Norfolk Boreas Offshore Wind Farm

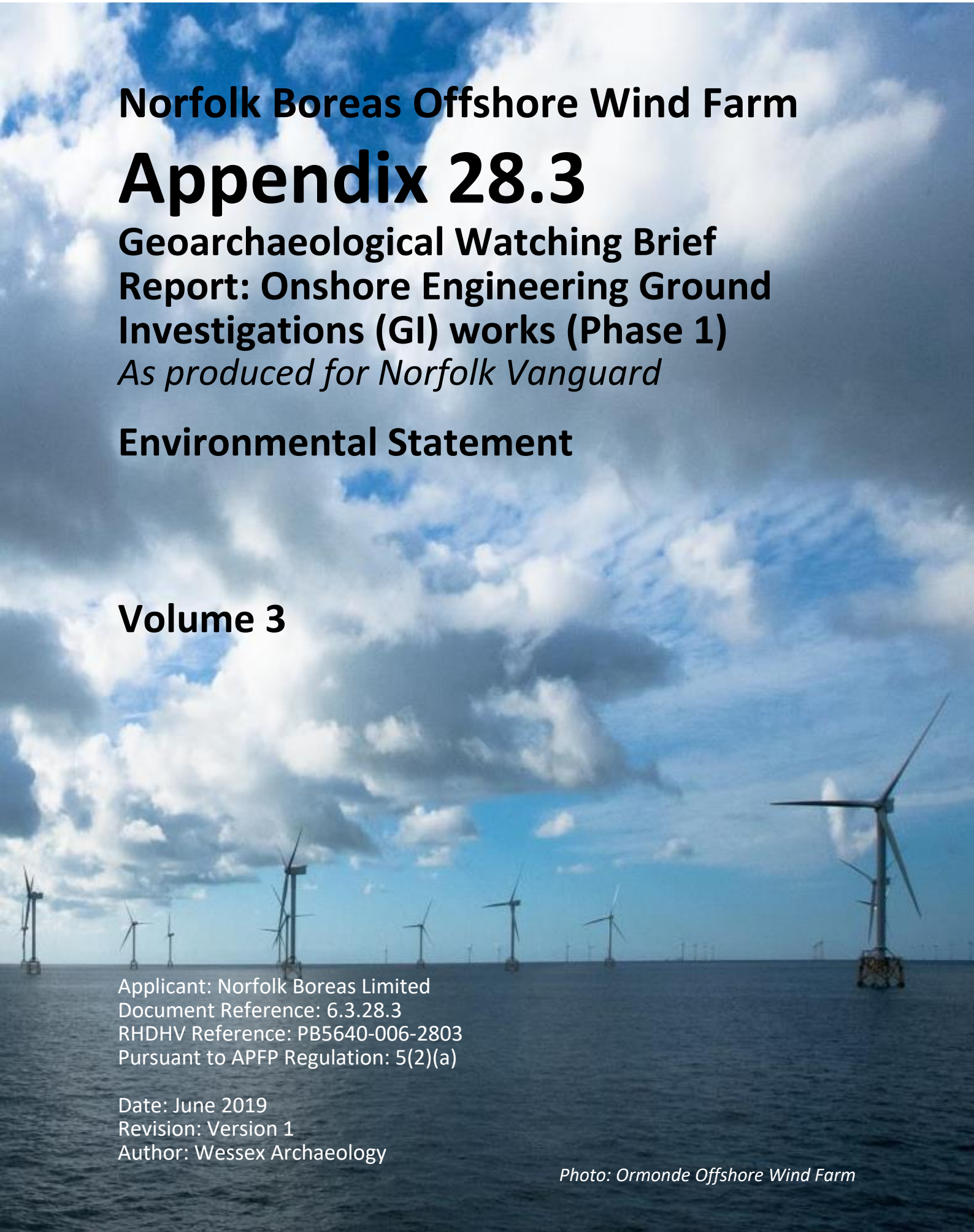
Appendix 28.3

Geoarchaeological Watching Brief Report: Onshore Engineering Ground Investigations (GI) works (Phase 1)

As produced for Norfolk Vanguard

Environmental Statement

Volume 3



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Norfolk Vanguard Offshore Wind Farm Onshore Archaeology and Cultural Heritage

Geoarchaeological Watching Brief: Onshore Engineering Ground Investigations (GI) works (Phase 1)

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Norfolk Vanguard Offshore Wind Farm Onshore Archaeology and Cultural Heritage

Geoarchaeological Watching Brief: Onshore Engineering Ground Investigations (GI) works (Phase 1)

Contents

Figures

Norfolk Vanguard Offshore Wind Farm Onshore Archaeology and Cultural Heritage

Geoarchaeological Watching Brief: Onshore Engineering Ground Investigations (GI) works (Phase 1)

Summary

Wessex Archaeology (WA) was commissioned by Royal HaskoningDHV to carry out geoarchaeological monitoring of Ground Investigation (GI) works for a proposed landfall and cable route associated with the Norfolk Vanguard Offshore Wind Farm onshore project area that runs east-west across Norfolk from the coastal village of Happisburgh inland towards Necton. The GI works are being carried out ahead of the submission of a Development Consent Order (DCO) application and associated Environmental Statement and subsequent construction (if approved) of an approximately 60 kilometre-long, onshore HV cable route and associated infrastructure.

The investigation focused on possible landfall sites (L1A and L1B) at the coast, and at seven key crossing locations where the proposed cable route intersects major transport routes or waterways where trenchless (e.g. HDD) methods will be required. The investigation also examined ground conditions in two locations (the northwest option and the southeast option) at the proposed *Happisburgh Landfall Point*, which together with the River Bure and River Wensum were identified in advance as being of particular archaeological and geoarchaeological interest.

No deposits resembling the Cromer Forest-Bed Formation were encountered in boreholes in the Landfall areas. The minerogenic sands, clays and gravels recorded beneath the surface deposits are most likely glacial in origin. These are underlain by sands, with some silt/clay and gravelly beds and they are collectively part of the Crag Group of Early Pleistocene marine deposits and may include representatives of the Red, Norwich and Wroxham Crag Formations.

At all seven crossing points the deposits encountered were all minerogenic and largely glacial in origin, with no deposits of significant palaeoenvironmental potential recorded directly by the monitoring geoarchaeologist. Deposits in Crossings 4-7 described as glacially derived may also include the underlying sands and gravels of the Wroxham Crag Formation. In one location (borehole BH17-C3-02, Crossing 3) an organic deposit in the form of a pseudo-fibrous peat was recorded at relatively shallow depth, from 0.15 to 1.7mbgl. This peat was not observed directly by the geoarchaeologist, and was not found to be present in the subsequent cores in that area.

Seven U-100 samples were retained were laboratory-based description (BH17-C3-03 13.5-13.9m, BH17-C4-01 1.5-1.95m, BH17-C4-02 4.5-4.95m, BH17-L1A-04 6.0-6.45m, BH17-L1A-04 6.5-7.0m, BH17-L1A-05 2.0-2.45m, BH17-L1B-04 11.6-12.05m). On-site interpretation suggested that these sediments were likely to be of glacial origin; however, the core samples were retained for detailed laboratory description in order to check these findings, and ensure that there were no thin discrete organic bands or lenses preserved which could have been missed during GI monitoring.

No deposits resembling the Cromer Forest-Bed Formation were encountered in retained samples from Crossings 3 and 4 or the Landfall transects, and confirm descriptions and interpretations in the field that the samples largely comprise minerogenic deposits of glacial origin. Deposits in retained samples from the Landfall Transects are consistent with a glaciogenic or reworked glaciogenic origin. The glacial origin for the landfall sediments would tally well with suggestions from the AHOB team (Ancient Human Occupation of Britain Project) that a large doline-type geological feature (also termed sinkhole and solution feature) may be present which has infilled with glacial deposits. If

Cromer Forest-Bed Formations sediments do survive they are likely to be found at a significant depth.

Norfolk Vanguard Offshore Wind Farm Onshore Archaeology and Cultural Heritage

Geoarchaeological Watching Brief: Onshore Engineering Ground Investigations (GI) works (Phase 1)

Acknowledgements

Thanks are due to Royal Haskoning DHV for commissioning the work. Mel Foster from GHD for onsite assistance, providing the logs and SI drilling for their cooperation.

The sediments were described and interpreted by Richard Payne and Dr Alex Brown who also compiled this report. The project was managed on behalf of Wessex Archaeology by David Norcott.

Norfolk Vanguard Offshore Wind Farm Onshore Archaeology and Cultural Heritage

Geoarchaeological Watching Brief: Onshore Engineering Ground Investigations (GI) works (Phase 1)

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology (WA) was commissioned by Royal HaskoningDHV to carry out geoarchaeological monitoring of Ground Investigation (GI) works for a proposed landfall and cable route associated with the Norfolk Vanguard Offshore Wind Farm onshore project area. The proposed cable route runs for approximately 60km east-west across Norfolk from the coastal village of Happisburgh inland towards Necton (**Figure 1**).

1.1.2 The investigation focused on possible landfall sites (L1A and L1B) at the coast, and at seven key crossing locations where the proposed cable route intersects major transport routes or waterways where trenchless (HDD) methods will be required. These locations are:

- *- Crossing 1 (A47)*
- *- Crossing 2 (East Dereham to Fakenham railway line)*
- *- Crossing 3 (River Wensum)*
- *- Crossing 4/5 (River Bure and A140)*
- *- Crossing 6/7 (A149 and Norwich to Cromer railway line)*

1.1.3 The investigation also examined ground conditions in two locations (the northwest option and the southeast option) at the proposed *Happisburgh Landfall Point*, which together with the River Bure and River Wensum were identified in advance as being of archaeological and geoarchaeological interest.

2 AIMS AND OBJECTIVES

2.1.1 The project aims were to:

- Establish the presence and/or absence of deposits of archaeological and geoarchaeological potential (particularly deposits of Palaeolithic age such as the Cromer Forest Bed ‘CF-bF’) as revealed through monitoring of GI works at SI locations along the proposed cable route;
- Establish whether and how far the CF-bF or similar sub-till strata extend inland along the proposed cable route;
- Obtain samples from suitable deposits with geoarchaeological potential, particularly the CF-bF and immediately overlying & underling strata;
- Report on results, making recommendations for suitable work on samples which are proportionate to the impact of the scheme;

2.1.2 These aims were addressed by achieving the following objectives:

- Monitoring of 37 cable percussion boreholes at SI locations along Crossings 1-7 (C1 to C7) and the northwest and southeast options for the proposed Happisburgh Landfall point (Landfalls L1A and L1B);
- Geoarchaeologically recording, describing and interpreting the sediment sequences revealed through cable percussion coring at each SI location;
- Negotiating with the SI team for the taking of appropriate samples for further investigation. Samples included:
  - Disturbed bulk samples to aid description and interpretation of sediment;
  - Intact stratified core samples in the form of U100s which are best suited for palaeoenvironmental assessment and dating.

3 GEOLOGICAL AND ARCHAEOLOGICAL BACKGROUND

3.1.1 Over recent decades there has been a tremendous amount of research undertaken in East Anglia with the main focus on the pre-Anglian river systems of the Ancaster, Bytham (the latter river previously known as the Ingham) and Thames (eg, Rose et al. 2001; 2002; Rose, 2009; Westaway, 2009) and associated Lower Palaeolithic sites at Pakefield, Suffolk and Happisburgh, Norfolk relating to the earliest occupation of Britain (Parfitt et al. 2005; 2010; Ashton et al. 2008a, 2014). This area is also a type site for the Anglian Glaciation deposits (tills) and has been extensively studied (e.g. Read et al. 2007; Pawley et al. 2008).

3.1.2 There is a rich archaeological record particularly for Lower Palaeolithic sites and artefacts in the region (Wymer, 1999; Pettitt and White, 2012). Key sites such as Happisburgh 1 and 3 (Ashton et al 2008a, Parfitt et al. 2010) and Pakefield (Parfitt et al. 2005) in coastal positions have provided important artefactual and palaeoenvironmental records. Investigations at Happisburgh have also revealed the oldest known hominin footprint surface outside Africa at between approximately 1 million and 0.78 million years ago (Ashton et al. 2014). Similarly, inland sites such as Hoxne, Suffolk (Singer et al. 1993; Ashton et al. 2008b) and Norton Subcourse, Norfolk (Schreve, 2004) preserve important artefact assemblages and palaeolandscape archives. The Early Middle Palaeolithic site of aggregate Area 240 situated in the now submerged lower extents of the post-Anglian Palaeo-Yare floodplain highlights the importance of the region in terms of current terrestrial, coastal and marine setting (Tizzard et al 2014). These archaeological sites are closely related to their contemporary drainage configuration and glacial history of the region requiring any analysis of the earliest archaeological record to be contextualised by the changing pattern of pre- and post-Anglian river systems and topography.

3.1.3 The pre-Anglian Lower and early Middle Pleistocene succession in East Anglia is characterised by a series of estuarine, fluvial and alluvial sediments of the Cromer Forest-bed Formation (CF-bF) overlain by the glacial till. This succession dates from ca. 2.0 to 0.45 MA (million years ago).

3.1.4 The CF-bF includes a number of important sites famous for Early and early Middle Pleistocene fossil remains. It is only recently that Lower Palaeolithic archaeology has been found within the CF-bF, in particular at Happisburgh Site 1, dating to c. 530 ky (Ashton et al 2008a, Ashton and Lewis 2012), Pakefield, dating to ca. 700 ky (Parfitt et al 2005), and at Happisburgh Site 3 (HSB3), dating to ca. 850 ka or possibly ca. 950 ka (Parfitt et al 2010). The latter represents the earliest evidence for a hominin presence in northern Europe.

3.1.5 Of particular significance to the present study are the Early to early Middle Pleistocene deposits at Happisburgh. Here the coastal cliffs are mainly composed of glacial sediments from the Anglian Glaciation (MIS 12; 478 to 424 ka). At their base lie a complex series of

river, estuarine and near shore marine deposits of the Cromer Forest bed Formation (CFbF). The deposits span a period of 2 to 0.5 million years. They infill part of the Crag Basin and interdigitate with Crag sediments of marine origin.

3.1.6 The CF-bF at Happisburgh has long been known to contain fossil bones and other environmental remains key for understanding the Early and early Middle Pleistocene environmental history of northern Europe. Studies carried out since 2000 by the Ancient Human Occupation of Britain (AHOB) and Pathways to Ancient Britain (PAB) Projects have identified several localities associated with important Lower and early Middle Pleistocene archaeology, and associated environmental indicators. Two of these locales are particularly notable for the present study, Happisburgh Site 1 (HSB1) and Happisburgh Site 3 (HSB3), both located on the modern foreshore.

3.1.7 At HSB1 archaeology was found within sediments consisting of organic muds and fluvial sands occupying a channel feature, some 100m in width and trending approximately S-N (Ashton and Lewis 2012). It is associated with a rich array of environmental indicators.

3.1.8 HSB 3 is located 1km north west of HSB 1. Here artefacts and environmental datasets have been recovered from within the newly defined Hill House Formation. The Hill House Formation primarily consists of a series of stacked channels, filled with lag gravels overlain by laminated sands and silts, indicating deposition in the Lower reaches of a large river (Parfitt et al. 2010) and may date as early as 950 thousand years ago (Parfitt et al. 2010); these represent the earliest evidence for a hominin presence in northern Europe. The Hill House Formation overlies sands and silts of the Norwich Crag Formation, deposited in a predominantly marine coastal shelf environment (Lee et al. 2006).

3.1.9 The CF-bF deposits, including those associated the HSB 1 and HSB 3, are known to extend inland from the modern foreshore, however, their specific location and extent is unknown. Consequently, there is considered to be an opportunity for the current project to potentially help further advance archaeological knowledge of the area and a steering group has been set up with representatives from the Natural History Museum and British Museum, who have worked in the area over the last decade, as part of the Ancient Human Occupation of Britain (AHOB) Project.

4 LOCATION AND GEOLOGY OF SI AREAS

4.1.1 The location of each SI area is outlined below along with a description of the solid and superficial geology. Age estimates are expressed in millions of years ago (MA) and thousands of years ago (Ka). These dates are supplemented where relevant with the comparable Marine Isotope Stage (MIS) where odd numbers indicate an interglacial and even numbers a glacial stage.

4.1.2 **Crossing 1** is located on the A47 just to the west of Dereham (**Figure 2**). The solid geology is mapped by the British Geological Survey (BGS) as Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation and Culver Chalk Formation of late Cretaceous date (72 to 94 MA); together these form part of the White Chalk subgroup.

4.1.3 The solid geology is overlain by poorly sorted glacial sediment (till) of the Lowestoft Formation, deposited during the Anglian glaciation (MIS 12, 478 to 424 ka), with clay, silt, sand and gravel alluvium confined to low lying areas along watercourses and associated floodplains.

4.1.4 **Crossing 2** is located to the northeast of Dereham at Northall Green (**Figure 3**) in a transect that runs west-east across the East Dereham to Fakenham railway line. The solid geology

is mapped by the BGS as Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation of late Cretaceous date. The solid geology at Crossing 2 is overlain by poorly sorted glacial sediment of the Weybourne Town Till Member, also likely of Anglian glacial date.

4.1.5 **Crossing 3** site is located at the River Wensum, east of Swanton Morley (**Figure 4**). Here the solid geology is mapped by the BGS as Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation of Late Cretaceous date. This is overlain by a range of superficial geological deposits, including glaciofluvial sands and gravels, fluvial sands and gravels (River Terrace Deposits), Head (poorly sorted cold-climate slope wash deposits), and riverine alluvium (clay, silt, sand and gravel). Holocene peats are also mapped by the BGS immediately to west of the crossing site. The site is located ~2.5 km south west of gravel pits at Swanton Morley where rich pollen, plant macro-fossils, non-marine molluscs and vertebrate remains of Ipswichian age (Mis 5e; 123-109 ky) were recovered from alluvial muds, silts sands and brecciated clays; these were overlain by fluvial sands and gravels that themselves produced cold stage vertebrate remains (Coxon et al, 1980).

4.1.6 **Crossings 4** and **5** are located adjacent to each other to the north of Aylsham (**Figure 5**). The investigation area encompasses the River Bure in the west and the A140 in the east. The solid geology is mapped by the BGS as interbedded sand and gravel of the Wroxham Crag Formation, formed between the Pre-Pastonian/Baventian and Cromerian Stages (approximately 2 MA to 500 ka) of the Quaternary period. At this time, the local landscape was dominated by swamps, estuaries and deltaic environments. The bedrock is exposed at the surface either side of the River Bure.

4.1.7 The solid geology at **Crossing 4** (River Bure) is likely to be overlain by deposits of riverine alluvium predominantly comprising clay, silt, sand and gravel. The superficial geology at **Crossing 5** is more varied, including glaciofluvial sand and gravel of the Happisburgh Glacigenic and Briton's Lane Formations. Poorly sorted gravel, clayey sand and sandy clay slope wash deposits (Head and colluvium) occur to the east of the A140. Restricted deposits of glacial till may also overlie the bedrock in places.

4.1.8 **Crossings 6** and **7** are located on the northwest side of North Walsham where the investigation area encompasses the A149 and the Norwich to Cromer railway line (**Figure 6**). The solid geology is mapped as sand and gravel of the Wroxham Crag Formation. The solid geology is overlain by superficial deposits comprising glaciofluvial sand and gravel of the Briton's Lane Formation and Happisburgh Glacigenic Formation.

4.1.9 The **Happisburgh Landfall Points** are located on the East coast of Norfolk to the southwest of the village of Happisburgh (**Figure 7**). The solid geology of the Happisburgh landfall points is mapped as sands and gravels of the Crag Group, formed approximately 5 million years ago in the Quaternary and Neogene Periods when the local environment was dominated by shallow seas.

4.1.10 The solid geology is overlain by sand and gravel of the Happisburgh Glacigenic Formation, and poorly sorted till deposits of the Bacton Green Till Member. The Happisburgh Glacigenic Formation is thought to have been deposited during MIS 12 (Preece et al. 2009)

4.1.11 **Happisburgh Landfall Point: South West option** is located 0.8 km south-west of the of early Middle Pleistocene channel deposits of Happisburgh Site 1 and 2.0 km south west of the Lower Pleistocene channel deposits Happisburgh Site 3.

4.1.12 **Happisburgh Landfall Point: North West option** is located 0.2 km south of the of the Lower Pleistocene channel deposits of Happisburgh Site 1 and 1.2 km of the Lower Pleistocene channel deposits Happisburgh Site 3.

5 METHODOLOGY

5.1 Monitoring: Cable percussion coring

5.1.1 The primary purpose of the coring was to provide geotechnical information for the ground investigations; any sampling was carried out with the cooperation of the drilling teams. The attending geoarchaeologist liaised fully with the teams on site as to their requirements, and what was practical and possible to sample. The deposits from each borehole have been summarised in the **Appendix 10.1**.

Locations monitored

5.1.2 Whilst all works at the landfall site were monitored, the likelihood of significant deposits varied at the crossing-points moving landwards.

5.1.3 At the higher potential crossings of the Wensum and Bure (Crossings 3 and 4, **Figures 4** and **5**), a geoarchaeological presence was maintained for sufficient duration to ensure that description (and sampling where possible and practical) of the expected Holocene riverine sediments was carried out, as well as any sub-till deposits if present. This was supplemented by desk-based interpretation and review of GI log data from the other investigation points following fieldwork.

5.1.4 For the remaining crossing points (Crossings 1, 2, 5, 6 and 7), the geoarchaeologist maintained regular contact with the GI team to establish whether significant strata were present in the first 1-2 cores at each location. In cases where significant strata were present, then attendance by the geoarchaeologist could be made to provide a more detailed record and retain suitable samples, with results supplemented by desk-based interpretation and review of GI log data from the other cores following fieldwork. Where no strata of significance were judged to be present by the geoarchaeologist, the data was reviewed by desk-based methods only.

5.2 Sample Collection

Disturbed 'bulk' samples

5.2.1 Due to the restrictions of the GI methods mentioned above, samples of the deposits available for examination were mostly restricted to the disturbed upcast material retrieved from the borehole using a chisel drill bit/clay cutter. Whilst useful for description, such samples are of very limited to no use for any further scientific work.

Intact stratified core samples

5.2.2 For both palaeoenvironmental assessment and absolute dating methods, if possible an intact stratified sequence (i.e. a core) was to be obtained. The only practical way of achieving this was to obtain a whole U100 core sample during the coring process, ideally from a deposit of paleoenvironment interest.

5.2.3 Seven samples were retained for detailed description and possible subsampling, and are listed below. These do not necessarily represent high potential deposits, but finer grained low energy deposits in which it was possible to take a U100 sample and may warrant closer inspection.

- BH17-C3-03 13.5 – 13.95m

- BH17-C4-01 1.5 – 1.95m
- BH17-C4-02 4.5 – 4.95m
- BH17-L1A-04 6.0 – 6.45m
- BH17-L1A-04 6.5 – 7.0m
- BH17-L1A-05 2.0 – 2.45m
- BH17-L1B-04 11.6 – 12.05m

5.3 Survey and location data

5.3.1 Borehole locations were surveyed in by the GI team.

5.4 Sediment Description

5.4.1 Description and interpretation of deposits in cores, both in the field and laboratory, was undertaken by a trained geoarchaeologist (following Hodgson 1997), and included where possible information regarding:

- *Depth;*
- *Texture;*
- *Composition;*
- *Colour;*
- *Inclusions;*
- *Structure (bedding, ped characteristics etc.);*
- *Contacts between deposits.*

6 RESULTS

6.1 Introduction

6.1.1 The deposits recorded from 37 boreholes across Crossings 1-7 and Landfall L1A and L1B are outlined below alongside laboratory-based description of the seven retained core sequences (listed above in **5.2.3**); more detailed descriptions and outline interpretation of the sediments are contained in **Appendix 10.1** and **10.2.** All depths are provided in metres below ground level (mbgl) and metres Ordnance Datum (mOD).

6.2 Crossing 1 (A47)

6.2.1 The deposits encountered in the two boreholes to the north of Crossing 1 were comprised of a gravelly silty clay topsoil and subsoil down to a maximum depth of 1 mbgl, overlying firm silty and sandy clays followed by sandy gravelly clay from approximately 4 mbgl to the termination of the borehole at 9.6 mbgl in BH17-C101 and 15 mbgl in BH17-C1-02.

6.2.2 The deposits recorded in the two boreholes to the south of Crossing 1 consisted of a silty sandy clay topsoil and subsoil to a maximum depth of 1.1 mbgl, overlying deposits of sandy clay, sand and sandy silty clays to a depth of approximately 9.5 mbgl. Below 9.5 mbgl the deposits were recorded as a silty sandy flint and chalk gravel to a depth of 9.8 mbgl in BH17-C1-03 and 15.45 mbgl in BH17-C1-04.

6.2.3 No deposits of archaeological/geoarchaeological potential were encountered in the boreholes.

6.3 Crossing 2 (East Dereham to Fakenham railway line)

6.3.1 The deposits recorded in all four boreholes at Crossing 2 comprised a soft orange brown slightly gravely sandy clay topsoil to 0.4 mbgl overlying a firm slightly gravelly clay extending to between 13.95 (BH17-C2-03) to 15.3 mbgl (BH17-C2-01), becoming sandier below to the base of the boreholes. No deposits of archaeological/geoarchaeological potential were encountered in the boreholes.

6.4 Crossing 3 (River Wensum)

6.4.1 The deposits recorded at Crossing 3 comprised a firm dark brown sandy clay topsoil overlaying gravels and gravelly sands in BH17-C3-01. In BH17-C3-02 the topsoil overlay a very soft dark brown pseudo fibrous peat to 1.7 mbgl, below which there is a silty fine to coarse sand to 2.2 mbgl sealing coarse sand and flint gravels to 7.8 mbgl. In BH17-C3-03 and BH17-C3-04 the dark orange brown silty gravelly clay topsoil overlies firm gravelly sands.

6.4.2 Samples were retained from BH17-C3-03 (13.5–12.9 mbgl, 8.83–8.43 mOD) for laboratory-based descriptions (**Appendix 10.2**). The deposits comprise a stiff dark grey slightly gravelly sandy clayey silt. The gravels comprised abundant weathered chalky gravels= clasts ≤40mm, including a defined band of chalky gravels from 13.52–13.56 mbgl (8.82–8.79 mOD).

6.4.3 Except for the peat identified between 0.15 to 1.7 mbgl in depth in BH17-C3-02, no deposits of clear archaeological/geoarchaeological potential were encountered in the boreholes. The fluvial sands and gravels are likely to be equivalent in age to those 2km upstream at Swanton Morley (see 4.1.4) and therefore have wider geoarchaeological potential, although no deposits with such potential were identified in these boreholes.

6.5 Crossing 4 (River Bure)

6.5.1 The deposits recorded in BH17-C4-01 to BH17-C4-04 comprised slightly gravelly sandy clay to gravelly clay sand topsoil overlying a soft to medium light brown grey, dark grey to orange grey slightly gravelly sandy clay over sandy clays, sands and gravels to depths of between 4.2 and 6.6 mbgl resting on chalk.

6.5.2 Samples were retained from BH17-C4-01 (1.5–1.95 mbgl, 11.31–10.86 mOD) and BH17-C4-02 (4.5–4.95 mbgl, 8.05–7.60 mOD) for laboratory-based description (**Appendix 10.2)**. The deposits in BH17-C4-01 comprise a firm greyish-brown slightly gravelly sandy silt. The deposits in BH17-C4-02 differed, comprising a yellowish brown silty fine to medium sand of yellow-brown and dark greyish brown hue (4.62-4.82 mbgl, 7.93-7.73 mOD), overlying a gravelly sandy silt to 4.95 mbgl (7.60 mOD).

6.5.3 No deposits of archaeological/geoarchaeological potential were encountered.

6.6 Crossing 5 (A140)

6.6.1 The deposits recorded in BH17-C5-01 to BH17-C5-04 comprised gravelly/sandy clay to clayey gravelly sand topsoil overlying dark brown to orange brown slightly gravelly sand and sandy clay resting on chalk at depths between 11.9 to 12.4 mbgl. No deposits of archaeological/geoarchaeological potential were encountered in the boreholes.

6.7 Crossing 6 (A149)

6.7.1 The deposits recorded in BH17-C6-01 to BH17-C6-04 comprised a silty to sandy slightly gravelly clay topsoil overlying dark orange brown, dark greyish and yellowish brown to dark

brown medium to firm sandy clays, sands and gravelly sands. No deposits of archaeological/geoarchaeological potential were encountered.

6.8 Crossing 7 (Norwich to Cromer railway line)

6.8.1 The deposits recorded in BH17-C7-01 to BH17-C7-04 comprised gravelly slightly sandy clay topsoil overlying dark grey, dark greyish and orange brown and brownish grey medium to firm sands and sandy clays with gravel. No deposits of archaeological/geoarchaeological potential were encountered in the boreholes.

6.9 Landfall L1A

6.9.1 Boreholes BH17-L1A-01 and BH17-L1A-02 were located in the south west landfall area. The deposits recorded in both boreholes were very similar and consisted of a medium brown sandy loam topsoil over clayey sand and sandy clays. Sand with some gravel in places was recorded from 7 mbgl until blowing sands caused the drilling to be abandoned at 17 mbgl in BH17-LIA-01 and 14 mbgl in BH17-LIA-02.

6.9.2 Boreholes BH17-L1A-03 and BH17-L1A-04 were located to the northeast of BH17-L1A-01 and BH17-L1A-02 and to the southwest of properties lining the cliff top. The deposits were very similar, comprising a sandy loam topsoil overlying sandy and gravelly clays over a grey sand. Blowing sands caused drilling to be abandoned in BH17-L1A-03 at 18 mbgl and recorded down to 20 mbgl in BH17-L1A-04.

6.9.3 Borehole BH17-L1A-05 was drilled on the beach at low tide. The deposits recorded comprised 1.8 m of coarse beach sand containing fragments of brick, most likely derived from a former or denuded brick built structure (e.g. pillbox). From 1.8 to 3.4 mbgl a stiff brown clay with occasional small stones was encountered. This stiff brown clay in turn overlay a grey sandy clay over a coarse grey sand to 8 mbgl, at which point drilling was stopped due to the rising tide.

6.9.4 Samples were retained from BH17-L1A-04 (6.0–7.0 mbgl, -0.21 to -1.21 mOD) and BH17-L1A-05 (2-2.45 mbgl, -0.09 to -0.54 mOD) for laboratory-based description (**Appendix 10.2)**. The deposits in both samples comprised a stiff dark greyish-brown slightly gravelly sandy clayey silt with occasional weather subrounded chalk gravels.

6.9.5 The sequences encountered are consistent with glaciogenic sediments overlying marine sands of the Crag Group. No deposits of archaeological/geoarchaeological potential were encountered in the boreholes.

6.10 Landfall L1B

6.10.1 Boreholes BH17-L1B-01 to BH17-L1B-04 were located in the north west landfall area in fields adjacent to the Happisburgh Cliffs. BH17-L1B-05 was to be drilled on the beach but was not attempted. The deposits recorded were very similar in all boreholes, and consisted mainly of a medium brown sandy loam topsoil and subsoil over sands, sandy clays and gravelly clays down to approximately 20 mbgl.

6.10.2 Samples were retained from BH17-L1B-04 (11.6–12.05, -3.81 to -4.26 mOD) for laboratory-based description **(Appendix 10.2)**. The deposits comprised a very dark to dark greyish-brown slightly gravelly sandy clayey silt with a thin band of sandy silty clay from 11.82–11.84 mbgl (-4.03 to -4.05 mOD).

6.10.3 These boreholes are located immediately south of the Happisburgh Site 1 early Middle Pleistocene channel fill, however, no deposits clearly resembling these were encountered in the boreholes.

7 DISCUSSION AND CONCLUSION

7.1 Landfall transects

7.1.1 No deposits resembling the Cromer Forest-Bed Formation were encountered in boreholes in the Landfall areas. The minerogenic sands, clays and gravels recorded beneath the surface deposits are most likely glacial in origin.

7.1.2 In the south west landfall area these glaciogenic units appear to be directly underlain by marine deposits belonging to the Crag Group.

7.1.3 The north-west landfall area is located 0.2 km south of the channel deposits associated with Happisburgh 1. No deposits clearly resembling these deposits were identified in the boreholes. The subsurface deposits in these boreholes would be consistent with a glaciogenic and reworked glaciogenic origin. Such an interpretation would tally well with suggestions from the AHOB team (Ancient Human Occupation of Britain Project) that a large doline-type geological feature (also termed sinkhole and solution feature) may be present, which has infilled with reworked glacial deposits. Some of the sands and gravels may represent Crag Group (or reworked Crag Group) deposits, although this is not possible to determine from a review of the borehole records alone.

7.1.4 The conclusion at this stage from the borehole survey results, supported by anecdotal evidence from local farmers, is that if Cromer Forest-Beds do survive they will be found at significant depth.

7.2 Crossings 1–7

7.2.1 At all seven crossing points the deposits encountered, both in the field and laboratory, were all minerogenic and largely glacial in origin, with no deposits of significant palaeoenvironmental potential recorded directly by the monitoring geoarchaeologist.

7.2.2 However, in one location (borehole BH17-C3-02, Crossing 3) an organic deposit in the form of a pseudo-fibrous peat was recorded at relatively shallow depth, from 0.15 to 1.7mbgl (**Appendix 10.1**). This was not observed directly by the geoarchaeologist, and was not found to be present in the subsequent cores in that area, which were monitored directly after the GI team alerted Wessex Archaeology to the presence of peat. Given the shallow depth of this deposit, any subsequent cable trenching or groundworks would allow easy access to these deposits; conversely, HDD would pass significantly below it. Additionally, fluvial and alluvial deposits with geoarchaeological potential may also be present in this area.

7.2.3 In Crossings 4–7, deposits described as glacially derived may also include the underlying interbedded sands and gravels of Wroxham Crag Formation, which itself rests on chalk. Differentiation between glacial sediment and the Wroxham Crag is not possible from the borehole records, but the possibility that both are represented should at least be borne in mind.

7.2.4 However, both deposits are of limited geoarchaeological potential. The Wroxham Crag Formation pre-dates (> MIS 19) the earliest identified hominin occupation of Britain (Wroxham Crag Formation), although glacially-derived sediments (MIS 12) may seal underlying deposits of geoarchaeological potential (e.g. Cromer Forest Bed). Although no

Cromer Forest Beds were identified during the current GI works, differentiating between Wroxham Crag and glacially derived deposits could be relevant in determining the likelihood of encountering underling strata of geoarchaeological potential.

8 RECOMMENDATIONS

8.1.1 All the deposits recorded both in the field and laboratory comprised minerogenic deposits of largely glacial origin. Laboratory-based description of retained core sections confirmed the field-based descriptions.

8.1.2 No deposits of palaeoenvironmental potential were recorded and no further work is recommended on the cores.

9 REFERENCES

Ashton, N.M. and Lewis, S.G., 2012. The environmental contexts of early human occupation of northwest Europe: the British Lower Palaeolithic record. *Quaternary International* 271, 50-64.

Ashton, N., Lewis, S G., Parfitt, S A., Penkman, K E H. and Coope, G R., 2008. New evidence for complex climate change in MIS 11 from Hoxne, Suffolk, UK, *Quaternary Science Reviews* 27, 652–668.

Ashton, N., Lewis, S G., De Groote, I., Duffy, S M., Bates, M., Bates, R., Hoare, P., Lewis, M., Parfitt, S A., Peglar, S., Williams, C., and Stringer, C., 2014. Hominin Footprints from Early Pleistocene Deposits at Happisburgh, UK. *PLoS ONE* 9 (2), e88329.

Clark , C D., Gibbard, P L. and Rose, J., 2004. Pleistocene glacial limits in England, Scotland and Wales. In: J Ehlers, and P L Green (Eds), *Quaternary glaciations - extent and Chronology, part 1: Europe*. London, Elsevier, 47–82.

Coxon P, Hall AR, Lister A et al. 1980. New evidence on the vertebrate fauna, stratigraphy and palaeobotany of the interglacial deposits at Swanton Morley, Norfolk. *Geological Magazine* 117: 525–546.

Hodgson, J M., 1997. *Soil Survey Field Handbook*, Harpenden, Soil Survey Technical Monograph No. 5.

Lee, J R., Rose, J., Hamblin, R J O., Moorlock, B S P., 2004. Dating the earliest lowland glaciation of eastern England: a pre-MIS 12 early Middle Pleistocene Happisburgh glaciation, *Quaternary Science Reviews* 23, 1551–1566.

Lee, J R., Rose, J, Candy, I, Barendregt, R W., 2006. Sea-level changes, river activity, soil development and glaciation around the western margins of the southern North Sea Basin during the Early and early Middle Pleistocene: evidence from Pakefield, Suffolk, UK, *Journal of Quaternary Science* 21, 2, 155–179.

Parfitt, S A., Barendregt, R W., Breda, M., Candy, I., Collins, M J., Coope, G R., Durbidge, P., Field, M H., Lee, J R., Lister, A M., Mutch, R., Penkman, K E H., Preece, R C., Rose, J., Stringer, C B., Symmons, R., Whittaker, J E., Wymer J J., and Stuart, A J., 2005. The earliest record of human activity in northern Europe, *Nature* 438, 1008–1012.

Parfitt, S A, Ashton, N M., Lewis, S G., Abel, R L., Coope, G R., Field, M H., Gale, R., Hoare, P G., Larkin, N R., Lewis, M D., Karloukovski, V., Maher, B A, Peglar, S M., Preece, R C., Whittaker, J E., and Stringer, C B., 2010. Early Pleistocene human occupation at the edge of the boreal zone in northwest Europe. In: *Nature* 466, 229–33.

Pawley, S M., Bailey, R M., Rose, J., Moorlock, B S P., Hamblin, R J O., Booth, S J. and Lee, J R., 2008. Age limits on Middle Pleistocene glacial sediments from OSL dating, north Norfolk, UK, *Quaternary Science Reviews* 27, 1363–1377.

Pettitt, P. and White, M J., 2012. *The British Palaeolithic: Human societies at the edge of the Pleistocene world*. Abingdon, Routledge.

Read, A., Godwin, M., Mills, C A., Juby, C., Lee, J R., Palmer, A P., Candy, I. and Rose, J., 2007. Evidence for Middle Pleistocene temperate-climate high sea-level and lowland-scale glaciation, Chapel Hill, Norwich, UK. *Proceedings of the Geologists' Association* 118, 143–156.

Rose J, 2009. Early and Middle Pleistocene landscapes of eastern England. *Proceedings of the Geologists' Association* 120, 3–33.

Rose, J., Moorlock, B S P. and Hamblin, R J O., 2001. Pre-Anglian fluvial and coastal deposits in Eastern England: lithostratigraphy and palaeoenvironments, *Quaternary International* 79, 5–22.

Rose J., Candy I., Moorlock B S P., Wilkins H, Lee J A., Hamblin R J O., Lee J R., Riding J B., Morigi A N., 2002. Early and early Middle Pleistocene river, coastal and neotectonic processes, southeast Norfolk, England. *Proceedings of the Geologists' Association* 113: 47–67.

Schreve, D., (ed.), 2004. *The Quaternary Mammals of Southern and Eastern England*. Quaternary Research Association.

Singer, R., Gladfelter, B G. and Wymer, J J., (eds), 1993. *The Lower Paleolithic Site at Hoxne, England*. Chicago, University of Chicago Press.

Tizzard, L., Bicket, A. R., Benjamin, J. and De Loecker, D. 2014. A Middle Palaeolithic site in the southern North Sea: investigating the archaeology and palaeogeography of Area 240. *Journal of Quaternary Science 29* 1099-1417.

Westaway, R., 2009. Quaternary vertical crustal motion and drainage evolution in East Anglia and adjoining parts of southern England: chronology of the Ingham River terrace deposits, *Boreas* 38, 261–284.

Wymer, J J., 1999. *The Lower Palaeolithic Occupation of Britain*. Wessex Archaeology and English Heritage.

10 APPENDIX

10.1 Borehole logs

Location:	594636.58 312774.60	**Borehole ID:**	Crossing 1 BH17-C1-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	46.31 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	46.31 – 46.01	Soft orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Frequent rootlets.	Topsoil
0.3 – 1.0	46.01 – 45.31	Soft orangish brown slightly gravelly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint.	Subsoil
1.0 – 2.5	45.31 – 43.81	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	Glacially derived sediment
2.5 – 3.45	43.81 – 42.86	Firm to stiff light greyish brown slightly silty gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional siltstones.	
3.45 – 4.5	42.86 – 41.81	Firm to stiff light greyish brown slightly silty gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional siltstones.	
4.5 – 6.0	41.81 – 40.31	Firm light greyish brown slightly sandy gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	
6.0 – 7.5	40.31 – 38.51	Firm light grey slightly sandy gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	
7.5 – 9.5	38.51 – 36.81	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk.	
9.5 – 9.6	36.81 – 36.71	Stiff light grey slightly sandy gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint.	

Location:	594667.09 E 312794.73 N	**Borehole ID:**	Crossing 1 BH17-C1-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	46.06 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	46.06 – 45.66	Soft orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Frequent rootlets.	Topsoil
0.4 – 1.5	45.66 – 44.56	Firm orangish brown slightly gravelly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	Subsoil
1.5 – 1.7	44-56 – 44.36	Firm dark orangish brown mottled dark brown slightly gravelly slightly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse flint.	Glacially derived sediment
1.7 – 3.0	44.36 – 43.06	Firm light grey mottled dark grey slightly gravelly very sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional light orangish brown staining.	
3.0 – 3.4	43.06 – 42.66	Firm to stiff light grey mottled dark grey silty CLAY. Occasional gravel sized lenses of dark orangish brown fine to coarse SAND.	
3.4 – 4.3	42.66 – 41.76	Very soft light brownish grey slightly gravelly slightly sandy silty CLAY. Gravel of subangular to subrounded fine to medium mixed lithologies. Occasional light orangish brown staining.	
4.3 – 7.5	41.76 – 38.56	Stiff light brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk and flint.	
7.5 – 9.45	38.56 – 36.61	Firm light whitish grey slightly gravelly silty CLAY. Gravel of subangular to subrounded fine to medium chalk and occasional flint.	
9.45 – 12.45	36.61 – 33.61	Stiff light grey slightly gravelly silty CLAY. Gravel of subangular to subrounded fine to medium chalk.	
12.45 – 15.0	33.61 – 31.06	Stiff to very stiff dark grey slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk.	

Location:	594670.58 E 312839.54 N	**Borehole ID:**	Crossing 1 BH17-C1-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):	45.20 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	45.20 – 44.80	Soft dark brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.	Topsoil
0.4 – 0.9	44.80 – 44.30	Soft dark brown mottled dark orangish brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.	Subsoil
0.9 – 1.9	44.30 – 43.30	Stiff dark greyish brown mottled dark orangish brown slightly gravelly slightly sandy slightly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional cobbles (<85mm) of flint. Rare gravel sized pockets of dark orangish brown clayey SAND.	Glacially derived sediment
1.9 – 3.5	43.30– 41.70	Stiff to very stiff dark brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk. Rare gravel sized pockets of dark orangish brown fine to coarse SAND.	
3.5 – 9.5	41.70 – 35.70	Stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
9.5 – 9.8	35.70 – 35.40	White grey slightly silty sandy GRAVEL. Gravel of subangular to subrounded fine to coarse white chalk and black flint.	

Location:		594695.52 E 312868.66N	**Borehole ID:**	Crossing 1 BH17-C1-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):		45.00 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	45.00 – 44.60	Soft to firm dark greyish brown mottled orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint and rare chalk.	Topsoil
0.4 – 1.5	44.60 – 43.50	Soft to firm dark brown slightly silty slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint.	Subsoil
1.5 – 1.8	43.50 – 43.20	Firm light greyish brown mottled dark orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.	Glacially derived sediment
1.8 – 3.7	43.20 – 41.30	Medium dense dark orangish brown slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
3.7 – 9.6	41.30 – 35.40	Firm to stiff light grey slightly sandy silty CLAY.	
9.6 – 12.0	35.40 – 33.00	Medium dense light grey slightly silty sandy subangular to subrounded fine to coarse flint and chalk GRAVEL. Gravel sized pockets of light grey slightly sandy CLAY.	
12.0 - 12.5	33.00 – 32.50	Dense light orangish brown very sandy subangular to subrounded fine to coarse flint and chalk GRAVEL.	
12.5 – 15.45	32.50 – 29.55	Stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and rare flint.	

Location:	599332.97 E 315346.00 N	**Borehole ID:**	Crossing 2 BH17-C2-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	58.92 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	58.92 – 58.52	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets.	Topsoil
0.4 – 1.0	58.52 – 57.92	Firm to stiff dark orangish brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint and white chalk. Occasionally mottled dark grey.	Glacially derived sediment
1.0 – 1.5	57.92 – 57.42	Firm to stiff light orangish brown mottled dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. Occasionally mottles dark brown and light greyish white.	
1.5 – 4.0	57.42 – 54.92	Firm light brownish grey occasionally mottled dark orangish brown and light orangish brown slightly sandy gravelly CLAY. Gravel subangular to subrounded fine to coarse white chalk and occasional flint.	
4.0 – 5.2	54.92 – 53.72	Stiff dark brown mottled dark grey and dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint.	
5.2 – 6.7	53.72 – 52.22	Firm to stiff dark grey mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint.	
6.7 – 7.2	52.22 – 51.72	Stiff dark orangish brown mottled dark reddish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse white chalk and occasional flint. Occasional black spots.	
7.2 – 15.3	51.72 – 43.62	Firm to stiff dark grey slightly sandy gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse white chalk and rare flint. Occasionally mottled dark orangish brown.	
15.3 – 16.5	43.62 – 42.42	Light greyish brown clayey fine to medium SAND. Fine to coarse gravel sized pockets of light greyish brown mottled dark orangish brown sandy CLAY.	
16.5 – 20.0	42.42 – 38.92	Medium dense dark yellowish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint and chalk.	

Location:	599394.14 E 315347.46 N	**Borehole ID:**	Crossing 2 BH17-C2-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	58.41 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.5	58.41 – 57.91	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets	Topsoil
0.5 – 2.0	57.91 – 56.41	Firm to stiff dark orangish brown occasionally mottled dark greyish brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasional black spots.	Glacially derived sediment
2.0 – 5.5	56.41 – 52.91	Stiff light grey mottled dark orangish brown slightly sandy gravelly slightly silty CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Occasional black spots.	
5.5 – 10.3	52.91 – 48.11	Stiff dark brownish grey occasionally mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
10.3 – 10.7	48.11 – 47.71	Firm dark grey slightly sandy slightly gravelly silty CLAY. Gravel of subangular to subrounded fine to coarse flint and chalk.	
10.7 – 14.8	47.71 – 43.61	Firm to stiff dark grey occasionally mottled dark orangish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
14.8 – 16.5	43.61 – 41.91	Stiff dark orangish brown slightly sandy slightly grave CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare laminations of fine to medium SAND.	
16.5 – 18.0	41.91 – 40.41	Stiff dark orangish brown mottled light grey sandy slightly silty slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
18.0 – 20.0	40.41 – 38.41	Dense to medium dense dark orangish brown gravelly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	

Location:	599547.92 E 315352.43 N	**Borehole ID:**	Crossing 2 BH17-C2-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):	58.79 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	58.79 – 58.49	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.	Topsoil
0.3 – 0.8	58.49 – 57.99	Soft orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	Glacially derived sediment
0.8 – 2.0	57.99 – 56.79	Firm to stiff light greyish brown and orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	
2.0 – 4.3	56.79 – 54.49	Firm light brownish grey slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint.	
4.3 – 5.8	54.49 – 52.99	Stiff dark grey slightly silty gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	
5.8 – 6.3	52.99 – 52.49	Firm light greyish brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint.	
6.3 – 9.0	52.49 – 49.79	Firm light greyish occasionally stained orangish brown slightly gravelly slightly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse flint and chalk. Occasional black spots.	
9.0 – 10.95	49.79 – 47.84	Firm dark grey slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint.	
10.95 – 13.95	47.84 – 44.84	Stiff dark grey slightly silty gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	
13.95 – 15.0	44.84 – 43.79	Stiff light orangish brown slightly silty slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	
15.0 – 16.5	43.79 – 42.29	Medium dense light brown slightly silty slightly clayey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint and chalk.	
16.5 – 20.0	42.29 – 38.79	Medium dense becoming very dense light brown gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint and chalk.	

Location:	599596.68 E 315324.32 N	**Borehole ID:**	Crossing 2 BH17-C2-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):	59.60 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	59.60 – 59.30	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. frequent rootlets	Topsoil
0.3 – 1.5	59.30 – 58.10	Soft to firm orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	Subsoil
1.5 – 3.0	58.10 – 56.60	Firm light grey mottled light orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	Glacially derived sediment
3.0 – 3.45	56.60 – 56.15	Firm to stiff dark grey mottled light grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Rare shell fragments. Rare black claystone.	
3.45 – 5.3	56.15 – 54.30	Stiff to very stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to medium chalk and occasional flint.	
5.3 – 5.6	54.30 – 54.00	Firm light brownish grey mottled dark grey and dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
5.6 – 10.5	54.00 – 49.10	Stiff to very stiff dark grey slight sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
10.5 – 12.45	49.10 – 47.15	Firm light greyish brown mottled dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	
12.45 – 13.3	47.15 – 46.30	Stiff dark grey occasionally mottled dark brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint.	
13.3 – 13.5	46.30 – 46.10	Firm orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
13.5 – 15.0	46.10 - 44.60	Firm light brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
15.0 – 16.5	44.60 – 43.10	Medium dense light orangish brown clayey silty fine to medium SAND. Gravel of subangular to subrounded fine to medium chalk and flint.	
16.5 – 20.0	43.10 – 39.60	Medium dense light brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse chalk and flint.	

Location:		604035.95 E 317597.72 N	**Borehole ID:**	Crossing 3 BH17-C3-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):		17.53 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.2	17.53 – 17.33	Firm dark brown slightly sandy CLAY with rootlets.			Topsoil
0.2 - 10.1	17.33 – 7.43	Medium dense light yellowish brown very silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint.			Fluvial depoists and/or glacially derived sediment
10.1 – 14.0	7.43 – 3.53	Medium dense light brownish grey very silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of flint and chalk.			
14.0 – 16.5	3.53 – 1.03	Medium dense light yellowish brown very silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint.			

Location:		604062.91 E 317610.41 N	**Borehole ID:**	Crossing 3 BH17-C3-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):		16.84 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.15	16.84 – 16.69	Firm dark brown slightly sandy CLAY with rootlets.			Topsoil
0.15 – 1.7	16.69 – 15.14	Very soft dark brown pseduofibrous PEAT.			Peat
1.7 – 2.2	15.14 – 14.64	Loose light brownish grey very silty fine to coarse SAND.			Alluvium
2.2 – 2.8	14.64 – 14.04	Dark greyish brown slightly silty fine to coarse SAND and angular to subrounded fine to coarse GRAVEL of flint.			Fluvial and/or glacially derived sediment
2.8 – 7.8	14.04 – 9.04	Medium dense light yellowish brown silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint.			
7.8 – 14.6	9.04 – 2.24	Medium dense light brownish grey very silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of flint and chalk.			
14.6 – 17.0	2.24 – -0.16	Medium dense light yellowish brown silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint.			

Location:		604294.25 E 317784.53 N	**Borehole ID:**	Crossing 3 BH17-C3-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):		22.33 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	22.33 – 22.03	Dark orangish brown slightly silty gravelly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets and plant matter.			Topsoil
0.3 – 1.0	22.03 – 21.33	Dark orangish brown slightly clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Subsoil
1.0 – 2.8	21.33 – 19.53	Medium dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Fluvial and/or glacially derived sediment
2.8 – 4.2	19.53 – 18.13	Very dense dark orangish brown slightly silty gravelly fine to coarse SAND and GRAVEL. Gravel of subangular to subrounded fine to coarse flint.			
4.2 – 9.1	18.13 – 13.23	Dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			
9.1 – 12.5	13.23 – 9.83	Firm to stiff dark brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare dark orangish brown staining.			
12.5 – 20.0	9.83 – 2.33	Firm to stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare dark orangish brown staining.			

Location:		604265.31 E 317755.75 N	**Borehole ID:**	Crossing 3 BH17-C3-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):		23.57 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	23.57 – 23.27	Dark orangish brown slightly silty clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets			Topsoil
0.3 – 0.7	23.27 – 22.87	Dark orangish brown slightly clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Subsoil
0.7 – 7.5	22.87 – 16.07	Dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Fluvial and/or glacially derived sediment
7.5 – 14.8	16.07 – 8.77	Medium dense orange brown slightly silty slightly gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			
14.8 – 17.1	8.77 – 6.47	Medium dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional cobbles of subangular to subrounded flint.			

Location:	619734.74 E 328684.81 N	**Borehole ID:**	Crossing 4 BH17-C4-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	12.81 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	12.81 – 12.41	Soft dark orangish brown mottled light brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to medium flint.	Topsoil
0.4 – 2.1	12.41 – 10.71	Soft dark orangish brown mottled light brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional rootlets	Glacially derived sediment and/or Crag Group
2.1 – 3.5	10.71 – 9.31	Soft dark grey slightly silty slightly silty sandy CLAY. Gravel of subangular to subrounded fine to medium flint.	
3.5 – 4.5	9.31 – 8.31	Medium dense dark greyish brown slightly gravelly slightly clayey silty fine to medium SAND. Gravel of subangular to subrounded fine to medium flint.	
4.5 – 5.8	8.31 – 7.01	Medium dense dark greyish brown slightly silty fine to coarse SAND and subangular to subrounded fine to coarse flint GRAVEL	
5.8 – 7.0	7.01 – 5.81	Structureless CHALK recovered as light greyish white slightly gravelly sandy SILT. Gravel of very weak to weak, low density greyish white chalk. Occasional fine to coarse flint.	Chalk Bedrock
7.0 – 20.0	5.81 – -7.19	Structureless CHALK recovered as off white with creamy edges around the gravel slightly gravelly sandy SILT. Gravel of very weak to weak, low density greyish white chalk. Occasional fine to coarse flint.	

Location:	619687.49 E 328656.77 N	**Borehole ID:**	Crossing 4 BH17-C4-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	12.55 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	12.55 – 12.25	Dark orangish brown gravelly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.	Topsoil
0.3 – 1.0	12.25 – 11.55	Dark orangish brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Gravel sized pockets of dark orangish brown sandy CLAY.	Subsoil
1.0 – 1.5	11.55 – 11.05	Medium dense dark brown slightly clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	Glacially derived sediment and/or Crag Group
1.5 – 3.5	11.05 – 9.05	Medium dense dark orangish brown slightly silty clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
3.5 – 4.5	9.05 – 8.05	Medium dense light grey slightly silty fine to coarse SAND and subangular to subrounded fine to coarse flint GRAVEL	
4.5 – 5.5	8.05 – 7.05	Medium dense dark orangish grey slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
5.5 – 6.6	7.05 – 5.95	Medium dense light brownish grey slightly silty fine to coarse SAND and subangular to subrounded fine to coarse flint GRAVEL. Occasional cobbles of white chalky CLAY.	
6.6 – 7.0	5.95 – 5.55	Structureless CHALK recorded as light brownish white slightly sandy gravelly SILT. Gravel of weak, low density greyish white chalk. Occasional fine to coarse flint.	Chalk Bedrock
7.0 – 20.0	5.55 – -7.45	Structureless CHALK recorded as white with occasional light orangish brown staining slightly sandy gravelly SILT. Gravel of weak, medium density off white chalk. Occasional fine to coarse flint.	

Location:	620061.55 E 328848.17 N	**Borehole ID:**	Crossing 4 BH17-C4-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):	12.58 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.5	12.58 – 12.08	Soft dark brown mottled light grey sandy CLAY. Frequent rootlets and plant matter.	Topsoil
0.5 – 1.4	12.08 – 11.18	Soft dark brown mottled light grey sandy CLAY. Occasionally mottled light orangish brown. Occasional rootlets and plant matter.	Subsoil
1.4 – 2.8	11.18 – 9.78	Medium dense dark grey slightly silty clayey SAND.	Glacially derived sediment and/or Crag Group
2.8 – 4.2	9.78 – 8.38	Medium dense dark greyish brown slightly clayey slightly silty sandy GRAVEL. Gravel of subangular to subrounded fine to coarse flint. Occasional coarse gravel and cobble sized pockets of chalky CLAY.	
4.2 – 20.0	8.38 – -7.42	Structureless CHALK recovered as off white with light orangish brown staining gravelly slightly sandy SILT. Gravel of weak low to medium density, white chalk with occasional light orangish brown staining. Occasional fine to coarse black flint.	Bedrock

Location:		620032.35 E 328829.95 N	**Borehole ID:**	Crossing 4 BH17-C4-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):		12.71 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.5	12.71 – 12.21	Soft dark brown mottled light grey slightly silty sandy CLAY. Frequent rootlets and plant matter.			Topsoil
0.5 – 1.0	12.21 – 11.71	Soft to firm light brownish grey mottled light orangish brown slightly silty slightly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasionally layered with soft dark brown silty slightly sandy slightly gravelly CLAY.			Subsoil
1.0 – 1.8	11.71 – 10.91	Firm organic rich dark brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to medium flint. Frequent rootlets and plant matter.			Glacially derived sediment and/or Crag Group
1.8 – 3.3	10.91 – 9.41	Firm locally very soft dark grey slightly sandy silty CLAY.			
3.3 – 4.3	9.41 – 8.41	Firm dark grey slightly silty slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional gravel sized pockets of white chalky CLAY.			
4.3 – 20.0	8.41 – -7.29	Structureless CHALK recovered as light cream slightly sandy gravelly SILT. Gravel of weak, low to medium density, light creamy chalk with occasional light orangish brown staining. Occasional flint.			Chalk Bedrock

Location:		620536.65 E 329029.86 N	**Borehole ID:**	Crossing 5 BH17-C5-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):		20.32 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.4	20.32 – 19.92	Dark orangish brown slightly clayey slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to medium flint.			Topsoil
0.4 – 1.0	19.92 – 19.32	Dark orangish brown slightly silty slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to medium flint. Frequent rootlets.			Subsoil
1.0 – 4.0	19.32 – 16.32	Medium dense dark orangish brown slightly silty fine to medium SAND.			Glacially derived sediment and/or Crag Group
4.0 – 7.0	16.32 – 13.32	Medium dense becoming dense dark orangish brown slightly clayey silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Gravel sized pockets of brown sandy CLAY.			
7.0 – 10.6	13.32 – 9.72	Dense dark orangish brown gravelly silty medium to coarse SAND. Gravel of subangular to subrounded fine to medium flint.			
10.6 – 12.0	9.72 – 8.32	Dense dark grey silty gravelly medium to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Frequent shell fragments. Occasional cobbles of flint.			
12.0 – 15.0	8.32 – 5.32	Structureless CHALK recovered as white grey slightly gravelly slightly sandy SILT. Gravel of weak, low to medium density, subangular to subrounded white grey CHALK. Rare medium to coarse black flint.			Chalk Bedrock

Location:	620598.48 E 3209046.06 N	**Borehole ID:**	Crossing 5 BH17-C5-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	20.65 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	20.65 – 20.25	Dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Frequent rootlets.	Topsoil
0.4 – 1.0	20.25 – 19.65	Dark brown clayey fine to medium SAND.	Glacially derived sediment and/or Crag Group
1.0 – 1.5	19.65 – 19.15	Dark orangish brown slightly clayey fine to medium SAND.	
1.5 – 2.5	19.15 – 18.15	Medium dense dark orangish brown fine to coarse SAND.	
2.5 – 3.5	18.15 – 17.15	Medium dense dark orangish brown slightly gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
3.5 – 4.5	17.15 – 16.15	Medium dense dark orangish brown fine to coarse SAND.	
4.5 – 5.5	16.15 – 15.15	Dense dark orangish brown slightly clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint and occasional chalk.	
5.5 – 7.0	15.15 – 13.65	Dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
7.0 – 10.8	13.65 – 9.85	Dense dark orangish brown slightly gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
10.8 – 12.4	9.85 – 8.25	Dense dark brownish grey slightly gravelly fine to coarse SAND. Gravel of fine to medium flint.	
12.4 – 15.0	8.25 – 5.65	Structureless CHALK recovered as white grey slightly gravelly slightly sandy SILT. Gravel of weak, low to medium density, subangular to subrounded white grey CHALK. Rare medium to coarse black flint.	Chalk Bedrock

Location:	620770.38 E 329039.70 N	**Borehole ID:**	Crossing 5 BH17-C5-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):	20.70 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	20.70 – 20.30	Soft dark brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint. Frequent rootlets.	Topsoil
0.4 – 0.9	20.30 – 19.80	Soft dark brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk.	Glacially derived sediment and/or Crag Group
0.9 – 1.8	19.80 – 18.90	Soft dark orangish brown slightly silty slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint.	
1.8 – 3.0	18.90 – 17.70	Firm dark orangish brown silty CLAY. Occasional lenses of dark orangish brown fine to medium SAND.	
3.0 – 6.5	17.70 – 14.20	Medium dense orangish brown silty medium to coarse SAND. Rare gravel of subangular to subrounded fine to coarse flint.	
6.5 – 11.3	14.20 – 9.40	Firm locally soft and stiff orangish brown very sandy CLAY. Occasionally stained reddish brown.	
11.3 – 12.2	9.40 – 8.50	Dense dark orangish brown slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to medium flint.	
12.2 – 15.0	8.50 – 5.70	Structureless CHALK recovered as white grey slightly gravelly slightly sandy SILT. Gravel of weak, low to medium density, subangular to subrounded white grey CHALK. Rare medium to coarse black flint.	Chalk Bedrock

Location:	620807.28 E 329057.98 N	**Borehole ID:**	Crossing 5 BH17-C5-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):	20.98 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	20.98 – 20.58	Soft dark orangish brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint. Frequent rootlets.	Topsoil
0.4 – 1.0	20.58 – 19.98	Soft dark orangish brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint.	Glacially derived sediment and/or Crag Group
1.0 – 2.5	19.98 – 18.48	Medium dense orangish brown silty fine to medium SAND.	
2.5 – 3.5	18.48 – 17.48	Medium dense dark orangish brown slightly silty fine to coarse SAND. Occasional gravel sized pockets of dark brown mottled grey CLAY.	
3.5 – 5.5	17.48 – 15.48	Medium dense dark orangish brown slightly silty fine to medium SAND. Occasional gravel sized pockets of dark brown mottled grey CLAY.	
5.5 – 6.0	15.48 – 14.98	Medium dense dark orangish brown silty fine to coarse SAND.	
6.0 – 7.7	14.98 – 13.28	Medium dense dark orangish brown silty clayey very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
7.7 – 11.5	13.28 – 9.48	Medium dense orangish brown slightly silty fine to coarse SAND.	
11.5 – 11.9	9.48 – 9.08	Dense dark greyish brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
11.9 – 15.0	9.08 – 5.98	Structureless CHALK recovered as white grey slightly gravelly slightly sandy SILT. Gravel of weak, low to medium density, subangular to subrounded white grey CHALK. Rare medium to coarse black flint.	Chalk Bedrock

Location:	626336.80 E 331280.87 N	**Borehole ID:**	Crossing 6 BH17-C6-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	34.59 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.5	34.59 – 34.09	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.5 – 1.1	34.09 – 33.49	Soft dark orangish brown clayey slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.	Glacially derived sediment and/or Crag Group
1.1 – 3.0	33.49 – 31.59	Medium dense dark yellowish brown slightly silty fine to coarse SAND and fine to coarse GRAVEL. Gravel of subangular to subrounded fine to coarse flint.	
3.0 – 5.0	31.59 – 29.59	Medium dense light yellowish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
5.0 – 6.0	29.59 – 28.59	Soft light orangish brown mottled dark orangish brown and light grey sandy slightly silty CLAY.	
6.0 – 7.5	28.59 – 27.09	Loose dark greyish brown clayey fine to medium SAND. Occasionally mottled dark orangish brown.	
7.5 – 15.45	27.09 – 19.14	Loose locally medium dense dark orangish brown silty fine to medium SAND.	

Location:	626383.55 E 331326.99 N	**Borehole ID:**	Crossing 6 BH17-C6-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	35.22 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	35.22 – 34.82	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.4 – 1.5	34.82 – 33.72	Dark orangish brown slightly silty slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.	Glacially derived sediment and/or Crag Group
1.5 – 2.0	33.72 – 33.22	Medium dense dark orangish brown slightly gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional pockets of dark brown sandy CLAY.	
2.0 – 5.0	33.22 – 30.22	Medium dense dark orangish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to medium flint.	
5.0 – 6.0	30.22 – 29.22	Light yellowish brown silty gravelly fine to coarse SAND. Rare fine to coarse pockets of dark orangish brown slightly sandy CLAY.	
6.0 – 7.0	29.22 – 28.22	Soft dark orangish brown slightly silty sandy CLAY. Occasionally mottled dark reddish brown.	
7.0 – 8.0	28.22 – 27.22	Medium dense dark orangish brown slightly silty clayey fine to coarse SAND.	
8.0 – 15.45	27.22 – 19.77	Firm dark orangish brown slightly silty sandy CLAY. Occasionally mottled dark reddish brown.	

Location:	626508.14 E 331291.05 N	**Borehole ID:**	Crossing 6 BH17-C6-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):	35.66 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.5	35.66 – 35.16	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.5 – 2.5	35.16 – 33.16	Medium dense dark orangish brown silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasionally fine to coarse pockets of dark brown sandy CLAY.	Glacially derived sediment and Crag Group
2.5 – 5.5	33.16 – 30.16	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
5.5 – 6.0	30.16 – 29.66	Medium dense dark yellowish brown slightly silty very gravelly fine to coarse SAND and Gravel. Gravel of subangular to subrounded fine to coarse flint.	
6.0 – 8.0	29.66 – 27.66	Firm dark orangish brown mottled dark reddish brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.	
8.0-15.0	27.66 – 20.66	Firm dark gravelly brown occasionally mottled dark orangish brown and dark reddish brown sandy CLAY.	

Location:	E N	**Borehole ID:**	Crossing 6 BH17-C6-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):	35.39 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	35.39 – 34.99	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.4 – 1.3	34.99 – 34.09	Firm to stiff dark orangish brown mottled light grey and dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded medium to coarse flint. Occasional black organic staining.	Glacially derived sediment and/or Crag Group
1.3 – 2.5	34.09 – 32.89	Medium dense dark orangish brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Fine to coarse gravel sized and cobble sized pockets of dark brown sandy CLAY.	
2.5 – 4.5	32.89 – 30.89	Medium dense dark greyish brown gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.	
4.5 – 5.8	30.89 – 29.59	Medium dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Medium to coarse gravel sized pockets of dark orangish brown silty slightly sandy CLAY.	
5.8 – 15.0	29.59 – 20.39	Medium dense dark grey mottled dark orangish brown and black organic staining silty clayey fine to medium SAND.	

Location:	626749.29 E 331461.97 N	**Borehole ID:**	Crossing 7 BH17-C7-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	34.10 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	34.10 – 33.70	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets.	Topsoil
0.4 – 1.5	33.70 – 32.60	Dark orangish brown fine to coarse SAND.	Glacially derived sediment and/or Crag Group
1.5 – 3.5	32.60 – 30.60	Medium dense dark orangish brown fine to medium SAND.	
3.5 – 3.9	30.60 – 30.20	Medium dense dark orangish brown slightly clayey silty fine to medium SAND.	
3.9 – 5.7	30.20 – 28.40	Medium dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Rare Cobbles of flint.	
5.7 – 7.5	28.40 – 26.60	Firm light greyish brown slightly gravelly slightly sandy silty CLAY. Gravel of subangular to subrounded fine to coarse flint. Frequent local dark orangish brown staining.	
7.5 – 9.5	26.60 – 24.60	Firm light orangish grey slightly sandy silty CLAY.	
9.5 – 12.7	24.60 – 21.40	Firm light brownish grey slightly sandy silty CLAY.	
12.7 – 19.0	21.40 – 15.10	Medium dense dark brownish grey silty fine to medium SAND.	
19.0 – 20.0	15.10 – 14.10	Very dense dark grey silty fine to medium SAND.	

Location:		626792.09 E 331492.52 N	**Borehole ID:**	Crossing 7 BH17-C7-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):		32.74 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	32.74 – 32.34	Soft dark orangish brown slightly gravelly slightly sandy CLAY. Gravel subangular to subrounded fine to coarse flint. Occasional rootlets.	Topsoil
0.4 – 3.0	32.34 – 29.74	Medium dense dark orangish brown clayey gravelly fine to coarse SAND. Gravel subangular to subrounded fine to coarse flint.	Glacially derived sediment and/or Crag Group
3.0 – 3.9	29.74 – 28.84	Soft orangish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint.	
3.9 – 5.5	28.84 – 27.24	Medium dense dark orangish brown slightly clayey slightly silty fine to coarse SAND. Fine to coarse gravel sized pockets of dark brown sandy CLAY.	
5.5 – 6.8	27.24 – 25.94	Firm orangish brown slightly silty sandy CLAY.	
6.8 – 10.5	25.94 – 22.24	Firm to stiff brownish grey locally mottled greyish brown slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and flint. Occasionally stained orangish brown.	
10.5 – 10.6	22.24 – 22.14	Firm brownish grey slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium chalk and flint.	
10.6 – 17.5	22.14 – 15.24	Loose becoming medium dense dark orangish brown silty fine to medium SAND.	
17.5 – 20.0	15.24 – 12.74	Dense dark greyish brown slightly gravelly slightly silty medium to coarse SAND. Gravel of subangular to subrounded fine to medium flint.	

Location:		626802.16 E 331579.34 N	**Borehole ID:**	Crossing 7 BH17-C7-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):		28.11 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	28.11 – 27.71	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets.	Topsoil
0.4 – 1.4	27.71 – 26.71	Firm dark orangish brown mottled light grey and dark reddish brown sandy CLAY. Rare subangular to subrounded fine flint gravel. Occasional laminations of fine to medium SAND. Occasional rootlets.	Subsoil
1.4 – 5.9	26.71 – 22.21	Loose becoming medium dense dark orangish brown slightly clayey silty fine to medium SAND. Occasionally mottled dark reddish brown.	Glacially derived sediment and/or Crag Group
5.9 – 9.0	22.21 – 19.11	Firm dark brownish grey occasionally mottled dark orangish brown slightly sandy slightly gravelly CLAY. Gravel subangular to subrounded fine to coarse chalk and rare flint.	
9.0 – 11.0	19.11 – 17.11	Medium dense dark grey silty slightly clayey fine to medium SAND. Occasional pockets of dark grey gravelly CLAY with chalk gravel.	
11.0 – 16.3	17.11 – 11.81	Dense to very dense dark brown grey silty fine to medium SAND.	
16.3 – 19.7	11.81 – 8.41	Stiff dark grey slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint.	
19.7 – 20.0	8.41 – 8.11	Dark grey slightly silty gravelly SAND. Gravel of subangular to subrounded fine to coarse flint. Pockets of dark grey CLAY.	

Location:		626845.20 E 331611.63 N	**Borehole ID:**	Crossing 7 BH17-C7-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):		25.84 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.4	25.84 – 25.44	Soft dark orangish brown slightly sandy slightly silty CLAY. Rare subangular to subrounded fine flint gravel. Frequent rootlets.	Topsoil
0.4 – 1.0	25.44 – 24.84	Stiff dark orangish brown slightly sandy CLAY. Occasionally mottled light grey.	Glacially derived sediment and/or Crag Group
1.0 – 6.4	24.84 – 19.44	Loose becoming medium dense light orangish brown slightly clayey silty fine to medium SAND. Rare gravel of subangular to subrounded fine to coarse flint. Occasional fine to coarse gravel and cobble sized pockets of dark brown mottled light grey and reddish brown sandy CLAY.	
6.4 – 7.7	19.44 – 18.14	Medium dense dark orangish brown silty slightly clayey gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
7.7 – 10.0	18.14 – 15.84	Firm to stiff dark brownish grey mottled dark orangish brown and dark brown slightly gravelly slightly silty sandy CLAY. Gravel of subangular to subrounded fine to coarse flint. Rare shell fragments.	
10.0 – 16.7	15.84 – 9.14	Loose becoming medium dense dark grey silty fine to coarse SAND. Rare subangular to subrounded fine to medium flint.	
16.7 – 20.0	9.14 – 5.84	Firm to stiff dark brownish grey slightly gravelly slightly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.	

Location:	639341.81 E 329922.11 N	**Borehole ID:**	Landfall SE option BH17-L1A-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	4.14 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	4.14 – 3.84	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.3 – 2.0	3.84 – 2.14	Stiff to very stiff dark orangish brown mottled light grey sandy CLAY. Rare gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments, black mottling and rootlets.	Glacially derived sediment
2.0 – 4.0	2.14 – 0.14	Firm dark orangish brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasionally mottled light grey and light greyish brown.	
4.0 – 4.5	0.14 – -0.36	Firm to stiff dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	
4.5 – 5.5	-0.36 – -1.36	Medium dense light brown silty slightly gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	Marine sands; Crag Group
5.5 – 7.0	-1.36 – -2.86	Medium dense dark grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
7.0 – 8.5	-2.86 – -4.36	Medium dense light greyish brown silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.	
8.5 – 10.0	-4.36 – -5.86	Loose light grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
10.0 - 11.0	-5.86 – -6.86	Medium dense dark grey slightly gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	
11.0 – 15.0	-6.86 – -10.86	Medium dense light brown silty slightly gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	

Location:		639485.00 E 329738.21 N	**Borehole ID:**	Landfall SE option BH17-L1A-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):		3.25 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	3.25 – 2.95	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.			Topsoil
0.3 – 1.8	2.95 – 1.45	Stiff dark orangish brown mottled light grey sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasionally mottled dark brown and black and occasional rootlets.			Glacially derived sediment
1.8 – 2.7	1.45 – 0.55	Soft to firm dark greyish brown slightly silty slightly sandy CLAY.			
2.7 – 7.0	0.55 – -3.75	Medium dense dark yellowish brown silty fine to coarse SAND. Occasional fine to coarse gravel sized pockets of dark brown sandy CLAY.			Marine Sands; Crag Group
7.0 – 8.0	-3.75 – -4.75	Medium dense dark greyish brown silty micaceous fine SAND.			
8.0 – 10.0	-4.75 – -6.75	Medium dense dark greyish brown silty fine to coarse SAND.			
10.0 – 14.0	-6.75 – -10.75	Medium dense light grey brown mottled dark greyish brown silty fine to coarse SAND.			

Location:		639479.54 E 329911.26 N	**Borehole ID:**	Landfall SE option BH17-L1A-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):		3.66 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	3.66 – 3.36	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.			Topsoil
0.3 – 1.1	3.36 – 2.56	Soft to firm dark orangish brown mottled light grey sandy CLAY. Rare subangular to subrounded fine to coarse flint gravel.			Glacially derived sediment
1.1 – 3.4	2.56 – 0.26	Firm to stiff dark orangish brown mottled light greyish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional shell fragments.			
3.4 – 7.0	0.26 – -3.34	Firm to stiff dark grey sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.			
7.0 – 13.0	-3.34 – -9.34	Medium dense light grey silty fine to coarse SAND.			Marine sands; Crag Group
13.0 – 18.0	-9.34 – -14.34	Very dense to dense light grey silty fine to medium SAND.			

Location:		639551.64 E 329979.62 N	**Borehole ID:**	Landfall SE option BH17-L1A-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):		5.79 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	5.79 – 5.49	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.			Topsoil
0.3 – 1.8	5.49 – 3.99	Medium dense dark orangish brown clayey fine to medium SAND. Rare gravel of subangular to subrounded fine to coarse flint.			Glacially derived sediment and/or Crag Group
1.8 – 4.1	3.99 – 1.69	Firm dark orangish brown mottled light grey and occasionally mottled dark brown very slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to coarse flint.			
4.1 – 10.0	1.69 – -4.21	Firm to stiff dark greyish brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional bands and mottling with dark orangish brown. Occasional shell fragments.			
10.0 – 20.0	-4.21 – -14.21	Loose becoming medium dense and very dense dark grey silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Marine sands; Crag Group

Location:		639665.41 E 330085.17 N	**Borehole ID:**	Landfall SE option BH17-L1A-05	**Comments:** Norfolk Vanguard Cable Route
Level (top):		1.91 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 1.8	1.91 – 0.11	Dark yellowish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			Beach sands
1.8 – 2.0	0.11 – -0.09	Soft to firm dark brown slightly silty slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional shell fragments and occasionally laminated.			Glacially derived sediment
2.0 – 4.6	-0.09 – -2.69	Firm to stiff dark grey sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.			
4.6 – 8.0	-2.69 – -6.09	Medium dense dark grey gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.			Marine sands; Crag Group

Location:	638643.01E 330317.53 N	**Borehole ID:**	Landfall NW option BH17-L1B-01	**Comments:** Norfolk Vanguard Cable Route
Level (top):	11.58 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	11.58 – 11.28	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.3 – 1.0	11.28 – 10.58	Dark orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional rootlets.	Glacially derived sediment and/or Crag Group
1.0 – 1.5	10.58 – 10.08	Light orangish brown slightly gravelly clayey fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.	
1.5 – 4.0	10.08 – 7.58	Loose light orangish brown slightly silty clayey fine to medium SAND. Occasional fine to coarse pockets of light orangish brown sandy CLAY.	
4.0 – 7.8	7.58 – 3.78	Medium dense light brown gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments.	
7.8 – 9.5	3.78 – 2.08	Firm to stiff dark orangish brown occasionally mottled dark reddish brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium flint. Occasional thin dark greyish brown laminations. Occasional shell fragments.	
9.5 – 10.3	2.08 – 1.28	Stiff to very stiff dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	
10.3 – 14.0	1.28 – -2.42	Dense to very dense light greyish brown mottled light orangish brown silty fine to medium SAND.	Marine sands; Crag Group
14.0 – 20.0	-2.42 – -8.42	Dense light greyish brown silty micaceous fine SAND	

Location:	638719.03 E 330167.24 N	**Borehole ID:**	Landfall NW option BH17-L1B-02	**Comments:** Norfolk Vanguard Cable Route
Level (top):	11.42 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	11.42 – 11.12	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.3 – 1.5	11.12 – 9.92	Light orangish brown slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Coarse gravel sized pockets of reddish brown slightly silty fine to medium SAND. Occasional rootlets.	Glacially derived sediment and/or Crag Group
1.5 – 2.0	9.92 – 9.42	Medium dense dark orangish brown fine to coarse SAND.	
2.0 – 3.0	9.42 – 8.42	Firm dark orangish brown and greenish grey slightly sandy CLAY. Occasional mottling with dark reddish brown. Occasionally laminated with fine to coarse SAND.	
3.0 – 8.9	8.42 – 2.52	Dense dark orangish brown fine to coarse SAND. Rare fine to medium gravel sized pockets of dark orangish brown mottled light grey clayey SAND. Rare shell fragments.	
8.9 – 9.0	2.52 – 2.42	Soft dark orangish brown sandy silty CLAY.	
9.0 – 10.5	2.42 – 0.92	Medium dense dark orangish brown fine to coarse SAND. Rare gravel sized pockets of dark orangish brown mottled light grey clayey SAND. Rare shell fragments.	
10.5 – 12.2	0.92 – -0.78	Medium dense dark orangish brown slightly clayey slightly silty SAND. Fine to medium sized pockets of soft dark orangish brown CLAY.	
12.2 – 17.5	-0.78 – -6.08	Firm to stiff dark greyish brown slightly sandy silty CLAY. Occasional shell fragments. Rare subangular to subrounded fine to coarse flint gravel.	
17.5 – 19.45	-6.08 – -8.03	Dark grey slightly silty fine to medium SAND. Occasional Shell fragments. Occasional fine to coarse gravel sized pockets of dark grey sandy CLAY.	

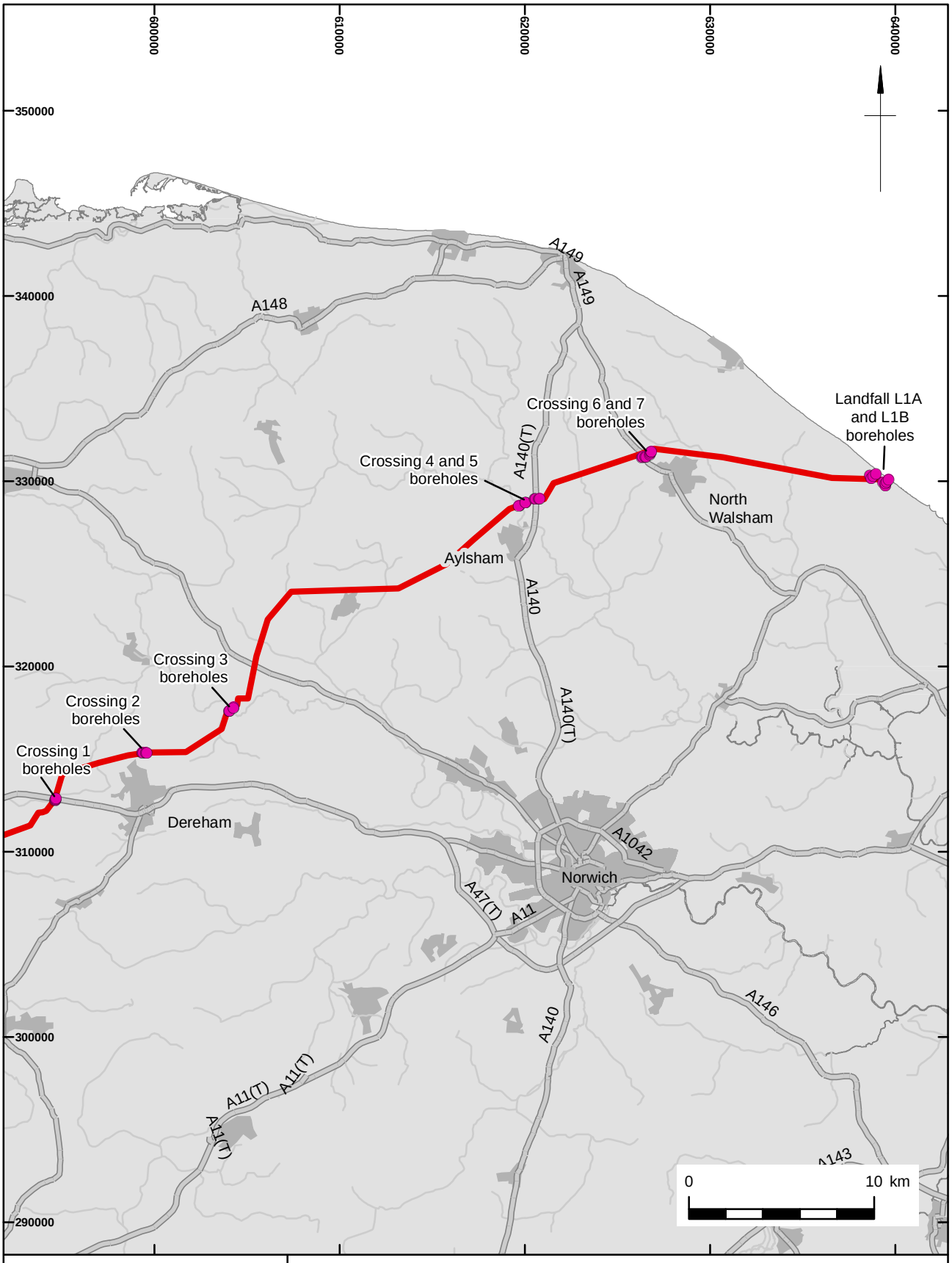
Location:		638828.69 E 330276.05 N	**Borehole ID:**	Landfall NW option BH17-L1B-03	**Comments:** Norfolk Vanguard Cable Route
Level (top):		12.42 mAOD	**Drg:**		
Depth		**Sediment description**			**Interpretation**
Mbg	mOD				
0 – 0.3	12.42 – 12.12	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.			Topsoil
0.3 – 11.5	12.12 – 0.92	Medium dense light orangish brown silty fine to medium SAND. Rare subangular to subrounded fine to coarse flint gravel. Fine to medium gravel sized pockets of dark reddish brown slightly silty clayey SAND.			Glacially derived sediment and/or Crag Group
11.5 – 13.0	0.92 – -0.58	Dense dark orangish brown gravelly silty fine to medium SAND. Gravel of subangular to subrounded fine to medium flint. Occasional fine to coarse gravel sized pockets of dark orangish brown sandy CLAY.			
13.0 – 13.8	-0.58 – -1.38	Very dense dark orangish brown gravelly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			
13.8 – 16.0	-1.38 – -3.58	Very dense dark greyish brown occasionally dark grey silty fine to coarse SAND. Fine to coarse gravel sized pockets of dark greyish brown sandy CLAY.			
16.0 – 20.0	-3.58 – -7.58	Very dense dark grey silty fine to coarse SAND. Rare gravel of subangular to subrounded fine to medium flint. Rare shell fragments.			

Location:	638976.43 E 330.391.52 N	**Borehole ID:**	Landfall NW option BH17-L1B-04	**Comments:** Norfolk Vanguard Cable Route
Level (top):	7.79 mAOD	**Drg:**		

Depth		**Sediment description**	**Interpretation**
Mbg	mOD		
0 – 0.3	7.79 – 7.49	Soft dark brown sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint.	Topsoil
0.3 – 1.5	7.49 – 6.29	Dark orangish brown slightly clayey slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint.	Glacially derived sediment and/or Crag Group
1.5 – 3.0	6.29 – 4.79	Soft dark orangish brown slightly sandy slightly gravelly CLAY. Gravel of subangular to subrounded fine to coarse flint. Fine to coarse sized pockets of light brownish white CLAY.	
3.0 – 8.2	4.79 – -0.41	Very dense light greyish brown slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional shell fragments. Occasionally mottled dark orangish brown.	
8.2 – 9.0	-0.41 – -1.21	Firm dark orangish brown mottled dark grey slightly silty slightly sandy CLAY. Occasional laminations and dark brown staining.	
9.0 – 10.0	-1.21 – -2.21	Medium dense light orangish brown slightly silty slightly gravelly fine to medium SAND. Gravel of subangular to subrounded fine to medium flint.	
10.0 – 10.3	-2.21 – -2.51	Dark orangish brown slightly silty slightly gravelly fine to coarse SAND. Gravel of fine-medium flint. Occasional clay pockets and shell fragments.	
10.3 – 13.4	-2.51 – -5.61	Firm to stiff dark brown slightly gravelly sandy CLAY. Gravel of subangular to subrounded fine to medium. Frequent shell fragments. Occasional dark orangish brown mottling.	
13.4 – 13.5	-5.61 – -5.71	Firm to stiff dark orangish brown slightly gravelly slightly sandy CLAY.	
13.5 – 16.0	-5.71 – -8.21	Dense dark yellowish brown slightly silty slightly gravelly SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional fine to coarse gravel sized pockets of dark orangish brown sandy CLAY.	

10.2 Laboratory-based core descriptions (selected core sections)

Depth		Sediment description	Interpretation
mbgl	mOD		
BH17-C3-03			
13.5 – 13.9	8.83 – 8.43	Stiff dark grey (10YR 4/1) slightly gravelly sandy clayey SILT. Abundant weathered subangular to subrounded gravel clasts of chalk ≤40mm with a defined band of chalky gravel at 13.53-13.56 mbgl.in sandy clayey SILT matrix.	Glacially derived sediment
BH17-C4-01			
1.5 – 1.95	11.31 – 10.86	Firm greyish-brown (10YR 5.2) slightly gravelly sandy SILT with yellowish-brown mottling (10YR 5.4). Very occasional subangular to subrounded weathered flint ≤8mm.	Glacially derived sediment and/orCrag Group
BH17-C4-02			
4.5 – 4.62	8.05 – 7.93	Gap	
4.62 – 4.63	7.93 – 7.92	Firm brown to yellow-brown (10YR 5.2 to 5.4) slightly silty fine to medium SAND	Glacially derived sediment and/or Crag Group
4.63 – 4.82	7.92 – 7.73	Firm dark greyish brown (10YR 4/2) slightly gravely silty fine to medium SAND. Gravels are subangular to subrounded ≤10mm.	
4.82 – 4.95	7.73 – 7.60	Firm very dark grey to very dark greyish-brown (10YR 3/1 to 3/2) slightly gravelly sandy SILT. Subangular to subrounded gravels ≤20mm.	
BH17-L1A-04			
6.0 – 7.0	-0.21 – -1.21	Stiff dark greyish brown (10YR 4/2) slightly gravelly sandy clayey SILT. Gravel is fine to medium, weathered and abraded, angular to subrounded ≤20mm. Occasional chalk flecks.	Glacially derived sediment
BH17-L1A-05			
2 – 2.45	-0.09 – -0.45	Very dark greyish-brown (10YR 4/2) slightly gravelly sandy clayey SILT. Subrounded chalk ≤20mm.	Glacially derived sediment
BH17-L1B-04			
11.6 – 12.05	-3.81 – -4.26	Very dark grey to very dark greyish-brown (10YR 3/1 to 3/2) slightly gravelly sandy clayey SILT. Very occasional subangular to subrounded gravels ≤10mm. Fine dark grey (10YR 3/1) slightly sandy silty CLAY band from 11.82–11.84 mbgl	Glacially derived sediment



Borehole locations

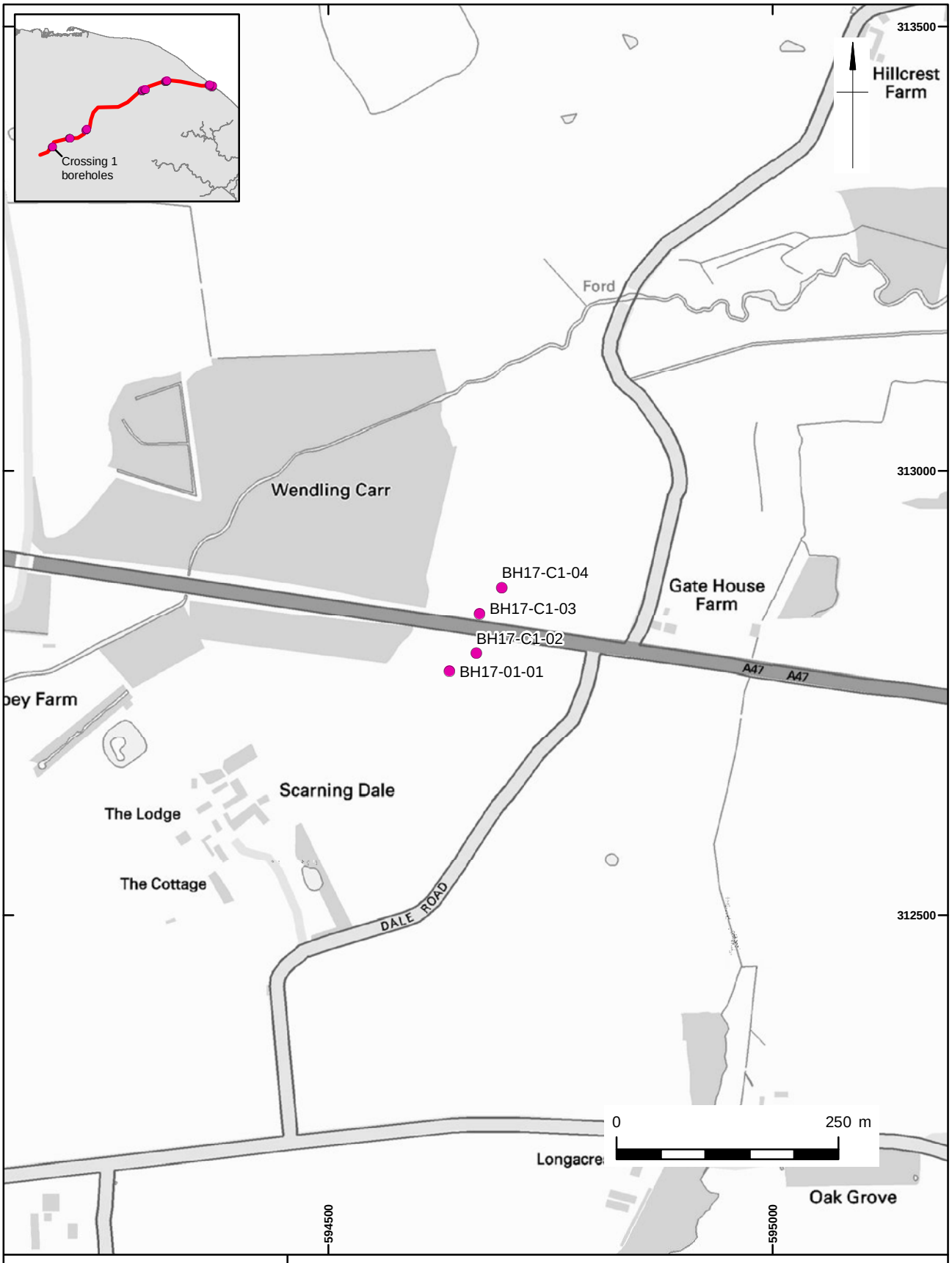
Approximate route of cable

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:300,000 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Norfolk Vanguard onshore project area borehole locations

Figure 1



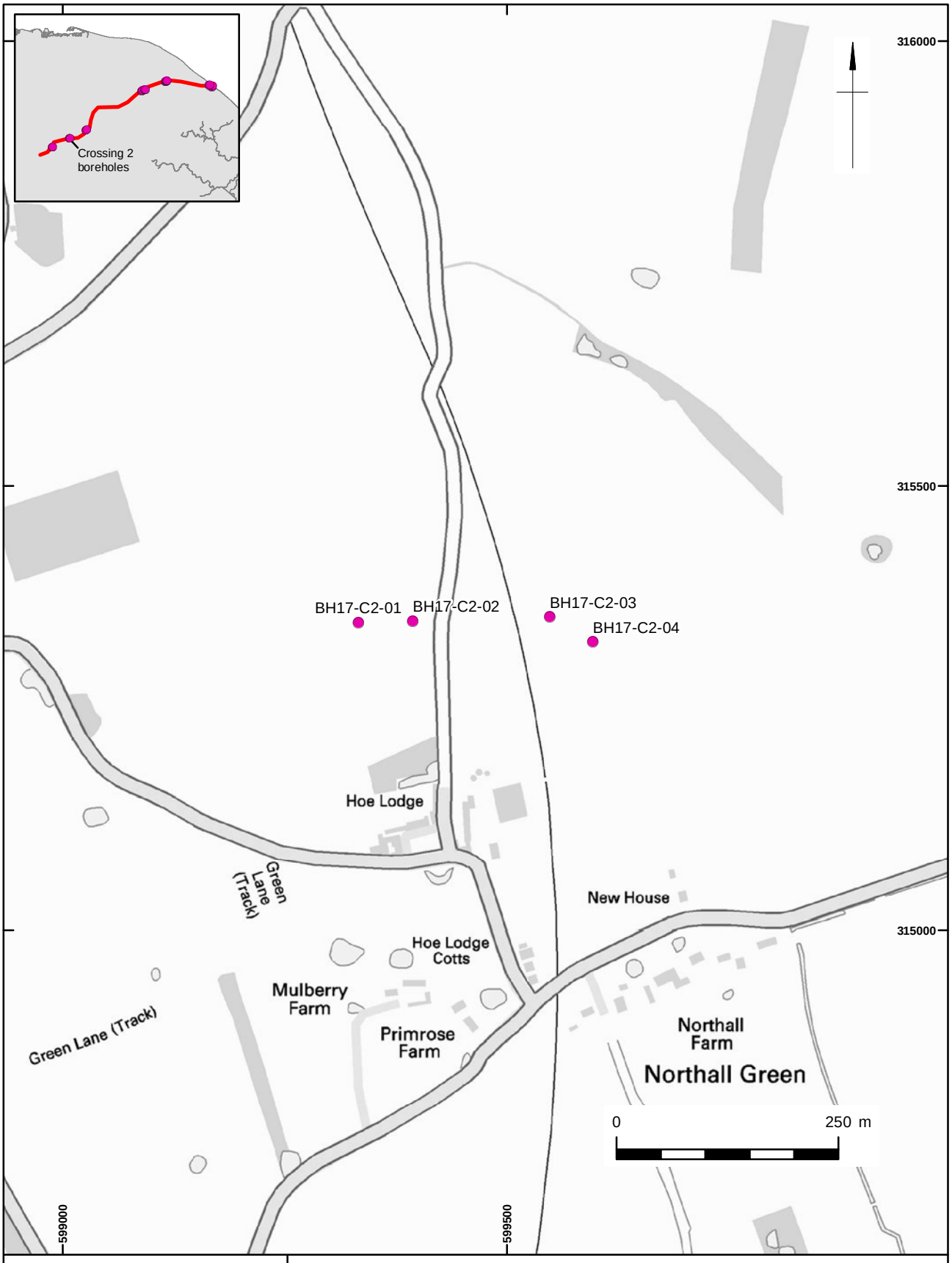
Borehole locations

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:6250 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Crossing 1 borehole locations

Figure 2



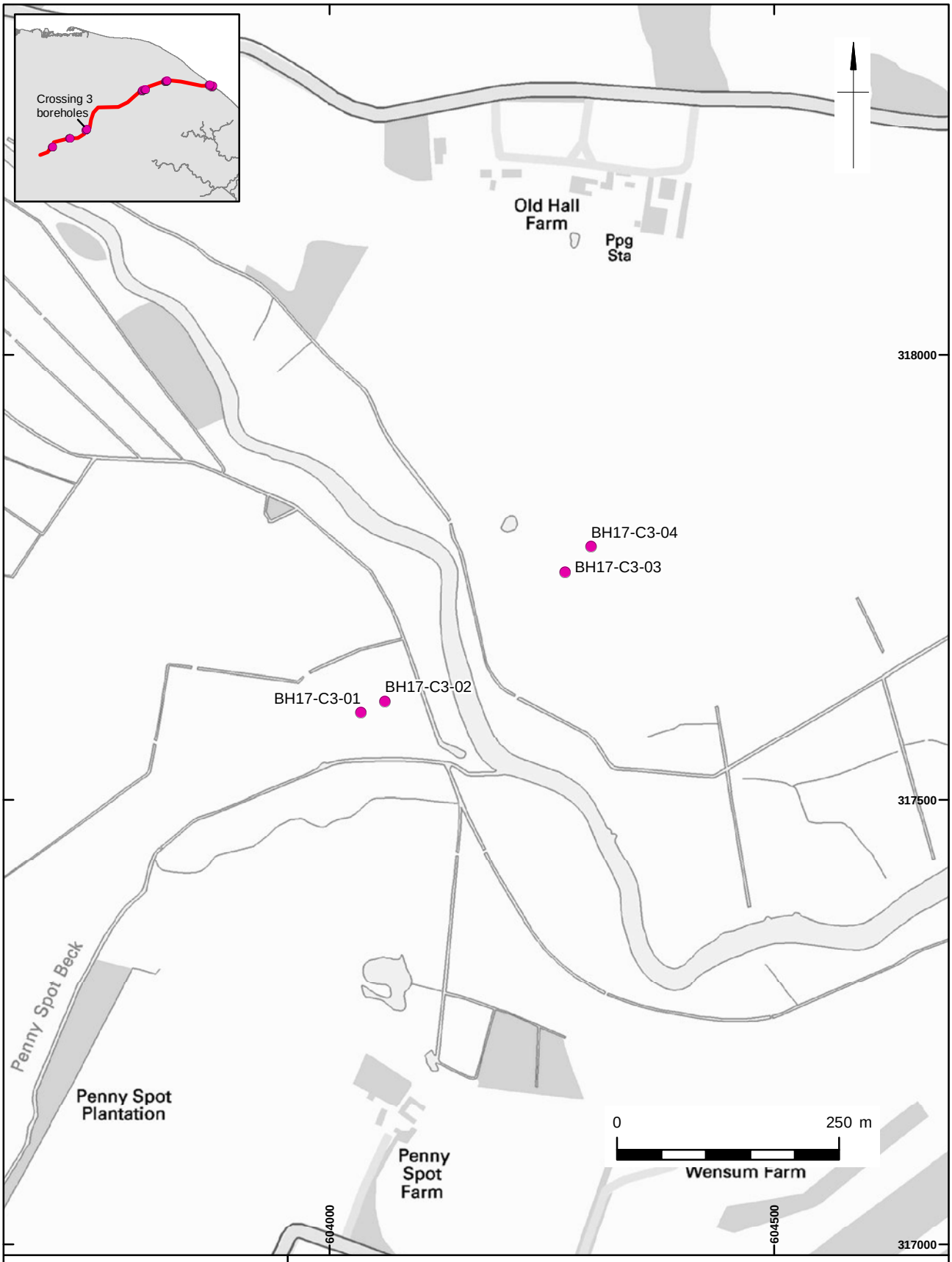
Borehole locations

Date:	25/10/2017	Revision Number:	0
Scale:	1:6250 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Coordinate system:
OSGB36 (OSTN15/OSGM15)

Crossing 2 borehole locations

Figure 3



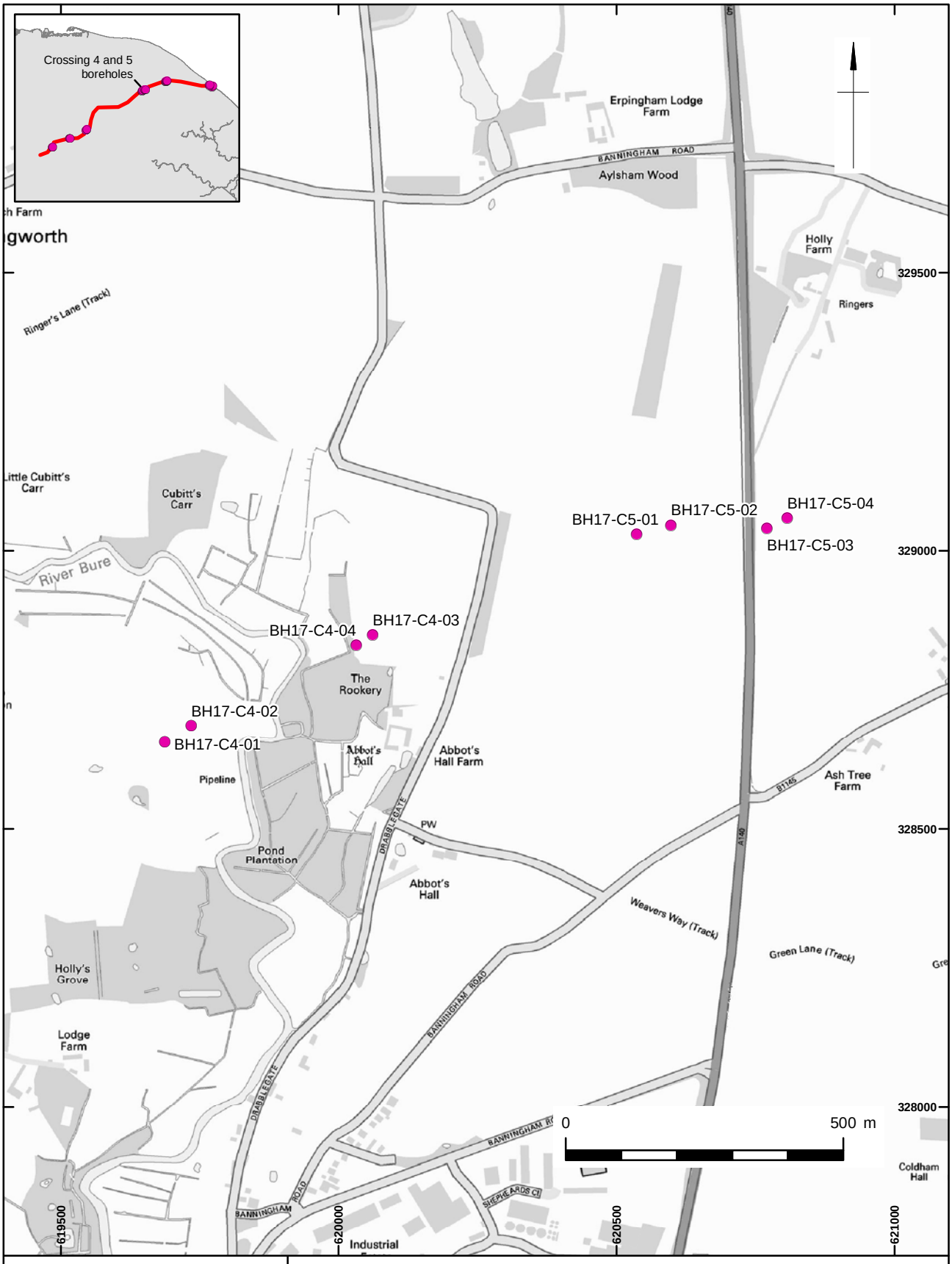
Borehole locations

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:6250 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Crossing 3 borehole locations

Figure 4



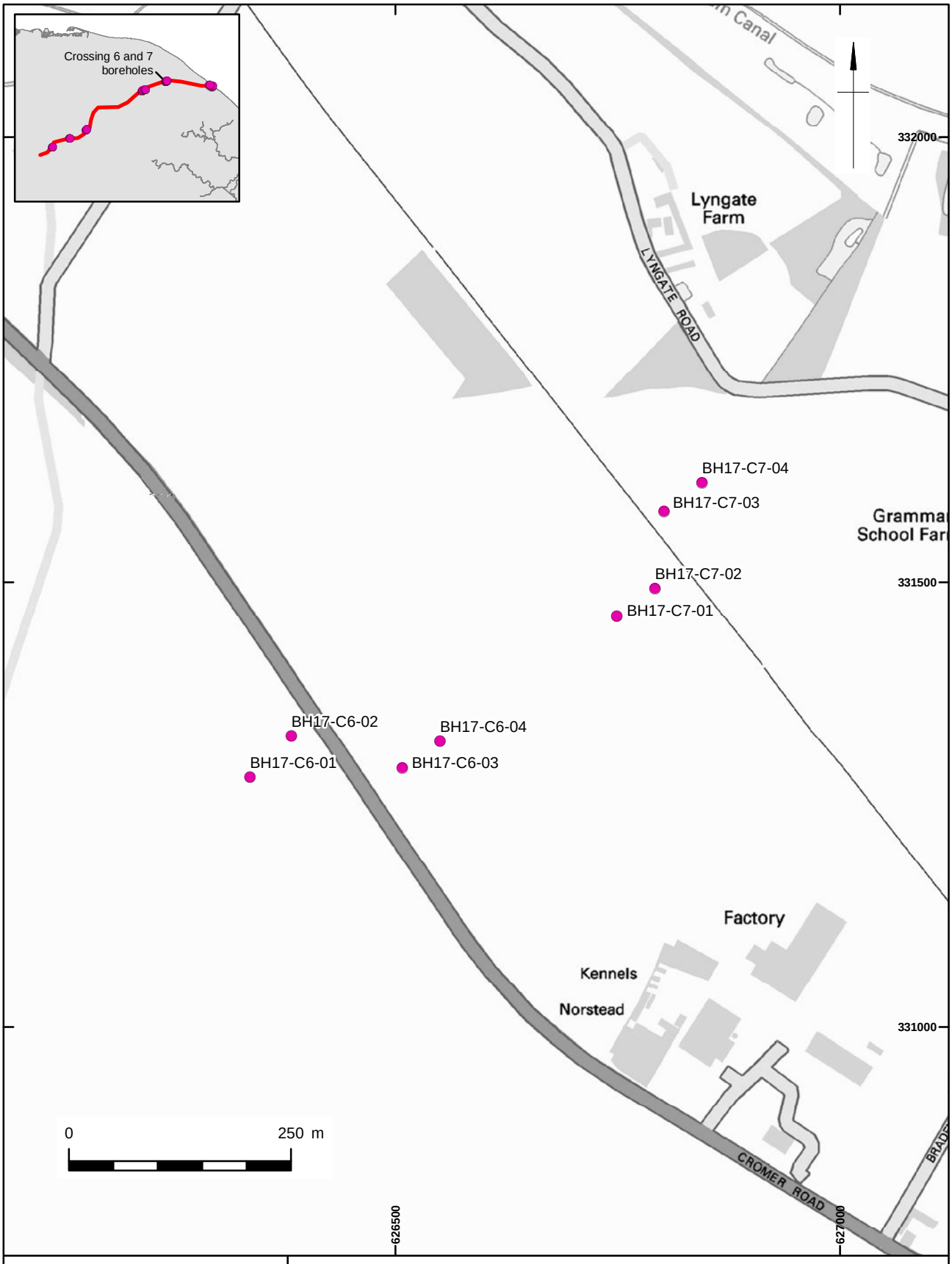
Borehole locations

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:10,000 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Crossing 4 and 5 borehole locations

Figure 5



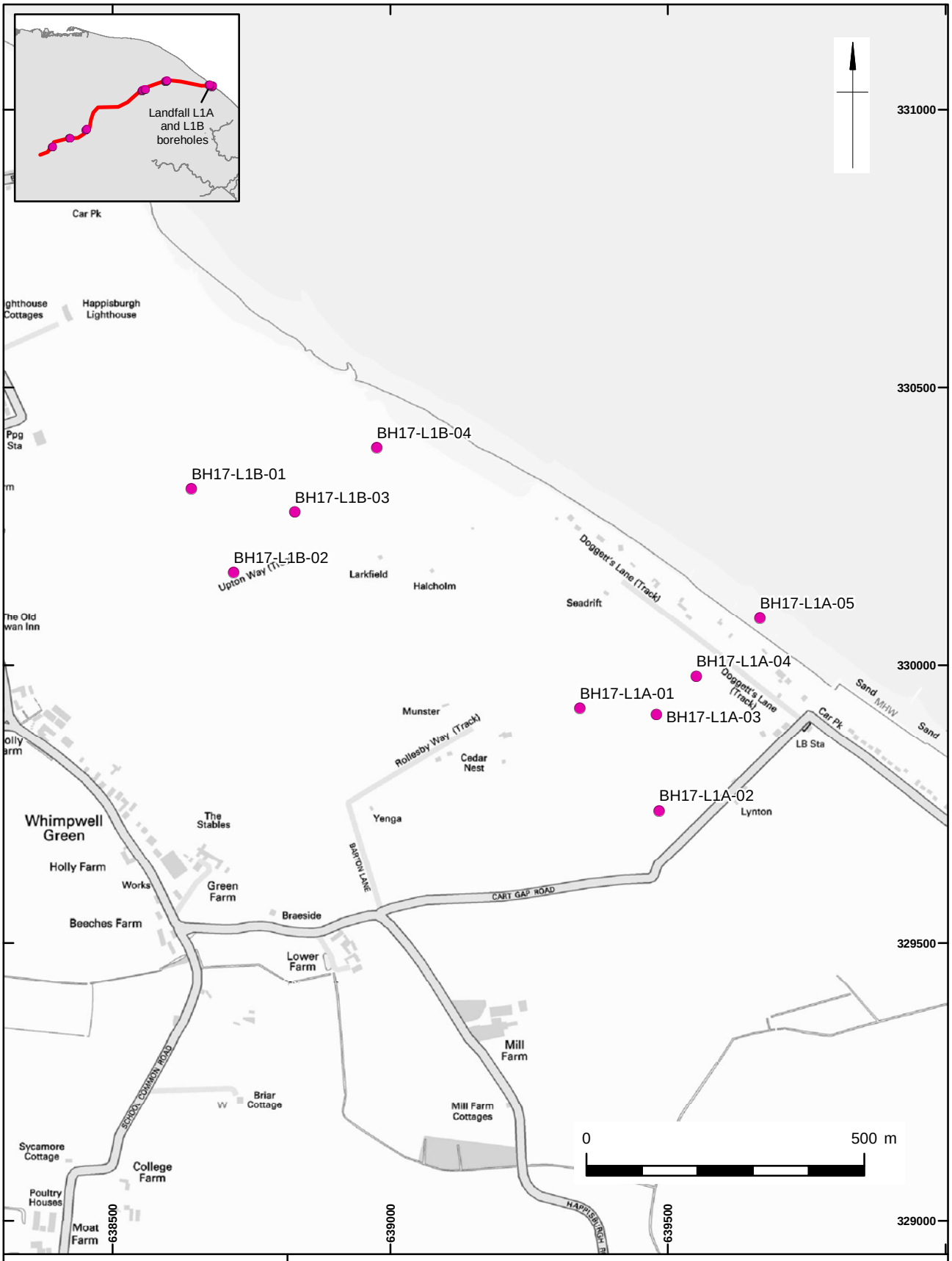
Borehole locations

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:6250 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Crossing 6 and 7 borehole locations

Figure 6



Borehole locations

Coordinate system: OSGB36 (OSTN15/OSGM15)

Date:	25/10/2017	Revision Number:	0
Scale:	1:6250 at A4	Illustrator:	KJF
Path:	X:\PROJECTS\114841\GIS\FigsMXD\2017_10_25		

Landfall L1A and L1B borehole locations

Figure 7