MOTT MACDONALD

Agricultural Land Classification Report

Cambridge South East Transport

April 2021

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Executive summary

An Agricultural Land Classification (ALC) survey has been carried out along a proposed new public transport route for south east Cambridge, to form part of the Environmental Statement (ES) for the CSET Scheme. The surveyed route is located primarily within arable farmland and runs for approximately 8.5kms between the A1307/A11/A505 junction and Cambridge Biomedical Campus (CBC), skirting the eastern edges of Sawston, Stapleford and Great Shelford.

The ALC survey was undertaken between the 22nd March - 2nd April 2021, investigating key soil properties across the route, for the determination of ALC Land Grades and their distribution. The survey followed the '*Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land*' (MAFF, 1988) and the '*Soil Survey Field Handbook'* (Hodgson,1997).

The survey indicates along the route where it crosses agricultural land that:

- 0.60 kms will pass through ALC Grade 3b land ('Moderate'),
- 4.05 kms will pass through ALC Grade 3a land ('Good'); and
- 3.40 kms will pass through ALC Grade 2 land ('Very Good').

Furthermore, the 15.5 ha site of the A11 Travel Hub is composed of

- 2.87ha Grade 3b land ('Moderate),
- 7.82 ha ALC Grade 3a land ('Good'), and
- 4.82 ha of ALC Grade 2 land ('Very Good').

The typical soil characteristics were that of very slightly stony calcareous loams that varied frequently in profile depth to the either chalk drift, superficial deposits of sand and gravel or chalk bedrock.

1 Introduction

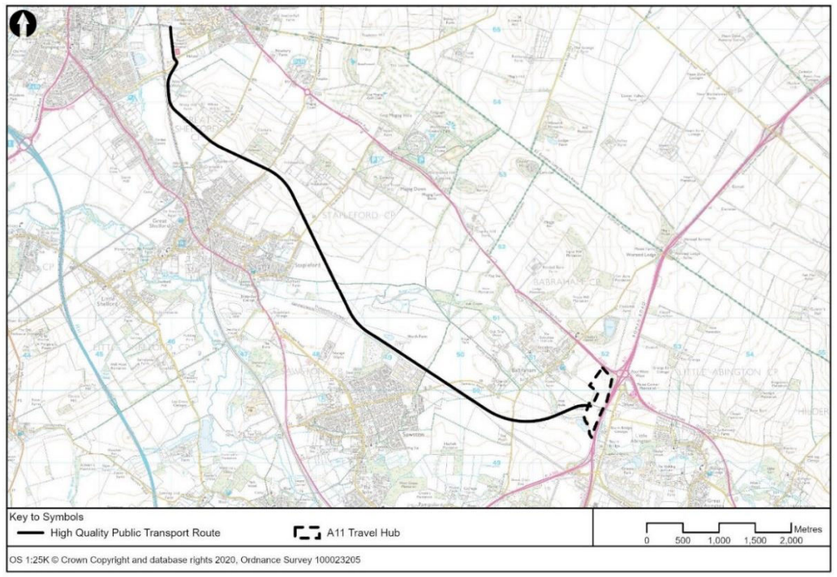
1.1 Background

The Greater Cambridge Partnership is proposing to procure the construction of infrastructure required to enable a High Quality Public Transport (HQPT) service to operate between the A11 / A1307 junction (near Babraham) and Cambridge – this scheme is known as Cambridge South East Transport (hereafter referred to as the 'CSET Scheme'). The project is made up of three core elements:

- A new segregated and guided public transport route, with public transport priority measures between the A11 and A1307 junction and Cambridge Biomedical Campus (CBC), that avoids general traffic congestion.
- A new Travel Hub which will be an area where car parking is provided and an interchange with the high-quality public transport will be available.
- Emergency and maintenance access that also provides new high-quality active travel facilities.

Figure 1.1 shows the location of the CSET Scheme in the context of Cambridge and its surroundings.

Figure 1.1: Location of CSET Scheme



Source: Mott Macdonald

1.2 Scope of work

An Agricultural Land Classification (ALC) survey has been completed as part of the EIA for the Scheme. The ALC survey has identified and quantified key soil characteristics that are ultimately used to determine the distribution of ALC Grades across the route.

The ALC survey was undertaken between the 22nd March - 2nd April 2021. The route is located primarily within arable farmland and runs for approximately 8.5kms between the A1307/A11/A505 junction and Cambridge Biomedical Campus (CBC), skirting the eastern edges of Sawston, Stapleford and Great Shelford, 1 km north-east of Calverley and 1.5 km south-east of Rawdon village centres. At the eastern end an additional area of approximately 15.5ha, was also surveyed as the site of the location of the A11 Travel Hub.

A total of 79 auger bores were completed to a maximum depth of 1.2m from which soil samples were collected and analysed on site and in the laboratory. The location of the bores was generally one bore every 100m along the route, with a grid of bores set up on the travel hub. A map showing the location of the bores is shown in Appendix A. Bore numbering commenced with nr 1 in the north near Nine Wells Local Nature Reserve and nr 79 in the travel hub.

1.3 Agricultural Land Classification Grades

The ALC framework allows the categorisation of land according to the extent to which its key physical characteristics impose long-term limitations on agricultural productivity. Such limitations may operate in four principal ways: (1) affecting the range of crops which can be grown; (2) the level of yield; (3) the consistency of yield; and (4) the cost of obtaining it.

Alongside the many interactions between them, these factors form the basis for classifying land into one of five ALC Grades. These are described below[1] and will be referenced throughout this report:

- **Grade 1: Excellent quality agricultural land**
  - 'Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.'
- **Grade 2: Very good quality agricultural land**
  - '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'.
- **Grade 3: Good to moderate quality agricultural land**
  - 'Land with moderate limitations which affect the choice of crops, timing, and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2'.
  - **Subgrade 3a**: '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'.

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

  - **Subgrade 3b**: ‘Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year’.
- **Grade 4: Poor quality agricultural land**
  - ‘Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land’.
- **Grade 5: Very poor quality agricultural land**
  - ‘Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops’.

2 Baseline information

2.1 Land use

The route is almost exclusively arable land with a variety of current cropping practices evident (winter and spring cereals, fallow ground and potato ridges). In addition, one field contained permanent grassland, which did not appear to be utilised for grazing, and one bore was located within a *corner* of a field where the land has been set-aside from arable production.

2.2 Topography

Ordnance Survey (OS) mapping[2] indicates the route to be very gently undulating between approximately 15m AOD to 35m AOD,

2.3 Geology

British Geological Survey (BGS) mapping was consulted to determine on-site geology prior to intrusive survey. This included both the superficial (drift) and bedrock (solid) geological constituents.

2.3.1 Superficial geology

BGS ‘*GeoIndex’* mapping[3] records superficial deposits of River Terrace Deposits (sand and gravel sediment), in the approximate location of bores 31 – 34; 63 to the perimeter of the A11 Travel Hub site; and extending throughout approximately two thirds of the A11 Travel Hub site. Superficial deposits of Alluvium (clay, silt, sand and gravel) are recorded in the approximate location of bores 35 – 41 and bore 67.

2.3.2 Bedrock geology

The same mapping records West Melbury Marly Chalk Formation in the approximate location of bores 1 -8; Zig Zag Chalk Formation in the approximate location of bores 9 – 47; and Holywell Nodular Chalk Formation in the approximate location of bores 48 to 79.

2.4 Climatological data and flood risk

Climatological and flood risk data are key physical factors considered for the derivation of Agricultural Land Classification.

2.4.1 Climatological data

‘*Climatological Data for Agricultural Land Classification*’[4] was consulted to obtain data relevant to the site. The data were averaged and summarised as below.

[2] Ordnance Survey © Crown copyright [2020 Ordnance Survey ®]. All rights reserved. Licence number 100026791.
[3] British Geological Survey. *GeoIndex Geological Map Viewer* [accessed date: April 5th, 2021].
[4] The Met Office, Soil Survey and Land Research Centre and Ministry of Agriculture, Fisheries and Food (1989). *Climatological Data for Agricultural Land Classification.*

Table 2.1: Climatological data for mid-route (bore 37).

Variable	Measurement
National Grid Reference	TL 48539 50988
Altitude in meters (ALT)	20
Average annual rainfall (AAR) in mm	576
Lapse rate for average annual rainfall (LAAR) in mm / metre	0.3
Average summer rainfall (ASR) (April to September) in mm	296
Accumulated temperature above 0° C (AT0) (January to June)	1,448
Accumulated temperature above 0° C (ATS) (April to September)	2,449
Moisture deficit for winter wheat (MDMWHT) in mm (from regressions on ATS and ASR)	121
Moisture deficit for potatoes (MDMPOT) in mm (from regressions on ATS and ASR)	117
Median duration of field capacity (FCD) in days, when the soil moisture deficit is zero	101

2.4.2 Flood risk

The Environment Agency's '*Flood Map for Planning*'[5] highlights that most of the route and A11 Travel Hub area is categorised as a Flood Zone 1. This denotes land deemed to have a 'less than 1 in 1,000 annual probability of river or sea flooding'. There are three small areas that are within Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding). Two of these areas are associated with the route crossings of the river Granta, the third is located around the southern tip of the A11 Travel Hub.

2.5 Agricultural land classification

Initial desk-top inspection of the route using the Department for Environment, Food and Rural Affairs' (Defra) '*Magic Map Application*'[6] suggests that the land comprises ALC Grade 2 and 3 land in roughly equal amounts. The Magic Map only provides a predictive provisional ALC Grade at 1:250,000 scale and does not distinguish between subgrades 3a ('Good quality') or 3b ('Moderate quality'), which represents the crucial boundary between the best and most versatile[7] (BMV) (Grades 1 – 3a) and moderate or poorer quality land (Grades 3b, 4 and 5).

'Magic Map Application' mapping demonstrates that there are two proximal post-1988 ALC surveys that have been conducted close to the eastern end of the route. They are Land at Cambridge road, Babraham (ALC06389), and land at the Welding Institute, Great Abington ALC00991).

2.6 Soil Associations

Inspection of National Soil Association mapping[8] for the route suggests that soils in the area comprise of the following six Associations.

- **Wantage 2**: Shallow well drained calcareous silty soils over argillaceous chalk. Sometimes affected by groundwater. Deeper well drained coarse loamy soils in places. Complex soil patterns locally.
- **Milton**: Deep permeable calcareous fine loamy soils over river terrace and chalky drift, variably affected by groundwater. Some similar shallower well drained soils over gravel in places. Complex soil patterns locally.

[5] Environment Agency (accessed 6th April 2021]. *Flood Map for Planning*.
[6] Department for Environment, Food and Rural Affairs (Defra) (accessed 6th April 2021). *Magic Map Application*.
[7] Ministry of Housing, Communities and Local Government (2019). *National Planning Policy Framework (NPPF)*.
[8] Hodge, C.A.H. (1984). Soils and their use in Eastern England *(Bulletin / Soil Survey of England and Wales)*.

- **Swaffham Prior**: Well drained calcareous coarse and fine loamy soils over chalk drift or rubble. Some similar shallow soils. Deep non-calcareous loamy soils in places. Striped and polygonal soil patterns locally.
- **Thames**: Seasonally wet deep clays over river alluvium. Stoneless, mainly calcareous and affected by groundwater.
- **Upton 1:** Shallow well drained calcareous silty soils overlying chalk. Deeper fine silty calcareous soil locally
- **Moulton**: Well drained coarse and fine loamy soils with similar shallow calcareous coarse loamy soils over chalk or chalk rubble in places. Patterned ground of stripes and polygons gives very variable soil depth[9].

[9] Cranfield University (accessed 5th April 2021). *Land Information System (LandIS)*.

3 Methodology

Prior to the intrusive survey, baseline environmental information impacting soil resource characteristics was investigated. This is detailed in Section 2 and includes aspects such as relief, geology, soil types, available ALC information, weather, maps, satellite images and land-use.

The intrusive survey was undertaken in accordance with the guidance included within the '*Agricultural Land Classification of England and Wales'*[7] and the '*Soil Survey Field Handbook'*[10].

Soil profiles were examined up to a depth of 120 cm, or to bedrock if shallower. A total of 67 hand auger bores were taken along an approximate 7. km linear route and a further 12 taken within the 15.5ha site of the proposed A11 Travel hub. Every attempt was made to satisfy the requirement for 1 auger bore per linear 100m or per ha, but this was not possible at a few locations due to various restrictions. In addition to hand augering, two soil inspection pits were dug to 1.2m in contrasting soil types. The first was dug at bore location 26 on the most common soil association encountered - Swaffham Prior. The second was dug at close to bore location 36 within the Thames Association.

The hand auger points were pre-positioned and flagged in the field by the GI contractor (Tetra Tech), and the coordinates supplied to Mott MacDonald prior to the commencement of the survey. An Edelman (Dutch) auger was used by an employee of Tetra Tech to excavate the soil where it was subsequently examined and logged by a Mott Macdonald soil scientist. Please refer to Appendix C for coordinates of the auger bores and soil pit locations throughout the site.

For assessing soil calcareousness, 10% hydrogen chloride was used. A Munsell Soil Colour Chart[11] was used to judge soil colours and a clinometer was used to measure slope gradients. Buried service plans were used at the bore location planning stage to ensure that buried services were avoided, and a Cable Avoidance Tool was used by a Tetra Tech site engineer as a secondary safety measure at the time of auger boring.

Soil samples of topsoil and subsoils were also taken from individual fields along route for laboratory analysis of nutrient content. This followed guidance outlined in the AHDB '*Nutrient Management Guide'* (RB209)[12], adhering to W-shaped transects to obtain 25 sub-samples to form a composite sample. The analysis includes:

- extractable phosphorus (P),
- extractable potassium (K),
- extractable magnesium (Mg),
- Total Nitrogen (N),
- organic matter; and
- pH.

[10] Hodgson, J. M (1997). *The Soil Survey Handbook: Describing and Sampling Soil Profile*.
[11] Munsell Colour (2010). *Munsell soil colour charts: with genuine Munsell colour chips.*
[12] Agriculture and Horticulture Development Board (AHDB) (2020). *Nutrient Management Guide (RB209).*

4 Survey results

4.1 Soil resources

4.1.1 Soil profiles

The soils across the route vary distinctly, broadly in line with the Soil Associations it crosses, but some similarities exist. All soils are calcareous throughout the profiles with most being strongly calcareous (>10%). Most have virtually stoneless topsoil (0-2%), increasing to about 7% where soils are located within the Thames Association. Topsoils are typically dark brown (10YR 4/3-4/4), and organic matter content is typical to that found in most arable topsoils (2.3-6.2%).

Soils throughout the site are generally well-drained but with some evidence of drainage impedance in the form of mottles (most notably yellow to orange mottles 10YR 7/6 – 7.5YR5/6), just above or within the chalk drift or chalk bedrock. In soils over superficial geology mottling is generally stronger and more abundant in the medium to heavy soils (7.5YR5/6).

Profile depths vary distinctly from around 45cm as seen in the Swaffham Prior Association, to 120cm as seen in the Thames and Moulton Associations as well as the Swaffham Prior Association. In addition, in some areas across the route profile depths vary frequently as figure 4.1.1 indicates.

Figure 4.1.1: One field in the proposed route passes through indicating the frequency of profile depth changes. The Lighter areas indicate shallower soils over chalk drift or chalk bedrock. In areas such as these careful consideration must be given to providing an 'overall picture' when reporting land grades
Source: Google Earth

Figure 4.1.2: Inspection pit close to bore 26 within the Swaffham Prior Association. A well drained calcareous soil over chalk rubble. This example is atypically deep showing chalk drift at around 100 cms.

Figure 4.1.3: Inspection pit close to bore location 35. Picture shows the typical profile of the Thames Soil Series. A seasonally wet deep clayey soil affected by groundwater

Figure 4.1.4: Example of a borehole excavation laid out for examination and logging

4.1.2 Soil Chemistry

Soil samples were analysed at NRM Laboratories (UKAS Accredited). Table 4.1 summarise these results. Soil auger logs are shown in Appendix B.

Table 4.1: Summary of laboratory soil nutrient results for topsoil (TS) and upper subsoil (SS).

Sample ID No.	Soil pH	Available nutrient concentration (mg/l)			Total Nitrogen (%w/w)	Organic matter (%w/w)
		Phosphorus (P)	Potassium (K)	Magnesium (Mg)		
Field 1 TS	8.0	9.0 (0)	51.1 (0)	25.4 (0)	0.258	5.0
Field 1 SS	8.2	6.0 (0)	28.6 (0)	21.3 (0)	0.273	5.0
Field 2 TS	7.8	12.2 (1)	147 (2-)	34.8 (1)	0.090	5.7
Field 2 SS	8.2	7.2 (0)	96.7 (1)	35.8 (1)	0.237	4.5
Field 3 TS	8.1	11.4 (1)	194 (2+)	33.3 (1)	0.159	3.4
Field 3 SS	8.0	7.2 (0)	60.0 (0)	36.5 (1)	0.107	2.4
Field 4 TS	8.1	9.4 (0)	224 (2+)	29.3 (1)	0.162	3.4
Field 5 TS	8.2	11.6 (1)	203 (2+)	25.8 (1)	0.182	3.4
Field 5 SS	8.3	7.6 (0)	122 (2-)	22.4 (0)	0.125	2.8
Field 7 TS	8.1	13.8 (1)	119 (1)	34.0 (1)	0.150	3.1
Field 7 SS	8.2	10.4 (1)	93.5 (1)	34.0 (1)	0.141	2.7

Sample ID No.	Soil pH	Available nutrient concentration (mg/l)			Total Nitrogen (%w/w)	Organic matter (%w/w)
		Phosphorus (P)	Potassium (K)	Magnesium (Mg)		
Field 8 TS	8.1	29.8 (3)	191 (2+)	42.8 (1)	0.150	3.3
Field 8 SS	8.2	7.6 (0)	61.7 (1)	31.3 (1)	0.150	3.2
Field 9 TS	8.1	18.8 (2)	120 (1)	64.8 (2)	0.205	4.4
Field 9 SS	8.3	16.2 (2)	88.6 (1)	36.5 (1)	0.161	3.5
Field 10 TS	8.2	14.8 (1)	138 (2-)	42.8 (1)	0.176	4.3
Field 10 SS	8.3	5.2 (0)	66.4 (1)	28.5 (1)	0.179	3.7
Field 11/12 TS	8.3	7.8 (0)	81.8 (1)	35.9 (1)	0.133	2.8
Field 11/12 SS	8.5	4.6 (0)	57.2 (0)	33.3 (1)	0.082	2.1
Field 13 TS	8.0	9.8 (1)	107 (1)	44.2 (1)	0.116	2.7
Field 13 SS	8.1	4.2 (0)	56.0 (0)	41.2(1)	0.080	2.3
Field 14 TS	8.0	10.8 (1)	92.7 (1)	47.8 (1)	0.221	5.0
Field 14 SS	8.6	6.2 (0)	45.5 (0)	39.7 (1)	0.058	1.8
Field 15 TS	7.9	21.0 (2)	177 (2-)	62.8 (2)	0.188	4.3
Field 15 SS	8.2	7.4 (0)	82.2 (1)	45.8 (1)	0.084	2.2
Field 16 TS	8.1	13.0 (1)	187 (2+)	54.3 (2)	0.262	6.2
Field 16 SS	8.1	7.8 (0)	146 (2-)	49.8 (1)	0.161	4.3
Field 17 TS	8.1	11.2 (1)	90.6 (1)	53.0 (2)	0.078	2.3

Soil Nutrient indices in brackets (RB209 *Nutrient Management Guide*)

The laboratory nutrient analysis indicates that available phosphorus (P) was only found to be at optimal levels in the topsoil (as defined by Index 2, 16-25 mg/l) according to the AHDB '*Nutrient Management Guide*', *RB209*[12]), in 3 of the 15 fields sampled. All remaining fields but one were found to be deficient, with 3 scoring 0 (0-9mg/l defined as very low).

Potassium (K) concentrations in topsoils where found to be in the optimal range (Index 2- 121-180 mg/l. and Index 2+ 181-240mg/l) in 6 fields and low in the remainder. Magnesium (Mg) levels followed a similar pattern with optimal levels (Index 2 51-100mg/l) in 4 fields and low in the remainder. Only one field (Field 15) was found to have optimal levels for P, K and Mg

P, K and Mg in the upper subsoils were more frequently low or very low. Only one field (field 9), had optimal levels of P, Two had optimal levels of K (Field 5 and 16), and all fields were found to be low (26-50mg/l), or very low (0-25mg/l) in Mg

Organic matter was found to be between 2.3-6.2% within the topsoils and 1.8-5% in the subsoils. This is broadly typical of arable land in this region. Soil pH range (7.8-8.5) is typical of shallow soils over chalk bedrock. At these values soil alkalinity may begin to limit the availability of soil N and P to arable crops and grass.

4.2 Agricultural Land Classification

4.2.1 Climatic limitations

With a means of 1,443°C of accumulated temperature (Jan - June), above 0°C and 575 mm of average annual rainfall across the site (Section 2.4.1), climatic conditions do not represent significant factors limiting crop production. The ALC Grade according to climatic limitations is therefore ALC Grade 1.

4.2.2 Gradient and microrelief

The route gradients are typically between 0-1 degrees and does not have complex microtopography. As such, gradient and microrelief are not considered to represent limiting factors.

4.2.3 Flooding

As outlined in Section 2.4.2, the Environment Agency's '*Flood Map for Planning*'[5] suggests that the vast majority of the route and A11 Travel Hub area has a 'less than 1 in 1,000 annual probability of river or sea flooding', which does not represent a site limitation. that is categorised as a Flood Zone 1. As such, the ALC Grade according to flood risk for most of the site is 1

Three small areas that are within Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding), do represent a site limitation. All have been assessed as land that occasionally floods in winter for medium duration (2-4 days) and/or frequently floods in winter for short periods (less than 2 days) and given ALC Grade 3a. The presence of two receiving ponds at the eastern river crossing (bore 67) and immediately south of the A11 travel hub site assists the confidence of this grading It should be noted here that the grade given according to flood risk within these three areas has not downgraded the land from its calculated interactive limitations (see section 4.2.5. below).

4.2.4 Soil depth, texture and stoniness

The soils across the site are typically sandy clay loams, medium clay loam or occasionally lighter medium sandy loam topsoils, with a few flints, pebbles and chalk stones above the drift geology or throughout the profile. Horizons within the drift geology are appreciably stonier with estimates of 15-30% small chalk stones to chalk rubble. Profiles ranged in depth frequently but are predominantly shallow as 66 of 79 bores were within 120cm when stopped by drift geology or bedrock. The majority however are deeper than 60cms and depth was not found to be the critical limiting factor at any location. the Grade according to depth is 1 (53 bores), 2 (31 bores).

ALC Grade according to stoniness is 1 throughout the route. Therefore, neither soil texture, depth nor stone content represent the critical limiting factor

4.2.5 Chemical limitation

No evidence of long-term agricultural limitations caused by soil chemical properties was observed on-site. As such, there are no chemical limitations considered to affect the site ALC Grade.

4.2.6 Interactive limitations

Calculation and assessment of soil wetness using the ALC survey data obtained indicate that 66 bores graded as Grade 1; and 13 as Grade 2. Soil wetness was not calculated to be a singular critical limiting factor in any bore location. With regard to droughtiness, 34 bores were graded as Grade 2, 32 as Grade 3a and 13 as Grade 3b. The data used for these calculations is included within Appendix B.

4.2.7 Erosion

Some minor wind erosion is evident upon reviewing satellite imagery of the lighter soils in the east. This was not noticeable at the time of the survey and therefore erosion is not considered an agricultural limitation.

4.2.8 ALC Grades

Considering all factor-specific ALC Grades, 'drought characteristics' were by far the most frequent limiting factor that influenced final ALC grade. Final ALC grade distribution is 34 bores graded as ALC grade 2 ('Very Good'); 32 bores graded as ALC grade 3a ('Good') and 13 graded as Grade 3b ('Moderate').

The percentage of the route and travel hub site designated by ALC grade is set out below:

- Grade 2:
  - 3.40 km, 43% of the route
  - 4.82 ha, 30% of A11 Travel Hub site.
- Grade 3a:
  - 4.05 km, 49% of the route
  - 7.82 ha, 51% of A11 Travel Hub site.
- Grade 3b:
  - 0.60 km, 8% of the route
  - 2.87ha, 19% of A11 Travel Hub site.

Note: It is important to bear in mind here the aforementioned discussion of the complex patterns of soil variability, in particular the frequently changing depth to chalk drift or chalk bedrock (see section 4.1.1.). Thus when calculating land grades across the route consideration was given to individual bore results that *contrasted the sequence* they were found within. With the careful use of satellite imagery and visual inspections of surface chalk fragments across the route it has been possible, with a high degree of confidence, to provide a map of *best-fit,* common place in soils and geologies such as those found across the route. The most frequent variation found was that medium depth soils would become transiently shallow as the photo in section 4.1.1. highlights.

The ALC grade map of the route and A11 Travel Hub site is included in drawing (Appendix A).

5 Conclusions and recommendations

The ALC survey indicates that although the soils form complex patterns across the Scheme they are typically

- very calcareous sandy clay loams,
- medium clay loam or
- occasionally lighter topsoils, overlying chalky drift or chalk bedrock.

Profiles ranged in depth frequently from 45-120cm and had a few flints, pebbles and chalk stones above the drift geology or throughout the soil profile. Soils across the route appeared generally well drained but with common evidence of slight impedance in the form of mottles, ranging in colour from orange/yellows to occasional grey.

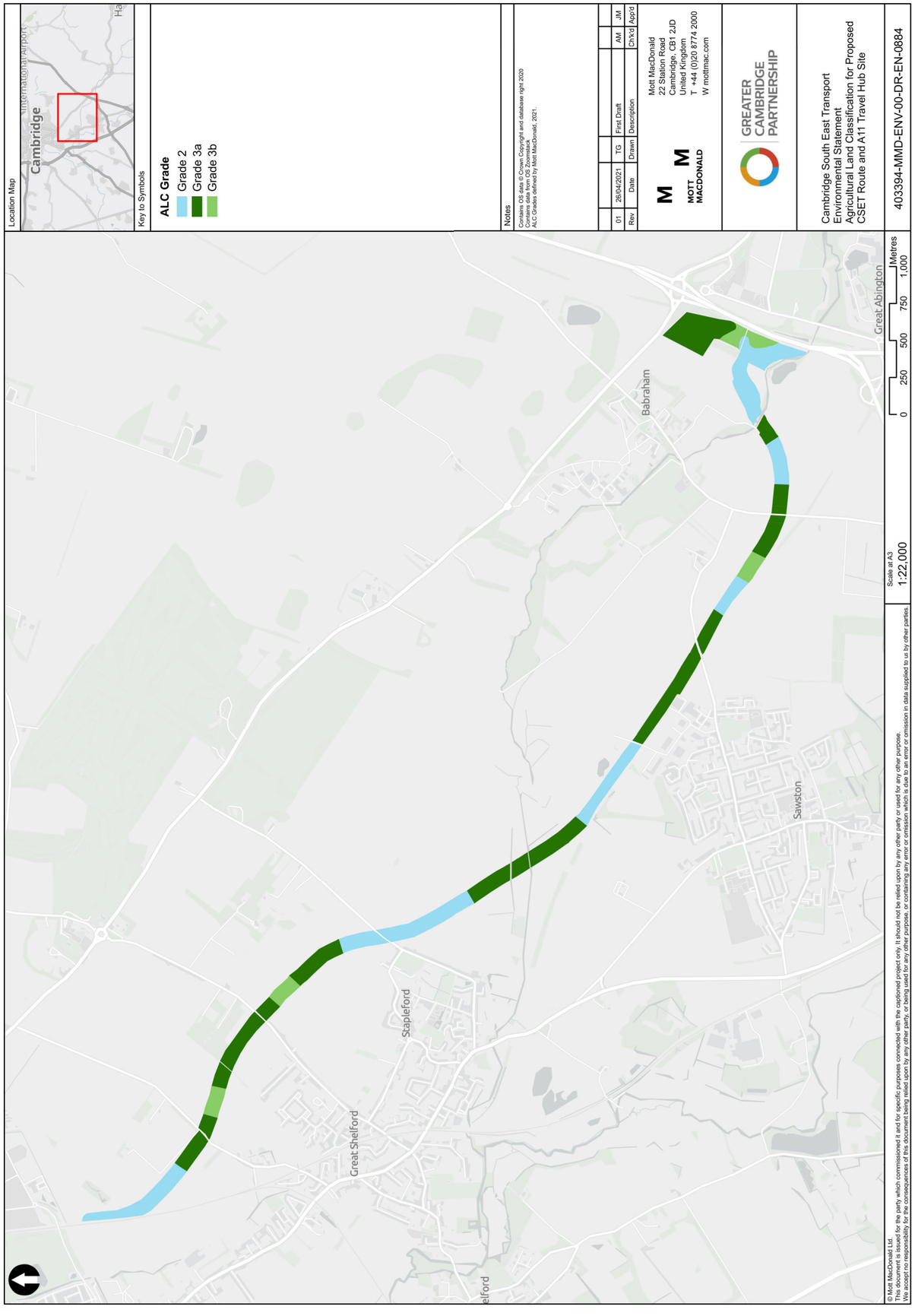
The proposed route is shown to be split between ALC Grade 2 ('Very Good', covering 43%), Grade 3a ('Good', covering 49%) and Grade 3b ('Moderate' covering 8%).

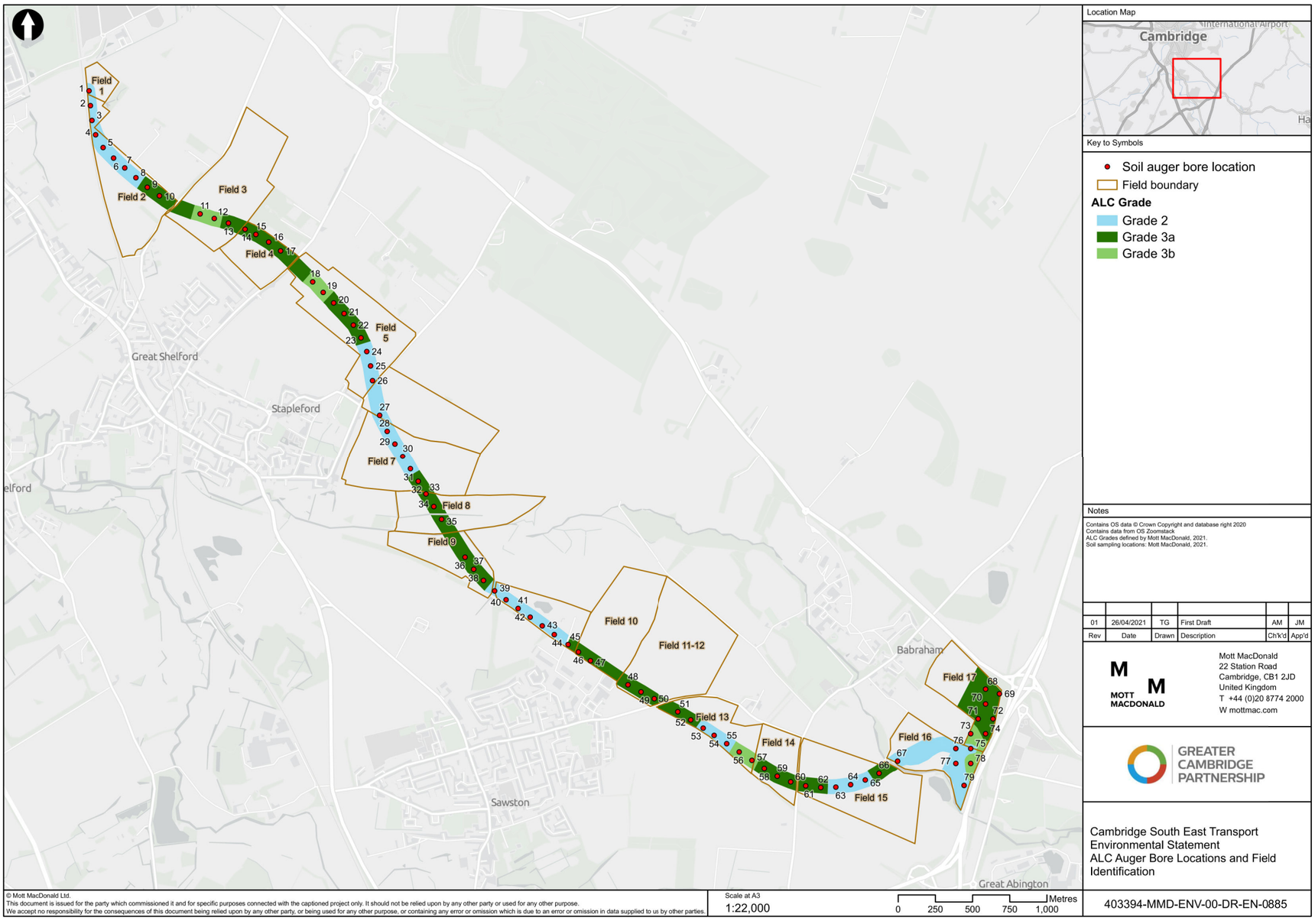
The proposed site of the A11 travel hub is shown to be split between ALC Grade 2 ('Very Good', covering 30%), Grade 3a ('Good', covering 51%) and Grade 3b ('Moderate, covering 19%).

In addition to the establishment of agricultural land grades by the publishing of this report, a site-specific Soil Management Plan should be produced before the commencement of construction once detailed design plans are available. This should build on the draft Spoil Management Strategy produced for the Scheme (see Appendix G). A Soil Management Plan will provide the most effective means of mitigating damage to soil resources and ensure sustainable handling throughout the construction process.

Appendices

A. ALC Maps showing Land Grades and auger bore locations





B. Soil auger bore log

Table B.1: Soil auger bore log and the grade of soil wetness and droughtiness

Auger Bore Number	Horizon (cm)	Texture	Soil Colour		Calcareousness ($CaCO_3$) (%)	Stoniness (%)	Soil Wetness Grade	Soil Droughtiness Grade	
			Matrix	Mottling				Wheat	Potato
1	0-25	mZCL	10YR5/2	None	10%	1	1	1	2
	25-35	mZCL	10YR6/2	None	10%	1			
	35-75	hZCL	2.5Y8/3	10YR8/8 (strong)	10%	0			
	75-120	hZCL	2.5Y8/2	10YR8/8 (strong)	10%	Marl			
2	0-25	mZCL	10YR5/2	None	10%	1	1	1	2
	25-36	mZCL	10YR6/2	None	10%	1			
	36-75	hZCL	2.5Y8/2	10YR8/8 (strong)	10%	Marl			
	75-120	hZCL	2.5Y8/2	10YR8/8 (strong)	10%	0			
3	0-26	mZCL	10YR5/2	None	10%	1	1	1	2
	26-36	hZCL	10YR6/2	None	10%	1			
	36-70	hZCL	2.5Y8/2	10YR8/8 (strong)	10%	0			
	70-120	hZCL	2.5Y8/2	10YR8/8 (strong)	10%	Marl			
4	0-28	mCL	10YR4/2	None	10%	2	2	2	2
	28-37	hCL	10YR4/3	None	10%	2			
	37-64	hZCL	10YR5/4	10YR7/3 (common)	10%	1			
	64-120	hZCL	2.5Y6/8	--	10%	Chalk Drift			
5	0-28	mCL	10YR4/3	None	10%	1	1	2	2
	28-54	hCL	10YR5/4	None	10%	1			
	54-85	hCL	10YR5/6	7.5YR5/6 (few)	10%	1			
	85-120	hCL	2.5Y8/4	--	10%	Chalk Drift			

6	0-25	mCL	10YR4/3	None	10%	1	1	2	2
	25-50	hCL	10YR4/4	None	10%	1			
	50-78	hCL	10YR5/4	7.5YR5/6 (few)	10%	1			
	78-120	hCL	2.5Y8/4	--	10%	Chalk Drift			
7	0-28	mCL	10YR4/2	None	10%	1	1	3a	2
	28-48	hCL	10/YR4/3	None	10%	1			
	48-62	hCL	10YR5/3	7.5YR5/6 (few)		1			
	62-75	hCL	2.5Y8/4	--	10%	Chalk Drift			
8	0-32	SCL	10YR4/3	None	10%	1	1	2	2
	32-58	SCL	10YR4/4	None	10%	1			
	58-95	SCL	10YR5/3	None	10%	1			
	95-120	hCL	2.5Y8/2	--	10%	Chalk Drift			
9	0-27	SCL	10YR4/3	None	10%	1	1	3a	2
	27-48	SCL	10YR4/4	None	10%	1			
	48-95	SCL	10YR5/3	10YR6/6 (few)	10%	10			
						Chalk			
10	0-22	mCL	10YR4/2	None	10%	1	1	3a	2
	22-54	mCL	10YR4/3	None	10%	1			
	54-76	hCL	10YR5/4	7.5YR5/6 (few)	10%	1			
						Chalk			
11	0-30	mCL	10YR4/2	None	10%	2	1	3b	3a
	30-55	SCL	10YR5/3	10YR6/6 (few)	10%	20			
						Chalk			
12	0-27	SCL	10YR4/2	None	10%	1	1	3b	3b
	27-47	SCL	10YR5/3	None	10%	20			

						Chalk		
13	0-26	SCL	10YR4/2	None	10%	1	1	3a	3a
	26-47	SCL	10YR5/3	None	10%	1			
	47-74	SCL	2.5Y8/2	--	10%	Chalk Drift			
14	0-27	mCL	10YR4/3	None	10%	1	1	3a	2
	27-44	mCL	10YR5/3	None	10%	20			
	44-70	mCL	2.5Y8/2	--	10%	Chalk Drift			
15	0-32	mCL	10YR4/3	None	10%	1	1	3a	2
	32-44	mCL	10YR5/3	None	10%	20			
	44-70	mCL	2.5Y8/2	--	10%	Chalk Drift			
16	0-26	mCL	10YR4/3	None	10%	1	1	3b	3b
	26-32	SCL	10YR5/4	None	10%	1			
	32-50	SCL	10YR6/3	None	10%	20			
						Chalk			
17	0-28	mCL	10YR4/3	None	10%	1	1	1	2
	28-50	SCL	10YR5/4	None	10%	1			
	50-92	SCL	10YR5/3	10YR7/6 (few)	10%	5			
	92-120	SCL	2.5Y8/2	--	10%	Chalk Drift			
18	0-27	mCL	10YR4/3	None	10%	1	1	3b	3a
	27-52	mCL	10YR5/3	None	10%	10			
						Chalk Drift			
19	0-26	mCL	10YR4/3	None	10%	1	1	3b	3a
	26-48	mCL	10YR5/3	None	10%	10			
	48-120	mCL	2.5Y8/2	--	10%	Chalk Drift			
20	0-28	mCL	10YR4/2	None	10%	1	1	3a	2
	28-38	mCL	10YR4/3	None	10%	1			
	38-50	mCL	10YR5/3	None	10%	10			
	50-75	mCL	2.5Y8/2	--	10%	Chalk Drift			

21	0-25	mCL	10YR4/2	None	10%	1	1	2	2
	45-40	SCL	10YR4/3	None	10%	1			
	40-58	SCL	10YR5/3	None	10%	1			
	58-70	SCL	10YR5/3	10YR7/6 (few)	10%	30			
	70-120	SCL	2.5Y8/2	--	10%	Chalk Drift			
22	0-28	mCL	10YR4/2	None	10%	1	1	3a	2
	28-42	SCL	10YR4/3	None	10%	1			
	42-68	SCL	10YR5/3	10YR7/6 (few)	10%	10			
	68-80	SCL	2.5Y8/2	--	10%	Chalk Drift			
23	0-28	mCL	10YR4/4	None	10%	1	1	3b	3b
	28-35	mCL	10YR5/4	None	10%	1			
	35-48	SCL	10YR5/3	10YR7/6 (few)	10%	15			
						Chalk			
24	0-30	SCL	10YR4/2	None	10%	1	1	2	2
	30-42	SCL	10YR4/3	None	10%	1			
	42-62	SCL	10YR5/3	None	10%	1			
	62-95	SCL	10YR5/6	None	10%	15			
	95-120	SCL	2.5Y8/2	--	10%	Chalk Drift			
25	0-30	SCL	10YR4/2	None	10%	1	1	2	2
	30-55	SC	10YR6/3	10YR6/6 (common)	10%	1			
	55-80	SCL	10YR5/3	None	10%	1			
	80-95	SCL	10YR5/6	10YR7/4 (few)	10%	5			
	95-120	SCL	10YR6/6	None	10%	5			
26	0-30	SCL	10YR4/2	None	10%	1	1	2	2
	30-65	SCL	10YR4/4	None	10%	1			

	65-95	SCL	10YR5/3	None	10%	5			
	95-120	SCL	10YR5/3	10YR6/2 (few)	10%	15			
27	0-32	SCL	10YR4/2	None	10%	1	1	3a	2
	32-45	cSZL	10YR5/4	None	10%	1			
	45-66	SCL	2.5Y8/2	--	10%	Chalk Drift			
28	0-32	SCL	10YR4/2	None	10%	2	1	1	2
	32-65	SCL	10YR4/3	None	10%	1			
	65-86	SCL	10YR4/4	None	10%	1			
	86-120	cSZL	10YR5/6	10YR6/2 (few)	10%	15			
29	0-32	SCL	10YR4/2	None	10%	1	1	3a	3a
	32-46	SCL	10YR5/3	None	10%	10			
	46-75	SCL	2.5Y8/2	--	10%	Chalk Drift			
30	0-28	SCL	10YR4/2	None	5%	2	1	1	2
	28-66	SCL	10YR4/3	None	5%	2			
	66-105	SCL	10YR5/3	7.5YR5/2 (few)	10%	1			
	105-120	HP	10YR2/2	None	5%	0			
31	0-33	SCL	10YR4/3	None	10%	1	1	2	2
	33-50	cSZL	10YR5/3	None	10%	15			
	50-120	cSZL	10YR5/3	None	10%	35			
32	0-27	SCL	10YR4/3	None	10%	6	1	2	3a
	27-45	SCL	10YR4/4	None	10%	6			
	45-70	SCL	10YR6/6	5YR5/4 (few)	10%	2			
	70-120	cSZL	10YR 5/3	--	10%	35			
33	0-28	SCL	10YR4/3	None	10%	7			
	28-46	SCL	10YR4/4	None	10%	6			

	46-77	SCL	10YR6/6	5YR5/4 (few)	10%	2	1	2	3a
	77-100	SCL	10YR6/6	--	10%	30			
34	0-28	SCL	10YR4/3	None	10%	8	2	2	3a
	28-54	SCL	10YR4/4	None	10%	6			
	54-75	mSL	7.5YR5/4	10YR5/4 (few)	10%	5			
						Stopped by Gravels			
35	0-25	SCL	10YR4/3	None	10%	8	2	2	3a
	25-35	SCL	10YR6/4	None	10%	5			
	35-58	mSL	10YR6/8	5YR5/3 (few)	10%	15			
	58-120	mSL	10YR6/8	--	10%	35			
36	0-20	SCL	10YR3/2	None	5%	7	2	2	3a
	20-32	SCL	10YR4/2	10YR6/6 (common)	5%	5			
	32-75	SCL	5YR5/6	7.5YR6/8 (common)	5%	5			
	75-102	hCL	5YR5/6	7.5YR4/6 (common)	5%	5			
	102-120	hCL	2.5YR5/8	--	5%	5			
37	0-30	SCL	10YR4/3	None	5%	7	2	1	3a
	30-65	SCL	10YR4/4	7.5YR6/8 (common)	5%	5			
	65-120	SC	10YR6/6	7.5YR6/0 (common)	5%	1			
38	0-28	SCL	10YR4/3	None	10%	2	2	2	3a
	28-55	mSL	10YR5/4	None	10%				

	55-78	mS	10YR6/8	7.5YR6/8 (common)	10%	2	2	2	3a
	78-120	SCL	10YR6/8	7.5YR6/6 (common)	10%	1			
39	0-24	SCL	10YR4/2	None	10%	1	1	2	2
	24-53	SCL	10YR4/3	5YR5/6 (few)	10%	2			
	53-90	SCL	10YR5/6	10YR6/3 (common)	10%	5			
	90-95	mSL	10YR6/8	None	10%	15			
	95-120	mSL	10YR6/8	--	10%	30			
40	0-26	SCL	10YR4/3	None	10%	2	Disturbed ground (2)	2	2
	26-55	SCL	10YR3/2	10YR5/2 (common)	10%	2			
	55-104	hCL	10YR5/4	10YR6/6 (common)	10%	10			
	95-120	hCL	2.5Y8/2	--	10%	Chalk Drift			
41	0-23	hCL	10YR4/3	None	10%	0	2	2	2
	23-30	C	10YR6/6	7.5YR5/8 (few)	10%	0			
	30-76	C	10YR5/6	7.5YR5/8 (common)	10%	0			
	76-95	C	5YR6/1	10YR6/6 (common)	10%	10			
	95-120	C	2.5Y8/2	--	10%	Chalk Drift			
42	0-12	mCL	10YR4/2	None	10%	0	2	2	2
	12-32	hCl	10YR4/4	7.5YR6/8 (few)	10%	0			
	32-62	hCL	10YR5/3	10YR5/6 (common)	10%	0			
	62-78	SCL	10YR4/3	10YR5/6 (common)	10%	5			

						Chalk			
43	0-22	SCL	10YR4/2	None	10%	0	2	2	2
	22-50	SCL	10YR4/3	7.5YR5/8 (few)	10%	0			
	50-68	C	10YR6/2	7.5YR5/8 (common)	10%	0			
	68-120	SCL	10YR5/4	10YR5/6 (few)	10%	5			
44	0-15	SCL	10YR4/3	None	10%	1	1	3a	2
	15-40	SCL	10YR4/4	None	10%	1			
	40-70	SCL	10YR7/6	None	10%	15			
						Chalk			
45	0-15	SCL	10YR4/3	None	10%	1	1	2	2
	15-44	SCL	10YR4/2	None	10%	1			
	44-72	SCL	10YR5/4	10YR7/4 (few)	10%	1			
	72-120	mS	10YR6/6	7.5YR6/8 (few)	10%	5			
46	0-30	SCL	10YR4/3	None	10%	1	1	3a	2
	30-45	SCL	10YR4/4	None	10%	1			
	45-68	mSZL	10YR5/6	None	10%	20			
						Chalk			
47	0-30	SCL	10YR4/3	None	10%	1	1	3a	2
	30-47	SCL	10YR4/4	None	10%	1			
	47-70	mSZL	10YR5/6	None	10%	20			
						Chalk			
48	0-30	SCL	10YR4/3	None	10%	2	1	3a	3a
	30-47	SC	10YR4/4	5YR5/3 (common)	10%	0			
	47-85	LmS	10YR7/6	7.5YR5/6 (few)	10%	0			

	85-95	LmS	10YR7/6	7.5YR5/8 (few)	10%	15			
	95-120	LmS	2.5Y8/6	--	10%	Chalk Drift			
49	0-26	SCL	10YR4/3	None	10%	2	1	2	2
	26-55	SCL	10YR4/4	None	10%	1			
	55-70	SCL	10YR5/3	None	10%	15			
	70-120	SCL	2.5Y8/2	--	10%	Chalk Drift			
50	0-30	SCL	10YR4/3	None	10%	2	1	3a	2
	30-50	SCL	10YR4/4	None	10%	1			
	50-65	mSZL	10YR6/3	None	10%	15			
	65-75	mSZL	2.5Y7/4	--	10%	Chalk Drift			
51	0-30	SCL	10YR4/3	None	10%	2	1	3a	2
	30-52	SCL	10YR4/4	None	10%	10			
	52-65	mSZL	10YR6/3	None	10%	20			
	65-75	mSZL	2.5Y7/4	--	10%	Chalk Drift			
52	0-23	SCL	10YR4/2	None	10%	2	1	3a	2
	23-38	SCL	10YR4/4	None	10%	1			
	38-52	SCL	10YR4/4	None	10%	10			
	52-62	mSZL	10YR6/3	None	10%	15			
	62-75	mSZL	2.5Y7/4	--	10%	Chalk Drift			
53	0-26	SCL	10YR4/2	None	10%	2	1	2	2
	26-46	SCL	10YR4/4	None	10%	2			
	46-65	mSZL	10YR6/3	None	10%	15			
	65-95	mSZL	2.5Y7/4	--	10%	Chalk Drift			
54	0-32	SCL	10YR4/3	None	10%	1	1	2	2
	32-50	SCL	10YR5/4	None	10%	3			
	50-65	mSZL	10YR6/4	None	10%	15			
	65-95	mSZL	2.5Y7/4	--	10%	Chalk Drift			
	0-25	SCL	10YR4/3	None	10%	2			

55	25-40	SCL	10YR5/3	None	10%	10	1	3a	2
	40-65	SCL	10YR5/3	10YR6/6 (few)	10%	10			
	65-75	SCL	2.5Y8/2	--	10%	Chalk Drift			
56	0-25	SCL	10YR4/3	None	10%	1	1	3b	3a
	25-46	SCL	10YR5/3	None	10%	1			
	46-56	SCL	10YR5/3	10YR6/6 (few)	10%	15			
						Chalk			
57	0-25	SCL	10YR4/3	None	10%	2	1	3b	3a
	25-42	SCL	10YR5/3	None	10%	1			
	42-54	SCL	10YR5/3	None	10%	15			
						Chalk			
58	0-28	SCL	10YR4/2	None	10%	2	1	3a	2
	28-47	SCL	10YR5/3	None	10%	1			
	47-72	SCL	10YR5/3	None	10%	15			
						Chalk			
59	0-28	SCL	10YR4/2	None	10%	2	1	3a	2
	28-48	SCL	10YR4/4	None	10%	1			
	48-75	SCL	10YR5/3	None	10%	15			
						Chalk			
60	0-28	SCL	10YR4/2	None	10%	2	1	2	2
	28-50	SCL	10YR4/4	None	10%	1			
	50-67	SCL	10YR5/3	None	10%	15			
	67-120	SCL	2.5Y8/2	--	10%	25			
61	0-32	SCL	10YR4/2	None	10%	2	1	3a	2
	32-45	SCL	10YR4/3	None	10%	1			
	45-52	SCL	10YR5/3	None	10%	15			
	52-82	SCL	2.5Y8/2	--	10%	Chalk Drift			

62	0-30	SCL	10YR4/2	None	10%	3	1	3b	3a
	30-38	SCL	10YR4/3	None	10%	2			
	38-47	mSZL	10YR6/3	None	10%	20			
	47-68	mSZL	2.5Y7/4	--	10%	Chalk Drift			
63	0-25	SCL	10YR4/3	None	5%	3	2	2	2
	25-45	SCL	10YR4/4	None	5%	2			
	45-74	SC	7.5YR5/6	7.5YR5/6 (few)	5%	5			
	74-88	mSL	10YR7/4	10YR5/3 (few)	5%	5			
	88-120	mSL	2.5Y7/4	--	10%	Chalk Drift			
64	0-24	mSL	10YR4/3	None	1%	3	1	2	2
	24-52	mSL	10YR4/4	None	1%	2			
	52-105	mSL	10YR5/6	None	1%	5			
	105-120	SC	7.5YR5/8	10YR6/3 (common)	1%	5			
65	0-24	mSL	10YR4/3	None	1%	2	1	1	2
	24-52	cSL	10YR4/4	None	1%	1			
	52-105	cSL	7.5YR5/4	None	1%	1			
	105-120	.LcS	10YR5/6	None	1%	1			
66	0-24	mSL	10YR4/3	None	1%	3	1	2	3a
	24-52	cSL	10YR5/4	None	1%	5			
	52-120	cSL	10YR5/4	None		35			
67	0-26	hZCL	10YR4/3	None	1%	0	2	2	2
	26-54	ZC	10YR5/3	5YR6/3 (common)	1%	0			
	54-94	ZC	7.5YR6/3	10YR6/1 (common)	5%	0			
	94-108	ZC	10YR6/3	7.5YR6/3 (few)	5%	10			

	94-108	ZC	10YR6/3	7.5YR6/3 (few)	5%	10			
	108-120	ZC	2.5Y8/2	--	10%	Chalk Drift			
68	0-28	SCL	10YR4/3	None	10%	1	1	3a	2
	28-55	SCL	10YR7/6	None	10%	1			
	55-70	SCL	10YR6/6	None	10%	15			
						Chalk			
69	0-26	SCL	10YR4/3	None	10%	1	1	3a	2
	26-58	SCL	10YR7/6	None	10%	8			
	58-74	SCL	10YR6/6	None	10%	25			
						Chalk			
70	0-24	SCL	10YR4/3	None	10%	1	1	3b	3a
	24-38	SCL	10YR4/4	None	10%	1			
	38-58	SCL	10YR6/6	None	10%	15			
						Chalk			
71	0-23	SCL	10YR4/3	None	10%	1	1	3a	2
	23-43	SCL	10YR5/4	None	10%	10			
	43-74	SCL	10YR6/6	None	10%	40			
						Chalk			
72	0-20	SCL	10YR4/3	None	10%	1	1	1	2
	20-36	SCL	10YR4/4	None	10%	1			
	36-63	SCL	7.5YR5/4	7.5YR6/6 (few)	10%	0			
	63-90	mSL	10YR6/6	None	10%	10			
	90-120	mSL	2.5Y7/8	--	10%	Chalk Drift			
73	0-30	SCL	10YR4/3	None	10%	2	1	3b	3a
	30-45	mSL	10YR4/4	None	10%	8			
	45-55	mSL	10YR6/4	None	10%	15			
						Chalk			

74	0-26	mSL	10YR4/2	None	1%	1	1	2	3a
	26-42	mSL	10YR4/3	None	1%	0			
	42-63	mSL	7.5YR5/4	None	1%	0			
	63-120	mS	7.5YR5/4	None	1%	1			
75	0-27	SCL	10YR4/3	None	1%	1	1	1	2
	27-55	SCL	10YR4/4	None	5%	0			
	55-88	SCL	7.5YR5/4	7.5YR6/6 (few)	5%	0			
	88-100	mSL	10YR6/6	None	5%	15			
	100-120	mSL	2.57/6	--	10%	Chalk Drift			
76	0-25	SCL	10YR4/3	None	1%	1	1	2	2
	25-50	SCL	10YR6/6	None	5%	0			
	50-75	mSL	10YR6/3	7.5YR6/6 (few)	10%	0			
	75-120	LmS	10YR6/6	None	10%	5			
77	0-25	SCL	10YR4/3	None	1%	1	2	2	2
	25-46	SCL	10YR4/4	None	10%	0			
	46-65	C	10YR5/2	7.5YR5/4 (few)	10%	0			
	65-80	mSL	7.5YR5/6	5YR4/6 (few)	10%	1			
	80-120	mS	10YR6/6	None	10%	0			
78	0-28	mSL	10YR4/4	None	10%	1	1	3b	3a
	28-58	SCL	10YR4/6	None	10%	8			
	58-64	mSL	10YR5/6	None	10%	15			
						Chalk			
79	0-25	SCL	10YR4/3	None	5%	1	1	1	2
	25-55	SCL	10YR4/4	None	5%	2			
	55-102	SC	10YR5/6	10YR5/2 (common)	10%	0			

	102-120	mSL	10YR6/6	10YR6/2 (few)	10%	5

Key: mS- medium sand; cS- coarse sand; LmS- loamy medium sand; LcS- loamy coarse sand; mSL- medium sandy loam; cSL- coarse sandy loam; mSZL- medium sandy silt loam; mCL- medium clay loam; mZCL-medium silty clay loam; hCL- heavy clay loam; hZCL- heavy silty clay loam; SCL- sandy clay loam; C- clay; ZC- silty clay

C. Auger bore coordinates

Bore Identification number	X – Easting	Y – Northing	National Grid Reference (NGR)
1	545953	254212	TL 45953 54213
2	545962	254113	TL 45963 54113
3	545972	254013	TL 45973 54014
4	545997	253917	TL 45998 53917
5	546047	253831	TL 46048 53831
6	546118	253760	TL 46118 53760
7	546193	253694	TL 46193 53694
8	546268	253628	TL 46268 53628
9	546344	253563	TL 46345 53564
10	546426	253506	TL 46427 53506
11	546699	253384	TL 46700 53385
12	546795	253353	TL 46795 53354
13	546890	253322	TL 46890 53323
14	546984	253289	TL 46984 53289
15	547074	253246	TL 47075 53247
16	547160	253195	TL 47161 53195
17	547241	253136	TL 47241 53136
18	547456	252927	TL 47456 52927
19	547526	252856	TL 47527 52857
20	547597	252785	TL 47598 52786
21	547667	252714	TL 47668 52714
22	547730	252636	TL 47730 52636
23	547781	252550	TL 47781 52551
24	547819	252458	TL 47820 52458
25	547845	252361	TL 47845 52362
26	547858	252262	TL 47859 52263
27	547913	252010	TL 47913 52011
28	547957	251921	TL 47957 51921
29	548009	251835	TL 48009 51836
30	548061	251750	TL 48062 51751
31	548113	251665	TL 48114 51665
32	548166	251580	TL 48166 51580
33	548218	251495	TL 48219 51495
34	548271	251409	TL 48271 51410
35	548323	251324	TL 48324 51325
36	548481	251069	TL 48481 51070
37	548539	250988	TL 48539 50988
38	548605	250912	TL 48605 50913
39	548680	250843	TL 48678 50845
40	548757	250783	TL 48757 50783
41	548838	250724	TL 48838 50725
42	548919	250666	TL 48919 50666
43	549000	250607	TL 49000 50607

Bore Identification number	X – Easting	Y – Northing	National Grid Reference (NGR)
44	549081	250548	TL 49081 50549
45	549162	250490	TL 49162 50490
46	549243	250431	TL 49243 50432
47	549324	250373	TL 49324 50373
48	549576	250211	TL 49577 50211
49	549664	250163	TL 49664 50163
50	549753	250117	TL 49754 50118
51	549917	250030	TL 49917 50030
52	550004	249975	TL 50004 49920
53	550088	249920	TL 50088 49920
54	550161	249871	TL 50161 49871
55	550246	249815	TL 50246 49760
56	550330	249760	TL 50330 49703
57	550415	249703	TL 50415 49703
58	550498	249648	TL 50498 49648
59	550586	249597	TL 50586 49597
60	550676	249558	TL 50676 49558
61	550777	249532	TL 50777 49532
62	550878	249520	TL 50878 49520
63	551979	249523	TL 51979 49523
64	551079	249540	TL 51079 49540
65	551177	249571	TL 51177 49571
66	551270	249616	TL 51270 49571
67	551395	249698	TL 51395 49698
68	551986	250182	TL 51986 50182
69	552086	250182	TL 52086 50182
70	551986	250082	TL 51986 50082
71	551886	249982	TL 51886 49982
72	551986	249982	TL 51986 49982
73	551886	249882	TL 51886 49882
74	551986	249882	TL 51986 49882
75	551886	249782	TL 51886 49782
76	551786	249782	TL 51786 49782
77	551786	249682	TL 51786 49682
78	551886	249682	TL 51886 49682
79	551841	249534	TL 51841 49534