A46 Newark Bypass

TR010065/APP/6.3

6.3 Environmental Statement Appendix 9.3 Agricultural Land Classification Report - Track Changed

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A46 Newark Bypass

Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT

APPENDIX 9.3 AGRICULTURAL LAND CLASSIFICATION REPORT - TRACK CHANGED

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010065
Application Document Reference	TR010065/APP/6.3
Author:	A46 Newark Bypass Project Team, National Highways

Version	Date	Status of Version
Rev 1	April 2024	DCO Application
Rev 2	November 2024	Deadline 3 Submission

Contents

1 Introduction

1.1 Report aims

1.1.1 The Agricultural Land Classification (ALC) Report has been prepared as part of the Environmental Statement (ES) [APP-045 to APP-061 and AS-021] ~~(TR010065/APP/6.1)~~ submitted for the Development Consent Order (DCO) application for the Scheme.

1.1.2 In accordance with the ALC methodology for England and Wales[1], this report details the quality of agricultural land within the Order Limits for the Scheme.

1.1.3 This report aims to determine the distribution of ALC grades across the Scheme, including Best and Most Versatile (BMV) land, and has been informed by desk-based searches, as well as surveys conducted in 2021 and 2023.

1.1.4 This report supports the assessment of likely significant effects detailed in Chapter 9 (Geology and Soils) of the ES [APP-053~~045 to APP-061~~]**~~(TR010065/APP/6.1)~~**. This report has also informed the Outline Soil Management Plan (SMP) for the Scheme, contained in Appendix B.3 of the First Iteration Environmental Management Plan (EMP) ~~(TR010065/APP/6.5)~~ [REP2-010~~APP-184~~] which provides a framework to manage and monitor the soils disturbed during construction of the Scheme.

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[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.

2 Legislation and policy overview

2.1.1 The National Policy Statement for National Networks (NPSNN)[2] sets out the policy which the Scheme should comply with. It is also the basis for informing a judgement on the impacts of a Scheme, for example whether the Scheme is consistent with the needs of the NPSNN. Compliance of the Scheme with the NPSNN is detailed within the NPSNN Accordance Tables [AS-090]~~.(TR010065/APP/7.2).~~ The relevant sections are outlined below.

2.1.2 A draft NPSNN was published for consultation in March 2023. The consultation period ended in June 2023. The draft NPSNN may be subject to change following the consultation and once published in its designated form. Although this is currently in draft it has been considered in respect of the Scheme and the Draft NPSNN Accordance Tables [APP-192]~~(TR010065/APP/7.3)~~ summarise compliance of the Scheme with the draft NPSNN.

- Paragraph 4.15: *"All proposals for projects that are subject to the European Union's Environmental Impact Assessment Directive and are likely to have significant effects on the environment, must be accompanied by an ES, describing the aspects of the environment likely to be significantly affected by the project. The Directive specifically requires an environmental impact assessment to identify, describe and assess effects on human beings, fauna and flora, soil, water, air, climate, the landscape, material assets and cultural heritage, and the interaction between them."*
- Paragraph 5.167: *"During any pre-application discussions with the applicant, the local planning authority should identify any concerns it has about the impacts of the application on land-use, having regard to the development plan and relevant applications, and including, where relevant, whether it agrees with any independent assessment that the land is surplus to requirements."*
- Paragraph 5.168: *"Applicants should take into account the economic and other benefits of the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land in preference to that of a higher quality. Applicants should also identify any effects, and seek to minimise impacts, on soil quality, taking into account any mitigation measures proposed. Where possible, developments should be on previously developed (brownfield) sites provided that it is not of high environmental value. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination and how it is proposed to address this."*

[2] Department for Transport. (2014). National Policy Statement for National Networks.

- Paragraph 5.176: *"The decision-maker should take into account the economic and other benefits of the best and most versatile agricultural land. The decision-maker should give little weight to the loss of agricultural land in grades 3b, 4 and 5, except in areas (such as uplands) where particular agricultural practices may themselves contribute to the quality and character of the environment or the local economy."*
- Paragraph 5.179: *"Applicants can minimise the direct effects of a project on the existing use of the proposed site or proposed uses near the site by the application of good design principles, including the layout of the project and the protection of soils during construction."*

2.1.3 In 2009, Department for Environment Food and Rural Affairs (Defra) issued the Soil Strategy for England – Safeguarding our Soils[3]. This outlines the goal that by 2030 all of England's soils will be managed sustainably, with degradation threats tackled successfully, to improve the quality of England's soils and safeguard their ability to provide future generations with the vast range of soil ecosystem services. The aims of the Soil Strategy have also been incorporated into the Natural Environment White Paper (The natural choice: securing the value of nature[4]).

2.1.4 The National Planning Policy Framework (NPPF)[5] highlights in paragraph 180 that the planning system should both contribute to and improve the natural and local environment by protecting and enhancing soils. It also reinforces that the economic and other benefits of BMV agricultural land should be clearly and explicitly recognised. As part of this, the framework outlines that where significant development on agricultural land is demonstrated to be necessary, areas of poorer quality land ALC grades 3b, 4 and 5) should be used in preference to those of higher quality (grades 1, 2 and 3a). This directly relates to the ALC framework[1], which itself determines the quality of agricultural land in accordance with a suite of key soil properties.

[3] Department for Environment, Food and Rural Affairs. (2009) Safeguarding our Soils: A Strategy for England. Defra.

[4] Department for Environment, Food and Rural Affairs. (2011) The Natural Environment White Paper, The natural choice: securing the value of nature. London: The Stationery Office.

[5] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

3 Assessment Approach

3.1 Assessment location

3.1.1 Prior to the results reported herein, soil surveys were undertaken by a previous consultant on behalf of the Applicant during the options appraisal stage in 2021. Additional areas that were not subject to surveys have since been undertaken in 2023 and are reported here along with the findings of the previous survey.

3.1.2 The current desktop study and ALC surveys were undertaken within the main Scheme alignment, Farndon East and West Borrow Pits Floodplain Compensation Areas (FCA) and the Kelham and Averham FCA at the locations shown in Appendix A and in Figure 2.2 (Environmental Constraints) of the ES Figures [AS-025]~~(TR010065/APP/6.2)~~.

3.1.3 Land in four areas, namely the fields ~~centred~~centered around coordinates [480715, 356486], [479988, 355101], [481351, 355970] and [481422, 355876], was not surveyed as the land was not anticipated to be allocated for permanent removal from agriculture at the time of the surveys. An ALC grade was assigned to these areas based on neighbouring survey data and soil type, denoted by hatching in Appendix B of the ES Figures [AS-023 to AS-085]~~(TR010065/APP/6.2)~~.

~~3.1.3~~3.1.4 The land assessed within the main Scheme alignment principally comprises the Farndon East Borrow Pit and FCA and Farndon West Borrow Pit and FCA on either side of the A46, just north of the River Trent and south of the A617. In addition, a small area of land just north of the Winthorpe roundabout was also surveyed. It is proposed that Farndon East FCA will become a permanent lake, and it is proposed that Farndon West FCA would comprise of residual ponds formed in post-borrow pit excavations with floodplain grazing marsh created in the northern extent of the site.

~~3.1.4~~3.1.5 The land assessed within the Kelham and Averham FCA lies between Kelham and Averham on both sides of the A617.

3.2 Agricultural Land Classification framework

3.2.1 The ALC system represents an industry-standard framework for classifying agricultural land in accordance with the extent to which physical or chemical characteristics result in long-term limitations on agricultural use. The framework divides agricultural land into five grades, with Grades 1 – 3a representing BMV land[1].

- **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 – good quality agricultural land:** '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'.
    - **Subgrade 3b – moderate quality agricultural land:** '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'.
- **Other land – Woodland:** Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

3.3 Assessment methodology

3.3.1 A desk-based study was first undertaken to inform the subsequent on-site ALC survey in 2023. The desk-based study examined published information on climate, geology and soil in the locations outlined in Section 3.1 using the following sources:

- British Geological Survey (BGS) 'GeoIndex'[6] mapping
- Climatological Data for ALC[6]
- Multi-agency geographic information for the countryside (MAGIC) Map Application[7]
- Flood Map for Planning[7]
- National Soil Association mapping[8]

3.3.2 The ALC survey was conducted in accordance with the Soil Survey Field Handbook and appropriate ALC guidance[1].

3.3.3 It was undertaken on 10 to 12 January and 1 to 3 March 2023 at 57 locations situated on a 100 metre-by-100 metre grid (i.e. one bore per hectare) within the Scheme design at the time of the survey – as shown in the drawing contained in Appendix B. These sample locations were located using a GPS-enabled tablet. Soil profiles were examined to 1.2 metre using a 5cm diameter Dutch (Edelman) hand auger.

3.3.4 At each auger bore location, a range of soil properties were recorded using the methods outlined by the Soil Survey Field Handbook. This includes the horizon, soil texture, stone content, calcareousness, slope, colour and mottling.

3.3.5 Site conditions such as gradient, microrelief, exposure and aspect were also recorded in each survey area.

3.3.6 In order to calculate soil calcareousness, 10% hydrogen chloride was used. A Munsell Soil Colour Chart was used to judge soil colours and a clinometer was used to measure slope gradients.

3.3.7 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 trained operator.

3.3.8 Hand texturing was used to assess the soil texture throughout the soil profile at each borehole location. This involves rubbing a sample of moist soil in a bare hand to determine its constituent proportions of sand, silt and clay.

3.3.9 One soil sample was also obtained for external analysis of Particle Size Distribution (PSD) at a UKAS accredited laboratory. This represents a best-practice approach for substantiating the soil textures derived by hand during the site visit.

3.3.10 Changes to the Scheme design since conducting the survey mean that the following boreholes now lie outside the Order Limits of the Scheme: 1-7, 10-40, 84, 90-91, 95-97, 102-105, 108-112 and 120-

[6] The Met. Office (1989). Climatological Data for Agricultural Land Classification.

[7] Department for Environment, Food and Rural Affairs (Defra) Magic Map Application (2023). Available at: Magic Map Application (defra.gov.uk) (Last accessed December 2023).

[8] Ed. J.M. Hodgson, Cranfield University (2022). Soil Survey Field Handbook: Describing and Sampling Soil Profiles.

125. Additionally, HA13 from the 2021 ALC report now lies outside the boundary of the Scheme. They are still included in this report for information but are excluded from ALC grade and soil resources calculations.

4 Desk-based review

4.1 Introduction

4.1.1 The following section presents the findings of an initial desk-based review of available information conducted prior to the soil surveys on the area selected for the ALC survey as mapped in Appendix B of this report. The aim of this section was to guide survey methodology and complement the empirical results.

4.2 Land use

4.2.1 Land within the Order Limits consists predominantly of arable land, grassland and a small amount of woodland. Further detail on land use was obtained during surveys and is reported in Section 5.1.

4.3 Topography

4.3.1 The area is part of the River Trent floodplain and is low lying and flat. The southern part of the Scheme runs through the River Trent alluvial floodplain where natural ground levels are typically 9 to 10 metres Above Ordnance Datum (AOD) and embankments of the existing A46 rise up to a maximum 13 metres in height with 1V:2.5H slopes. To the east of the Brownhills Junction the land rises out of the floodplain and reaches a maximum 18 metres AOD near the eastern end of the Scheme at Winthorpe Junction. The Kelham and Averham FCA is also relatively flat, with elevations ranging from 13 metre AOD to 17 metre AOD across the Scheme. The topography of the Scheme is shown in Figure 9.1 (Topography) of the ES Figures [AS-047]~~(TR010065/APP/6.2)~~.

4.4 Geology

Superficial geology

4.4.1 British Geological Survey (BGS) 'GeoIndex'[6] mapping (1:50,000 resolution) indicates there are three different superficial geologies present within the Order Limits:

- Alluvium is shown to underlie the ALC survey location on the main Scheme alignment, which comprised boreholes 1 – 81a. It is described as 'soft to firm consolidated and compressible silty clay, but can contain silt, peat and gravel'.

- Both alluvium and Holme Pierrepont Sand and Gravel Member (HPSG) superficial geology are shown to underlie the Kelham and Averham FCA (boreholes 81b – 125). HPSG is described as 'pinkish, poorly sorted and compositionally rather immature, sandy gravels dominated by rounded pebbles of quartz/quartzite, flint, Triassic and Upper Carboniferous sandstone, Lower carboniferous cherts etc, which typically develops 1-2m above the floodplain'.
- Balderton Sand and Gravel member (BSG) is shown to underlie the small area surveyed to the north of the Winthorpe roundabout (A46/A1133), toward the extreme north of the main Scheme alignment. (boreholes 126-128). BSG is described as 'Orange-brown sandy gravel, dominated by round pebbles of quartz/quartzite, subangular flint and rarer Triassic sandstone'.

Bedrock geology

4.4.2 BGS 'GeoIndex' mapping (1:50,000 resolution) indicates there are three bedrock geologies present across the ALC survey location on the main Scheme alignment and the Kelham and Averham FCA.

4.4.3 The main Scheme alignment comprised the following bedrock geologies:

- The majority of the main Scheme alignment comprised Gunthorpe Member which underlies the northern portion of the surveyed area. This is described as 'mudstone, red-brown, subordinate siltstone and fine-grained sandstone, greenish grey gypsum veins and nodules'.
- A narrower band of Edwalton Member underlies approximately the southern third of the survey area. This is described as 'mudstone and siltstone, red-brown and greenish grey, variably dolomitic siltstone and very-fine grained sandstone common in the lower half and fine gypsum common in the upper half'.

4.4.4 The bedrock of the Kelham and Averham FCA and the area north of the Winthorpe roundabout is mapped to exclusively consist of the Mercia Mudstone Group, described as 'red, sometimes green-grey, mudstones and subordinate siltstones'.

4.5 Climatological data and flood risk

4.5.1 Climatological and flood risk data are key physical factors taken into account for the derivation of ALC.

Climatological data

4.5.2 Climatological Data for ALC[9] was consulted to obtain data relevant to the Scheme. Records of climatological data cover grid points every 5 kilometres across the UK. To gain insight into the climate within the Order Limits, four grid points were selected around the area and are summarised in Table 4 1.

Table 4-1: Climatological data

Variable	Measurement			
National Grid Reference	SK750500	SK750550	SK750600	SK800500
Altitude in meters (ALT)	19	25	25	15
Average annual rainfall (AAR) in mm	574	587	583	570
Lapse rate for average annual rainfall (LAAR) in mm / metre	1.1	1.1	1.1	0.7
Average summer rainfall (ASR) (April to September) in mm	290	295	295	285
Accumulated temperature above 0° C (AT0) (January to June)	2390	2380	2378	2395
Accumulated temperature above 0° C (ATS) (April to September)	1423	1414	1412	1426
Moisture deficit for winter wheat (MDMWHT) in mm (from regressions on ATS and ASR)	117	115	115	119
Moisture deficit for potatoes (MDMPOT) in mm (from regressions on ATS and ASR)	112	109	109	114
Median duration of field capacity (FCD) in days, when the soil moisture deficit is zero	112	113	116	110

Flood risk

4.5.3 The Environment Agency's 'Flood Map for Planning'[10] highlights that the land adjacent to the A46 (boreholes 1 to 81a in Appendix B, is categorised as being at a high risk of flooding. This is also referred to

[9] The Met. Office (1989). Climatological Data for Agricultural Land Classification.

[10] Environment Agency (2023) Flood Map for Planning [online] available at: Where do you want to check? - Check your long term flood risk - GOV.UK (check-long-term-flood-risk.service.gov.uk) (Last accessed December 2023).

as Flood Zone 3 (land having a 3.3% or greater annual probability of river flooding).

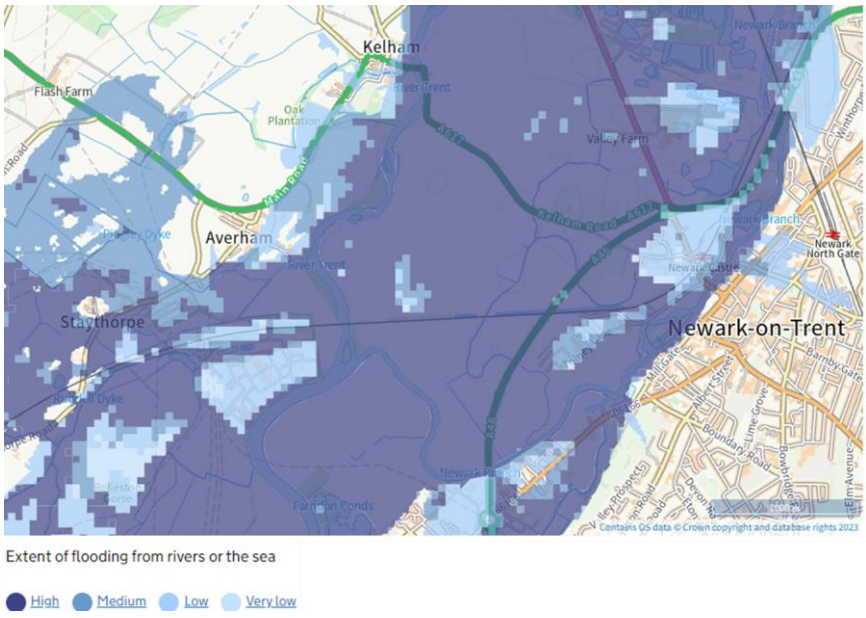
4.5.4 The Scheme north of Farndon East and West Borrow Pits and FCA, to the Winthorpe interchange is also predominantly at a high risk of flooding (>3.3%).

4.5.5 The area north of the Winthorpe interchange, where the land is more elevated (approximately 18-23 metres AOD) is not within in any flood zone.

4.5.6 The Kelham and Averham FCA to the west of the A617 (boreholes 81b to 115), is predominantly outside of flood risk zones except toward the northeast of the order limits where land is categorised as having a low risk of annual flooding (between 0.1% and 1%). On the east side of the A617 (boreholes117-125), the majority of the land is categorised as having a medium risk of annual flooding (1 – 3.3%), with a smaller area close to the River Trent categorised as having a high risk of annual flooding (>3.3%).

4.5.7 The Environment Agency's 'Flood Map for Planning'[7] is depicted in Figure 4.1 below.

Figure 4.1: Flood map for planning



4.6 Agricultural Land Classification

4.6.1 Initial desktop inspection of the route using the 'MAGIC Map Application'[11] suggests that the main Scheme alignment survey area comprises ALC Grade 3 with a small area of ALC Grade 2 in the north.

4.6.2 The area north of the survey area on the main Scheme alignment comprises ALC Grade 3.

4.6.3 The Kelham and Averham FCA comprises mainly ALC Grade 2 with a small area of ALC Grade 3 in the north-west of the site and on the east side of the A617.

4.6.4 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 BMV[12] (Grades 1 – 3a) and moderate or poorer quality land (Grades 3b, 4 and 5).

4.6.5 The ALC survey produced in April 2021 by a previous consultant for National Highways covers a large section of the northern half of the main Scheme alignment and only partially covers the land assessed here. The majority (29.1 ha) of the land previously surveyed was found to be grade 3b ('Moderate quality', non-BMV). A 14.7 ha area between the Winthorpe Roundabout and the ESSO garage, near the Winthorpe interchange, was graded 3a ('Good quality', BMV).

4.7 Soil associations

4.7.1 Inspection of National Soil Association mapping[9] for the main Scheme alignment and Kelham and Averham FCA suggests that there are five different soil associations within the 2023 ALC survey area and seven across the Order Limits.

- **Fladbury 2:** 'Greyish and brownish alluvium, with mottled clayey (not above 40cm in the Trent series) soils and subsidiary fine loamy soils pass into clayey subsoil. Slowly permeable subsoils, waterlogging caused by ground water'[13]. It is expected to be found within the main Scheme alignment from just north of the Farndon Roundabout to just east of the Winthorpe interchange.

[11] Department for Environment, Food and Rural Affairs (Defra) Magic Map Application (2023). Available at: Magic Map Application (defra.gov.uk) (Last accessed December 2023).

[12] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

[13] Cranfield University The Soils Guide (2023). Available at: LandIS - Land Information System - Associations (Last accessed December 2023).

- **Wharfe:** ‘Deep well drained, mainly fine loamy brown alluvial soils, tend to occur next to rivers. Permeable well drained, in some areas will be subject to winter flooding’. This soil association is anticipated to occur within the western portion of the main Scheme alignment ALC survey area. It is also present to the northeast corner of the Kelham and Averham FCA.
- **Arrow:** ‘Coarse loamy soils affected by groundwater, gleyic brown earths, cambic gley soils. Permeable but seasonally waterlogged on undrained land’. It is anticipated to cover most of the Kelham and Averham FCA and the area to the south of the Farndon East and West Borrow Pits and FCA.
- **Compton:** ‘Stoneless mostly reddish clayey soils affected by groundwater. Mainly mottled reddish and greyish subsoils down to greyish clay. Severely waterlogged and subject to seasonal flooding due to groundwater at shallow depths’. Compton soils are anticipated in the north of the Kelham and Averham FCA in which auger bore locations 110 to 112 were preselected for examination.
- **Newport 1:** ‘Deep mainly well drained medium sandy soils formed in glaciofluvial and river terrace deposits and, in a few places, stoneless, aeolian sand. Some affected by groundwater’. Anticipated to occur in the area north of the Winthorpe roundabout.
- **Blackwood:** Deep permeable sandy and coarse loamy soils affected by groundwater. Anticipated to be present in the location of the Winthorpe interchange to just north of the Winthorpe roundabout.
- **Dunnington Heath:** Reddish coarse and fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging. This association skirts the eastern side of the main Scheme alignment and is only anticipated to be present along Trent Lane and Quibell’s Lane.

5 Site surveys

5.1 Land use

5.1.1 The area within the main Scheme alignment consists of predominantly arable land, with one portion of rough grazing in the field bounded by Old Trent Dyke in the north-east. It is notable that this area was heavily poached and waterlogged during the survey visit conducted on 10 to 12 January 2023, which limited the extent of the survey in this area. The field encompassing auger bores 8 and 9 (please refer to Appendix B for a map of auger bore distribution) had infant trees recently planted, though due to their infancy, this was not considered 'Other Land' as per ALC guidelines[1].

5.1.2 The field east of the A46 was ploughed with maize stubble present, while the field bounding the A46 to the west was recorded to have sprayed off grass during the site visit. The field in the north-west of the main Scheme alignment survey area had been in use growing sugar beet.

5.1.3 The majority of Kelham and Averham FCA is currently in use as grassland for grazing, with evidence of previous grazing in this area. This changes to arable cropping in the fields adjacent to the A617 between the villages of Averham and Kelham.

5.1.4 The agricultural land to the north of the Farndon East FCA and Farndon West Borrow Pits / FCA, surveyed previously in 2021 consisted of a mixture grassland and arable fields with the former appearing more abundant.

6 Observed soils

6.1 Soil types

6.1.1 Across the study area, five distinct soil types were observed, a further 2 were delineated from the previous ALC data and one (Type 8 south of the Farndon roundabout) is based on national soil association mapping[9] as no soil survey has been carried out in this area to date (please refer to Appendix A for a map of soil type distribution).

- **Type 1 – Deep alluvial clay loam:** Stoneless or very slightly stony clay loam soils developed in alluvium and with risk of seasonal flooding. Topsoils occasionally heavy, some clay subsoils between 30-120cm and the inclusion of some sandy loam subsoils below 80cm. Soils throughout the majority of fields in the main Scheme alignment survey area fall into Soil Type 1, along with an area to the east of the A617, within the Kelham and Averham FCA. This is characterised by non-calcareous, dark brown (7.5YR 3/2, 3/3), stoneless (<1% small or medium hard stones) or very slightly stony (1-5%) heavy clay loam (less frequently medium clay loam) topsoils overlying heavy clay loam upper and lower subsoils with few (<2% matrix coverage) fine (1-2mm) light grey (7.5YR 7/1) or strong brown/reddish (7.5YRs 5/8) mottles. While the majority of subsoils were characterised as heavy clay loam, heavier clay subsoils were also commonly recorded at depths between 29-120cm. In line with the alluvial nature of soils in the vicinity, the coarser soil particles associated with sandy clay loam and medium sandy loam textures were commonly recorded in lower subsoils (typically below 80cm depth). Soils were typically Wetness Class I owing to <225 Field Capacity Days (FCD) and no slowly permeable layer (SPL) or gleying observed.
- **Type 2 – Deep loam with high potential for waterlogging:** Non-calcareous, very slightly stony loamy soil developed over alluvium with naturally high groundwater and mottled subsoils. Very slightly stony clay loam topsoils over sandy clay loam subsoils found within the main Scheme alignment with indications of frequent flooding. Typically a non-calcareous, brown (7.5YR 5/3), very slightly stony (1-5%) medium clay loam topsoil overlying a sandy clay loam subsoil. Typical of the wet conditions, fine (1-2mm) strong brown/reddish (7.5YR 5/8) mottling was apparent throughout the topsoil (<2% matrix coverage) and subsoil (10% matrix coverage). Soils were typically Wetness Class I owing to <225 FCD and no SPL or gleying observed.
- **Type 3 – Disturbed soils:** Mottled, commonly stoneless clay loam soils with some sandy clay loam and loamy sand subsoils. Evidence of previous disturbance leading to compacted soil structure and high susceptibility to flooding. Evidence of a previously disturbed soil profile situated in an area of approximately 2.7 hectare along the western boundary of the field bordering the A46 to the east. Soils in this area

were visually characterised by standing water and a high water table. Where hand augering was possible (auger bores 73, 76 and 79), soil profiles typically consisted of non-calcareous, stoneless (<1% small or medium hard stones) or very slightly stony (1-5%), brown (7.5YR 4/2) medium or heavy clay loam topsoils overlying slightly lighter brown (7.5YR 4/3 or 5/3) clay subsoils with fine grey mottles (<2% matrix coverage, 1-2mm, 7.5YR 7/1). Similarly to Soil Type 1, subsoils were occasionally sandy clay loam, medium sandy loam and loamy sand from 68cm depth, with mottling not recorded in these better draining horizons. The waterlogged nature of the area suggests soils have become compacted following reinstatement, with further indication of this area being previously disturbed through both historical aerial imagery and the identification of dark black, possible coal rock in the topsoil of auger bore 76. Soils were typically Wetness Class I owing to <225 FCD and no SPL or gleying observed.

- **Type 4 – Well draining loamy soils:** Sandy loam or sandy clay loam soils with sand and loamy sand within lower subsoils and variable stoniness. Soil profiles in the Kelham and Averham FCA are characteristically of lighter textures, making them distinct from soils adjacent to the A46 itself. Typical profiles comprise brown (7.5YR 4/3), non-calcareous sandy loam or sandy clay loam topsoils overlying brown (7.5YR 4/4) or light brown (7.5YR 4/6, 5/6) subsoils, with some sand or loamy sand lower subsoils). Topsoils tend to be very slightly stony (1-5%), although stoniness in subsoils can vary between very slightly to moderately (6-15%) or even very (>36%) stony. Mottling is uncharacteristic due to the typically strong drainage associated with these light soil textures. Soils were typically Wetness Class I owing to <225 FCD and no SPL or gleying observed.
- **Type 5 – Deep well draining soils:** Non-calcareous, deep well drained sandy soils, developed in glaciofluvial deposits of sand and gravel, found exclusively in the surveyed area north of the Winthorpe roundabout at an elevation of 19-21m (AOD). Dark Very dark greyish brown (10YR3/2), medium loamy sand to sandy loam, moderately stony topsoils to 32cm, with upper subsoils of loamy sand or sand. Lower subsoils consisted of stony to very stony, strong brown (7.5YR 4/6), medium sand to a depth of 100cm.
- **Type 6 – Loamy soils with poorer structured subsoils:** Deep variably textured soil recorded, with generally poorer structuring in the subsoils. Topsoils are non-calcareous and range from sandy loam to clay loam and to a depth of 38cm. Subsoils range from sandy loams to clay and structures recorded include prismatic and massive. Recorded depths ranged from 60 to 110cm with augering most commonly stopping in poorly structured marl. Soils variably affected by ground water and winter flooding.
- **Type 7 – Alluvial soils:** Deep non-calcareous and stoneless, predominantly silty clay loam soils recorded. Formed predominantly in alluvium and transitioning to more clayey soils in the south. Topsoils, typically silty clay loam (25-30cm), with one clay topsoil recorded

(HA21). Upper subsoils also typically silty clay loam (45-90cm), with one clay upper subsoil recorded (HA21). Lower subsoils recorded as silty clay or clay from 80 to 120cm, where in shallower profiles augering was stopped by high stone content. Soils variably affected by ground water and winter flooding.

- **Type 8 – Coarse loamy soils:** Deep permeable coarse loamy soils anticipated. Formed predominantly in superficial deposits of sand and gravel. Topsoil stoneless or slightly stony sandy loam (25cm). Upper subsoil, slightly stony sandy loam (50cm). Lower subsoil slightly stony sandy loam or loamy sand (100cm). Seasonal waterlogging and high winter water table expected.

6.1.2 Please note that the land located to the north-east of Old Trent Dyke (main Scheme alignment survey area) is comprised of two fields that at the time of visit were used as cattle pasture. Auger boreholes numbers 16, 17, 26, 27, 28, 29, 39, 40 and 41 were initially planned to be undertaken in this area. However, due to flooding it was not possible to conduct the ALC survey in these locations. A partial bore at location 7 was undertaken, although this was waterlogged from 68cm depth.

6.1.3 Elsewhere within the main Scheme alignment current survey area, surface waterlogging also meant that no bores were possible at the preselected locations; bores number 68, 70, 74 and 78. Partial auger bores were only able to be undertaken in locations 42 (to 80cm), 51 (40cm) and 78 (20cm) as soils were saturated with water and unable to be hand textured or assessed accurately to full 1.2m depth.

6.1.4 In the Kelham and Averham FCA, partial soil bores due to waterlogging were only possible at locations 109 and 110. Boring reached depths of 70cm and 72cm, respectively, before soils were saturated with water and unable to be hand textured or assessed accurately.

6.1.5 One soil sample was taken for external analysis of PSD. This was undertaken in line with ALC best-practice in order to corroborate the textures recorded in the field. The sample was collected from auger bore 102 and the PSD analysis confirmed that the sample contained 52% sand, 30% silt and 18% clay. The raw laboratory results from the 2023 survey reported herein are included in Appendix E.

7 ALC interpretation

7.1 Limiting factors

7.1.1 Climate conditions were not limiting factors on the ALC grade. At each of the four selected grid reference points (Section 4.5), the average annual rainfall (AAR) ranged from 570 – 574mm and the accumulated temperature above 0°C (AT0) ranged from 2378 - 2395° C. These values fall within Grade 1 when plotted on the 'Grade according to the climate' graph found in Figure 1 of the ALC guidance[1].

7.1.2 FCD at the four points fell within the parameters of Grade 1 land. With a range of 110 – 116 the median duration of days when the soil moisture deficit is zero is relatively low. This means that FCD does not have a limiting effect when determining wetness grades.

7.1.3 Site conditions such as gradient, exposure, and microrelief were similarly found not to be limiting factors in overall ALC grade.

7.1.4 The gradient of the surveyed areas was flat and so is not considered to be a limiting factor for ALC grade.

7.1.5 Microrelief conditions such as complex changes in slope or the presence of boulders or rock outcrops can impede the use of farm equipment and therefore influence the overall ALC grading. There were no instances of microrelief conditions that could have a limiting effect across the entire surveyed area.

7.1.6 Local climatic conditions such as exposure and frost risk are not considered to contribute to the overall ALC grade within the study area.

7.1.7 Overall soil depths were consistently greater than 60cm at each borehole location and as such pose no limitation to the ALC grade.

7.1.8 The topsoil within the main Scheme alignment mostly comprised medium heavy clay loam. This is not considered to be a limiting factor when accounting for wetness class or droughtiness.

7.1.9 The topsoil within the Kelham and Averham FCA was mainly medium sandy loam. This is not considered to be a limiting factor when accounting for wetness class but has an impact on soil droughtiness.

7.1.10 The volume of hard stones larger than 2cm within the top 25cm of the soil profile did not exceed 15% within any of the auger borehole locations. The volume of hard stones larger than 6cm within the top 25cm of the soil profile did not exceed 5%. No soft stones were encountered within the survey area. As such, stone content is not considered to be a major impediment to cultivation or to reduce the water capacity of the soil as per the limiting percentages set out in Table 5 of the ALC guidance[1].

7.1.11 No evidence of significant soil erosion was encountered during the ALC survey.

7.1.12 No chemical limitations within the site are expected. This means that no chemical factors are likely to have, a detrimental long-term effect on the soils overall ALC grade.

7.1.13 The key limiting factor across the main Scheme alignment survey area was flooding as was evident from reviewing the Environment Agency's 'Flood Map for Planning'7 and from observation of flooded conditions at the time of the site survey (as shown in the photographs in Appendix D). With an annual flood risk of 3.3% or greater the area is considered to have an occasional to frequent flood risk as per Table 2 and Table 3 of the ALC guidance[1].

7.1.14 The key limiting factor across the Kelham and Averham FCA was soil droughtiness. This is due to a combination of light soil textures, with much greater influence of sand in Soil Type 4 (Section 6.1), and stone content.

7.1.15 The limiting factor for each auger bore is included in the auger bore log in Appendix E.

7.2 Grading

7.2.1 The current 2023 detailed ALC survey and previous 2021 ALC survey show~~s~~ that the main Scheme alignment, including the Farndon East and West Borrow Pits and FCAs, is dominated by Grade 3b (~~77~~64%) and Grade 4 (~~7~~6%) land due to its risk of flooding. There is also Grade 3a BMV land accounting for 30%.

~~7.2.2 The previous 2021 ALC survey established the presence of Grade 3a (34%) and Grade 3b (66%) land, meaning that one third of this survey area is deemed BMV land.~~

~~7.2.3~~7.2.2 The Kelham and Averham FCA comprised of BMV land (~~74~~4980%) ~~with~~ including ALC Grades 2 (~~47~~3138%) and 3a (~~27~~1822%), and Grade 3b (~~2~~4621%) of the total land area.

~~7.2.4~~7.2.3 Appendix B outlines the distribution of ALC grades across both sites within the current Scheme design. In summary:

- Main Scheme alignment 2023 survey area
  - Grade 3b ('Moderate'): 5.8 ha (100%)
- Farndon East and West Borrow Pits and FCAs
  - Grade 3b ('Moderate'): 35.9 ha (84%)
  - Grade 4 ('Poor'): 6.0 ha (14%)
  - Other – Woodland: 0.7 ha (2%)
- Kelham and Averham FCA 2023 survey area
  - Grade 2 ('Very good'): 5.9 ha (~~31~~4738%)
  - Grade 3a ('Good'): 3.~~4~~5 ha (~~18~~2722%)
  - Grade 3b ('Moderate'): ~~8.9~~ 3.3 ha (~~46~~2621%)

- Other - Woodland: 0.79 ha (45%)

- Total 2023 survey area
  - Grade 2 ('Very Good'): 5.9 ha (9%)
  - Grade 3a ('Good'): 3.5 4 ha (5%)
  - Grade 3b ('Moderate'): 5051.6 5 ha (75%)
  - Grade 4 ('Poor'): 6.0 ha (9%)
  - Other - Woodland: 1.6 ha (2%)
- Main Scheme alignment 2021 survey area (including extrapolated data)
  - Grade 3a ('Good'): 14.731.4 ha (3463%)
  - Grade 3b ('Moderate'): 2918.1 6 ha (6627%)
- Total 2021 and 2023 survey area combined (including extrapolated data)
  - Grade 2 ('Very Good'): 5.9 ha (5%)
  - Grade 3a ('Good'): 18.234.8 ha (1629%)
  - Grade 3b ('Moderate'): 7970.1.7 ha (7259%)
  - Grade 4 ('Poor'): 6.0 ha (5%)
  - Other - Woodland: 1.6 ha (2%)

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7.2.57.2.4The combined area of the 2021 and 2023 survey within the Scheme design is 111117.4 2118.4 ha. Of this total area there was a combined total of 24430.1 7 ha of BMV land. Of the total surveyed area 22% is considered to be BMV land.

8 Summary and conclusion

8.1.1 ALC surveys carried out in 2021 and 2023 have identified that the main Scheme alignment including the Farndon East and West Borrow Pits and FCAs (2021 and 2023 data) predominantly comprises non-BMV land, including Grade 3b (~~70.8~~67.3 ha, ~~77~~64% of the area) and Grade 4 (6 ha, ~~7~~9%). ALC grade was primarily limited by flood risk, which was apparent during both the initial baseline desk study and site visits.

8.1.2 Conversely, the Kelham and Averham FCA comprises ~~74~~49~~80~~% BMV land, including Grade 2 (5.9 ha, ~~31~~47~~38~~%) and Grade 3a (3.~~5~~4 ha, ~~27~~18~~22~~%).

8.1.3 The total 2021 and 2023 survey area comprises ~~22~~34% BMV land with 5.9 ha falling within Grade 2 (5%) and ~~18~~34.~~28~~ ha falling within Grade 3a (~~16~~29%). Of the remaining area, ~~72~~59% was considered to be Grade 3b, 5% was Grade 4 and 2% was classified as Other – Woodland.

8.1.4 To limit detrimental impacts to soils across the two sites, soils should be handled in accordance with the Outline SMP (Appendix B.3 of the First Iteration EMP [~~APP-184~~REP2-010]~~(TR010065/APP/6.5)~~), which has been produced in conjunction with the results of this report.

9 References

[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.

[2] Department for Transport. (2014). National Policy Statement for National Networks.

[3] Department for Environment, Food and Rural Affairs. (2009) Safeguarding our Soils: A Strategy for England. Defra.

[4] Department for Environment, Food and Rural Affairs. (2011) The Natural Environment White Paper, The natural choice: securing the value of nature. London: The Stationery Office.

[5] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

[6] The Met. Office (1989). Climatological Data for Agricultural Land Classification.

[7] Department for Environment, Food and Rural Affairs (Defra) Magic Map Application (2023). Available at: Magic Map Application (defra.gov.uk) (Last accessed December 2023).

[8] Ed. J.M. Hodgson, Cranfield University (2022). Soil Survey Field Handbook: Describing and Sampling Soil Profiles.

[9] The Met. Office (1989). Climatological Data for Agricultural Land Classification.

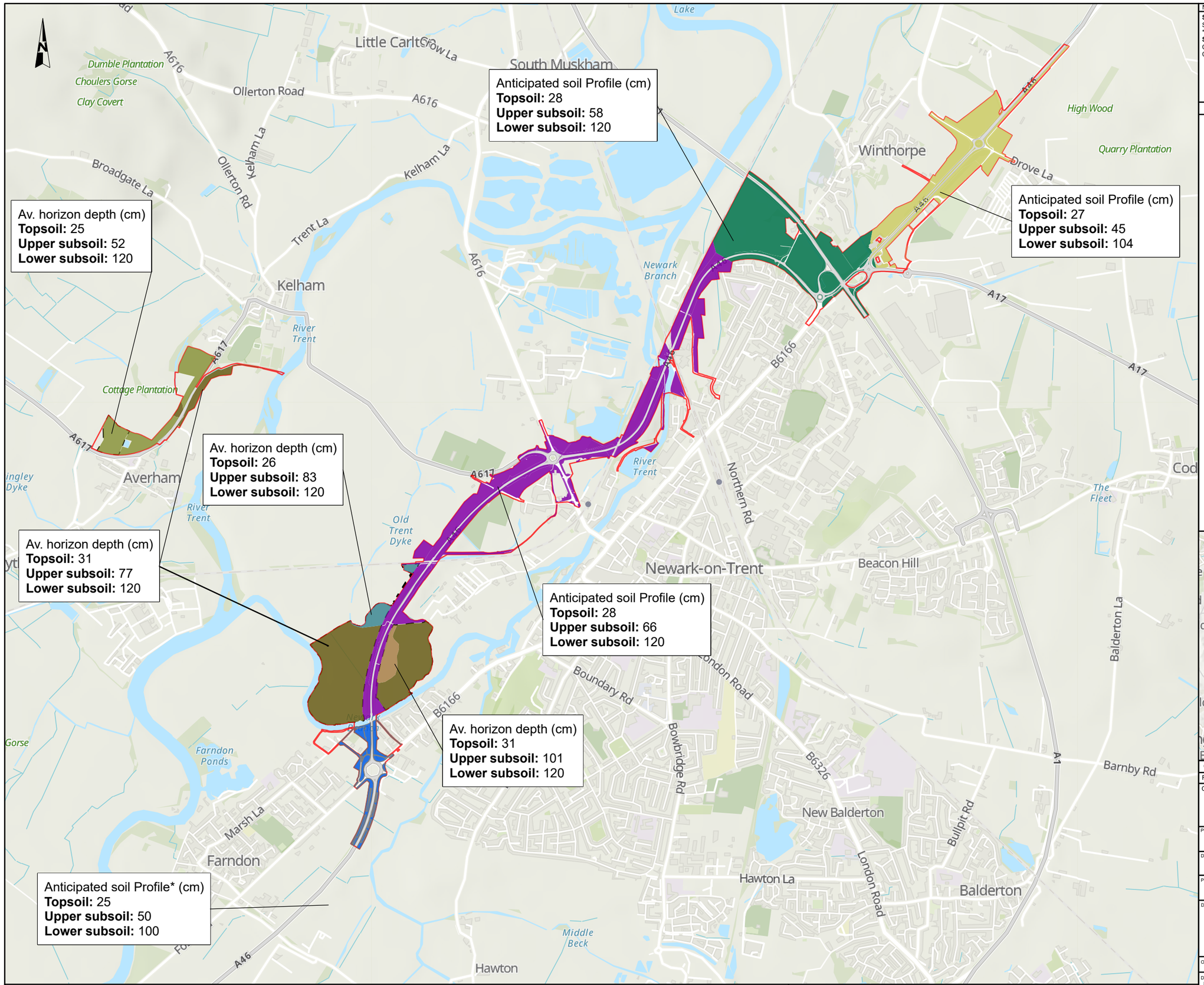
[10] Environment Agency (2023) Flood Map for Planning [online] available at: Where do you want to check? - Check your long term flood risk - GOV.UK (check-long-term-flood-risk.service.gov.uk) (Last accessed December 2023).

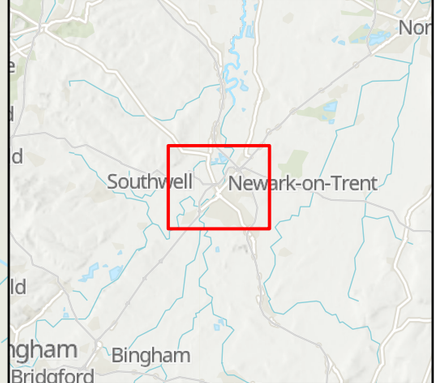
[11] Department for Environment, Food and Rural Affairs (Defra) Magic Map Application (2023). Available at: Magic Map Application (defra.gov.uk) (Last accessed December 2023).

[12] Department for Levelling Up, Housing & Communities (December 2023). National Planning Policy Framework [online] available at: National Planning Policy Framework (publishing.service.gov.uk) (last accessed March 2024).

[13] Cranfield University The Soils Guide (2023). Available at: LandIS - Land Information System - Associations (Last accessed December 2023).

Appendix A: Soil type distribution





NOTES

Source
Soil data collected by Mott MacDonald, 2023.
*Soil Survey of England and Wales
Service Layer Credits
Contains OS data © Crown Copyright and database right 2023
Contains data from OS Zoomstack

KEY TO SYMBOLS

- Order Limits
- ALC 2023 survey boundary

Soil type

- Soil Type 1: Deep alluvial clay loam
- Soil Type 2: Deep loam with high potential for waterlogging
- Soil Type 3: Disturbed soil
- Soil Type 4: Well-draining loamy soil
- Soil Type 5: Deep well-draining soil
- Soil Type 6: Loamy soils with poorer structured subsoil
- Soil Type 7: Alluvial soil

SSEW* Soil Association data

- Soil Type 8: Coarse loamy soil

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	08/12/23	DCO APPLICATION	BH	NR	HF

CLIENT: national highways

PURPOSE OF ISSUE: DCO APPLICATION

DEVELOPMENT CONSENT ORDER NUMBER: TR010065

PROJECT TITLE: A46 NEWARK BYPASS

DRAWING TITLE: Appendix A
Soil Type Distribution

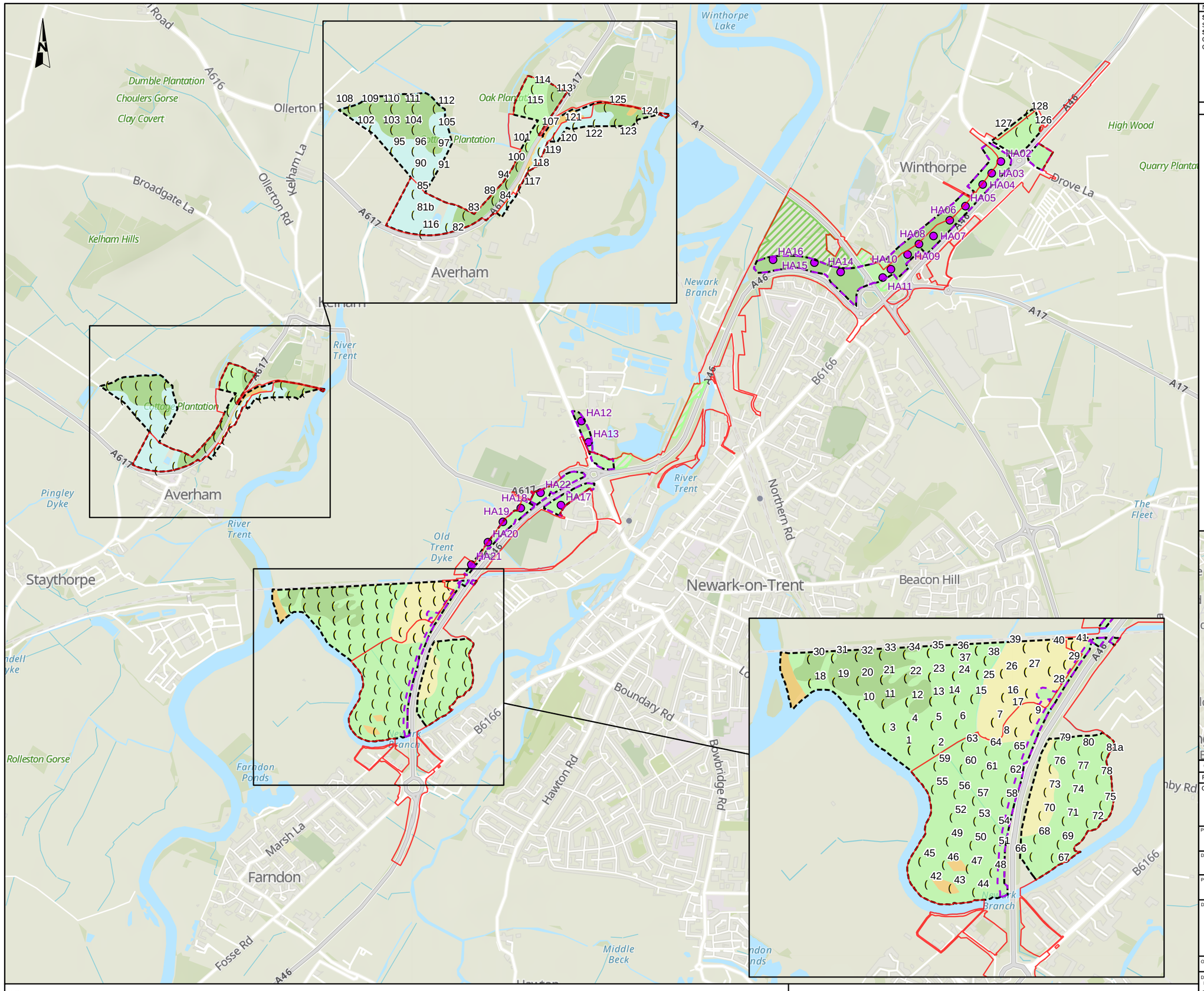
ORIGINAL SIZE: A3 | SCALE: 1:25,000

DRAWING NUMBER: HE PIN HE551478 | ORIGINATOR SKAG | VOLUME EGT | LOCATION CONWI_CONW | TYPE DR | ROLE LE | NUMBER 00014

PROJECT REF NO.: HE551478

REVISION: C01

Appendix B: Borehole locations for ALC survey



NOTES

Source
Soil data collected by Mott MacDonald 2023.
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KEY TO SYMBOLS

- Order Limits
- 2021 ALC survey borehole
- 2023 ALC survey borehole
- 2021 ALC survey boundary
- 2023 ALC survey boundary

Agricultural Land Classification (ALC) grade

- 2 - Very good
- 3a - Good
- 3b - Moderate
- 4 - Poor
- Other land

Agricultural Land Classification (ALC) grade extrapolated from survey data

- 3a - Good
- 3b - Moderate

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C02	05/11/24	DCO EXAMINATION	DT	NR	HF

CLIENT: national highways

PURPOSE OF ISSUE: DCO EXAMINATION

DEVELOPMENT CONSENT ORDER NUMBER: TR010065

PROJECT TITLE: A46 NEWARK BYPASS

DRAWING TITLE: Appendix B
Agricultural Land Classification Grade and Boreholes

ORIGINAL SIZE: A3 | SCALE: 1:25,000

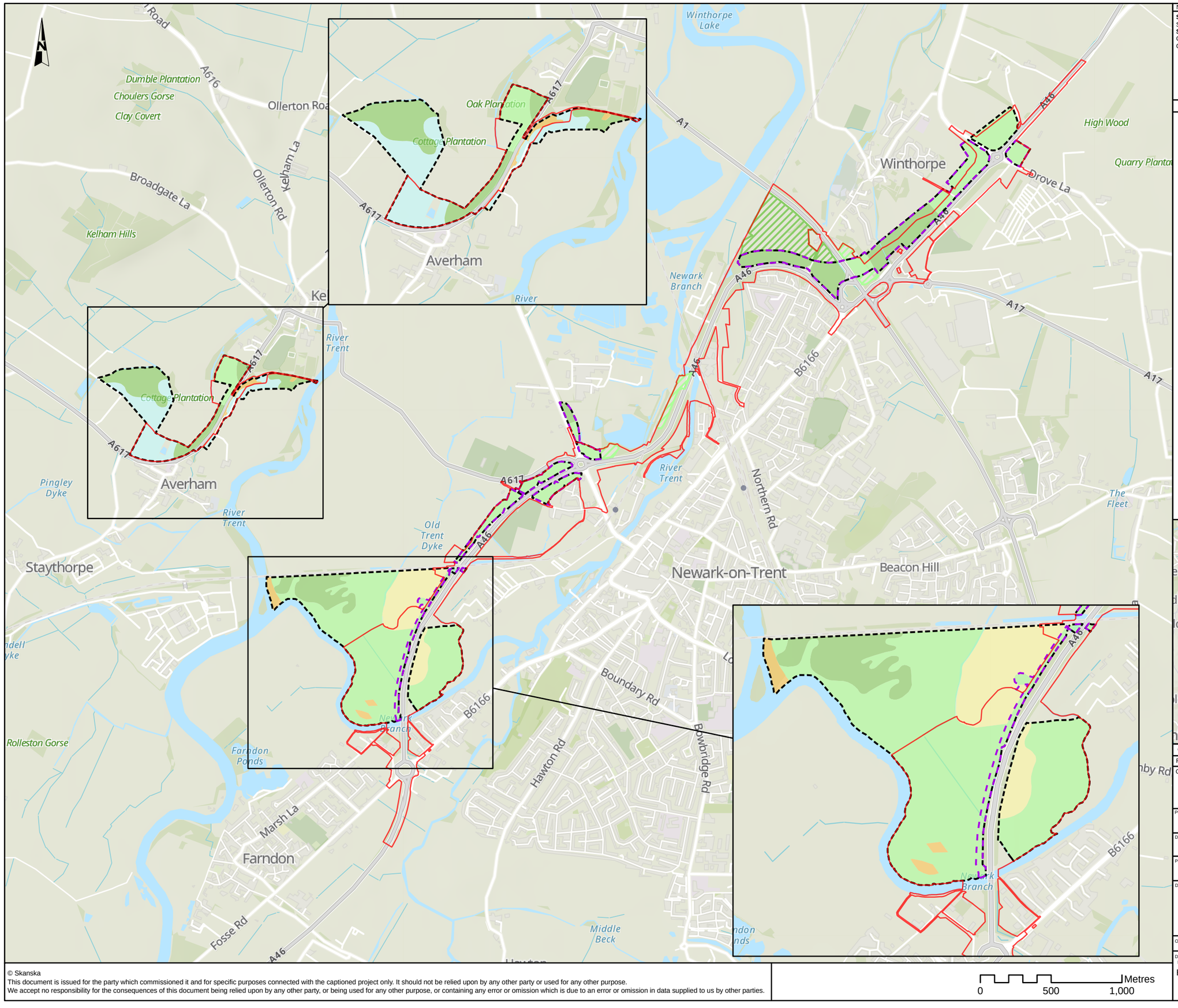
DRAWING NUMBER: HE PIN HE551478 | ORIGINATOR SKAG | VOLUME EGT | LOCATION CONWI_CONW | TYPE DR | ROLE LE | NUMBER 00015

PROJECT REF NO.: HE551478

REVISION: C02

0 500 1,000 Metres

Appendix C: ALC grades



NOTES

Source
Soil data collected by Mott MacDonald, 2023.
Service Layer Credits
Contains OS data © Crown Copyright and database right 2023
Contains data from OS Zoomstack

KEY TO SYMBOLS

- Order Limits
- 2021 ALC survey boundary
- 2023 ALC survey boundary

Agricultural Land Classification (ALC) grade

- 2 - Very good
- 3a - Good
- 3b - Moderate
- 4 - Poor
- Other land

Agricultural Land Classification (ALC) grade extrapolated from survey data

- 3a - Good
- 3b - Moderate

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C02	05/11/24	DCO EXAMINATION	DT	NR	HF

CLIENT: national highways

PURPOSE OF ISSUE: DCO EXAMINATION

DEVELOPMENT CONSENT ORDER NUMBER: TR010065

PROJECT TITLE: A46 NEWARK BYPASS

DRAWING TITLE: Appendix C
Agricultural Land Classification Grade

ORIGINAL SIZE: A3

SCALE: 1:25,000

DRAWING NUMBER: HE551478 | ORIGINATOR: SKAG | VOLUME: EGT
LOCATION: CONWI_CONW | TYPE: DR | ROLE: LE | NUMBER: 00017

PROJECT REF NO.: HE551478

REVISION: C02

0 500 1,000 Metres

Appendix D: Site photograph examples

Table D-1: Auger bore site photograph examples

Auger bore (AB)	Photograph	Auger bore (AB)	Photograph
AB1 Soil Type 1 Deep alluvial clay loam		AB58 Soil Type 1 Deep alluvial clay loam	

Auger bore (AB)	Photograph	Auger bore (AB)	Photograph
AB7 Soil Type 2 Deep loam with waterlogging		AB73 Soil Type 3 Disturbed soil	

Auger bore (AB)	Photograph	Auger bore (AB)	Photograph
AB79 Soil Type 3 Disturbed soil		AB109 Soil Type 4 Well drained loamy soils	

Auger bore (AB)	Photograph	Auger bore (AB)	Photograph
AB111 Soil Type 4 Well drained loamy soils		Flooded conditions within the main Scheme alignment survey area found within area of rough grazing	

Appendix E: Soil auger bore log

Table E-1: 2023 ALC Survey bore log

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
1	0-33	hCL	7.5YR 4/3	0	0 non	1%	38	5	2	Flooding	3b
	33-85	hCL	7.5YR 4/6	7.5YR 7/1	<2% few	1%					
	85-120	SCL	7.5YR 4/6	0	0 non	1%					
2	0-32	hCL	10YR 5/4	0	0 non	4%	36	3	2	Flooding	3b
	32-85	hCL	10YR 5/4	0	0 non	1%					
	85-120	SCL	10YR 7/6	0	0 non	1%					
3	0-30	hCL	10YR 4/4	0	0 non	3%	34	-1	2	Flooding	3b
	30-70	SCL	10YR 5/8	Mn	<2% few	1%					
	70-120	SCL	10YR 5/8	Mn	<2% few	1%					
4	0-30	hCL	10YR 4/4	0	0 non	3%	36	3	2	Flooding	3b
	30-85	hCL	10YR 5/8	0	0 non	1%					
	85-120	hCL	10YR 5/8	Mn	<2% few	1%					
5	0-35	hCL	10YR 4/2	0	0 non	5%	36	3	2	Flooding	3b
	35-120	hCL	10YR 6/8	0	0 non	1%					
6	0-32	hCL	10YR 4/2	0	0 non	5%	35	2	2	Flooding	3b
	32-50	hCL	10YR 6/8	0	0 non	1%					
	50-120	hCL	10YR 6/8	7.5YR 7/1	<2% few	1%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
7	0-30	mCL	7.5YR 4/3	7.5YR 5/8	<2% few	2%	N/A	N/A	N/A		N/A - Waterlogged
	30-68	SCL	7.5YR 4/2	7.5YR 5/8	2-20% common	3%					
	NFP (waterlogged)										
8	0-26	mCL	7.5YR 3/4	0	0 non	0%	35	2	2	Flooding	4
	26-42	mCL	7.5YR 4/3	0	0 non	0%					
	42-95	mCL	7.5YR 6/4	0	0 non	0%					
	95-120	SCL	7.5YR 6/4	0	0 non	1%					
9	0-25	mCL	7.5YR 4/3	0	0 non	1%	35	2	2	Flooding	4
	25-70	hCL	7.5YR 4/4	0	0 non	0%					
	70-120	SCL	7.5YR 6/4	0	0 non	0%					
10	0-35	hCL	7.5YR 4/3	0	0 non	4%	33	1	2	Flooding	3b
	35-88	hCL	7.5YR 4/4	7.5YR 7/1	<2% few	2%					
	88-120	hCL	7.5YR 4/4	7.5YR 7/1	2-20% common	1%					
11	0-35	hCL	7.5YR 4/2	0	0 non	4%	28	1	2	Flooding	3b
	35-72	hCL	7.5YR 4/3	0	0 non	2%					
	72-120	hCL	7.5YR 4/4	0	0 non	12%					
12	0-36	hCL	7.5YR 4/2	0	0 non	4%	31	1	2	Flooding	3b
	36-96	hCL	7.5YR 4/3	7.5YR 7/1	<2% few	2%					
	96-120	hCL	7.5YR 4/4	0	0 non	12%					
13	0-34	hCL	7.5YR 4/3	0	0 non	2%	34	2	2	Flooding	3b

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	34-90	hCL	7.5YR 4/4	7.5YR 7/1	<2% few	2%					
	90-120	hCL	7.5YR 4/4	7.5YR 7/1	2-20% common	2%					
14	0-34	hCL	7.5YR 4/3	0	0 non	4%	22	0	2	Flooding	3b
	34-85	hCL	7.5YR 4/4	7.5YR 7/1	<2% few	2%					
	85-120	C	7.5YR 4/4	7.5YR 7/1	<2% few	2%					
15	0-32	C	7.5YR 4/3	0	0 non	2%	4	-13	3a	Flooding	3b
	32-85	C	7.5YR 4/4	7.5YR 5/8	<2% few	2%					
	85-120	C	7.5YR 4/4	7.5YR 5/8	2-20% common	2%					
18	0-35	mCL	7.5YR 3/2	0	0 non	5%	35	-4	2	Flooding	3b
	35-120	mCL	10YR 4/4	0	0 non	0%					
19	0-34	mZCL	7.5YR 3/3	0	0 non	2%	26	12	2	Flooding	3b
	34-73	hCL	7.5YR 4/4	0	0 non	2%					
	73-120 *	mSL	7.5YR 4/4	0	0 non	45%					
20	0-33	mZCL	7.5YR 3/3	0	0 non	2%	31	12	1	Flooding	3b
	33-87	hCL	7.5YR 4/6	0	0 non	2%					
	87-120 *	mSL	7.5YR 4/6	0	0 non	38%					
21	0-27	mCL	7.5YR 4/2	0	0 non	25%	4	-15	3a	Flooding	3b
	27-65	mCL	10YR 4/3	0	0 non	0%					
	65-92	mCL	10YR 4/4	0	0 non	7%					
22	0-37	hCL	7.5YR 3/3	0	0 non	2%	36	-4	2	Flooding	3b

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	37-120	hCL	7.5YR 4/6	0	0 non	2%					
23	0-35	hCL	7.5YR 3/3	0	0 non	2%	33	9	2	Flooding	3b
	35-96	hCL	7.5YR 4/6	0	0 non	2%					
	96-120	C	7.5YR 4/6	7.5YR 5/8	<2% few	2%					
24	0-35	hCL	7.5YR 3/2	0	0 non	7%	34	-5	2	Flooding	3b
	35-87	hCL	7.5YR 4/4	0	0 non	0%					
	87-120	hCL	7.5YR 5/6	0	0 non	0%					
25	0-34	mCL	7.5YR 3/3	0	0 non	2%	15	-2	2	Flooding	3b
	34-65	hCL	7.5YR 4/4	0	0 non	2%					
	65-120	C	10YR 4/4	7.5YR 5/8	<2% few	2%					
30	0-37	SCL	7.5YR 3/2	0	0 non	5%	2	-12	3a	Flooding	3b
	37-50	SCL	7.5YR 6/3	0	0 non	5%					
	50-70	SCL	7.5YR 6/2	0	0 non	20%					
	70-90	cSL	7.5YR 6/3	0	0 non	30%					
	90-120 *	LcS	7.5YR 6/3	0	0 non	40%					
31	0-36	hCL	7.5YR 5/3	0	0 non	5%	34	1	2	Flooding	3b
	36-91	hCL	7.5YR 6/3	0	0 non	0%					
	91-120	hCL	7.5YR 6/4	0	0 non	0%					
32	0-34	mCL	7.5YR 3/4	0	0 non	5%	-1	-7	3a	Flooding	3b
	34-55	hCL	7.5YR 6/4	0	0 non	5%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	55-70	SCL	7.5YR 6/4	0	0 non	30%					
	70-90	cSL	10YR 8/6	0	0 non	50%					
	90-120 *	LcS	10YR 8/7	0	0 non	50%					
33	0-35	mCL	7.5YR 3/4	0	0 non	20%	-13	-22	3a	Flooding	3b
	35-65	SCL	7.5YR 6/4	0	0 non	20%					
	65-80	SCL	7.5YR 6/4	0	0 non	35%					
	80-120 *	LcS	10YR 8/6	0	0 non	40%					
34	0-35	hCL	7.5YR 5/2	0	0 non	2%	12	2	2	Flooding	3b
	35-80	hCL	7.5YR 6/3	0	0 non	2%					
	80-100	SCL	7.5YR 6/4	0	0 non	50%					
	100-120 *	LcS	7.5YR 6/4	0	0 non	50%					
35	0-31	hCL	7.5YR 5/2	0	0 non	1%	18	2	2	Flooding	3b
	31-85	hCL	7.5YR 6/3	0	0 non	1%					
	85-120 *	SCL	7.5YR 6/4	0	0 non	50%					
36	0-35	hCL	7.5YR 3/4	0	0 non	1%	11	-7	2	Flooding	3b
	35-95	C	7.5YR 6/4	7.5YR 5/1	<2% few	0%					
	95-120	C	7.5YR 6/4	7.5YR 5/1	<2% few	1%					
37	0-38	hCL	7.5YR 3/3	0	0 non	2%	17	0	1	Flooding	3b
	38-65	hCL	10YR 4/4	7.5YR 5/8	<2% few	2%					
	65-120	C	10YR 4/4	7.5YR 5/8	2-20% common	2%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
38	0-35	hCL	7.5YR 3/3	0	0 non	2%	41	9	2	Flooding	3b
	35-120	hCL	10YR 4/4	0	0 non	2%					
42	0-31	hCL	7.5YR 3/3	0	0 non	2%	N/A	N/A	N/A	Flooding	3b
	31-60	SCL	7.5YR 4/3	0	0 non	2%					
	60-80	mSL	7.5YR 4/3	0	0 non	2%					
	NFP (waterlogged)										
43	0-18	hCL	7.5YR 3/3	0	0 non	5%	9	17	2	Flooding	3b
	18-40	hCL	7.5YR 5/3	0	0 non	0%					
	40-90	C	7.5YR 6/3	0	0 non	0%					
	90-120	C	7.5YR 6/4	7.5YR 5/1	<2% few	1%					
44	0-34	hCL	7.5YR 3/3	7.5YR 7/1	<2% few	4%	19	-10	3a	Flooding	3b
	34-80	C	7.5YR 4/3	7.5YR 7/1	<2% few	2%					
	80-120	mCL	7.5YR 4/3	0	0 non	2%					
45	0-30	hCL	7.5YR 3/3	7.5YR 7/1	<2% few	2%	35	2	2	Flooding	3b
	30-70	hCL	7.5YR 4/3	7.5YR 7/1	<2% few	0%					
	70-120	mCL	7.5YR 4/4	7.5YR 7/1	<2% few	0%					
46	0-34	hCL	7.5YR 3/2	7.5R 5/8	<2% few	2%	36	3	2	Flooding	3b
	34-85	hCL	7.5YR 3/4	7.5R 5/8	<2% few	0%					
	85-120	SCL	7.5YR 3/4	0	0 non	0%					
47	0-35	mCL	7.5YR 3/2	0	0 non	2%	37	-8	2	Flooding	3b

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	35-120	hCL	7.5YR 4/3	0	0 non	0%					
48	0-30	C	7.5YR 3/3	7.5YR 7/1	<2% few	3%	19	-14	3a	Flooding	3b
	30-70	C	7.5YR 4/3	7.5YR 7/1	<2% few	1%					
	70-120	SCL	7.5YR 4/3	0	0 non	1%					
49	0-36	hCL	7.5YR 3/2	7.5R 5/8	<2% few	1%	36	3	2	Flooding	3b
	36-82	hCL	7.5YR 3/4	7.5R 5/8	<2% few	0%					
	82-120	SCL	7.5YR 3/4	0	0 non	0%					
50	0-30	mCL	7.5YR 3/2	0	0 non	1%	37	28	1	Flooding	3b
	30-55	hCL	7.5YR 4/3	0	0 non	0%					
	55-120	hCL	7.5YR 6/3	0	0 non	0%					
51	0-31	hCL	7.5YR 3/2	7.5YR 7/1	<2% few	2%	N/A	N/A	N/A		N/A - Waterlogged
	31-40	C	7.5YR 3/3	7.5YR 7/1	<2% few	2%					
	NFP (waterlogged)										
52	0-33	mCL	7.5YR 3/3	0	0 non	1%	37	4	2	Flooding	3b
	33-120	hCL	7.5YR 5/3	0	0 non	0%					
53	0-35	hCL	7.5YR 3/2	0	0 non	0%	38	5	2	Flooding	3b
	35-100	hCL	7.5YR 4/4	Mn	<2% few	0%					
	100-120	SCL	7.5YR 4/4	0	0 non	2%					
54	0-29	mCL	7.5YR 3/3	0	0 non	5%	5	-19	3a	Flooding	3b
	29-100	C	7.5YR 4/3	7.5YR 7/1	2-20% common	2%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	100-120	hCL	7.5YR 4/6	7.5YR 7/1	<2% few	2%					
55	0-35	hCL	7.5YR 3/3	0	0 non	0%	37	4	2	Flooding	3b
	35-120	hCL	7.5YR 5/4	0	0 non	0%					
56	0-30	mCL	7.5YR 3/2	0	0 non	1%	37	4	2	Flooding	3b
	30-120	hCL	7.5YR 5/3	0	0 non	0%					
57	0-35	hCL	7.5YR 3/2	0	0 non	0%	37	4	2	Flooding	3b
	35-120	hCL	7.5YR 4/4	0	0 non	0%					
58	0-33	mCL	7.5YR 3/2	7.5R 5/8	<2% few	4%	17	-10	3a	Flooding	3b
	33-95	C	7.5YR 4/3	7.5R 5/8	<2% few	1%					
	95-120	mSL	7.5YR 4/6	0	0 non	1%					
59	0-35	hCL	10YR 3/3	0	0 non	1%	36	3	2	Flooding	3b
	35-80	hCL	10YR 5/4	0	0 non	1%					
	80-120	hCL	10YR 5/4	0	0 non	1%					
60	0-38	hCL	7.5YR 3/3	0	0 non	2%	36	10	1	Flooding	3b
	38-75	hCL	7.5YR 4/4	0	0 non	2%					
	75-120	C	7.5YR 4/6	7.5YR 5/8	2-20% common	2%					
61	0-35	hCL	10YR 3/3	0	0 non	4%	36	3	2	Flooding	3b
	35-85	hCL	10YR 5/4	0	0 non	0%					
	85-120	hCL	10YR 5/4	0	0 non	0%					
62	0-32	C	7.5YR 3/2	7.5R 5/8	<2% few	2%	6	-12	3a	Flooding	3b

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	32-64	C	7.5YR 4/3	7.5R 5/8	<2% few	0%					
	64-90	C	7.5YR 5/2	7.5R 5/8	<2% few	0%					
	90-120	hCL	7.5YR 5/2	7.5YR 7/1	<2% few	0%					
63	0-33	hCL	7.5YR 3/3	0	0 non	2%	40	9	2	Flooding	3b
	33-120	hCL	7.5YR 4/4	0	0 non	2%					
64	0-30	mCL	7.5YR 3/4	0	0 non	0%	39	3	2	Flooding	3b
	30-95	hCL	7.5YR 4/4	0	0 non	1%					
	95-120	hCL	7.5YR 4/3	7.5YR 7/1	2-20% common	1%					
65	0-33	mCL	7.5YR 3/2	0	0 non	2%	24	-4	2	Flooding	3b
	33-52	hCL	7.5YR 4/3	7.5YR 7/1	2-20% common	2%					
	52-96	C	7.5YR 4/3	7.5YR 7/1	2-20% common	2%					
	96-120	mSL	7.5YR 4/6	0	0 non	0%					
66	0-33	hCL	7.5YR 3/3	0	0 non	4%	22	-5	2	Flooding	3b
	33-95	C	7.5YR 5/4	7.5YR 7/1	2-20% common	2%					
	95-120	SCL	7.5YR 4/6	0	0 non	2%					
67	0-29	mCL	7.5YR 3/3	0	0 non	4%	20	-13	3a	Flooding	3b
	29-70	C	7.5YR 5/4	7.5YR 7/1	2-20% common	2%					
	70-120	SCL	7.5YR 4/6	0	0 non	2%					
69	0-31	hCL	7.5YR 3/3	0	0 non	4%	10	-12	3a	Flooding	3b
	31-72	C	7.5YR 4/4	7.5YR 7/1	2-20% common	2%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	72-120	SCL	7.5YR 5/4	0	0 non	0%					
71	0-33	hCL	7.5YR 3/3	0	0 non	2%	9	-9	2	Flooding	3b
	33-55	C	7.5YR 4/4	7.5YR 7/1	2-20% common	0%					
	55-85	SC	7.5YR 4/6	7.5YR 7/1	<2% few	0%					
	85-120	mLS	7.5YR 6/6	0	0 non	0%					
72	0-31	hCL	7.5YR 3/3	0	0 non	2%	8	-10	2	Flooding	3b
	31-71	C	7.5YR 4/3	7.5YR 7/1	<2% few	0%					
	71-120	C	7.5YR 5/6	7.5YR 7/1	<2% few	0%					
73	0-30	hCL	7.5YR 4/2	0	0 non	0%	8	-8	2	Flooding	4
	30-95	C	7.5YR 5/3	7.5YR 7/1	2-20% common	0%					
	95-100	LmS	5YR 4/6	0	0 non	0%					
	100-120	hCL	5YR 4/6	0	0 non	0%					
75	0-28	hCL	7.5YR 3/3	0	0 non	2%	32	-6	2	Flooding	3b
	28-50	C	7.5YR 4/4	7.5YR 7/1	<2% few	2%					
	50-75	hCL	7.5YR 4/4	7.5YR 7/1	<2% few	0%					
	75-120	mSL	7.5YR 4/6	0	0 non	0%					
76	0-32	mCL	7.5YR 4/2	0	0 non	1%	33	-2	2	Flooding	4
	32-68	hCL	7.5YR 4/3	0	0 non	0%					
	68-102	SCL	7.5YR 6/4	0	0 non	0%					
	102-120	mSL	7.5YR 4/5	0	0 non	0%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
77	0-29	mCL	7.5YR 3/3	0	0 non	4%	34	-8	2	Flooding	3b
	29-45	C	7.5YR 4/3	7.5YR 7/1	<2% few	2%					
	45-120	mSL	7.5YR 6/6	0	0 non	2%					
78	0-20	hCL	7.5YR 3/2	0	0 non	4%	N/A	N/A	N/A	Flooding	3b
	NFP (waterlogged)										
79	0-32	mCL	7.5YR 4/2	0	0 non	2%	9	-9	2	Flooding	4
	32-88	C	7.5YR 4/3	7.5YR 7/1	<2% few	1%					
	88-120	C	7.5YR 4/3	7.5YR 7/1	<2% few	1%					
80	0-30	mCL	7.5YR 4/3	0	0 non	1%	37	4	2	Flooding	3b
	30-55	hCL	7.5YR 6/4	0	0 non	0%					
	55-120	SCL	10YR 5/4	0	0 non	0%					
81a	0-30	mCL	7.5YR 4/2	0	0 non	1%	37	4	2	Flooding	3b
	30-90	hCL	7.5YR 4/3	0	0 non	0%					
	90-120	hCL	7.5YR 4/4	0	0 non	0%					
81b	0-20	mSL	7.5YR 3/2	0	0 non	3%	32	-7	2	Droughtiness	2
	20-52	SCL	7.5YR 3/3	0	0 non	2%					
	52-85	mSL	7.5YR 4/2	0	0 non	2%					
	85-120	mSL	7.5YR 6/4	0	0 non	5%					
82	0-25	SCL	10YR3/3	0	0 non	1%	22	18	2	Droughtiness	2
	25-56	SCL	10YR3/4	0	0 non	0%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	56-105	mSL	7.5yr 5/3	0	0 non	5%					
	105-120	cS	7.5yr 5/4	0	0 non	35%					
83	0-20	SCL	10YR3/3	0	0 non	5%	4	14	3a	Droughtiness	3a
	20-45	SCL	10YR3/4	0	0 non	10%					
	45-75	mSL	7.5yr 5/3	0	0 non	10%					
	75-120	LcS	7.5yr 5/4	0	0 non	10%					
85	0-21	mSL	7.5YR 3/2	0	0 non	3%	32	14	1	Droughtiness	1
	21-55	mSL	7.5YR 3/3	0	0 non	3%					
	55-120	mSL	7.5YR 4/2	0	0 non	3%					
89	0-25	mSL	10YR4/2	0	0 non	5%	-9	-18	3a	Droughtiness	3a
	25-50	mSL	10YR4/3	0	0 non	10%					
	50-70	LcS	10YR5/6	0	0 non	15%					
	70-120	cS	7.5YR 5/6	2.5YR 4/6	<2% few	15%					
90	0-30	mSL	7.5YR 3/2	0	0 non	7%	18	-3	2	Droughtiness	2
	30-82	mSL	7.5YR 4/4	0	0 non	7%					
	82-120	mLS	7.5YR 4/6	0	0 non	5%					
91	0-30	mSL	7.5YR 3/2	0	0 non	4%	9	-14	2	Droughtiness	2
	30-85	mSL	7.5YR 4/4	0	0 non	7%					
	85-120	mLS	7.5YR 4/6	0	0 non	2%					
94	0-28	SCL	10YR3/2	0	0 non	10%	-33	-31	3b		3b

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	28-45	SCL	10YR4/3	2.5YR 4/4	2-20% common	15%				Droughtiness	
	45-70	cS	10YR5/6	2.5YR 4/4	2-20% common	25%					
	70-120	cS	10R 5/6	2.5YR 4/4	2-20% common	40%					
95	0-30	mSL	7.5YR 3/2	0	0 non	4%	6	2	2	Droughtiness	2
	30-60	mSL	7.5YR 6/6	0	0 non	4%					
	60-120	mS	7.5YR 8/6	0	0 non	12%					
96	0-31	mSL	7.5YR 3/2	0	0 non	7%	16	-9	2	Droughtiness	2
	31-83	mSL	7.5YR 4/6	0	0 non	17%					
	83-120 *	mSL	7.5YR 4/6	0	0 non	32%					
97	0-32	mSL	7.5YR 3/2	0	0 non	12%	5	-32	3b	Droughtiness	3b
	32-55	mSL	7.5YR 3/1	0	0 non	22%					
	55-120 *	mSL	7.5YR 3/1	0	0 non	32%					
100	0-32	C	10YR3/3	0	0 non	3%	-17	2	3a	Droughtiness	3a
	32-55	HCL	10YR4/1	2.5YR 4/4	20-40% many	5%					
	55-120	cS	10YR5/6	0	0 non	40%					
101	0-25	mSL	10YR4/2	0	0 non	10%	-26	-28	3b	Droughtiness	3b
	25-42	mSL	10YR4/3	0	0 non	2%					
	42-85	cS	10YR5/6	0	0 non	10%					
	85-120	cS	10YR5/6	0	0 non	5%					
102	0-30	mSL	7.5YR 3/2	0	0 non	3%	21	1	2		2

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	30-52	mSL	7.5YR 4/4	0	0 non	3%				Droughtiness	
	52-120	SCL	7.5YR 4/6	7.5YR 5/8	<2% few	2%					
103	0-30	mSL	7.5YR 3/2	0	0 non	12%	-7	-21	3a	Droughtiness	3a
	30-80	LmS	7.5YR 5/6	0	0 non	12%					
	80-120 *	mS	7.5YR 7/6	0	0 non	18%					
104	0-30	mSL	7.5YR 3/3	0	0 non	10%	-3	-25	3a	Droughtiness	3a
	30-55	SCL	7.5YR 4/4	0	0 non	10%					
	55-120	LcS	7.5YR 5/6	0	0 non	10%					
105	0-30	SCL	7.5YR 3/3	0	0 non	7%	27	-9	2	Droughtiness	2
	30-50	mCL	7.5YR 4/4	0	0 non	7%					
	50-120	SCL	7.5YR 5/6	0	0 non	7%					
107	0-25	mSL	10YR4/2	0	0 non	10%	-24	-17	3b	Droughtiness	3b
	25-48	mSL	10YR4/3	0	0 non	10%					
	48-75	LcS	10YR5/6	0	0 non	20%					
	75-120	cS	10YR5/6	0	0 non	40%					
108	0-31	SCL	7.5YR 4/3	0	0 non	6%	25	-9	2	Droughtiness	2
	31-75	SCL	7.5YR 4/4	0	0 non	6%					
	75-120	mSL	7.5YR 4/6	0	0 non	12%					
109	0-30	hCL	7.5YR 4/3	0	0 non	4%	N/A	N/A	N/A		
	30-48	SCL	7.5YR 4/4	0	0 non	4%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	48-70	mSL	7.5YR 4/4	0	0 non	7%					N/A - Waterlogged
	NFP (waterlogged)										
110	0-31	SCL	7.5YR 4/3	0	0 non	3%	N/A	N/A	N/A		N/A - Waterlogged
	31-50	SCL	7.5YR 4/4	0	0 non	6%					
	50-72	mSL	7.5YR 4/4	0	0 non	12%					
	NFP (waterlogged)										
111	0-37	mSL	7.5YR 4/3	0	0 non	3%	17	-6	2	Droughtiness	2
	37-90	mSL	7.5YR 4/4	0	0 non	3%					
	90-120	mS	7.5YR 4/6	0	0 non	3%					
112	0-30	SCL	7.5YR 4/3	0	0 non	12%	-9	-22	3a	Droughtiness	3a
	30-80	SCL	7.5YR 6/4	0	0 non	0%					
	80-120 *	SCL	7.5YR 6/4	0	0 non	0%					
113	0-33	SCL	10YR3/3	0	0 non	6%	-15	16	3a	Droughtiness	3a
	33-54	SCL	7.5YR 4/4	0	0 non	6%					
	54-65	SCL	7.5YR 4/6	0	0 non	20%					
	65-120	cS	10YR5/6	0	0 non	40%					
114	0-24	SCL	10YR3/2	0	0 non	10%	-33	-24	3b	Droughtiness	3b
	24-45	SCL	10YR3/3	0	0 non	10%					
	45-55	cS	10YR4/6	0	0 non	15%					
	55-120	cS	10YR5/6	0	0 non	40%					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
115	0-25	mSL	10YR3/2	0	0 non	10	-22	5	3b	Droughtiness	3b
	25-46	mSL	10YR3/3	0	0 non	10					
	46-65	SCL	10YR4/6	0	0 non	25					
	65-120	cS	10YR4/6	0	0 non	40					
116	0-20	mSL	7.5YR 3/2	0	0 non	6%	16	7	2	Droughtiness	2
	20-55	mSL	7.5YR 3/3	0	0 non	5%					
	55-120	mSL	7.5YR 6/4	0	0 non	25%					
117	0-31	C	10YR3/3	0	0 non	2%	29	34	2	Droughtiness	2
	31-48	C	10YR4/1	2.5YR 3/6	20-40% many	1%					
	48-68	C	10YR4/1	2.5YR 3/6	20-40% many	1%					
	68-120	SCL	10YR4/2	2.5YR 3/6	20-40% many	1%					
118	0-26	hCL	10YR3/3	0	0 non	5%	-10	20	3a	Droughtiness	3a
	26-48	C	10YR4/3	0	0 non	10%					
	48-68	SCL	10YR4/2	5YR 4/4	<2% few	10%					
	68-120	cS	10YR5/6	0	0 non	40%					
119	0-20	SCL	10YR3/3	0	0 non	1%	28	2	2	Droughtiness	2
	20-68	C	10YR4/2	5YR 4/4	<2% few	1%					
	68-120	C	10YR5/2	5YR 4/4	2-20% common	1%					
120	0-30	SCL	10YR3/3	0	0 non	1	15	-5	2	Droughtiness	2
	30-80	SCL	10YR5/4	7.5YR 6/8	2-20% common	0					

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	80-100	SCL	10YR5/4	7.5YR 6/8	20-40% many	0					
	100-120	cS	10YR5/6	7.5YR 6/8	<2% few	40					
121	0-25	mCL	10YR3/2	0	0 non	2%	8	29	2	Droughtiness	2
	25-45	mCL	10YR3/3	0	0 non	1%					
	45-85	SCL	7.5YR 4/4	2.5YR 4/6	2-20% common	1%					
	85-95	LcS	7.5YR 4/4	2.5YR 4/6	2-20% common	20%					
	95-120	cS	10YR5/6	2.5YR 4/6	2-20% common	40%					
122	0-30	mSL	10YR3/2	0	0 non	2%	5	6	2	Droughtiness	2
	30-62	SCL	10YR4/4	2.5YR 4/6	2-20% common	1%					
	62-80	SCL	10YR4/6	2.5YR 4/6	2-20% common	10%					
	80-95	mSL	10YR4/6	2.5YR 4/6	2-20% common	25%					
	95-120	mSL	10YR5/6	2.5YR 4/6	2-20% common	40%					
123	0-25	mSL	10YR3/2	0	0 non	1%	30	25	2	Flooding	3a
	25-42	SCL	10YR4/4	0	0 non	1%					
	42-120	SCL	10YR4/6	2.5YR 4/6	2-20% common	1%					
124	0-32	mSL	10YR3/2	0	0 non	1%	3	19	3a	Flooding	3a
	32-55	mSL	7.5YR 4/4	0	0 non	1%					
	55-85	LmS	7.5YR 4/6	7.5YR 5/6	<2% few	0%					
	85-120	mS	7.5YR 4/6	0	0 non	0%					
125	0-29	C	10YR4/3	0	0 non	1%	19	0.4	2	Flooding	3a

Auger No	Soil Horizon (cm)	Texture	Soil Colour		Mottling%	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	29-50	C	10YR5/2	7.5YR 6/8	2-20% common	0%					
	50-120	C	10YR5/6	7.5YR 6/8	2-20% common	0%					
126	0-30	LmS	10YR3/2	0	0 non	15%	-52	-33	3b	Droughtiness	3b
	30-50	LmS	10YR3/4	0	0 non	30%					
	100	mS	10YR3/4	0	0 non	40%					
127	0-30	LmS	10YR3/2	0	0 non	15%	-38	-3	3b	Droughtiness	3b
	30-45	LmS	7.5YR 4/4	0	0 non	20%					
	45-70	LmS	7.5YR 4/4	0	1 non	30%					
	70-100	LmS	7.5YR 4/4	0	2 non	40%					
128	0-32	mSL	10YR3/2	0	0 non	5%	-33	-36	3b	Droughtiness	3b
	32-50	LmS	7.5YR 4/4	0	0 non	15%					
	50-70	mS	7.5YR 4/6	0	0 non	15%					
	70-100	mS	7.5YR 4/6	0	0 non	25%					

Soil texture key: mS – medium sand LmS – loamy medium sand; LcS – loamy coarse sand; mSL – medium sandy loam; SCL – sandy clay loam; mCL – medium clay loam; mZCL – medium silty clay loam; hCL – heavy clay loam; C – clay.

AB marked with an asterisk (*) were not completed to the full depth of 1.2m and the soil conditions were inferred from the soil above.

Borehole numbers 16, 17, 26, 27, 28, 29, 39 40, and 41 are not included in the borehole log due to no data being collected due to flooded conditions of the survey site.

Table E-2: 2021 ALC Survey Borehole Log

Auger No	Soil Horizon (cm)	Texture/Bedrock	Soil Colour		Mottling %	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
HA01	No data made available										
HA03	No data made available										
HA05	0-25	mSL	7.5YR 3/2	Mn Flecks	0 non	10%	-35	-40	3b	Droughtiness	3b
	25-40	mSL	7.5YR 3/2	0	0 non	13%					
	40-70	mS	5YR 4/6	0	0 non	20%					
	70-100	mS	7.5YR 5/6	0	0 non	20%					
	NFP - Stones	Gravel	NA	0	0 non	NA					
HA06	No data made available										
HA07	0-20	mSL	7.5YR 3/2	0	0 non	10%	9	-16	3a	Droughtiness	3a
	20-40	mSL	7.5YR 3/2	0	0 non	10%					
	40-65	mSL	7.5YR 4/4	0	0 non	10%					
	65-90	mSL	5YR 3/4	0	0 non	10%					
	90-120	LmS	5YR 4/4	0	0 non	5%					
HA08	No data made available										
HA09	0-35	CL	7.5YR 3/2	0	0 non	8%	12	6	2		2

Auger No	Soil Horizon (cm)	Texture/Bedrock	Soil Colour		Mottling %	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	35-60	SCL	7.5YR 4/2	10YR5/3 5YR3/3	NA	5%				Droughtiness	
	60-80	mSL	7.5YR6/2	10YR3/3 5YR4/4	NA	3%					
	80-100	mSL	7.5YR5/4	2.5Y 6/2 7.5YR5/2	NA	3%					
	NFP - Auger Stopped	NA									
HA10	No data made available										
HA11	0-35	CL	7.5YR3/2	0	0 non	14%	-41	-31	3b	Droughtiness	3b
	35-60	C	7.5YR3/4	0	0 non	10%					
	NFP - Hard	Marl	NA	0	0 non	0%					
HA12	No data made available										
HA13	0-30	ZCL	7.5YR3/2	0	0 non	0%	-12	-4	3a	Wetness and Flooding	3b
	30-45	ZCL	7.5YR4/2	0	0 non	0%					
	45-60	ZC	7.5YR4/4	7.5YR5/8	NA	0%					

Auger No	Soil Horizon (cm)	Texture/Bedrock	Soil Colour		Mottling %	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	60-80	ZC	7.5Y5/8	2.5Y 5/2	NA	0%					
	NFP - Gravel in Water Table										
HA14	No data made available										
HA15	0-35	mSL	5YR3/2	0	0 non	20%	3	-17	3a	Droughtiness	3a
	35-70	cSL	5YR3/4	0	0 non	11%					
	70-80	cSL	5YR3/4	5YR4/3 5YR4/4	NA	12%					
	80-110	C	5YR4/4	5YR3/4	NA	3%					
	NFP	Marl									
HA16	No data made available										
HA17	0-28	ZCL	10YR3/3	0	0 non	0%	30	9	2	Flooding	3b
	28-60	ZCL	10YR4/3	0	0 non	0%					
	60-110	ZCL	10YR4/4	0	0 non	1%					
	NFP - Drain										
HA18	No data made available										
HA19	0-25	ZCL	10YR3/3	0	0 non	0%	51	26	1	Flooding	3b
	25-70	ZCL	10YR4/4	0	0 non	0%					

Auger No	Soil Horizon (cm)	Texture/Bedrock	Soil Colour		Mottling %	Stones	Moisture Balance		Droughtiness	Final ALC	
			Matrix	Mottle		Total (%)	Wheat	Potatoes	Grade	Limitation	Grade
	70-90	ZCL	10YR4/4	0	0 non	0%					
	90-120	C	10YR4/3	0	0 non	0%					
HA20	No data made available										
HA21	0-30	C	10YR3/3	0	0 non	0%	-5	-12	3a	Wetness and Flooding	3b
	30-70	C	7.5YR4/4	10YR4/3 10YR3/3	NA	0%					
	70-90	C	10YR4/4	7.5YR4/2 7.5YR5/4	NA	0%					
	90-110	C	7.5YR4/4	10YR4/2 10YR4/3	NA	0%					
	NFP - Auger Stopped										
HA22	No data made available										

Appendix F: Particle Size Distribution results

ANALYTICAL REPORT

Report Number	**53270-23**	**W680**	[redacted]
Date Received	**20-JAN-2023**	**MOTT MACDONALD**	
Date Reported	**27-JAN-2023**	**10 TEMPLE BACK**	
Project	**SOIL**	**BRISTOL**	
Reference	**MOTT MACDONALD**	**BS1 6FL**	
Order Number			

Laboratory Reference		**SOIL604653**
Sample Reference		**A46 TS BH102**
Determinand	**Unit**	**SOIL**
Sand 2.00-0.063mm	% w/w	52
Silt 0.063-0.002mm	% w/w	30
Clay <0.002mm	% w/w	18
Textural Class **		SCL/SL

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.

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

Reported by

[redacted]
Natural Resource Management, a trading division of Cawood Scientific Ltd.
Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS
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ANALYTICAL REPORT

Report Number	**62648-23**	**W680** [redacted]	**Client A46 NEWARK BYPASS**
Date Received	**10-MAR-2023**	**MOTT MACDONALD**	
Date Reported	**24-MAR-2023**	**10 TEMPLE BACK**	
Project	**100103345**	**BRISTOL**	
Reference	**A46 NEWARK BYPASS**	**BS1 6FL**	
Order Number	**100103345**		

Laboratory Reference		**SOIL617096**	**SOIL617097**	**SOIL617098**	**SOIL617099**	**SOIL617100**	**SOIL617101**				
Sample Reference		**BH89 TS**	**BH100 TS**	**BH113 USS**	**BH117 USS**	**BH126 TS**	**BH128 LSS**				
Determinand	**Unit**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**				
Sand 2.00-0.063mm	% w/w	69	27	58	21	81	88				
Silt 0.063-0.002mm	% w/w	16	14	21	26	11	4				
Clay <0.002mm	% w/w	15	59	21	53	8	8				
Textural Class **		SL	C	SCL	C	LS	LS				

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.

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

Reported by [redacted]
Natural Resource Management, a trading division of Cawood Scientific Ltd.
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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.