6.4	6.5-9.3	9.3-19.9
		Heavy	<=4.6	4.7-7.6	7.7-10.5	10.6-19.9

ANALYSIS REPORT

DATE **26th January 2024**

SAMPLES FROM **WINKING HILL, TOPSOIL 0-20MM, 02-01-2024**

Report Reference: 63497/24

DAVID ROYLE
LDCL
COWSLIP OFFICES
FIMBER
DRIFFIELD
EAST YORKSHIRE YO25 9LY
Tel: 01977 555869

Explanatory Note: Cropping

High	Above average and associated with crop residues returns and regular OM inputs, including ley-arable rotations. Organic and conservation agricultural systems would appear in this group.	On target --- **Continue Rotational Monitoring**
Typical	Typical levels and is associated with crop residue returns and regular OM inputs, such as cover crops, compost or FYM.	
Low	Lower than average associated with intensive cropping & few organic matter inputs. Plan to add OM inputs and retain crop residues in the field. **Be aware: changes in SOM as a result of a change in practice can take a long time.**	Lower than average --- **Review**
Very Low	Very low associated with very intensive cropping and very few organic matter returns. Plan to regularly add OM inputs and retain crop residues in the field. **Be aware: changes in SOM as a result of a change in practice can take a long time.**	Very Low --- **Investigate**

Explanatory Note: Grassland Fields [Lowland]

High	Above average for the climate and soil type. Well drained, near neutral pH, well managed returns through grazing and inputs. Be aware that high levels could suggest an accumulation of undecomposed SOM near the soil surface due to a deteriorating pH and drainage, for example due to compaction.	On target --- **Continue Rotational Monitoring**
Typical	Typical for the climate and soil type. Associated with well drained near neutral pH, well managed returns through grazing and inputs.	
Low	Lower than average for the climate and soil type, intensively managed or recently reseeded and/or low OM inputs. If the soil is compacted and regularly poached by livestock, then OM soil incorporation by biological activity will have been reduced.	Lower than average --- **Review**
Very Low	Very low for climate/soil type. Intensively managed or recently reseeded and/or very low OM inputs. If the soil is compact and regularly poached by livestock, then OM incorporation by biological activity will have been reduced. Add more OM inputs to build SOM levels.	Very Low --- **Investigate**

Traffic light system: These advisory categories only apply to mineral soils. The benchmarks **are not appropriate for peats/ organic soils, i.e. soils with >20% organic matter to 40cm depth.**

In grassland situations only: SOM results >=15% on light & >=20% on med/heavy soil types suggest accumulation at the soil surface often indicating poor biological activity due to soil acidity or wetness on mineral soils.

Cropping & grassland: There is no defined **critical SOM value to aim for,** feeding the soil with organic inputs is more important than reaching an absolute target value.

Please note: A different set of benchmarks would also be required for upland grass and semi-natural systems.

OM = Organic Matter, **SOM** = Soil Organic Matter

Reference: ADHB-BBRO Soil Biology & Soil Health Partnership protocol and benchmarking document July 2022. Rainfall categories for the SOM benchmarks in AHDB report:91140002 final report 02.pdf (windows.net) see pages 7-11, based on work originally in Defra project SP0310

MICRO NUTRIENT REPORT

DATE **26th January 2024**

SAMPLES FROM **WINKING HILL, TOPSOIL 0-20MM, 02-01-2024**

DAVID ROYLE
LDCL
COWSLIP OFFICES
FIMBER
DRIFFIELD
EAST YORKSHIRE YO25 9LY
Tel: 01977 555869

Reference: **63497/345456/24** Field Name: **FIELD 1 0-20CM**	**Result**	**(*)**
Sand (2.00 - 0.063mm) %	57	
Silt (0.063 - 0.002mm) %	22	
Clay (< 0.002mm) %	21	
Textural Classification	Sandy Clay Loam	**1**

Notes (*)

(1) 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	26th January 2024	DAVID ROYLE
SAMPLES FROM	WINKING HILL, TOPSOIL 0-20MM, 02-01-2024	LDCL COWSLIP OFFICES FIMBER
SAMPLED BY		DRIFFIELD EAST YORKSHIRE
Report reference	63497/24	Tel: 01977 555869 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.

Field Name / Ref / Soil Type	*Last Crop / Next Crop*		*P2O5*	*K2O*	*MgO*		*Lime*
FIELD 1 0-20CM	**Not Given / W Wheat**	*Units/Acre*	**0**	**0**		*T/Ac*	**0**
345456 / Medium	**(Yield: 8 t/ha) / Straw Removed**	*Kg/Ha*	**0**	**0**		*Te/Ha*	**0**

At Index 2, phosphate and potash can be applied when convenient during the year but at Index 0 and 1, they should be applied and worked into the seedbed.
At Mg Index 0, magnesium fertiliser should be applied every 3-4 years at 50 to 100 kg MgO/ha.
Monitoring sulphur requirements of crops is advisable because the risk of deficiency is increasing, as atmospheric deposition of sulphur declines. Not all cereal crops will require sulphur and the responsiveness of a crop to the application of sulphur is dependant on soil texture and winter rainfall. Where deficiency has been recognised or is expected in winter or spring-sown cereals, apply 25-50 kg SO3/ha as a sulphate-containing fertiliser in early March to end of April for all cereals, taking into account the drilling date.

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

ANALYTICAL REPORT

Report Number	**18038-24**	**J143**	**DAVID ROYLE**	**Client**	**WINKING HILL**
Date Received	**18-JAN-2024**		**LDCL**		**TOPSOIL 02-01-24**
Date Reported	**30-JAN-2024**		**COWSLIP OFFICES**		
Project	**SOIL**		**FIMBER**		
Reference	**WINKING HILL**		**DRIFFIELD**		
Order Number			**EAST YORKSHIRE YO25 9LY**		

Laboratory Reference		**SOIL674659**	**SOIL674660**
Sample Reference		**TP TS TOPS OIL 0-27CM**	**TP SS T/S 27-120CM**
Determinand	**Unit**	**SOIL**	**SOIL**
Sand 2.00-0.063mm	% w/w	34	21
Silt 0.063-0.002mm	% w/w	37	37
Clay <0.002mm	% w/w	29	42
Textural Class **		HCL	C

Notes

Analysis Notes

The sample submitted was of adequate size to complete all analysis requested.
The results as reported relate only to the item(s) submitted for testing.
The results are presented on a dry matter basis unless otherwise stipulated.

Document Control

** Please see the attached document for the definition of textural classes.

Reported by

Teresa Clyne

Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
Tel: 01344 886338
Fax: 01344 890972
email: enquiries@nrm.uk.com

ADAS (UK) Textural Class Abbreviations

The texture classes are denoted by the following abbreviations:

Class	Code
Sand	S
Loamy sand	LS
Sandy loam	SL
Sandy Silt loam	SZL
Silt loam	ZL
Sandy clay loam	SCL
Clay loam	CL
Silt clay loam	ZCL
Clay	C
Silty clay	ZC
Sandy clay	SC

For the *sand, loamy sand, sandy loam* and *sandy silt loam* classes the predominant size of sand fraction may be indicated by the use of prefixes, thus:

- vf Very Fine (more than 2/3's of sand less than 0.106 mm)
- f Fine (more than 2/3's of sand less than 0.212 mm)
- c Coarse (more than 1/3 of sand greater than 0.6 mm)
- m Medium (less than 2/3's fine sand and less than 1/3 coarse sand).

The subdivisions of *clay loam* and *silty clay loam classes* according to clay content are indicated as follows:

- M medium (less than 27% clay)
- H heavy (27-35% clay)

Organic soils i.e. those with an organic matter greater than 10% will be preceded with a letter O.

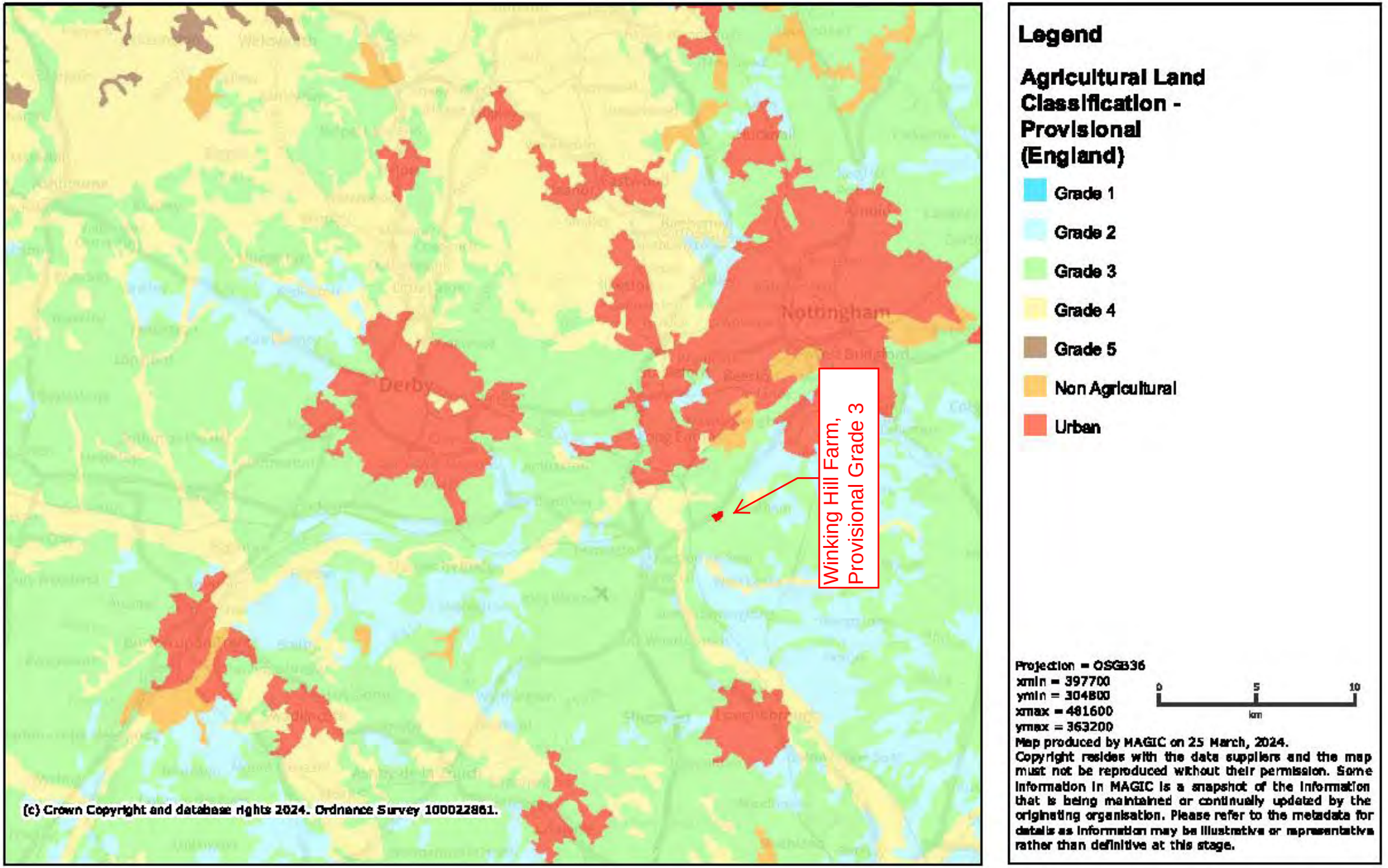
Peaty soils i.e. those with an organic matter greater than 20% will be preceded with a letter P.

Pegasus: Winking Hill proposed BESS
Soil Profile Pit Description

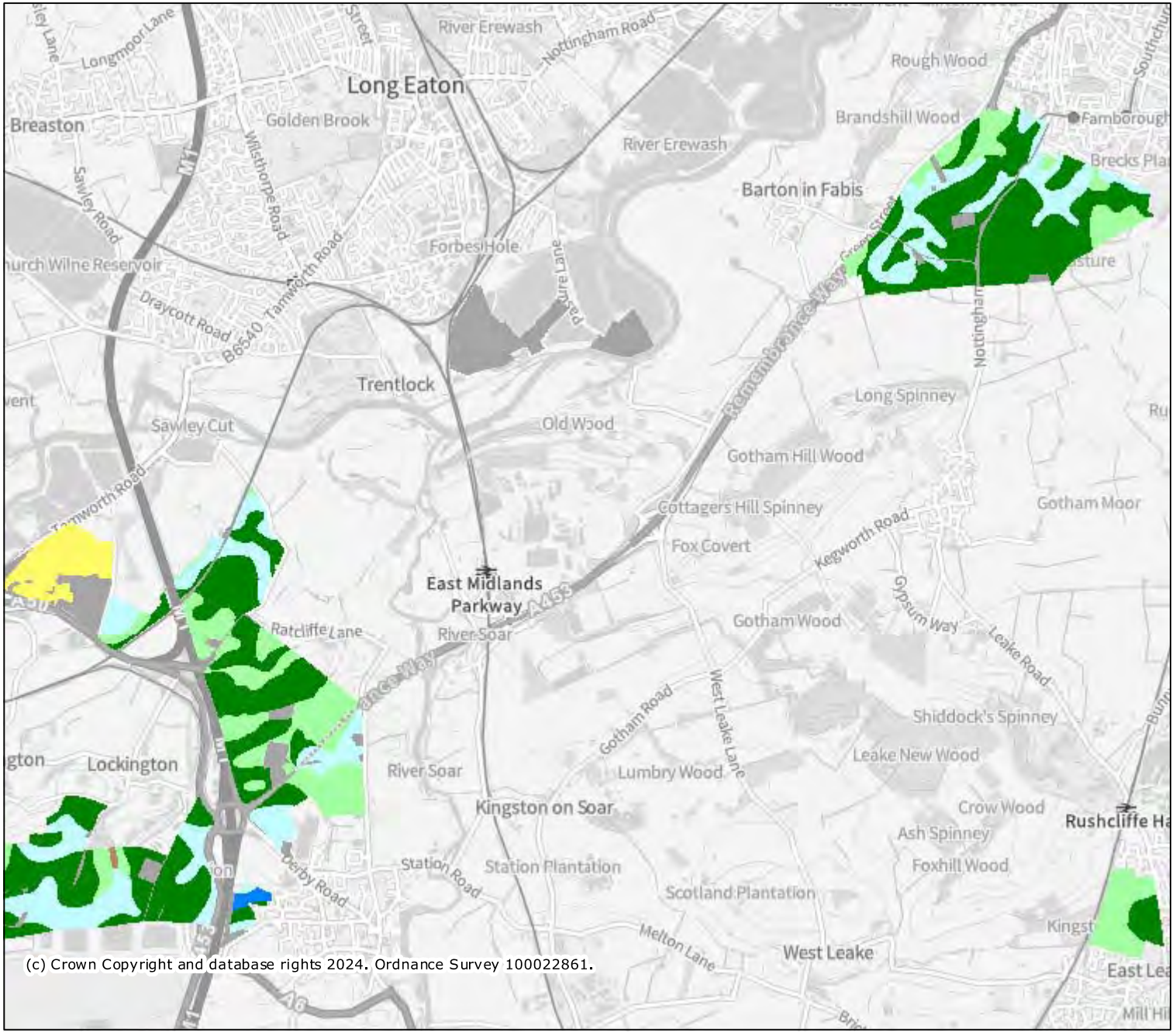
Profile Pit TP1	
Location:	**Northeast of site, auger boring 32 in field 10N (See Appendix 1)**
OS Grid Reference:	**SK 51180 29834**
Land Use:	Agricultural – Stubble (direct drilled)
Aspect:	1-3° SE gentle slope
Soil Type 1:	Slightly stony heavy clay loam or clay topsoil overlying an appreciably silty heavy clay loam or clay at depth. Moderately well-structured topsoil overlying weak to moderately well developed and poorly drained subsoil. Worcester Soil Association.
Land Quality:	ALC Subgrade 3b, (Wetness Class IV – poorly drained. .

Soil Profile 1	Depth (cm)	Description
	**0-0.27** (topsoil)	Dark reddish brown (5YR 3/3) heavy clay loam; common ochreous manganese and dark reddish brown mottles; rare to few (1-3%) small angular flint and subangular sandstones and rare siltstones; moist wet; moderately developed coarse to medium sub angular blocky structure; medium packing density; moderately firm; abundant fine fibrous and medium fleshy roots; common very large, medium and very small pores; few fissures closed. few very large medium earthworms; broken distinct boundary. Possible inclusions of subsoil in the topsoil.
	**0.27-35** (subsoil)	Red (2.5YR 4/6) appreciably silty heavy clay; abundant ochrous (7.5YR 5/6) and manganese (7.5YR 2.5/1) mottles, few indistinct pale grey mottles (5YR 7/1). Common (3-5%) small angular flint and subangular sandstones and rare siltstones; moist with depth filling with water; moderately well developed coarse and medium angular blocky structure; medium packing density; firm; few fine fibrous roots; few to common small pores; common fine fissures; no visible fauna (underwater); non calcareous; Slowly permeable.
	**0.35 -1.00** (subsoil)	Underwater Subsoil across the site was broadly homogenous, however due to saturated ground conditions at the time of survey, observation of undisturbed soils were not possible at a depth greater that 35cm. **End of Trial Pit.**
		
		

APPENDIX 7: PROVISIONAL ALC GRADE



APPENDIX 8: POST 1988 PUBLLISHED ALC GRADE



Legend

Post 1988 Agricultural Land Classification (England)

- Grade 1
- Grade 2
- Grade 3a
- Grade 3b
- Grade 4
- Grade 5
- Not Surveyed
- Other

Projection = OSGB36
xmin = 442200
ymin = 324300
xmax = 459000
ymax = 336000

0 1 2
km

Map produced by MAGIC on 25 March, 2024.

Flood map for planning

Your reference	Location (easting/northing)	Created
App9_FloodRis	**451060/329854**	**25 Mar 2024 9:58**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

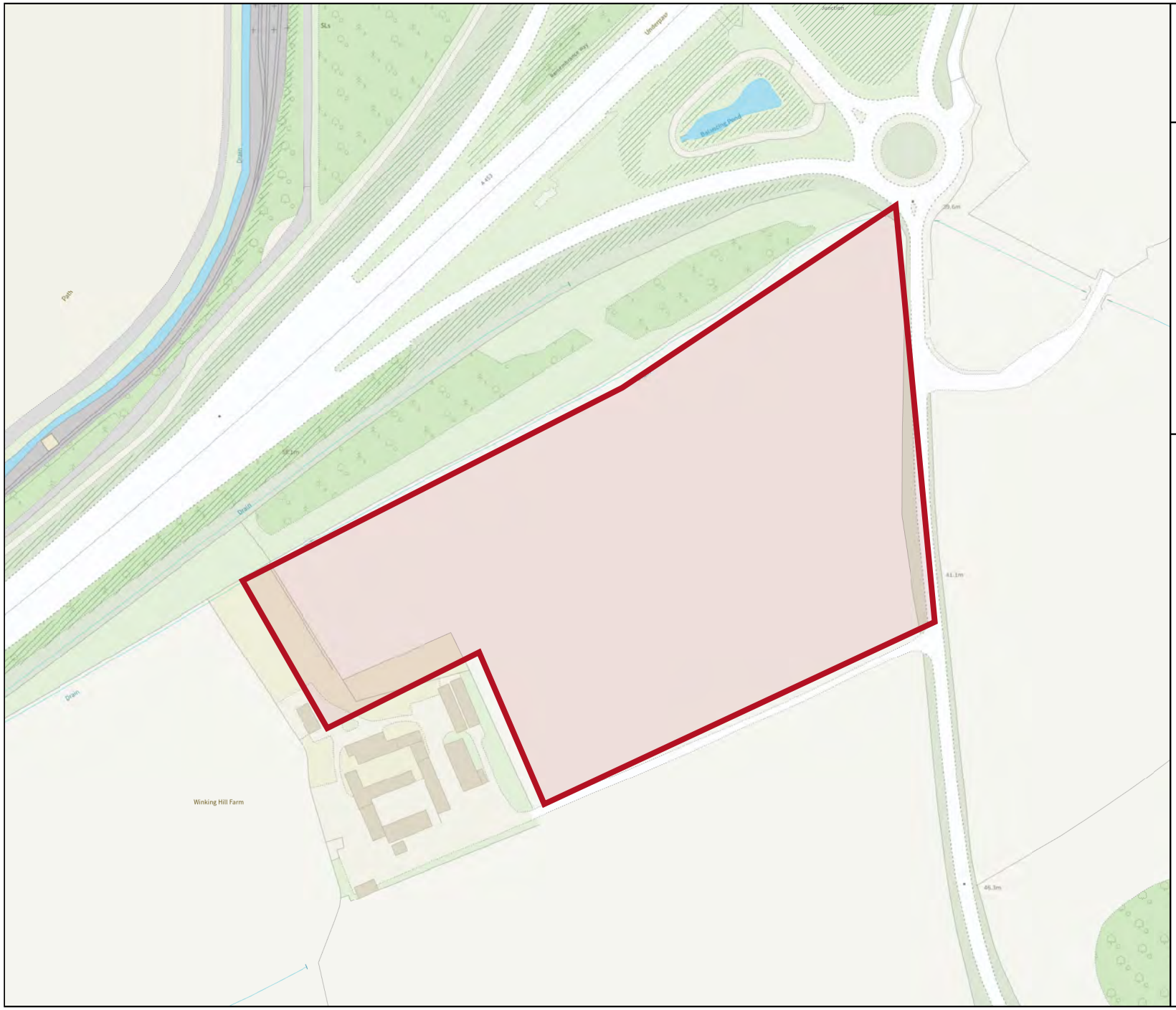
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
App9_FloodRis

Location (easting/northing)
451060/329854

Scale
1:2500

Created
25 Mar 2024 9:58

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m