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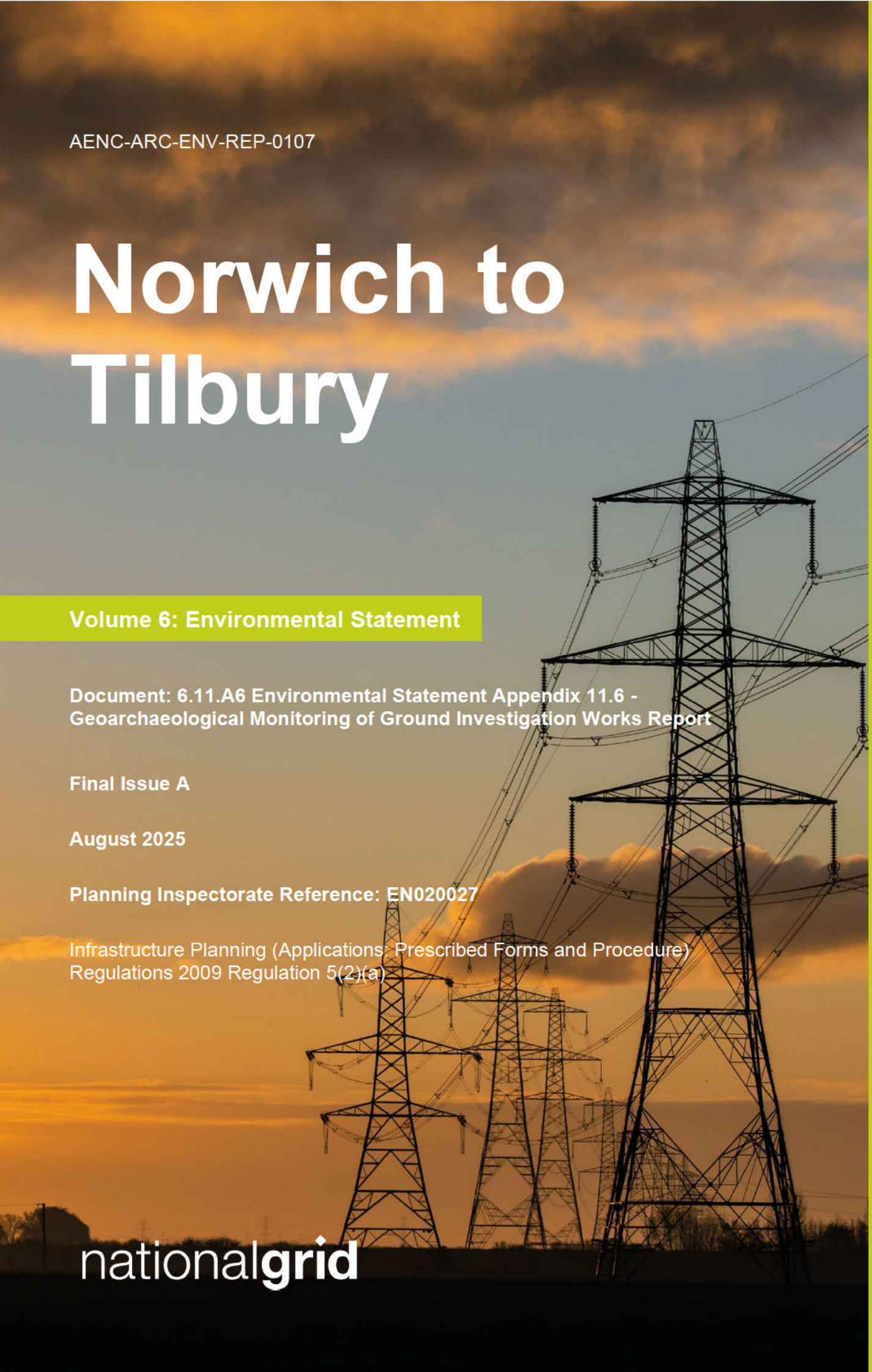

nationalgrid

EAGW24

Norwich to Tilbury: Waveney Valley Crossing

Geoarchaeological Monitoring and Recording of Geotechnical Investigation (GI) Groundworks

Headland Archaeology Midlands & West
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for Arcadis
on behalf of National Grid

Version 3.1
26/08/2025

HEADLAND ARCHAEOLOGY

PROJECT INFORMATION:

PROJECT NAME	**Norwich to Tilbury**
TYPE OF WORK	Geoarchaeological Monitoring and Recording of Geotechnical Investigation (GI) Groundworks
CLIENT	Arcadis on behalf of National Grid
GI CONTRACTOR	Structural Soils
PLANNING REF	N/A
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LOCAL AUTHORITIES	Section A: South Norfolk Council
	Section B: Mid-Suffolk District Council
ARCHAEOLOGICAL ADVISORS	Norfolk – John Percival
	Suffolk – Matt Baker
FIELDWORK DATES	02/09/2024-1/11/2024
OASIS ID	HEADLAND1-531325
SCCAS PARISH CODES	PAL 079

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PROJECT SUMMARY

Headland Archaeology were commissioned by Arcadis behalf of National Grid to undertake geoarchaeological monitoring of geotechnical investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The Proposed Development Area (PDA) comprises an approximately 184km linear route for a new electricity transmission connection between existing substations at Norwich (NGR: TG 216023) and Tilbury (NGR: TQ 661762).

This report concerns geoarchaeological monitoring of GI groundworks in the area of the River Waveney valley crossing. Interventions were carried out across a mixture of arable and pastoral fields, centred on NGR: TM 09902 79419. The River Waveney valley crossing includes both project area Section A: South Norfolk Council and Section B: Mid-Suffolk District Council, which are under the oversight of these respective planning authorities.

The principal aim of the geoarchaeological monitoring was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. The purpose of the investigation was to record and advance understanding of the significance of these assets, and to provide data that will inform the further mitigation strategy and a future phase of purposive geoarchaeological investigation.

Records from a total of 15-no. monitored interventions in the River Waveney valley were used to create 2-no. deposit models of superficial geological deposits in this area of the route. The modelling revealed that the chalk bedrock was overlain by a complex sequence of superficial geological deposits relating to past fluvial, glacial and lacustrine environments, that were commonly capped by combinations of made ground, topsoil, alluvium and river terrace deposits.

Deposits of palaeoenvironmental and geoarchaeological interest were identified as follows: alluvium, peat, lodge farm clay and silt deposits as well as possible interglacial lacustrine deposits. Tufa deposits were also locally present within uppermost alluvial layers.

No archaeological deposits were encountered beneath the made ground.

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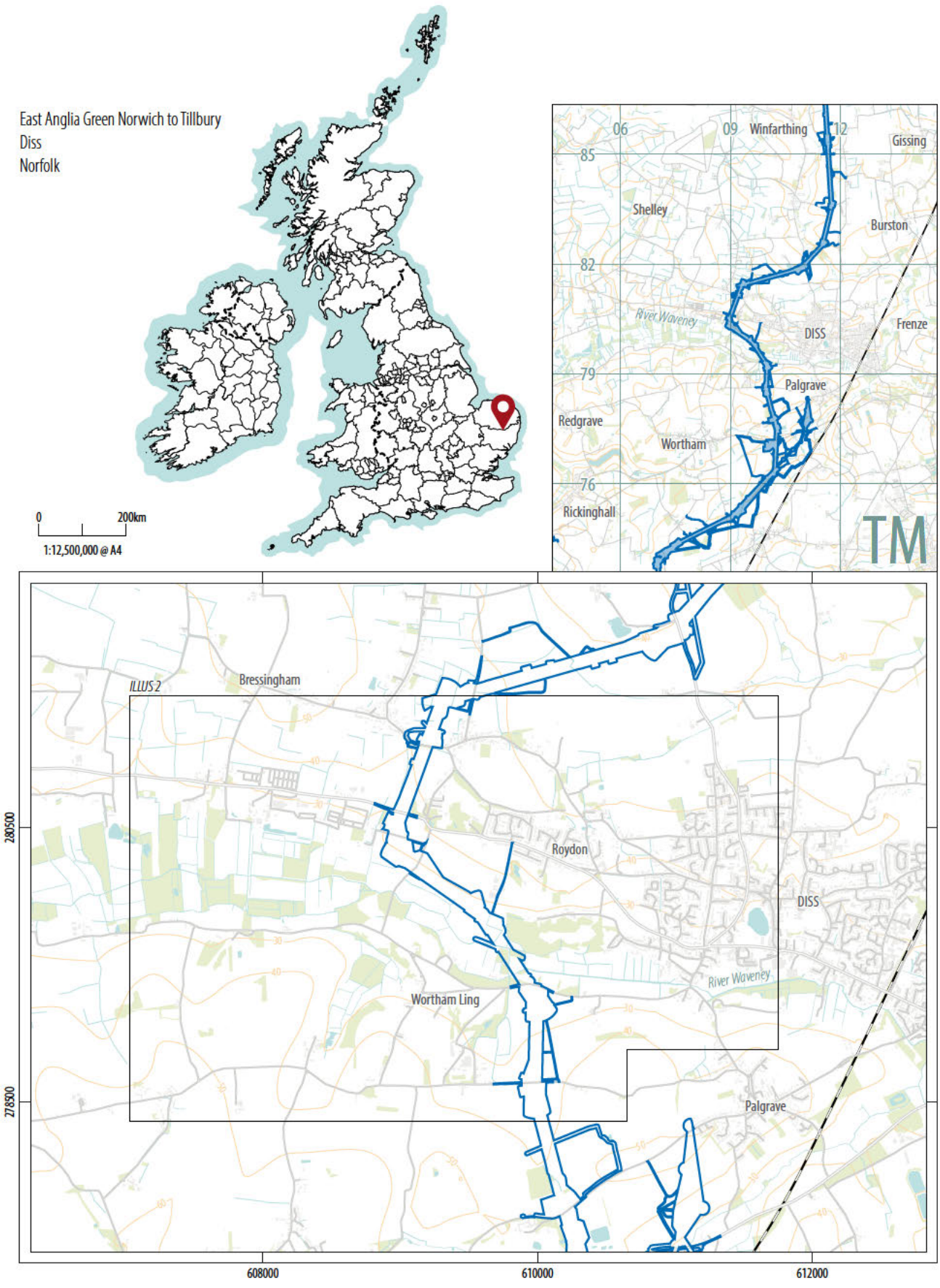

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ILLUS 1 Site location

Norwich to Tilbury: Waveney Valley Crossing

Geoarchaeological Monitoring and Recording of Geotechnical Investigation (GI) Groundworks

1. INTRODUCTION

1.1. PROJECT BACKGROUND

1.1.1. Headland Archaeology (UK) Ltd. was commissioned by Arcadis on behalf of National Grid (hereafter the 'client') to undertake geoarchaeological monitoring and recording of geotechnical investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The overarching project comprises a new electricity transmission connection between existing substations at Norwich and Tilbury.

1.1.2. The purpose of the geoarchaeological monitoring of the GI works was to gather additional information to inform a future phase of mitigation comprising purposive geoarchaeological investigation. As such, environmental sampling strategies and specialist dating of deposits relating to geoarchaeological deposits will be undertaken during further mitigation, to allow a robust, informed sampling and dating strategy based on this phase of data gathering.

1.1.3. This report describes the results of the fieldwork dated: 02/09/2024-01/11/2024 inclusive that was conducted in the River Waveney valley crossing area (centred on NGR: TM 09902 79419); as well as the subsequent modelling of deposits present in the monitored geotechnical intervention (GI) groundworks and provides an assessment of the geoarchaeological and palaeoenvironmental potential of these deposits.

1.1.4. The methodology for geoarchaeological monitoring and predictive deposit modelling follows the approach set out in the WSI (Headland Archaeology, 2024).

1.1.5. This document conforms to current best practice guidelines, including the following: CIfA Standard and guidance for archaeological monitoring and recording (CIfA, 2014a-c); 'Geoarchaeology: using earth sciences to understand the archaeological record' (Historic England 2015); 'Deposit Modelling and Archaeology: guidance for mapping buried deposits' (Historic England 2020), and 'Preserving Archaeological Remains' (Historic England 2016).

1.1.6. This document also takes into account the relevant standards and guidance of both Norfolk and Suffolk County.

2. SCOPE OF THE WORK

Rationale for current Geoarchaeological Works

2.1.1. GI works at Waveney Valley Crossing comprised a total of 24-no. geotechnical pits and 21-no. boreholes, of which 7-no. geotechnical pits and 12-no. boreholes were identified as having geoarchaeological potential and were designated for monitoring.

2.1.2. The selected pits and boreholes were chosen based on their geoarchaeological potential, targeted primarily on river terrace deposits in the Waveney Valley (Table 2-1).

2.1.3. The 19-no. interventions selected for monitoring, are as follows:

- 12 cable percussion boreholes, of which 3 were descoped
- 3 trial pits, 1 of which was descoped
- 4 infiltration pits

2.1.4. Of these, 3-no boreholes and 1-no trial pits were descoped prior to works commencing. In total 15-no. geological interventions were monitored and are reported on here.

Table 2-1: Rationale for monitoring of Pits and Boreholes in Section A and Section B – Waveney Valley crossing

Location No	Intervention Type	NGR	Reason for geoarchaeological monitoring
MM_RG_TP_105	Test pit	609548.18, 279838.27	Presence of river terrace deposits (sands and gravels)
MM_RG_BH_103	Cable percussion borehole	609594.5, 279746.18	Presence of peat deposits
MM_RG_BH_104	Cable percussion borehole	609512.61, 279681.18	Presence of river terrace deposits (sands and gravels)
MM_RG_BH_105	Cable percussion borehole	609738.25, 279672.85	Presence of peat deposits
MM_RG_BH_106	Cable percussion borehole	609692.26, 279594.06	Presence of peat deposits
MM_RG_BH_107	Cable percussion borehole	609677.85, 279504.51	Presence of peat deposits
MM_RG_BH_108	Cable percussion borehole	609880.53, 279528.69	Presence of peat deposits
MM_RG_IP_103	Infiltration pit	609998.49, 279531.32	Presence of peat deposits
MM_RG_BH_109	Cable percussion borehole	609841.8, 279448.12	Presence of river terrace deposits (sands and gravels)
MM_RG_IP_107	Infiltration pit	610097.96, 279412.46	Presence of river terrace deposits (sands and gravels)
MM_RG_BH_110	Cable percussion borehole	609956.86, 279377.21	Presence of river terrace deposits (sands and gravels)
MM_RG_BH_111	Cable percussion borehole	609838.78, 279335.28	Presence of river terrace deposits (sands and gravels)
MM_RG_BH_112	Cable percussion borehole	610083.98, 279304.46	Presence of river terrace deposits (sands and gravels)
MM_RG_IP_106	Infiltration pit	610169.09, 279254.24	Presence of river terrace deposits (sands and gravels)
MM_RG_TP_107	Test pit	609813.76, 279208.31	Presence of river terrace deposits (sands and gravels)
MM_RG_IP_105	Infiltration pit	609838.93, 279096.78	Presence of river terrace deposits (sands and gravels)
MM_RG_TP_108	Test pit	609886.29, 279064.19	Presence of Lodge Farm silt and clay member - clay, silt and sand – within wider area of geoarchaeological potential

Location No	Intervention Type	NGR	Reason for geoarchaeological monitoring
MM_RG_BH_113	Cable percussion borehole	609956.89, 279094.01	Presence of Lodge Farm silt and clay member - clay, silt and sand – within wider area of geoarchaeological potential
MM_RG_BH_114	Cable percussion borehole	610034.5, 279041.14	Presence of Lowestoft Diamicton – within wider area of geoarchaeological potential

2.1.5. This report sits alongside an Archaeological Watching Brief Report and provides an assessment of the geoarchaeological potential of these sequences and a suitable reference within which to inform further geoarchaeological works, where appropriate.

2.1.6. All work was carried out in accordance with standard industry guidelines for archaeological excavation (CIfA, 2014a-e) and Historic England guidance (Historic England 2015, 2022, 2023).

3. SITE DESCRIPTION

3.1. LOCATION

3.1.1. The Waveney Valley Crossing (hereafter the 'scheme area') is oriented north-west to south-east and is centred on OSGB NGR (TM 09902 79419).

3.1.2. The scheme area straddles the county border between Suffolk (Mid-Suffolk District) and Norfolk (South Norfolk District), with the River Waveney acting as the county boundary as the scheme crosses the River Waveney c.1km east of Diss.

3.1.3. Land-use in the scheme area is mostly of mixed agricultural and residential use, with the areas at the north and south comprised of large arable fields, and rough, damp pasture towards the centre in proximity to the River Waveney. Residential housing is scattered throughout the landscape.

3.1.4. In proximity to the scheme area are Wortham Ling, a Site of Special Scientific Interest (SSSI), and the Roydon Fen Nature Reserve.

3.1.5. Summaries of the scheme-wide descriptions of the route within their eight geographical sections are located in the OWSI and are not repeated here.

3.2. TOPOGRAPHY

3.2.1. The scheme encompasses land on the northern (Norfolk) and southern (Suffolk) banks of the River Waveney, which flows beyond Diss for c.60km and into a tidal estuary at Great Yarmouth. The landscape around Diss is low and rolling (45 – 40m AOD) and declines very gently into the valley of the River Waveney (23 – 24m AOD). The valley floor forms a level floodplain, through which the modern river meanders.

4. GEOARCHAEOLOGICAL BACKGROUND

4.1. BEDROCK GEOLOGY

4.1.1. At or within 1km of the scheme boundary, two bedrock units underlie the Quaternary deposits (BGS 2025). The Late Cretaceous (100 – 70 Ma BP) Chalk (Lewes Nodular, Newhaven, Culver and Portsdown Formations) is a deep marine bioclastic carbonate rock that accumulated in deep oceanic waters (BGS, 2025). Two c. 1km^2 outliers of the Late Pliocene-Early Pleistocene (2.8 – 1.8 Ma BP) Norwich Crag Formation are mapped 0.5km to the south-west of the scheme. The Norwich Crag comprises six members that were deposited discontinuously over southern East Anglia during a marine high-stand (BGS, 2025).

4.1.2. The members of the Norwich Crag represent different low-energy shoreface facies. The Chillesford Church (medium micaceous sand with planar bedding) and Creeting Members (medium-fine micaceous sand) likely represent inter-tidal sand deposits. The Chillesford Clay (bioturbated and shelly silty clay), College Farm Clay (silty clay, sometimes with laminated sand) and Eastern Bavents Clay Members (pale grey clay

with silt or fine sand beds) probably accumulated in estuarine or tidal-flat environments (Bowen, 1999; BGS, 2025). The Westleton Beds (rounded flint-rich cobble gravels) are thought to represent an energetic, wave-washed beach (Mathers, 1996).

4.1.3. Past studies near the scheme found that the Chalk bedrock has an irregular surface. The rockhead generally undulates from 10 – 20m AOD but, near Diss, falls sharply to – 30m to – 40m AOD (Wilcox and Stanczyszyn, 1983: 6). These abrupt changes are most pronounced within or near to the current river valleys (e.g. River Waveney) and form "buried channels" running parallel to the modern watercourses in East Anglia (Lee et al., 2020). These are thought to reflect pre-glacial drainage networks in East Anglia which were over-deepened during the Pleistocene glaciation, probably by meltwater beneath the over-riding Anglian ice-sheet (Woodland, 1970; but see Gallois, 2018 and Lee et al., 2020). The type and thicknesses of the overlying superficial units may also change abruptly within the Scheme.

4.2. SUPERFICIAL GEOLOGY

4.2.1. The BGS (2025) record nine superficial Quaternary deposits at or within 1km of the scheme boundary, these are described below alongside other Quaternary deposits that have been recorded in the vicinity of the Scheme. A summary of superficial deposits and their geoarchaeological and/or palaeoenvironmental potential is given in Table 4 1.

4.2.2. The 'Ingham Sand and Gravel Formation' (Early to Middle Pleistocene: 2.8 – 0.46 Ma BP) is described as a coarse sandy gravel fining upwards to coarse pebbly sand, with intermittent clay and silt beds (BGS 2025). The unit is distinguished by high proportions of exotic gravel clasts (round Triassic quartzite and vein quartz) alongside local flint. It is interpreted as a fluvial deposit of the ancient Bytham River, which was diverted by the Anglian Stage Ice Sheet between 0.46 – 0.42 Ma BP (Westaway 2008; but see Gibbard et al. 2013, Lewis et al., 2021). Bytham River gravels have yielded late Upper Palaeolithic lithics in some regions of East Anglia (Davis et al 2021).

4.2.3. The 'Croxton Member' is generally poorly defined and recorded in geological surveys, but comprises sand and gravel and is likely to also relate to the River Bytham (BGS 2025; Lewis et al, 2021). It seems to have been historically used more in Norfolk recording of deposits and at times has been confused with the Kesgrave Catchment Subgroup.

4.2.4. The 'Happisburgh Formation' is thought to represent a major glacial period of the Middle Pleistocene (0.7-0.5 Ma BP) called the Cromerian Stage glaciation (MIS 19-13), although the exact timing of this period is still subject to debate (Lee et al., 2015; Lee et al., 2004). It consists of a range of diamictons, sands and gravels, sands and laminated silts and clays (BGS, 2025). The diamictons (Happisburgh Till, Corton Till and California Till members) are typically dark grey sandy matrix-supported diamictons that contain a high abundance of flint and quartzose lithologies relative to chalk, distinguishing them from the chalkier tills of the overlying Lowestoft Formation (ibid.), although visual similarities in the diamictons has often made discerning the boundaries between units hard, and necessitated the frequent recording of 'Undifferentiated Happisburgh Formation and Lowestoft Formation' within logs.

4.2.5. The 'Lowestoft Formation' is primarily represented by a diamicton of dark to mid-grey, very stiff clay with frequent flint and chalk gravel clasts that formed during the Anglian Stage glaciation (Middle Pleistocene, 0.46 – 0.42 Ma BP; BGS 2025). Associated with the diamicton (till) are silt and silty clay deposits, sometimes laminated, that occur intercalate the diamicton in local and thin deposits. In some places the laminated silt to reach thicknesses of 17m or more (Mathers et al. 1993). Some (ibid. 1993) consider these laminated silts to be pro-glacial lacustrine deposits from impounded water, and others (Woodland 1970) to have resulted from sub-glacial sedimentation in the "buried channels".

4.2.6. Following the Anglian Stage glaciation glacial outwash deposits were laid down in the Waveney valley. These deposits have been rarely preserved within the valley margins.

4.2.7. Laminated silt and clay deposits then began to accumulate again within Waveney Valley. These were deposited as palaeo-lakes developed due to impounded water in the late Anglian Stage and into the interglacial period. The 'Lodge Farm Silt and Clay Member' as well as the Hoxnian Stage 'Interglacial

Lacustrine Deposits' can currently be found preserved on the valley sides above the modern floodplain. The sequence at nearby Hoxne is of national archaeological importance because they contain abundant palaeoenvironmental evidence and also a rich Palaeolithic archaeological record (Suffolk Heritage Explorer, 2025a: Monument record HXN 001).

4.2.8. Cold-stage lake-marginal deltaic deposits and glacio-fluvial outwash deposits then formed during the Wolstonian and Devensian Stage glaciations, as nearby palaeo-lakes (e.g. Lake Fenland/ Lake Sparks) drained through the Little Ouse–Waveney valleys and onwards to the southern North Sea Basin (Gibbard et al, 2009).

4.2.9. 'Head' deposits are mass-movement deposits formed of poorly sorted clays, silts, sands and gravel that have been redeposited down-slope because of solifluction in cold-climate conditions. In this region, they are thought to have mostly formed under the cold-climate conditions of the Wolstonian Stage glaciation (0.374-0.130 Ma BP) (Mathers et al., 1993).

4.2.10. 'River Terrace Deposits' consist of clays, silts, sands and gravels which have been deposited by fluvial action in a floodplain or braided riverbed. Changes in base level cause the river to incise and abandon these surfaces, leaving a series of terraces at different elevations. At this part of the Scheme, the lower three of the River Waveney's four river terraces have been identified. These are generally comprised of sand, or sand with fine flint gravel (Mathers et al., 1993).

4.2.11. 'Alluvium' is the finer grained fluvial fraction of clay, silt or sand that is deposited by rivers on their floodplains during flood events and has been identified in proximity to the modern River Waveney channel. These deposits can seal other floodplain marginal environments such as peatlands (BGS 2025).

4.2.12. Associated with the River Waveney and its floodplain are 'Peat' deposits formed of partially decayed plant matter that has accumulated slowly in waterlogged and anaerobic conditions. Regionally, 'Mere', 'Calcareous Tufa' and 'Shell Marl' have also been recorded in northern East Anglia in association with Holocene river valley deposits.

4.3. MODERN SOILS

4.3.1. The contrasting superficial cover over the scheme has created multiple Soilscapes (LandIS, 2025). Soilscape 18 (impermeable, base-rich clayey soil) has formed on the till, whereas soilscape 10 (free-draining, acid and sandy) has formed on the alluvial or glaciofluvial gravel. Soilscapes 8 (acid, loamy and clayey soil) and 9 (lime-rich loamy and clayey soils) has formed primarily on head deposits, derived from each of those parent deposits. Soilscape 27 (waterlogged fen peat soil) has formed primarily in the valley floor.

Table 4-1: Summary of the previously recorded superficial deposits with estimated date range and associated geoarchaeological/palaeoenvironmental potential.

Deposit Type	Date	Description	Mapped on BGS[1]	Potential
Ingham Sand and Gravel Formation: *Sand and Gravel*	Early to Middle Pleistocene (Pre-Anglian) 2.8mya – 0.46mya	Fluvial deposits from an ancient pre-glacial drainage system (River Bytham). Typically a coarse sandy gravel fining upwards to coarse pebbly sand, but locally finer and reflective of sub-environments (e.g. lakes) (BGS, 2025). The unit is distinguished by high proportions of exotic gravel clasts (round Triassic quartzite and vein quartz).	Yes, within 1km of scheme boundary, Suffolk	Low, potential for locally high areas
Croxton Sand and Gravel Member: *Sand and Gravel*	Middle Pleistocene (Pre-Anglian) 2.8mya – 0.46mya	Fluvial deposits from an ancient pre-glacial drainage system (River Bytham). This unit has at times been confused with the upper surface of the Kesgrave Catchment Subgroup.	Yes, within 1km of scheme boundary, Norfolk	Low, potential for locally high areas

Deposit Type	Date	Description	Mapped on BGS[1]	Potential
Happisburgh Formation: *diamicton*	Middle Pleistocene: Cromerian Stage (0.7-0.5 Ma BP)	Poorly sorted sediments deposited directly by ice sheets in glacial conditions. Unlikely to yield archaeological assemblages, but may seal deposits of archaeological and palaeoenvironmental interest	Yes, within scheme boundary	Low
Lowestoft Formation: *diamicton*	Middle Pleistocene: Anglian Stage (0.478-0.424 Ma BP)	Poorly sorted sediments deposited directly by ice sheets in glacial conditions. Unlikely to yield archaeological assemblages but may seal deposits of archaeological and palaeoenvironmental interest.	Yes, within scheme boundary	Low
Laminated Glacial Silts: *Clay and Silt*	Middle Pleistocene: Anglian Stage (0.478-0.424 Ma BP)	Fine-grained sediments deposited in multiple low-energy standing-water environments within the glacial land-system. These can include sub-glacial (tunnel valleys) or pro-glacial (impounded lakes or kettle-holes) and can be basins (e.g. varves) or lateral deposits (e.g. lacustrine kame terraces). Laminations can reflect season melt-freeze cycles.	Yes, within 1km of scheme boundary in section.	Variable. If from lakes potentially high. If from sub-glacial features, very low.
Lodge Farm Silt and Clay Member: *Clay and Silt*	Middle Pleistocene: Anglian Stage likely into Hoxnian (0.478-0.424 Ma BP)	Late Anglian Stage glacial and interglacial deposits of clay and silt.	Yes, within scheme boundary	High
Interglacial Lacustrine Deposits: *Clay and Silt*	Middle Pleistocene: Hoxnian Interglacial Stage (0.424-0.374 Ma BP)	Interglacial lacustrine deposit of Hoxnian age. Usually organic-rich, interbedded sand, silt and clay. Interglacial lakes deposits are rich sources of palaeoenvironmental information and may also contain megafaunal remains. Interglacial lake margins have been frequently found to have localised Palaeolithic deposits. Paleosols associated with these lakes may also be of high importance.	Deposits are mapped 7km downstream of Scheme boundary	Very High
Glacio-Lacustrine and Glacio-Fluvial Outwash	Middle – Late Pleistocene	Sands and gravels deposited by seasonal meltwater outwash in periglacial conditions at the edge of an ice sheet or glacial lake under cold climatic conditions that have been subsequently incised through and preserved as former floodplains. May contain secondary archaeological assemblages or seal stratified deposits of archaeological and palaeoenvironmental interest such as kettle holes.	No	Low
Head: *Clay, Silt, Sand and Gravel*	Middle – Late Pleistocene: mostly Wolstonian Stage (0.373-0.144 Ma BP)	Poorly sorted slope deposits deposited by solifluction in peri-glacial environments. Has the potential to bury sediments of geoarchaeological and palaeoenvironmental interest and may contain stratified secondary archaeological assemblages	Yes, within 1km of scheme boundary	Medium to low

Deposit Type	Date	Description	Mapped on BGS[1]	Potential
Cover Sand: *Fine to Very Fine Sand*	Pleistocene	Fine grained sand particles that have transported by air in cold climate conditions (aeolian processes) and which form blanket deposits in lowland areas and are usually horizontally bedded.	No	Low
River Terrace Deposits, 1, 2 and 3: *Sand and Gravel*	Late Pleistocene-Holocene	Sands and gravels deposited by fluvial mechanisms that have been subsequently incised through and preserved as former floodplains. Terraces surfaces can be an important source of Lower and Middle palaeolithic artefacts (usually preserved in non-primary contexts) and can also seal organic sediments of palaeoenvironmental significance	Yes, within scheme boundary and 1km of boundary	High
Alluvium	Holocene	Fine-grained sediments of Holocene date deposited by fluvial activity. Alluvial environments are a focus for human activity, and an effective trap for artefacts and ecofacts with good preservation potential	Yes, within scheme boundary	High
Peat	Holocene	Partially decayed organic matter preserved within waterlogged conditions in lakes bogs and along river valleys: peatlands are a foci for human activity. Excellent preservation potential for palaeoenvironmental resources and cultural remains	Yes, within scheme boundary	Very High.

[1] British Geological Survey (BGS) 1:50,000 or 1:625,000 superficial geology mapping (NERC, 2024).

[2]The formation of peat deposits found around Wisbech has previously been attributed to the period between the late Bronze Age and early Romano-British period by Alderton and Waller (1994:250), along with the possibility for additional early Holocene formation by Archaeological Field Unit (1995:10).

5. ARCHAEOLOGICAL BACKGROUND

5.1. OVERVIEW

5.1.1. A Historic Environment Baseline Report (HEBR) for the works was produced by Arcadis on behalf of National Grid (2024). This report discusses the historical background and archaeological potential of the works in great detail, by each council region, and is summarised below. This summary focuses on both designated and non-designated heritage assets that are within or adjacent to the draft order limits, and therefore most likely to be disturbed by the proposed works.

5.1.2. This was synthesised within the OWSI for the archaeological trial trenching works produced by Headland Archaeology (2025), and this synthesis it repeated here.

5.2. SECTION A: SOUTH NORFOLK COUNCIL

Summary of Archaeological Background

5.2.1. Within and near to the scheme boundary, archaeological evidence for human activity has been discovered for all time-periods except for the Iron Age, with several sites containing evidence for multiple phases of human occupation. It is however possible that undiscovered archaeological remains from any period may survive within the scheme boundary. Therefore, any deposits with potential for good environmental preservation could theoretically provide evidence for any period from the Palaeolithic through to the present.

5.2.2. The designated heritage assets in this region of the works comprise various scheduled monuments, listed buildings and conservation areas, as well as two registered parks and gardens. Non-designated heritage assets comprise findspots, cropmarks, geophysical anomalies, earthworks and 20th century military assets as well as post-medieval farmsteads, a derelict brickworks, and a cold war era bunker.

Prehistoric: Palaeolithic to Neolithic

5.2.3. The earliest archaeological activity identified within the draft order limits consists of findspots of Upper Palaeolithic and Mesolithic worked flint. Neolithic activity is likewise limited to lithic scatters.

Prehistoric: Bronze Age and Iron Age

5.2.4. Bronze Age activity is largely represented by scatters of pottery and flintwork, but the additional identification of excavated pits (1114) and ditches (1169) also suggest an increase in farming requiring the physical alteration of the landscape. The cropmarks of a potential burnt mound (1120) have also been identified within the draft order limits.

Roman and Romano-British periods

5.2.5. Romano-British activity consists of excavated pits and field systems (1271) and findspots comprising metalwork, coins, and pottery. Some of these findspots are concentrated enough to likely represent settlement and cemetery activity. One such concentration is located on land 500 m south-east of Fundenhall (1130) and likely represents a Romano-British settlement site which became an Anglo-Saxon cemetery. Additionally, likely but unconfirmed Romano-British activity consists of cropmarks of rectilinear enclosures (1254) and field boundaries (1255).

Early medieval and medieval

5.2.6. The early medieval period is represented by finds of metalwork and pottery. The dominance of items considered to be grave goods suggest the locations of at least two Anglo-Saxon cemeteries within the draft order limits. The first (1246), on farmland 400 m north-east of Shelfanger and the second (1130) on farmland immediately south of Hapton Road. An ornate early/middle Saxon burial was identified at the second site (1276) located 360m to the west of the proposed works. Grave goods included: a necklace with a gold openwork pendant in the centre, flanked by two gold spacer beads, and then two gold coins of Merovingian King Sigebert III as pendants; a continental pottery bi-conical bowl with cordon and grooved decoration; a copper alloy bowl; an iron knife; 13 copper alloy chatelaine rings with punched ring and dot decoration; and a copper alloy chatelaine ring with a fragment of a possible decorated girder hanger attached to it.

5.2.7. Medieval activity consists primarily of findspots, and artefacts recovered during fieldwalking and metal detector surveys. Additionally, there is a medieval church at Kenningham (1067), three moated sites (1013, 1014 and 1024), and a settlement centre with medieval origins (1227). Two deserted medieval villages are also known to be present within the draft order limits at Kenningham (1010) and Granville (1089). Medieval activity is also represented by two medieval strip fields (1029 and 1072), a possibly medieval house (1096) and a deer park at Winfarthing (1064).

5.2.8. Flordon Hall is a timber framed medieval structure currently used as a farmhouse. Occupied from at least the 15th century, the hall itself is unlikely to be impacted by the works. However, surrounding medieval landscaping works in the form of ditches, bank and drains may extend into the draft order limits, if they have not been truncated by the post-medieval agricultural activity at the hall. The hall has two related Grade II assets comprising a piggery (1172231) and barn (1373055). These are isolated structures at least 200m from the draft order limits and are unlikely to be disturbed by the works.

Post-medieval and Modern

5.2.9. Post medieval assets comprise four non-designated buildings, excavated archaeological features and finds derived from metal detector and walkover surveys, and cropmarks. The four buildings consist of two farms (1313 and 1307), a former workhouse (1312) and Heywood Manor House (1305). Only the manor house has the potential to be impacted by archaeological works. Located approximately 100m to the east of the

draft order limits, landscaping works associated with the 17th century structure may extend into the draft order limits.

5.2.10. Modern heritage assets within the draft order limits of this region of the proposed works are limited to a World War One (WWI) military airfield (1037) located 2.5 km north-north-east of Winfarthing.

5.3. SECTION B: MID-SUFFOLK DISTRICT COUNCIL

Summary of Archaeological Background

5.3.1. Within and near to the scheme boundary, archaeological evidence for human activity has been discovered for all time-periods except for the Iron Age, with several sites containing evidence for multiple phases of human occupation. It is however possible that undiscovered archaeological remains from any period may survive within the scheme boundary. Therefore, any deposits with potential for good environmental preservation could theoretically provide evidence for any period from the Palaeolithic through to the present.

5.3.2. The designated heritage assets in this region of the works comprise various scheduled monuments, listed buildings and conservation areas. Non-designated heritage assets include records, moated sites, railways, canals, woodlands, cropmarks, burnt mounds, a milestone, Roman roads, parkland, earthworks, and 20th century military assets as well as numerous buildings largely comprising post medieval farmsteads and outbuildings.

Prehistoric: Palaeolithic to Neolithic

5.3.3. The earliest activity identified within the draft order limits are findspots of Upper Palaeolithic and Mesolithic flintwork as well as a single site of possible Mesolithic occupation consisting of a ditch with worked deer antler and flintwork inclusions (2003).

5.3.4. Neolithic activity consists of more widespread and concentrated lithic scatters, a causewayed ring ditch (2008) that may represent the remains of a causewayed enclosure or henge monument, and an oval cropmark (2009) which has not been investigated archaeologically but may represent the remains of a Neolithic long barrow.

Prehistoric: Bronze Age and Iron Age

5.3.5. The Bronze Age is represented by cropmarks of potential ring ditches (2028) and findspots of lithics, pottery and metalwork including a hoard (2045), recorded by the Suffolk HER and by the Portable Antiquities Scheme. Potential funerary monuments consist of these ring ditches, as well as a small mound possibly representing a barrow (2037). The hoard comprised 81 copper alloy artefacts including socketed axe heads, winged axe heads, swords, sickles and a large amount of casting waste.

5.3.6. The Iron Age is represented by scatters and findspots of pottery (2062) and metalwork and a settlement site (2068) consisting of a roundhouse with a central sunken circular hearth containing black earth, grit tempered Iron Age pottery and flints. To the south of the roundhouse was a ditch or pit and to the north was a possible furnace. This site may also represent Neolithic activity, but the HER does not provide further details.

Roman and Romano-British periods

5.3.7. Romano-British activity largely consists of scatters and findspots of pottery and metalwork. A number of finds concentrations could indicate the location of buildings or farmsteads and others likely relate to settlement sites. Large concentrations of 1204 and 598 Romano-British artefacts (2166 and 2134) are suggestive of settlement activity and a third concentration of Romano-British artefacts (2162) may indicate the locations of buildings or farmsteads.

5.3.8. A Roman road (2113) transects the works, running east to west. The linear nature of the road makes it likely a small portion within the draft order limits will be disturbed or truncated.

5.3.9. The Romano-British period is also represented by excavated archaeological remains comprising an isolated ditch (2138), and ditches, pits, and a possible palisade (2140).

Early medieval and medieval

5.3.10. The early medieval period is represented by an artefact scatter (2164) that is indicative of a Romano-British and Anglo-Saxon period cemetery. Early medieval period activity also consists of findspots, and low-density artefact scatters.

5.3.11. Medieval activity largely consists of findspots of pottery and metalwork, as well as moated sites, a medieval farmstead (Wickham Abbey Farm: 2208) and settlement centre at Mendlesham Green (2244). The numerous moated sites in the area likely represent a network of manorial sites and include a moated dovecote (2207), hall (2241) and windmill (2250). Several of the sites are identified from undated cropmarks (2227) and would require further investigation to confirm their date and function.

5.3.12. One of the moated sites is the scheduled monument Offton Castle (1006049). It is located approximately 100m to the north of the draft order limits. Likely occupied from at least the medieval period, the site consists of quadrangular moated site, standing on high ground. The enclosed area remains at least 3 m above the surrounding ground level. The Victoria County History for Suffolk (1911) states the asset is 'an early befossed moat adapted to later defence'. The scheduled monument itself will not be disturbed, but there is potential for related and previously unrecorded remains to survive below ground and extend into the footprint of the works.

5.3.13. A medieval Grade I listed building, the Church of St Mary (1263030) is located approximately 100m south-west of the draft order limits. The asset comprises a nave, chancel, west tower and south porch and largely dates to the 14th and 15th centuries with later alterations and additions and 19th century restorations. Related burials are situated away from the draft order limits, but there is still limited potential for previously unrecorded burials to stray within the works and be disturbed.

5.3.14. A mid-16th century 'Barn 30 metres west of Roydon Hall', is a Grade II* listed building (1284584) located immediately adjacent to an access track within the draft order limits. This barn is freestanding with no associated structures and is unlikely to be disturbed by the archaeological works.

Post-medieval and Modern

5.3.15. Post medieval assets largely comprise non-designated buildings, structures, and finds derived from metal detector and field walking surveys, mostly relating to extant farmsteads which are unlikely to be directly disturbed by archaeological works.

5.3.16. An 18th century bridge (2409), hospital building (St John's house: 2415) and undated milestone (2411) are all adjacent to the draft order limits and are likewise unlikely to be directly disturbed. The post medieval period is also represented by excavated archaeological remains comprising 19th century boundary ditches (2496).

5.3.17. Modern heritage assets in the region are limited to the site of a former World War II pillbox (2301). The structure is no longer extant and its position approximately 150m beyond the draft order limits makes its disturbance unlikely.

6. AIMS AND OBJECTIVES

6.1. INVESTIGATION AIMS

6.1.1. The primary aim of the geoarchaeological monitoring and recording was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. In general, the purpose of the watching brief was to record and advance understanding of the significance of any heritage assets, to create a predictive deposit model for the site, and to inform appropriate mitigation strategies.

6.1.2. The principal objectives were to:

- Identify, record and characterise the extent and depth of the Pleistocene and Holocene deposit sequence in the vicinity of the scheme area.
- Identify significant variations in the deposit sequence indicative of localised features such as palaeochannels, topographic highs or buried 'islands'.
- Identify the location and extent of any waterlogged organic deposits and/or buried soils or land-surfaces and address the potential for the preservation of archaeological and palaeoenvironmental remains within these deposits.
- Define zones of landscape stability within the vertical sequence that may have been of sufficient stability for human occupation at various periods in the past.
- Discuss the sequence of sediments within the wider landscape context of known quaternary geology and geomorphology.
- Inform the requirement for further geoarchaeological or paleoenvironmental investigation in the PDA.

6.1.3. These objectives were to be achieved through the monitoring of selected ground investigation works and subsequent deposit modelling.

6.2. RESEARCH AGENDA

6.2.1. The following regional research framework agendas are relevant to this work:

- East of England Regional Research Framework (ALGAO East of England 2020) (Research Frameworks, 2024).

6.2.2. In particular, the data collected during the geoarchaeological survey may contribute to these specific research agenda questions:

Palaeolithic-Mesolithic

- Pal-Meso 05: How can East Anglian sites contribute to our understanding of the Upper Palaeolithic and Mesolithic periods nationally?
- Pal-Meso 11: Are deposit modelling and predictive modelling useful tools?

Neolithic

- Neo 23: How can we better characterize the variability of the Neolithic landscape?

Roman

- LIA-Rom 06: How can we increase our understanding of the Iron Age and Roman environment?

7. METHODOLOGY

7.1. OVERVIEW

7.1.1. All site work was carried out in accordance with the site-specific WSI (Headland Archaeology, 2024a). The fieldwork was undertaken under the supervision of a suitably qualified geoarchaeological specialist.

Table 7-1: Summary of geoarchaeological work covered in this report.

EXPLORATORY HOLE ID	MAX. DEPTH (m BGL)	TRANSECT ID	TYPE
MM_RG_BH_103	11.7	1	Cable Percussion Borehole
MM_RG_BH_104	20	1	Cable Percussion Borehole
MM_RG_BH_105	16.5	1	Cable Percussion Borehole
MM_RG_BH_106	28.5	1	Cable Percussion Borehole
MM_RG_BH_107	15	1	Cable Percussion Borehole
MM_RG_BH_108	20.53	1,2	Cable Percussion Borehole
MM_RG_BH_109	31.5	2	Cable Percussion Borehole
MM_RG_BH_110	30.45	2	Cable Percussion Borehole
MM_RG_BH_114	31.6	2	Cable Percussion Borehole
MM_RG_IP_102	2.55	1	Infiltration Pit
MM_RG_IP_103	1.3	2	Infiltration Pit
MM_RG_IP_105	1.65	2	Infiltration Pit
MM_RG_IP_107	1.2	2	Infiltration Pit
MM_RG_TP_105	1.9		Trial Pit
MM_RG_TP_108	4	2	Trial Pit

7.2. TRIAL PITS

7.2.1. Trial pits excavated using a tracked 360° excavator under direct supervision. A toothed excavator bucket was used to remove any hard surfaces/demolition deposits, with all soft deposits removed in spits using a flat bladed ditching bucket.

7.2.2. During geoarchaeological monitoring of trial pits, the attendant geoarchaeologist logged upcast from the trial pit on the site of the excavation and measured deposit boundaries without entering the pit. Recordings and photographs were taken from the section.

7.3. BOREHOLES

7.3.1. Drilling was conducted using a Dando 3000 cable percussion drilling rig. Boreholes comprised 9-no. cable percussion boreholes to a maximum of 31.6-metres and average depth of 22.86-metres (Table 7-1).

7.3.2. Boreholes were monitored by the attendant geoarchaeologist until refusal or bedrock, or maximum depth of intervention was reached, whichever was first. Sequences were photographed and a record made of the depth of each sedimentary unit.

7.3.3. The sediments were described on a summary proforma according to standard methodologies based on Jones (1999) and with the aid of a Munsell soil colour chart. This included a description of colour, compaction, texture, sorting, structure, inclusions (including abundance, shape and material) and contacts.

7.3.4. Grab samples of deposits of geoarchaeological and palaeoenvironmental interest were taken at the discretion of the attendant geoarchaeologist. Samples were labelled using waterproof marker pens and an internal label. An overview of the samples taken is provided in Table 7-2.

Table 7-2: Overview of collected samples

IDENTIFIER	TYPE OF SAMPLE	<SAMPLE>	DEPTH (M BGL)	NUMBER OF CONTAINERS
MM_RG_IP_103	Bulk	102	1.10 - 1.30m	1
MM_RG_TP_108	Bulk	101	2.00 - 2.20m	1
MM_RG_BH_106	Bulk	1	0.50 - 0.70m	1
MM_RG_BH_106	Bulk	2	0.50 - 0.70m	1
MM_RG_BH_105A	Bulk	100	1.20m	1
MM_BH_RG_107	Bulk	0	0	1
MM_RG_BH_108	Bulk	0	0.3 - 1.2m	1

7.4. GEOARCHAEOLOGICAL DEPOSIT MODELLING

7.4.1. The geoarchaeological deposit records were entered into industry standard borehole management software (Rockworks™) to create a model of the key Quaternary Age sub-surface strata on site.

7.4.2. A sequence of commonly occurring lithological deposits was identified based on the results of the borehole survey recorded on site and in the laboratory. These were correlated into stratigraphic units based on these lithological descriptions. The stratigraphy defines distinct depositional processes, associated environments, and landform types (e.g. river terrace deposits, glacial till, and lacustrine deposits). The model indicates, where relevant, the depth of made ground.

7.4.3. The following stratigraphic units were assigned, presented in order of deposition:

- Made Ground
- Topsoil
- Alluvium - 2
- Peat - 1
- Alluvium - 1
- Tufa
- River Terrace – sand and gravels
- Head
- River Terrace - T1 (Early)
- Lodge Farm Clay and Silt Member
- Glacio-Lacustrine and Outwash
- Glaciofluvial Deposit 2
- Till - Lowestoft Formation
- Till - Undifferentiated Happisburgh Till And Lowestoft Formation
- Glacial Silt and Clay
- Glaciofluvial Deposit 1

- Till - Happisburgh Formation
- Ingham Sand and Gravel Member
- Bedrock

7.4.4. The subsurface geometry of deposits is illustrated as 2D-fence diagrams, and the Transects (1,2) are used to present related constrained linear data sets to provide representative cross sections, illustrating the range of deposits present within each area and their predicted distribution between intervention points. All deposit modelling was undertaken using RockWorks (version 20.0) and follows current best practice (Historic England, 2020).

7.4.5. Deposit modelling allows for the spatial interpretation of the data, identifying probable environments represented, and the determination of areas of higher and lower geoarchaeological/archaeological/palaeoenvironmental potential by extrapolating the thickness and elevation of deposits between given data points. Where deposits are laterally constrained (such as channels/ roddons) modelling may give an erroneous impression of the distribution of deposits (e.g., elevation and thickness).

7.4.6. All deposit modelling follows current best practice (Historic England, 2020).

8. RESULTS

8.1. OVERVIEW

8.1.1. The results of the geoarchaeological watching brief are presented below. A record of the full geoarchaeological descriptions of assessed material is available in Appendix 1. The dataset used in the deposit modelling is available in Appendix 2.

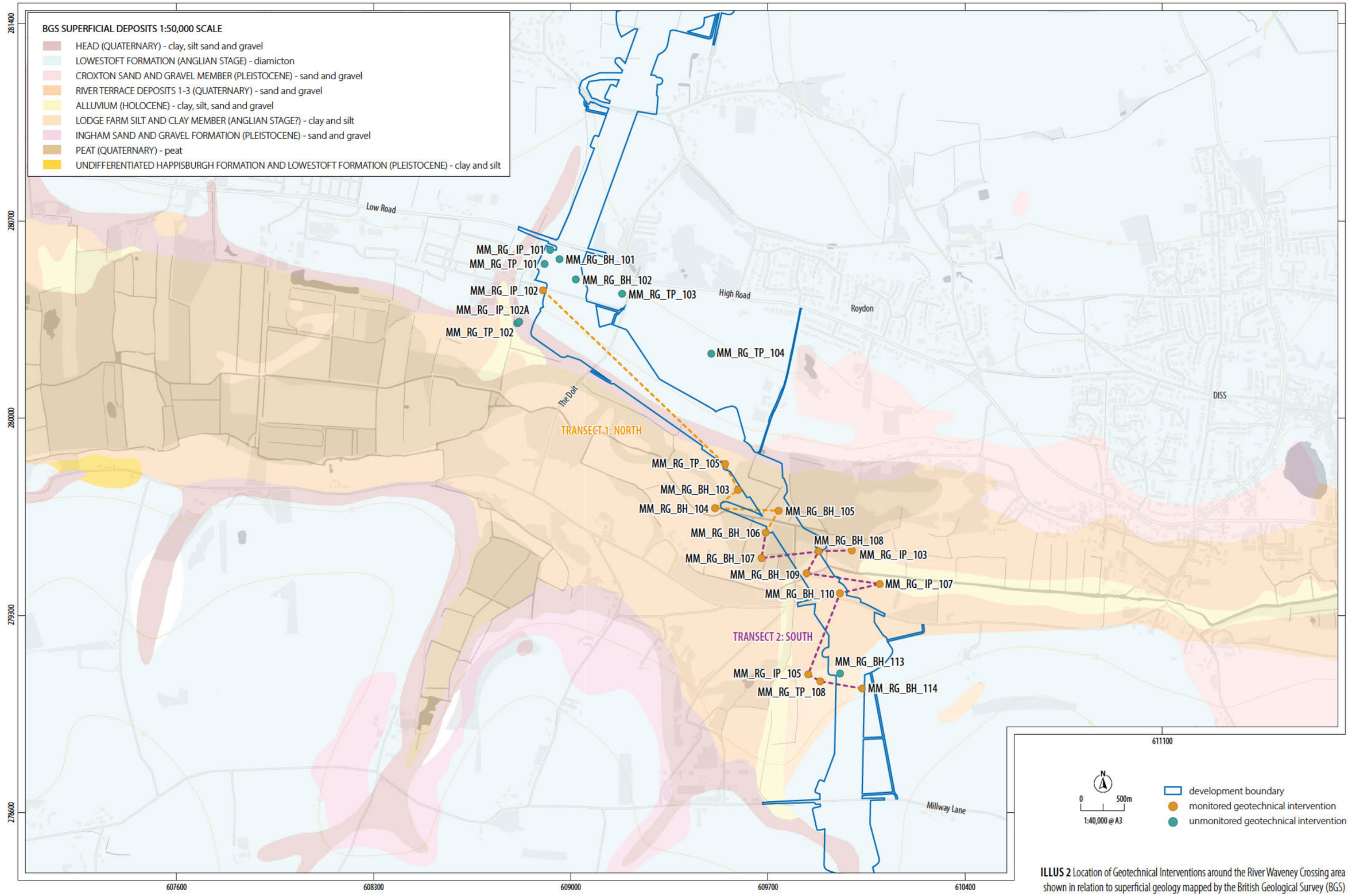
Locations

8.1.2. A table of borehole and trial pit locations is given below (Table 8-1) and locations are also shown in Illus 2.

8.1.3. The mean surface elevation of interventions taken from across the site was 25.23m AOD (above ordnance datum), with a minimum elevation of 22.75m AOD at MM_RG_BH_105, and a maximum elevation of 30.46m AOD at MM_RG_IP_103.

Table 8-1: Intervention Locations and Depths

Intervention ID	TRANSECT ID	MAX. DEPTH (m BGL)	LOCATION (OSGB)		
			Easting (X)	Northing (Y)	Elevation (Z)
MM_RG_BH_103	1	11.7	609593.99	279746	23.28
MM_RG_BH_104	1	20	609512	279681.003	23.517
MM_RG_BH_105	1	16.5	609737.978	279672.008	22.754
MM_RG_BH_106	1	28.5	609691.99	279593.995	23.321
MM_RG_BH_107	1	15	609677.365	279503.678	23.724
MM_RG_BH_108	1,2	20.53	609879.99	279528.016	22.97
MM_RG_BH_109	2	31.5	609837.49	279450.062	23.912
MM_RG_BH_110	2	30.45	609955.896	279378.997	24.728
MM_RG_BH_114	2	31.6	610034.023	279041.113	29.956
MM_RG_IP_102	1	2.55	608901.398	280454.287	26.167
MM_RG_IP_103	2	1.3	609997.983	279530.988	30.46
MM_RG_IP_105	2	1.65	609842.957	279090.968	26.627
MM_RG_IP_107	2	1.2	610096.994	279412.017	23.172
MM_RG_TP_105		1.9	609842.957	279090.968	26.627
MM_RG_TP_108	2	4	609886.035	279066.496	27.226
	TOTAL	**218.38**		**MEAN ELEVATION**	**25.229**



ILLUS 2 Location of Geotechnical Interventions around the River Waveney Crossing area shown in relation to superficial geology mapped by the British Geological Survey (BGS)

Overview of Lithology and Stratigraphy

Lithology

8.1.4. Throughout most of the assessed area organic loamy topsoil was followed immediately by deep sandy and gravelly deposits, apart from where fine-grained silts, clays and peats were initially encountered in the centre part of the valley. These medium to coarse grained units were then followed variably by diamictons of gravelly clays and silts, fine-grained silts and clays, and coarse-grained sands and gravels. The bedrock where it was encountered across the site, was uniformly chalk.

Stratigraphy

8.1.5. A broad stratigraphic sequence was identified, comprising a total of 19-no. units representative of the major depositional phases identified on site (Table 8-2). The thickness of these units in each intervention is shown in Table 8-3.

Table 8-2: Table of stratigraphic units

UNIT	ORDER OF DEPOSITION
Made Ground	19
Topsoil	18
Alluvium - 2	17
Peat - 1	16
Alluvium - 1	15
Tufa	14
River Terrace – sands and gravels	13
Head	12
River Terrace - T1 (Early)	11
Lodge Farm Clay And Silt Member	10
Glacio-Lacustrine And Outwash	9
Glaciofluvial Deposit 2	8
Till - Lowestoft Formation	7
Till - Undifferentiated Happisburgh Till And Lowestoft Formation	6
Glacial Silt And Clay	5
Glaciofluvial Deposit 1	4
Till - Happisburgh Formation	3
Ingham Sand And Gravel Member	2
Bedrock	1

Table 8-3: Summary of thickness of stratigraphic units

Intervention- ID	Easting	Northing			2	PEAT - 1	1	TUFA		HEAD	
MM_RG_BH_103	609594	279746		0.44					8.56		
MM_RG_BH_104	609512	279681		0.4			0.4		17.3		
MM_RG_BH_105	609738	279672		0.3	0.9	0.8	2		2.7		
MM_RG_BH_106	609692	279594		0.5		0.5	0.5		12		
MM_RG_BH_107	609677.4	279503.7		0.5					7.9		
MM_RG_BH_108	609880	279528		0.25		1.35			11.4		
MM_RG_BH_109	609837.5	279450.1		0.5					14.1		
MM_RG_BH_110	609955.9	279379		0.5					14.1		
MM_RG_BH_114	610034	279041.1		0.3						3.4	
MM_RG_IP_102	608901.4	280454.3	1.9				0.65				
MM_RG_IP_103	609998	279531		0.35				0.2			0.75
MM_RG_IP_105	609843	279091		0.4					0.55	0.7	
MM_RG_IP_107	610097	279412		0.4		0.35			0.45		
MM_RG_TP_105	609843	279091		0.15			0.2		1.55		
MM_RG_TP_108	609886	279066.5		0.3						0.8	
		MEAN:	1.9	0.38	0.9	0.75	0.75	0.2	8.24	1.63	0.75

Intervention-ID		GLACIO-		TILL - LOWESTOFT		TILL -		TILL -			Total Depth
MM_RG_BH_103				1.55			1.15			0.3	**11.7**
MM_RG_BH_104	1.9										**20**
MM_RG_BH_105				3.8			3.9			2.1	**16.5**
MM_RG_BH_106	2	4	1			5				2.7	**28.2**
MM_RG_BH_107				1.1	5.5						**15**
MM_RG_BH_108			7								**19.45**
MM_RG_BH_109			1.55			6.35	2.6	5.7		0.5	**31.3**
MM_RG_BH_110			7.4		3	2.45		4.05			**28.55**
MM_RG_BH_114				5.8	5.9	15.6			0.6	0.85	**32.45**
MM_RG_IP_102											**2.55**
MM_RG_IP_103											**1.3**
MM_RG_IP_105											**1.65**
MM_RG_IP_107											**1.2**
MM_RG_TP_105											**1.9**
MM_RG_TP_108	2.75		0.15								**4**
MEAN:	2.216667	4	3.42	3.0625	4.8	7.35	2.55	4.875	0.6	1.29	

8.2. TRANSECT 1

8.2.1. Transect 1 (Illus 3) covers the northern end of the Waveney Valley Crossing and includes interventions that are to the north of the River Waveney in Norfolk, between MM_RG_IP_102 and MM_RG_BH_106. This transect should be read together with Transect 2, which covers the southern end of the Waveney Valley Crossing.

8.2.2. Chalk bedrock was present to the base of three boreholes in this transect: MM_RG_BH_103 at 11.58m AOD, MM_RG_BH_105 at 8.34m AOD, and MM_RG_BH_106 at (-)3.18m AOD.

8.2.3. A complex superficial sequence of deposits then followed.

8.2.4. Ingham Sand and Gravel was present directly overlying the bedrock in MM_RG_BH_103 between 11.58-12.57m AOD and in MM_RG_BH_105 between 8.34-12.35m AOD.

8.2.5. Glacial Silt and Clay, potentially from subglacial channels, then followed and in the transect and was found in MM_RG_BH_106 between (-)3.17-(-)2.47m AOD, in MM_RG_BH_107 between 8.72-14.22m AOD, and in MM_RG_BH_104 from 3.51-5.41m AOD.

8.2.6. Till deposits then followed between MM_RG_BH_103 and MM_RG_BH_107 mostly likely from the Lowestoft Formation although some may originate from the earlier Happisburgh Formation. Till deposits were commonly 'medium grey (battleship) firm clay with chalk gravel (30%). Gravel is mostly fine-medium SR – R.' (e.g. BH107: 14.22-15.32m AOD).

8.2.7. Overlying the till was glaciofluvial deposits in MM_RG_BH_106 and MM-RG_BH_108 that were followed by lacustrine deposits of variably laminated silts and clays in MM_RG_BH_106, MM_RG_BH_107 and MM-RG_BH_108. In MM_RG_BH_106 'Soft dark brown fine sandy silty clay. No visible inclusions.' (3.71-5.21m AOD) was followed by 'Mid grey brown fine sandy clay silt.' (5.21-5.71m AOD) within a unit of 'glaciolacustrine deposits and outwash', which may represent an organic interglacial lacustrine deposit. Lacustrine Lodge Farm silts and clay were found in MM_RG_BH_105 (14.25-16.05m AOD) recorded as 'Stiff dark green-grey slightly fine sandy clay, with <1% shell fragments'.

8.2.8. River Terrace sand and gravel deposits then followed, with these later fluvial deposits recorded widely across boreholes. River Terrace deposits were often thick with an average thickness of 8.22m. The deepest river terrace deposits were found in MM_RG_BH_109 and MM_RG_BH_110 in the central part of the valley where in excess of 14m of sands and gravels were recorded. There are may be some uncertainties about the exact transition between glaciofluvial deposits where these underlay the river terrace deposits.

8.2.9. Recent alluvial deposits varied across the transect but were generally organic and described as 'Soft light yellow brown fine sandy silt with calcareous peat lenses' in MM-RG_BH_104: 22.72-23.11m AOD and 'Friable black highly organic clayey silt' MM_RG_BH_105: 21.55-22.45m AOD. Within alluvium deposits peat was found in MM_RG_BH_105 (0.8m thickness), the thickest peat deposit in the transect was in MM_RG_BH_108 where 1.3m thickness was recorded between 21.37- 22.72m AOD.

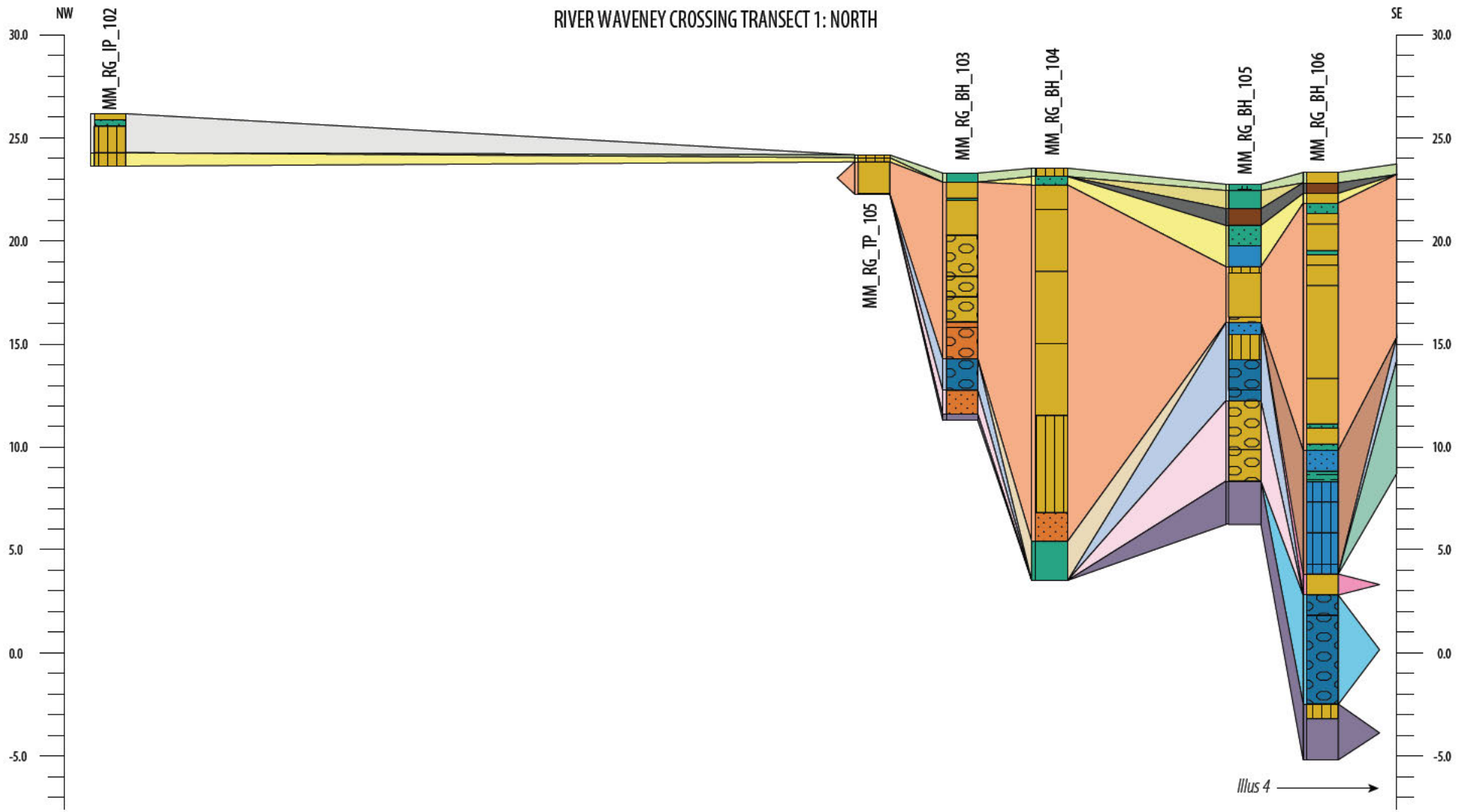
8.2.10. Topsoil then capped all deposits apart from in MM_RG_IP_102 where 1.9m thickness of made ground overlay an alluvium deposit.

8.3. TRANSECT 2

8.3.1. Transect 2 (Illus 4) covers the southern end of the Waveney Valley Crossing and includes interventions that are immediately to the north of the River Waveney in Norfolk and south of the river in Suffolk. The transect spans MM_RG_IP_107 to MM_RG_BH_114. This transect should be read together with Transect 1, which covers the northern end of the Waveney Valley Crossing.

8.3.2. Chalk bedrock was present to the base of a single borehole at the edge of the valley in this transect: MM_RG_BH_114 at (-)1.64m AOD.

8.3.3. A complex sequence of superficial deposits then followed.



ILLUS 3 River Waveney Crossing Transect 1: North

8.3.4. The earliest superficial deposits in this transect was that of a suspected thin and reworked Ingham Sand and Gravel at the base of MM_RG_BH_114 at (-)1.64- (-)1.04m AOD.

8.3.5. This was directly overlain by the Happisburgh Till that was recorded in MM_RG_BH_109: (-)7.58-(-)1.38m AOD, MM_RG_110: (-)6.77-(-)2.72m AOD, and MM_RG_BH_114: (-)1.04-(-)0.74m AOD. The Happisburgh Till was described as in MM_RG_BH_110 basally as a 'Firm grey / dark grey slightly sandy clay with gravel and chalk, SR-SA0, to 30mm ø, mostly <10mm (20%)' (30-30.45mbgl) to a 'Very stiff dark grey silty clay. Massive. No inclusions.' (27.45-28mbgl) at its upper contact.

8.3.6. A coarse Glaciofluvial Deposit-1 was only recorded from (-)1.38-1.21m AOD in MM_RG_BH_109, initially containing 'clods of dark grey compact clay with chalk (30-40mm), and rare cobbles.' (25-24mbgl), it graded into a 'Dark grey silty / fine sandy polymictic gravel' that contained 2 belemnite fossils (23.5-23mbgl). This unit was overlain by a further till 'Lowestoft Till' as well as 'Undifferentiated Happisburgh Till and Lowestoft Till deposits in MM_RG_BH_110 and MM_RG_BH_114. The Lowestoft Till was highly compact, grey and contained a higher fraction of chalk gravel (up to 40%) than the deeper, earlier deposits.

8.3.7. Lodge Farm Clay and Silt Member deposits were recorded MM_RG_TP_108(23.37-26.16m AOD), with a maximum thickness of 2.75m in MM_RG_TP_108.

8.3.8. This was then overlain in the transect by later Glacio-fluvial deposits in MM_RG_BH_108, _109, _110 and _114.

8.3.9. Head deposits then capped the Middle Pleistocene sequences in MM_RG_TP_108: 26.12-26.92m AOD and MM_RG_BH_114: 26.25-29.65m AOD in the southernmost part of the scheme area, where rising ground is found on the margins of the river valley.

8.3.10. River Terrace deposits then variably followed in all interventions between MM_RG_BH_107 and MM_RG_IP_105. Of particular interest in this transect was the Tufa deposit that appears to have formed beneath green hued terrace sand (likely the early River Terrace 1) in MM_RG_IP_103. The Tufa deposit (and subsequently the overlying sand deposit) was elevated above the rest of the floodplain (29.16-29.36m AOD).

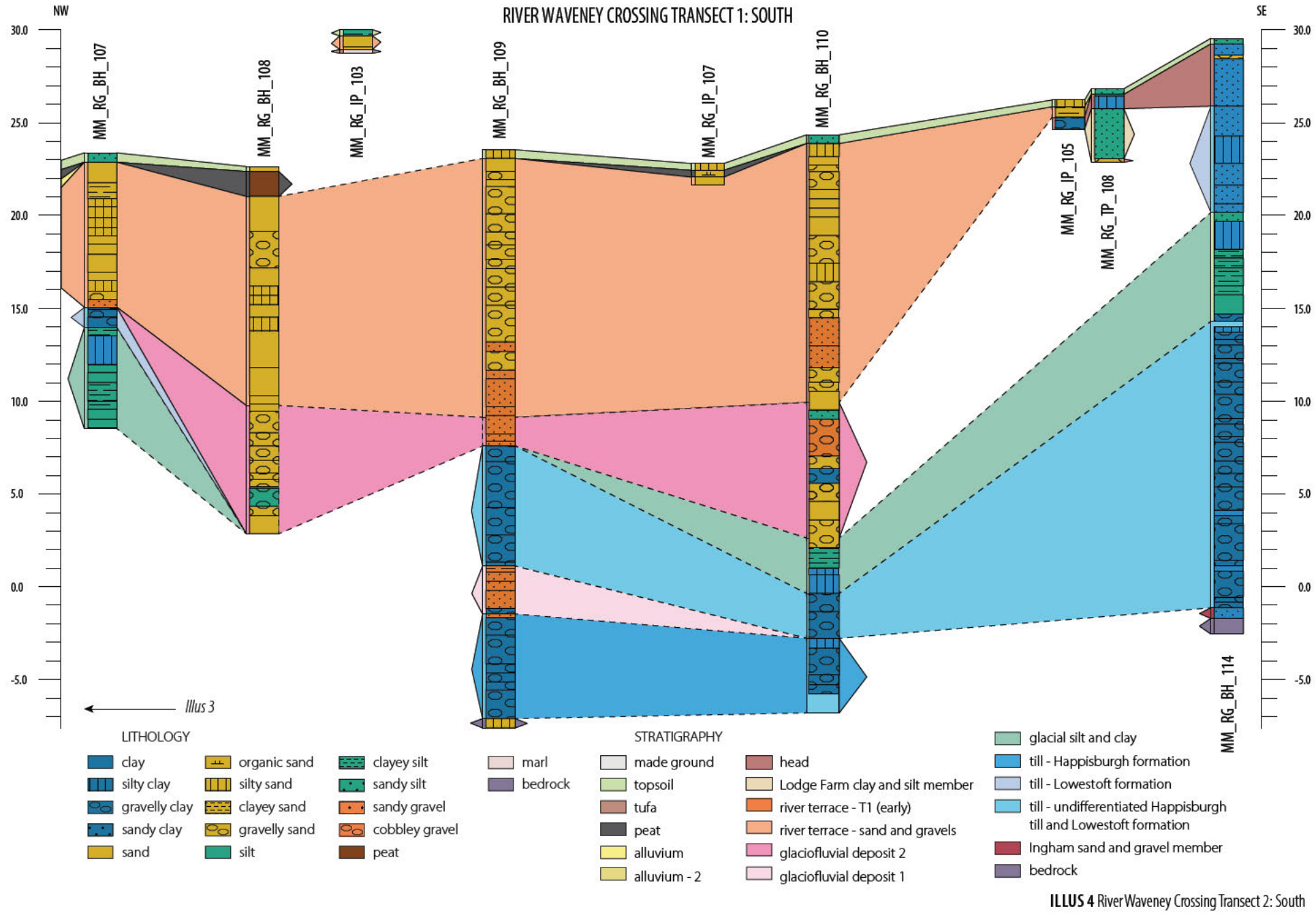
8.3.11. Peat deposits occurred overlying the river deposits in MM_RG_BH_108 and MM_RG_IP_107.

8.3.12. In all interventions in this transect a loamy topsoil capped the sequence of deposits.

8.4. RELIABILITY

8.4.1. Confidence in the deposit modelling produced for this study is moderate. Although the scheme area was quite small with a relatively high density of boreholes, there was significant depth of deposits, which together with the laterally constrained nature of the fluvial deposits, and the discontinuous preservation of units due to past erosional processes means that there is considerable potential for undiscovered, discontinuous, deposits of interest between borehole locations, and beyond the immediate transect route.

8.4.2. Cores in this study were all logged by suitably qualified geoarchaeologists and demonstrated a considerable refinement of the pre-existing GI/SI datasets reviewed earlier in this report (Section 5: Archaeological Background). There was a reasonable correlation between sedimentation patterns that had been previously defined and seen in publicly available GI records (NERC, 2024), and those that were logged in this study.



ILLUS 4 River Waveney Crossing Transect 2: South

9. DISCUSSION

9.1. THE EARLY PLEISTOCENE ENVIRONMENT: ANCIENT RIVER SYSTEMS

9.1.1. The basal sequence of deposits suggests that following sea level retreat in the early Quaternary (of which there do not appear to be any surviving Crag deposits in the study area), in the early to middle Pleistocene the River Bytham deposited fluvial material across the valley. This is seen as the Ingham Sands and Gravels in the stratigraphic model. These deposits appear to now be confined to the margins of the river valley and were only rarely found directly overlying the chalk bedrock where they haven't been eroded by later geomorphological processes. In the stratigraphic model all potential River Bytham fluvial deposits have been recorded as Ingham Sands and Gravels, but it should be noted that some may also be Croxton Sands and Gravels as seen in British Geological Survey mapping.

9.1.2. These earliest deposits are extremely unlikely to contain any archaeological material having formed prior to c.700,000 BP. This is because modern humans 'Homo sapiens sapiens' originated around 160,000 years ago, and these deposits are of a similar or earlier age to that of the earliest evidence for hominids (human ancestors) in the UK, which were recorded beneath the Happisburgh Till at Happisburgh on the Norfolk coast.

9.2. THE MIDDLE PLEISTOCENE ENVIRONMENT: GLACIAL CYCLES

9.2.1. Following the deposition of the River Bytham deposits the Happisburgh Till was deposited in the valley. Glaciation is a highly erosive process so we can reasonably assume that the glaciations have destroyed most archaeology-bearing horizons (e.g. soil surfaces) that precede them, and here this and subsequent glaciation was likely to have eroded the majority of the River Bytham deposits.

9.2.2. The Happisburgh till represents the earliest lowland glaciation in Eastern England and formed in the 'Cromerian Stage glaciation' that occurred between MIS 19 and MIS 13 (c.800-500,000 BP) (Lee et al 2004). The Cromerian Stage contained warm interglacial periods, and the fluviatile material seen in MM_BH_RG_109 overlying the Happisburgh till unit may be a relict meltwater feature of an interglacial either within the Cromerian or following this period.

9.2.3. Lowestoft till was then deposited during the Anglian Stage glaciation that occurred between c.478-424,000. This was the most extensive glaciation that has occurred in Britain during the Quaternary period. Distinguishing between the upper Happisburgh till and Lowestoft Till can be difficult in bulk

9.2.4. CPT samples and because of glaciotectonic deformation of sediments, so where uncertainties remain this was recorded as 'Undifferentiated Happisburgh Till and Lowestoft Till' in the model. Till was recorded in all boreholes apart from MM_BH_RG_108 and MM_BH_RG_104.

9.2.5. Following the till there were fluvial sediments in MM_RG_BH_106, MM_RG_BH_108 and MM_RG_BH_109 that suggest glaciofluvial meltwater initially utilised the Waveney Valley - likely in the immediate post-glacial period - to drain nearby icesheets, this was then followed by finer grained sediments that suggest the obstruction of meltwater and build-up of water as a lake within the valley. This likely persisted for some time, possibly into the Hoxnian Stage interglacial and beyond as particularly in the southern Suffolk valley margins at MM_RG_BH_114, MM_RG_TP_106 and MM_RG_BH_110 these fine silty deposits reached a considerable maximum thickness of 5.9m (MM_RG_BH_114).

9.2.6. Of geoarchaeological interest are the 'mid-grey brown fine sandy clay silt' MM_RG_BH_106: 17.5-19mbgl [10-8.5m AOD]), and 'soft dark brown fine sandy silty clay' (MM_RG_BH_106: 19-19.5mbgl [8.5-8m AOD]) that were seen in the upper part of the glacio-lacustrine and outwash deposits in MM_RG_BH_106. These possibly organic, brown silty deposits have high potential to be interglacial deposits, potentially of Hoxnian age, and may contain palaeoenvironmental information from a time that hominids were known to have been present within the wider environment. Hoxne (Suffolk Heritage Explorer, 2025a: Monument record HXN 001), and Lodge Hall in Mildenhall (Suffolk Heritage Explorer, 2025b: Monument record MLN 002) have both shown evidence of lakeside Palaeolithic activity in lakeside environments. Further targeting

of these deposits may be useful in contributing to Pal-Meso 05: How can East Anglian sites contribute to our understanding of the Upper Palaeolithic and Mesolithic periods nationally?

9.2.7. Following the end of lacustrine deposition in the valley, further coarse and cobbly mixed fluviatile material was found in boreholes suggestive of glaciofluvial outwash (MM_RG_BH_110, MM_RG_BH_103). This possibly derived from meltwater within the Devensian Stage glaciation. The river channel within the Wolstonian and Devensian Stages was likely to have been a cold-climate gravel-chocked braided channel system that persisted into the formation of the earliest River Waveney terrace, where it may have been reworked.

9.2.8. Head deposits were found in the southern River Waveney valley margins in MM_RG_BH_114, MM_RG_TP_108, MM_RG_IP_105. These likely formed under periglacial (cold climate) conditions in the Wolstonian Stage (between 374-130,000 BP). Their position beneath river terrace deposits may be useful for constraining age of the terraces, and it is possible that further investigation in these areas could reveal buried deposits of geo/archaeological interest such as the potential Lodge Farm Clay and Silt Member deposit immediately beneath the Head in MM_RG_TP_108 (26.12-23.74mAOD).

9.3. THE LATE PLEISTOCENE ENVIRONMENT: FLUVIAL ACTIVITY IN THE WAVENEY VALLEY

9.3.1. The transition from cold-climate deposits into the river terraces and between terraces is gradational across the valley. There is no clear delineation between any of the fluvial deposits that have accumulated to a significant thickness of sands and gravels in all boreholes within the Waveney Valley (NB: limited fluvial material was found in MM_RG_BH_114, and recent river terrace deposits were absent). The widespread presence of coarse material (sands and gravels) without interruption by alluvium or organic deposits suggests that the channel likely often avulsed and migrated across the valley floor.

9.3.2. Shells were found within few of the likely Pleistocene deposits. Preservation of shells, may indicate overall better preservation of other deposits of palaeoenvironmental interest within the unit (e.g. microfossils such as pollen and diatoms) and further work on these deposits and sequences – particularly those that have been assigned as likely Lodge Farm Clay and Silt Member (a possible lacustrine deposit) may provide useful palaeoenvironmental information about the Palaeolithic environment which is currently less well researched:

- MM_RG_BH_114: 16.5-16m AOD *(Lodge Farm Clay and Silt Member),* MM_RG_BH_105 14.25-16.05m AOD (*Lodge Farm Clay and Silt Member).*
- MM_RG_BH_110: 12.7-10.1m AOD (*River Terrace - sand and gravels*).
- MM_RG_BH_103: 20.28-18.28m AOD (*River Terrace 2*); MM_RG_BH_110: 20-18.5m AOD (*River Terrace – sands and gravels*).
- MM_RG_BH_106: shells were found in most units between 21-9.8m AOD (*River Terrace – sands and gravels*), MM_RG_BH_107: shells were found in most units between 22-16.2m AOD (*River Terrace - sands and gravels*).

9.4. HOLOCENE: WARM AND WET ENVIRONMENTS

9.4.1. The deposition of finer grained alluvium and peat within hollows in the river terraces in the uppermost part of the sequences is indicative of warmer, water-logged environments that most likely formed during the Holocene period. Both alluvium and peat preserve organic material well, and it is likely that these deposits were formed in periods of increasing human activity in the River Waveney valley, and so may provide useful palaeoenvironmental information about these human-environment interactions over time (peat was recorded in: MM_RG_BH_105; MM_RG_BH_106; MM_RG_BH_108; MM_RG_IP_107).

9.4.2. Widespread topsoil formation in all boreholes suggests that soil stabilisation has occurred likely because of a decrease in groundwater table the modern period.

9.4.3. MM_RG_IP_103 there was a calcareous deposit that may have been tufa formation. Tufa deposits can be valuable in understanding past climates, as they often contain fossils and other evidence of past

environmental conditions. Its formation in this part of the floodplain may account for why the MM_RG_IP_103 was raised above the Waveney floodplain.

10. SUMMARY OF GEOARCHAEOLOGICAL POTENTIAL

10.1.1. The following units encountered in the watching brief are deemed to be of potential geoarchaeological or palaeoenvironmental interest:

- Pleistocene silts and clays of possible lacustrine origin:
  - Lodge Farm Silt and Clay Member Deposits: MM_RG_BH_114, MM_RG_TP_108 MM_RG_BH_110, MM_RG_BH_105
  - Interglacial Lacustrine Silts and Clay: MM_RG_BH_106
- Holocene peat deposits recorded in the central part of the Waveney valley:
  - Peat was recorded in the following boreholes: MM_RG_BH_105; MM_RG_BH_106; MM_RG_BH_108; MM_RG_IP_107
- Deep alluvial deposits in MM_RG_BH_105 which may preserve palaeoenvironmental material of interest.
- Potential tufa formation beneath river terrace deposits in MM_RG_IP_103.

11. RECOMMENDATIONS FOR FURTHER ANALYSIS, PUBLICATION AND ARCHIVE

11.1. OVERVIEW

11.1.1. Any future onsite geoarchaeological works should focus upon the deposits of interest described in Section 10: Summary of Geoarchaeological Potential.

11.1.2. It is recommended that any data generated during subsequent GI at the site should be reviewed by a suitably qualified geoarchaeologist.

11.1.3. A summary of this report should be included in any future publications of geoarchaeological data from the site. An assessment report should be produced after any further works and the deposit model refined as additional data is produced.

11.1.4. The results of any additional field investigations and specialist assessments should be reported and appropriately archived in the local archives and published on OASIS to ensure that results are made accessible for future researchers. If any later work is reported in academic journals the articles must be published with open access.

11.2.RATIONALE FOR FURTHER ANALYSIS

Fieldwork and Sampling

11.2.1. The peat should be targeted in locations where the deepest deposits are present, to provide the longest palaeoenvironmental sequence. A peat probe survey should be used to discover the location of the deepest deposits (likely the centre part of the valley in the floodplain of the modern channel) and a transect should be created to retrieve samples suitable for palaeoenvironmental assessment. Alluvial samples within the transect may also be of use for palaeoenvironmental assessment.

11.2.2. The potential Tufa appears to be a shallow deposit so should be targeted through test pitting. Bulk and column samples should be collected and appropriately processed to extract samples for palaeoenvironmental assessment. In the first instance, Bulk sample <102> should be subsampled for assessment to understand the preservation potential of this deposit.

11.2.3. The potential interglacial deposits should be targeted by window sampling to retrieve undisturbed samples suitable for analysis. As this deposit appears to be isolated, careful placement of coring rigs at the location of MM_RG_BH_106 will be necessary, although there may be utility in finding how widespread the deposit is with additional boreholes.

11.2.4. The potential Lodge Farm Silt and Clay lacustrine deposit may be best targeted through a mix of test pitting and window sampling on the Suffolk valley margin between MM_RG_TP_108 and MM_RG_BH_114 where the deposit dips downwards. Of particular interest for further work is the areas where it was flagged that the Lodge Farm Clay and Silt Member deposits may have shells that are suitable for AAR dating around MM_RG_BH_114: 16-16.5mAOD, and MM_RG_BH_105: 14.25-16.05m AOD

Specialist Assessments

11.2.5. It is recommended that further works focus on collecting additional high-resolution data and recovering secure samples that can be used for dating, understanding the palaeohydrology (past water dynamics), and reconstructing the past climate and/or environmental changes.

- Sample selection for further analysis should be targeted to enable these aims to be addressed, and to contribute towards realising the research aims outlined in Section 6.2: Research Agenda.

Dating: Selection of dating methods

11.2.6. Dating of deposits will allow the sequences to be placed in the context of the local archaeological changes.

11.2.7. Macrofossils within units of interest targeted by further works (e.g. peat, tufa, alluvium) should be submitted for dating, although if this proves to be problematic due to the size or origin of macrofossils, organic sediments that would be suitable for bulk analysis could be dated using paired samples of the humic acid and humin fraction to increase the confidence in the resulting chronology.

11.2.8. For the older deposits of potential interest (e.g. lacustrine silts and clays/ interglacial lacustrine deposits) OSL dating or Amino Acid Racemisation of shells may be proper for dating deposits.

Understanding the Paleohydrology: Geochemistry

11.2.9. Isotope analysis as well as geochemical assessments of pH, Total Organic Carbon (TOC), Total Nitrogen (TN), and Phosphorous could be a useful tool for understanding some environmental changes that have across the scheme. These assessments may also provide information about anthropogenic impacts on the landscape, and environmental changes in otherwise sterile deposits (Avramidis et al, 2015; Lauryssen et al, 2024).

Reconstructing Past Climate/Environment Changes: Microfossil Analysis

11.2.10. Assessment of microscopic fossils sediment sequences such as: ostracods, diatoms and pollen to reconstruct local and regional climatic and environmental changes, particularly within deposits of palaeoenvironmental interest. Microfossil analysis can be extremely helpful in shedding light on depositional environments and chronologies, providing both information about the site itself and the wider environs. Pollen and diatoms are likely to be found in relative abundance within peat and alluvial sequences.

11.2.11. It is recommended that samples from a selection of further interventions undergo microfossil analyses as conditions are likely to vary across the scheme area, as seen in the watching brief deposit model.

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13. GLOSSARY OF SPECIALIST TERMS

Alluvium: Alluvial deposits are unconsolidated material (clay, silt, sand and gravel) deposited by running water e.g. rivers or streams. Material may be sorted or semi-sorted in a stream bed or its floodplain, and gravels are generally rounded.

Bedrock Geology: This is sometimes called solid geology. It is the main mass of rocks that form the Earth. The British Geological Survey (BGS) refers to everything older than 2.6 million years as bedrock.

Clast: A single constituent part of a sediment deposit produced by fragmentation of a larger part (e.g. gravel).

Clastic Sediments: *Detrital sediments* that are formed of broken rocks (clasts) or sometimes shell fragments, that have been eroded, transported and then redeposited at a new location. They are common in *littoral zones* where significant redeposition occurs. Particle sizes can range from silt to boulder.

Colluvium: Colluvial material or hillwash is unconsolidated material (silt, sand, gravel, and rock) that has been deposited at the base of a hillslope by processes like rainwash and downslope soil creep (erosion and gravity). Material is generally poorly sorted, and gravels are generally angular. May cap paleosols and important paleoenvironmental deposits.

Detrital sediments: Fragmented rocky material produced by weathering and then transported from its original site.

Eustasy/ Eustatic Change: Global changes in absolute sea level without regards to local isostatic changes. These changes have in the Pleistocene been almost entirely the result of glacial cycles which have sequentially stored water as ice causing sea level drops (regressions), and then melted and released water causing sea level rises (transgressions), a process also caused glacio-eustasy.

Fen: A low, marshy, sometime wooded area of land with waterlogged soils, that are usually alkaline or neutral. The Fenlands in eastern England around The Wash have been largely drained for arable agriculture since the 17th century.

Holocene: The current geological period, beginning 11.7 ka BP. The Holocene has been subdivided into three geological ages. The Greenlandian is the earliest age of the Holocene epoch (11.7 – 8.2 ka BP); this is followed by the middle Holocene age called the Northgrippian (8.2 – 4.2 ka BP), and then the Meghalayan (4.2 ka BP to present).is the second Quaternary period epoch.

Isostasy / Isostatic Change: Changes in the relative mass and buoyancy of a landmass, that causes its subsidence (e.g. due to growth of mountains or icesheets) or uplift (e.g. due to erosion of mountains or loss of icesheets). In the UK the melting of ice sheets at the end of the last glacial period is continuing to cause the crust to rebound in previously glaciated areas. This is known as an isostatic sea level change.

Landscape: All the visible features of an area of land, its landforms both natural and human made.

Last Glacial Maximum (LGM): The coldest part of the Last Glacial Period (Devensian) when ice sheets were at their greatest extent, in the UK this was between 27 – 18.5 ka BP.

Last Glacial Period / Devensian: This is also called the Devensian Glaciation (in the UK), and was the most recent phase of glaciation to have occurred in Britain, covering the period of 115 – 11.7 ka BP. It had fluctuating interstadial periods (less cold) and stadial periods (cold periods), with the most significant cool period and maximum ice sheet advance occurring in the Late Devensian. The glacial period followed the Ipswichian Interglacial.

Late Glacial Period/ Late Devensian: This is defined as the period of rapid climate fluctuations in the lattermost part of Devensian glaciation that occurred between 25 – 11.7 ka BP that covers the LGM and then rapid warming and retreat of ice sheets up to the start of the Holocene epoch. Coastal lowland areas in eastern Lincolnshire were covered by an onshore incursion of the North Sea Lobe (NSL) of the British-Irish Ice Sheet between c.29 – 14.7 ka BP.

Littoral Zone: A shoreline area, either relating to the sea or a lake.

Paleosol: An ancient soil formed on a past landscape, that has been buried by later sediments such as flood deposits, river terraces, landslides or further soil profiles. They can also be exposed be later erosion of the overlying sediments.

Palaeochannel: An abandoned fluvial channel – either a river or a stream – that has been infilled with later sediments.

Peat: A brown to black deposit formed of fibrous partially decomposed organic matter that has accumulated in a waterlogged, anoxic environment. It can rapidly form under cool, humid conditions that have been common in the post-glacial British climate.

Pleistocene: The Pleistocene epoch occurred between 2.58 Ma to 11.7 ka BP, it was dominated by cycles of glacial and interglacial periods. This was the first Quaternary period epoch.

Quaternary period: The most recent geological period from 2.58 Ma to present, including both the *Pleistocene* epoch (2.58 Ma to 11.7 ka BP), and the *Holocene* epoch (11.7 ka BP to present).

Regression: A fall in *relative sea level*.

Relative Sea Level: The height of the sea relative to a particular location, it is affected by both *isostasy* and *eustasy*.

Soil: The unconsolidated mixture of organic matter, minerals, gas, water, and organisms in which plants grow.

Superficial Geology: The looser surface material. The British Geological Survey (BGS) refers to all geologically recent (*Quaternary:* 2.6 Ma to present) deposits as superficial deposits.

Till: Unsorted, and generally very consolidated mix of material (clay, silt, sand gravels and boulders) deposited by and underneath a glacier. Glacial till has historically been also referred to as drift, glacial clay, boulder clay and diamicton.

Transgression: A rise in *relative sea level*.

Water lain deposits: These are deposited directly in water e.g. lakes, ponds, estuaries, the sea. They are distinct from alluvium and are described by the environment they were deposited in.

14. Appendices

14.1. APPENDIX 1: GEOARCHAEOLOGICAL LOGS

- Records highlighted in grey were only assessed on site and not sub-sampled for further laboratory analysis due to the potential risk of contamination within the samples (e.g. made ground or hydrocarbons).
- Records in this appendix are organised from north to south.

ANGULARITY-ROUNDNESS INDEX FOR CLASTS		LOWER CONTACT THICKNESS	
VA	Very Angular	**Sharp**	Boundary is <5mm thick
A	Angular	**Abrupt**	Boundary is 5-25mm thick
SA	Sub-Angular	**Clear**	Boundary is 25-60mm thick
SR	Sub-Rounded	**Gradual**	Boundary is 60-130mm thick
R	Rounded	**Diffuse**	Boundary is >130mm thick
VR	Very Rounded	**Indistinct**	Exact boundary is unclear

GUIDE TO GRAIN SIZE ABBREVIATIONS USED IN LOGS			
Sand		**Gravels**	
F	Fine grains (<0.25mm)	**F**	Fine pebble clasts (4-8mm)
M	Medium grains (0.25-0.50mm)	**M**	Medium pebble clasts (8-16mm)
C	Coarse grains (0.50-1.0mm)	**C**	Coarse pebble clasts (16-32mm)
Granules	Very coarse sand to very fine pebble clasts (1-4mm)	**VC**	Very coarse pebble clasts (32-64mm)
		Cobbles	Clasts 64-256mm
		Boulders	Clasts larger than 256mm that are separate from the bedrock

Table 14-1: MM_RG_IP_102 infiltration pit log

MM_RG_IP_102					
Site Code: EAGW24				**Elevation (mAOD)**	**26.167**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Infiltration Pit, excavated with JCB 3cx** **Length: 2.70m, Width: 0.5m, Orientation E-W**				**Easting**	**608901.398**
				Northing	**280454.287**
				Depth (m)	**2.55**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.30	Firm mid greyish brown, silty fine to coarse sand with fine to coarse gravels (5%) flint, chalk and reddish pink brick fragments, also contains <1% plastic (seed bag). Sharp lower boundary.	Made ground / farmer's track.		Modern
0.30	0.60	Firm dark blue grey to black fine to medium sandy silt, with 5% granular – fine CBM and chalk fragments (<1mm), with <1% decayed wood fragments (5 – 65mm).	Made ground.		Modern
0.60	1.90	Dark blue grey to black silty ashy sand with clayey pockets and frequent 20th c. refuse of ceramics, glass jars, foam plastic, and ashy / sandy clinker. Groundwater encountered at 1.8m.	Made ground.		Modern
1.90	2.55	Soft light blue grey silty sand with fine chalky sand, fine to medium SA -SR chalk gravel (5 – 35mm), pockets of decayed organics with	Likely Alluvium, possible puddle clay lining for made ground.	This unit was not sampled due to overlying made ground, and strong organic odour.	Holocene

MM_RG_IP_102					
Site Code: EAGW24				**Elevation (mAOD)**	**26.167**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Infiltration Pit, excavated with JCB 3cx** **Length: 2.70m, Width: 0.5m, Orientation E-W**				**Easting**	**608901.398**
				Northing	**280454.287**
				Depth (m)	**2.55**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		strong organic odour. End of TP.			

Figure 14-1: Section of MM_RG_IP_102

Table 14-2: MM_RG_TP_105 test pit log

MM_RG_TP_105					
Site Code: EAGW24				**Elevation (mAOD)**	24.168
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Test Pit** **Length: 3.00m, Width: 0.5m, Orientation: N-S (bearing 10°)** **Reason for monitoring: Presence of river terrace deposits (sands and gravels)**				**Easting**	609548.002
				Northing	279838.013
				Depth (m)	2.00
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.15	Loose mid-yellow grey slightly silty fine sand. Moderate rooting, sharp lower boundary.	Topsoil		Holocene
0.15	0.35	Loose dark yellow grey very slightly silty fine sand unit contained a single flint cobble (70mm; SR).	Subsoil/ Alluvium		Holocene
0.35	1.85	Loose light whiteish-yellow fine medium sand, mottled mid yellow brown, becoming much darker with light mottling from 0.80mbgl. Contains very, very rare fine gravel and Fe concretions. Mid grey green band with rare Fine to Medium SA-SR flint gravels (<1%) at 1.50 – 1.60m. Ground water seepage noted at 0.60mbgl.	Fluvial: River Terrace (3 ?)		Quaternary
1.85	1.90	Compact coarse golden sand with 5% fine SR flint (5–10mm). Test pit finished at 1.90bgl due to wall collapse	River Terrace 1		Quaternary

Figure 14-2: Section of MM_RG_TP_105

Table 14-3: MM_RG_BH_103 borehole log

MM_RG_BH_103					
Site Code: EAGW24				**Elevation (mAOD)**	**23.28**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609593.985**
				Northing	**279745.999**
				Depth (m)	**11.70**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.44	Under turf, friable black highly organic fine sandy clayey silt – almost peat with a sharp lower boundary.	Topsoil		Holocene
0.44	1.20	Compact light yellow to blue grey medium to coarse sand.	Fluvial : River Terrace (2 ?)		Quaternary
1.20	1.30	Compact light brownish grey sandy silt. Sand is fine with rare detrital peat/ organic material fragments to 20mm. Damp. Gradational into:	Fluvial (low energy): River Terrace (2 ?)		Quaternary
1.30	3.00	Mid blue grey medium sand with decayed rootlets.	Fluvial increasing channel velocity with depth. Roots post-depositional: River Terrace (2 ?)		Quaternary
3.00	6.00	Loose light grey yellow sand (medium to coarse) with 5% fine to coarse chalk, chert and flint gravel (A – R; c. 50mm SR) locally silty in some places gravelly, with abraded shell. Between 5.00-5.45mbgl sand pocket.	Fluvial: River Terrace (2 ?)		Quaternary
6.00	7.20	Loose golden coarse sand with 20% fine to coarse gravel and cobbles of flint, quartz, and rare chalk gravel (SA – SR)	Fluvial : River Terrace (1 ?)		Quaternary

MM_RG_BH_103					
Site Code: EAGW24				**Elevation (mAOD)**	**23.28**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609593.985**
				Northing	**279745.999**
				Depth (m)	**11.70**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
7.20	10.70	Firm dark blue grey clay with 5% chalk gravel fine SR (5–15mm), becoming stiff from 10mbgl	Till: Lowestoft Till		Pleistocene: Anglian Stage
10.70	11.70	Fine (5-10mm), SA-SR chalk gravel, with medium-coarse (1–55mm) SA-SR flint and chalk gravels in a coarse sandy matrix with some cobbles of flint. Water encountered at 10.70mbgl.	Fluvial: Ingham Sand and Gravel Formation		Pleistocene: Middle-Early
11.70	11.70	Chalk bedrock. End of geoarchaeological monitoring	Bedrock: Chalk		Pre-Quaternary

Figure 14-3: MM_RG_BH_103 SPT at 7.45m BGL

Table 14-4: MM_RG_BH_104 borehole log

MM_RG_BH_104					
Site Code: EAGW24				**Elevation (mAOD)**	**23.517**
Logger: JS /TG					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of river terrace deposits (sands and gravels)**				**Easting**	**609512**
				Northing	**279681.003**
				Depth (m)	**20.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.40	Dark brown black slightly silty fine to medium sand. Rooted.	Topsoil		Holocene
0.40	0.80	Soft light yellow brown fine sandy silt with calcareous peat lenses (peat in bulk).	Subsoil/ Alluvium		Holocene
0.80	2.00	Loose light brownish red fine to medium sand.	Fluvial: River Terrace (3 ?)		Quaternary
2.00	5.00	Loose greyish brown grading to yellowish grey fine to medium sand.	Fluvial: River Terrace (3 ?)		Quaternary
5.00	8.50	Wet, loose mid yellow grey medium coarse sand.	Fluvial: River Terrace (3 ?)		Quaternary
8.50	12.00	Wet, mid yellowish grey coarse granular sand. Remaining homogenous. Lower boundary grades.	Fluvial: River Terrace (2 ?)		Quaternary
12.00	16.70	Wet, dark brownish yellowish grey silty sand. Medium to coarse and granular. Grades to slightly clayey silty sand (coarse) with some laminations and dark flecks.	Fluvial: River Terrace (2 ?)		Quaternary
16.70	18.10	Light grey to brown coarse sandy gravel, clasts (are angular fine to medium (2 – 15mm) of flint and quartz, with rare coarse clasts of rounded chalk (20–50mm).	Fluvial: River Terrace (1 ?)		Quaternary

MM_RG_BH_104					
Site Code: EAGW24				**Elevation (mAOD)**	**23.517**
Logger: JS /TG					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of river terrace deposits (sands and gravels)**				**Easting**	**609512**
				Northing	**279681.003**
				Depth (m)	**20.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
18.10	20.00	Soft mid brown grey silt. No inclusions. End of borehole.	Glacial Silt and Clay		Pleistocene: Middle

Figure 14-4: MM_RG_BH_104 SPT at 19.00m BGL

Table 14-5: MM_RG_BH_105 borehole log

MM_RG_BH_105					
Site Code: EAGW24				**Elevation (mAOD)**	**22.754**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609737.978**
				Northing	**279672.008**
				Depth (m)	**16.50**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.30	Friable black highly organic clayey silt. Moderate rooting, crumbly structure.	Modern floodplain; Topsoil		Modern
0.30	1.20	Firm, dark brownish grey to black highly organic clayey silt.	Floodplain soil: Alluvium		Holocene
1.20	2.00	Friable mid reddish brown slightly clayey, slightly silty poorly formed peat with 25% fine slightly decayed plant fragments. Water encountered at 1.2mbgl. Drillers adding water from c. 2.00mbgl.	Wetland/ channel marginal?: Peat		Holocene
2.00	3.00	*Very* soft light green grey ephemeral fine sandy silt, drillers casing dropped as so soft. Lower boundary dubious.	Unit possibly interbedded with peat; possibly disturbed by drilling: Alluvium		Holocene
3.00	4.00	Clay recorded in SPT	Alluvium		Holocene
4.00	4.30	Loose mid brown grey slightly silty fine to medium sand.	Fluvial deposit (low energy): River Terrace (2 ?)		Quaternary
4.30	6.45	Compact mid grey yellow medium coarse	Fluvial deposit, normally grading (coarsens/higher		Quaternary

MM_RG_BH_105					
Site Code: EAGW24				**Elevation (mAOD)**	**22.754**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609737.978**
				Northing	**279672.008**
				Depth (m)	**16.50**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		sand. From 5.50m becoming slightly gravelly (5%) fine (10–20mm) flints SA.	energy down unit): River Terrace (2 ?)		
6.45	6.70	Gravelly sand. Gravel is 10% SA flints fine to coarse (< 40mm)	Fluvial deposit, (continuing to coarsen down): River Terrace (2 ?)		Quaternary
6.70	7.30	Stiff dark green-grey slightly fine sandy clay, with <1% shell fragments; <1% SA chalk fragments. Grading down to light blue-grey.	Lacustrine? : Lodge Farm Clay and Silt Member ?		Pleistocene: Late Anglian Stage - Hoxnian
7.30	8.50	Light blue grey slightly silty fine sand, with a single medium chalk (SR) gravel (15mm) clast. Water strike.	Lacustrine? : Lodge Farm Clay and Silt Member ?		Pleistocene: Late Anglian Stage- Hoxnian
8.50	10.00	Mid blue-grey slightly fine sandy and slightly silty, very gravelly clay. Contains 20% fine to medium gravel of SR chalk (coarsening down unit), and becoming chalkier with depth to 40% fine to medium SA–SR chalk gravels at base. Unit dampens down.	Till: Lowestoft Till		Pleistocene: Anglian Stage
10.00	10.50	Stiff dark blue grey clay with abundant (40%) chalk gravels.	Till: Lowestoft Till		Pleistocene: Anglian Stage

MM_RG_BH_105					
Site Code: EAGW24				**Elevation (mAOD)**	**22.754**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609737.978**
				Northing	**279672.008**
				Depth (m)	**16.50**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
10.50	12.90	Mid yellow grey coarse granular sand and gravel. Gravel is abundant fine to coarse with low cobble content, formed of flint, chalks, quartzite c. 40% chert & igneous rocks. Lower boundary grades over 50cm.	Fluvial: Ingham Sand and Gravel Formation		Pleistocene: Middle-Early
12.90	14.40	Granular, compacted light, very gravelly greyish yellow coarse sand. Gravels are fine to coarse and cobbles of mixed lithology with mostly flint cobbles. Artesian water pumping back up by 1m every time tool removed.	Fluvial: Ingham Sand and Gravel Formation		Pleistocene: Middle-Early
14.40	16.50	Chalk. Putty consistency. Sandy off-white chalk.	Bedrock : Chalk		Pre-Quaternary

Figure 14-5: MM_RG_BH_105 U4 at 7.0m BGL

Table 14-6: MM_RG_BH_106 borehole log

MM_RG_BH_106					
Site Code: EAGW24				**Elevation (mAOD)**	**23.321**
Logger: TG, JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609691.99**
				Northing	**279593.995**
				Depth (m)	**29.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.50	Loose, dark brown, sandy topsoil	Topsoil		Holocene
0.50	1.00	Sandy peat, black, damp.	Peat		Holocene
1.00	1.50	Loose, grey coarse sand with black (organic) mottling, sub-rounded, well-sorted	Alluvium		Holocene
1.50	2.00	Medium grey sandy silt with shell fragments, low plasticity, medium-grained sand.	River Terrace: Low-Medium Energy Fluvial: Fluvial: River Terrace (2 ?)	<1>	Quaternary
2.00	2.50	Greyish brown coarse sand SA-SR with black finer grained sand laminations up to 10mm with shell fragments. Wet.	River Terrace: Fluvial (increase in energy from overlying unit): Fluvial: River Terrace (2 ?)		Quaternary
2.50	3.80	Loose, medium to light grey coarse sand with shell fragments and medium to fine black sand laminations.	River Terrace: Fluvial: Fluvial: River Terrace (2 ?)		Quaternary
3.80	4.00	Medium grey sandy silt, low plasticity. Sand is coarse with shell fragments. Wet.	River Terrace: Fluvial (decreased energy): Fluvial: River Terrace (2 ?)		Quaternary
4.00	4.50	Greyish brown coarse sand SA – SR with rare black fine sand laminations up to 10mm	River Terrace: Fluvial (increased energy): Fluvial: River Terrace (2 ?)		Quaternary
4.50	5.50	Light brown to light grey coarse,	River Terrace:		Quaternary

MM_RG_BH_106					
Site Code: EAGW24				**Elevation (mAOD)**	**23.321**
Logger: TG, JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609691.99**
				Northing	**279593.995**
				Depth (m)	**29.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		well-sorted sand, with flint and shell fragments, SR – SA. Wet. No laminations.	Fluvial (increased energy): Fluvial: River Terrace (2 ?)		
5.50	10.00	Light brown to light grey coarse (SA-SR) well sorted sand, wet.	River Terrace: Fluvial (decreased energy): Fluvial: River Terrace (2 ?)		Quaternary
10.00	12.20	Medium grey to light brown coarse to medium sand with shell fragments, wet, loose. Geotech test at 10m and reduction in diameter from 10m resulted in poor recovery and fluidized returns. Coarse to medium sand suspended in water. Appears to be the same as 5.5 - 10m.	River Terrace: Fluvial (decreased energy): Fluvial: River Terrace (2 ?)		Quaternary
12.20	12.40	Medium grey sandy silt. Sand is coarse to medium.	River Terrace: Fluvial (decreased energy): Fluvial: River Terrace (2 ?)		Quaternary
12.40	13.20	Medium grey-brown coarse sand with shell fragments. Wet, lose, well-sorted, sub-rounded.	River Terrace: Fluvial (increased energy): Fluvial: River Terrace (2 ?)		Quaternary
13.20	13.50	Medium grey sandy silt, micaceous, low plasticity, wet, medium grained sand.	Fluvial: River Terrace (1 ?)		Pleistocene

MM_RG_BH_106					
Site Code: EAGW24				**Elevation (mAOD)**	**23.321**
Logger: TG, JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609691.99**
				Northing	**279593.995**
				Depth (m)	**29.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
13.50	14.50	Medium grey silty sandy clay, moderately plastic. Sand is medium and wet. Black mottling is aligned with fabric in 3–7mm long lenses.	Glacio-Lacustrine and Outwash		Late Pleistocene
14.50	15.00	Medium grey clayey silt, moderately plastic, minor sand component	Glacio-Lacustrine and Outwash		Late Pleistocene
15.00	16.00	Medium grey silty clay, stiff, highly plastic, damp. Very little sand, no clasts	Glacio-Lacustrine and Outwash		Late Pleistocene
16.00	17.50	Silty clay. Very soft, highly plastic, damp medium grey with silty bands 5cm thick, very little sand, no clasts	Glacio-Lacustrine and Outwash		Late Pleistocene
17.50	19.00	Mid grey brown fine sandy clay silt.	Interglacial Lacustrine? Hoxnian Stage Interglacial lake? : Lodge Farm Silt and Clay Member ?		Pleistocene
19.00	19.50	Soft dark brown fine sandy silty clay. No visible inclusions.			Pleistocene
19.50	20.50	Loose light greyish yellow coarse sand becoming fine, with medium flint SA–SR gravel, and from 20.50mbgl also with fine to medium SR chalk gravel.	Glacial Sands and Gravels: Glaciofluvial Deposit		Pleistocene

MM_RG_BH_106					
Site Code: EAGW24				**Elevation (mAOD)**	**23.321**
Logger: TG, JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609691.99**
				Northing	**279593.995**
				Depth (m)	**29.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		Water strike at 19.50mbgl.			
20.50	21.50	Dark blue-grey stiff fine sandy clayey silt with rare granular to fine SR chalk gravels (5%).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
21.50	25.80	Stiff dark blue gravelly clay. Gravels are 20% and SR chalk fine to medium (5–25mm).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
25.80	26.50	Soft grey fine silty sand.	Weathered bedrock? Possible Crag.		
26.50	28.50	Chalk.	Bedrock		Pre-Quaternary

Figure 14-6: MM_RG_BH_106 Bulk from 17.50 to 17.95m BGL

Table 14-7: MM_RG_BH_107 borehole log

MM_RG_BH_107					
Site Code: EAGW24				**Elevation (mAOD)**	**23.724**
Logger: JW/PM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609677.365**
				Northing	**279503.678**
				Depth (m)	**10.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.50	Dark brown loamy sandy silt. Humic and loose with roots. Moderately saturated.	Topsoil		Holocene
0.50	1.20	Loose greyish brown sand, fine to coarse, fining down-unit. Very mottled, blackish, orangeish and dark grey stains. Clean. Saturated. Massive.	Fluvial unit that has undergone redox: Fluvial: River Terrace (3 ?)		Quaternary
1.20	2.00	Dark brown, with some dark grey stains clayey sand (F – M) that is possibly slightly humic.	Fluvial: Fluvial: River Terrace (3 ?)	Bulk	Quaternary
2.00	2.50	At 2m, there is a grade to a more granular sand that contains 5% F – M gravel of SR – SA flint.	Fluvial (coarsening): Fluvial: River Terrace (3 ?)		Quaternary
2.50	2.95	Slightly silty sand. Pale yellowish brown with very fine gravels <5%. Very saturated with water.	Fluvial: Fluvial: River Terrace (3 ?)		Quaternary
2.95	4.50	Pale yellowish brown slightly silty sand with very few gravels (<5%). Sand is fine to coarse, gravel is flint SA-A, F – M. Very few shell flecks. Very wet from drilling.	Fluvial: Fluvial: River Terrace (2 ?)		Quaternary

MM_RG_BH_107					
Site Code: EAGW24				**Elevation (mAOD)**	**23.724**
Logger: JW/PM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609677.365**
				Northing	**279503.678**
				Depth (m)	**10.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
4.50	5.95	Yellowish brown sand with very few gravels (<2%). Sand is fine. Very few shell flecks. Drier, loose. (<1%) flint. Sand coarsens slightly from 5.50mbgl.	Fluvial: Fluvial: River Terrace (2 ?)		Quaternary
5.95	6.95	Yellowish brown slightly silty sand. Contains very few (<2%) fine flint gravel and very few shell flecks. Slight saturated granules.	Fluvial: Fluvial: River Terrace (2 ?)		Quaternary
6.95	7.50	Yellowish brown slightly silty sand. Contains very few (<2%) fine flint gravel and very few shell flecks. Slight saturated granules.	Fluvial: Fluvial: River Terrace (2 ?)		Quaternary
7.50	8.00	Pale yellowish brown sand with gravel. Sand is fine to coarse. Gravel is flint A – VA, fine to medium (5 – 10%).	Fluvial, coarsening: Fluvial: River Terrace (2 ?)		Quaternary
8.00	8.30	Yellowish brown cobbles, gravels and sand. Sand is fine to coarse (50%). Gravel is R – A, mixed lithology: flints, chalks (45%); cobbles are few (5%; 100mm – 140mm).	River terrace: Fluvial: River Terrace (2 ?)		Quaternary

MM_RG_BH_107					
Site Code: EAGW24				**Elevation (mAOD)**	**23.724**
Logger: JW/PM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609677.365**
				Northing	**279503.678**
				Depth (m)	**10.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
8.30	9.50	Medium grey (battleship) firm clay with chalk gravel (30%). Gravel is mostly fine-medium SR – R. Few orangey brown sandy lenses at upper transition into unit.	Till: Lowestoft Till		Pleistocene: Anglian Stage
9.50	9.95	Dark grey clayey silt, firm, slightly saturated. No inclusions / structures within sample.	Glacial Silt and Clay		Pleistocene: Anglian Stage ?
9.95	11.50	Medium grey stiff slightly silty clay, few gravel inclusions. Massive. Gravel is fine chalk, generally <5mm dia. (2%) Moderately saturated.	Glacial Silt and Clay		Pleistocene
11.50	11.95	Dark grey firm silt with some clay. Rare white flecks (<2mm dia) appear to be chalk granules. Massive: becomes lighter on saturation.	Glacial Silt and Clay		Pleistocene
11.95	12.50	Medium grey firm silt with some clay. Appears to contain lenses of lighter grey very fine sand – possibly laminated [hard to discern as C.P.,	Glacial Silt and Clay		Pleistocene

MM_RG_BH_107					
Site Code: EAGW24				**Elevation (mAOD)**	**23.724**
Logger: JW/PM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609677.365**
				Northing	**279503.678**
				Depth (m)	**10.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		hydrated]. Has some mica flecks.			
12.50	13.50	Massive medium grey slightly clayey silt – possibly laminated [hard to discern as C.P., hydrated]. Has some mica flecks.	Glacial Silt and Clay		Pleistocene
13.50	13.95	Medium grey slightly clayey silt with mica flecks and white $CaCO_3$ flecks in places – possibly shells (small, 1 – 3mm dia). Some olive coloured surface oxidation.	Glacial Silt and Clay	Small sample bag taken.	Pleistocene
13.95	14.50	Medium grey micaceous silt, moderately firm, with some dark grey stiff clay laminations at approximately 2 – 5cm thickness (silt 85%). Contains very few (<1%) gravels (F – M, A) mixed with very few white $CaCO_3$ granules (small, 1 – 3mm dia).	Glacial Silt and Clay		Pleistocene
14.50	14.95	Medium grey micaceous silt, moderately firm, with some dark grey stiff clay laminations at approximately 2 – 5cm thickness (silt 85%). Contains very few (<1%) gravels	Glacial Silt and Clay		Pleistocene

MM_RG_BH_107					
Site Code: EAGW24				**Elevation (mAOD)**	**23.724**
Logger: JW/PM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609677.365**
				Northing	**279503.678**
				Depth (m)	**10.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		(F – M, A) mixed with very few white $CaCO_3$ granules (small, 1 – 3mm dia).			
14.95	15.00	Medium grey micaceous silt, moderately firm, with some dark grey stiff clay laminations at approximately 2 – 5cm thickness (silt 85%). Contains very few (<1%) gravels (F – M, A) mixed with very few white $CaCO_3$ granules (small, 1 – 3mm dia).	Glacial Silt and Clay		Pleistocene

Table 14-8: MM_RG_IP_103 infiltration pit log

MM_RG_IP_103					
Site Code: EAGW24				**Elevation (mAOD)**	**30.46**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Infiltration Pit** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609997.983**
				Northing	**279530.988**
				Depth (m)	**1.30**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.35	Compact black very organic medium to fine sandy clay and silt. Contained a single dark red subrounded sandstone fragment (35mm). Sharp lower boundary	Topsoil.		Holocene
0.35	0.95	Loose light yellow grey fine to medium sand. Sharp lower boundary.	Fluvial: River Terrace (3 ?)		Holocene
0.95	1.10	Compact mid-greyish green fine to medium sand.	Fluvial: River Terrace (2 ?)		Quaternary
1.10	1.30	Compact light whitish grey calcareous silt with fine SR calcareous flecks and rare fine wood fragments, and rare detrital peat fragments End of TP.	Possible Tufa formation – likely early Holocene (Flandrian) mere: Mere Deposit	Bulk <102>	Quaternary : Holocene-Pleistocene transition

Figure 14-7: MM_RG_IP_103 calcareous section

Table 14-9: MM_RG_IP_107 infiltration pit log

MM-RG-IP107					
Site Code: EAGW24				**Elevation (mAOD)**	23.172
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Infiltration Pit, excavated with JCB 3cx** **Reason for monitoring: Presence of river terrace deposits (sands and gravels)**				**Easting**	610096.994
				Northing	279412.017
				Depth (m)	1.20
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.40	Compact dark brownish black slightly silty fine to medium sand. Unit is organic, and lightly rooted. Sharp lower boundary.	Topsoil		Holocene
0.40	0.75	Soft black highly organic peaty silty clay with 5% fine decayed detrital plant fragments. Sharp lower boundary.	Channel marginal wetland: Peat		Holocene
0.75	1.20	Loose light whitish blue grey, mottled mid-orangish brown, fine to medium sand. No visible inclusions. End of TP.	Fluvial deposit: River Terrace (3 ?)		Quaternary

Figure 14-8: MM_RG_IP_107

Table 14-10: MM_RG_BH_108 borehole log

MM_RG_BH_108					
Site Code: EAGW24				**Elevation (mAOD)**	**22.97**
Logger: JS					
Scheme Area: Waveney Valley Crossing				**Easting**	**609879.99**
GI Type: Cable Percussion Borehole				**Northing**	**279528.016**
Reason for monitoring: Presence of peat deposits				**Depth (m)**	**20.5**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.25	Compact dark grey brown highly organic clayey silty sand	Topsoil. Sharp boundary		Holocene
0.25	1.60	Black wet peat, frequent fine-medium semi-decayed plant fragments, becoming clayey from 1m.	Wetland: Peat	Sample 5	Holocene
1.60	3.50	Loose light green-grey fine medium sand becoming granular to fine gravel.	Fluvial: River Terrace (3?)		Quaternary
3.50	5.20	Loose light yellow grey medium-coarse sand, some gravel in bulk (fine – medium flint)			
5.20	5.50	As above but slightly siltier.			
5.50		Loose light yellow grey, slightly silty medium-coarse sand with some fine granules.			
6.50	6.95	Silty fine medium sand			
7.00	7.00	Very silty sand			
7.50	7.95	Golden medium coarse sand	Fluvial: River Terrace (2 ?)		Quaternary
8.20	8.30	Golden fine medium silty sand			
8.50	8.95	NO RECOVERY			
9.50	9.95	Golden medium sand			
10.50	10.95	NO RECOVERY			

MM_RG_BH_108					
Site Code: EAGW24				**Elevation (mAOD)**	**22.97**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609879.99**
				Northing	**279528.016**
				Depth (m)	**20.5**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
11.5	11.95	Light grey yellow medium coarse sand. 1% fine 5 - 10mm SR chalk gravel in upcast. some flint SASR 5 - 10mm gravel.			
12.5	12.70	Light grey yellow medium coarse sand. 5% flint SASR 5 - 15mm gravel.			
12.90	13.00	Light grey yellow medium coarse sand. 5% flint SASR 5 - 15mm gravel and X1 70mm flint gravel. Slightly greyer from 12.3m.			
13.3	13.3	silty gravelly sand, 15% gravel FMC, flint chalk quartzite, SASR, 5-70mm predominantly 40 - 35mm.	Glaciofluvial Deposit		Quaternary
14.5	14.95	silty gravelly sand, 15% gravel FMC, flint, chalk quartzite, SASR, 5-70mm predominantly 40 - 35mm			
15.2	15.3	silty gravelly sand, 15% gravel FMC, flint chalk quartzite, SASR, 5-70mm predominantly 40 - 35mm.			
16.0	16.45	Light grey yellow coarse sand with 10% fine chalk flecks and grey flint, 1 - 10mm,			

MM_RG_BH_108					
Site Code: EAGW24				**Elevation (mAOD)**	**22.97**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole** **Reason for monitoring: Presence of peat deposits**				**Easting**	**609879.99**
				Northing	**279528.016**
				Depth (m)	**20.5**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		sandstone SA 40mm.			
16	20	Gravel, some chalk			
16.7	16.7	Brown slightly gravelly silty sand, slightly clayey, with rare gravels.			
17.0	17.40	Light grey yellow coarse sand with 10% fine chalk flecks and grey flint, 1 - 10mm, sandstone SA 40mm			
17.45	17.50	Mid blue grey fine sandy silt band,5% chalky			
17.5	18.5	Grey slightly sandy slightly gravelly silt with occasional sand bands.			
18.5	18.5	Mid grey brown coarse granular sand with fine medium 5 - 45 SASR flint, chalk quartzite gravels.			
19.0	19.45	Medium golden sand, no gravel recovery.			
20.0	20.53	No Recovery	End of borehole.		

Figure 14-9: MM_RG_BH_108 SPT 12.50 to 12.76m BGL

Table 14-11: MM_RG_BH_109 borehole log

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing				**Easting**	**609837.49**
GI Type: Cable Percussion Borehole (+ rotary)				**Northing**	**279450.062**
Reason for monitoring: Presence of River Terrace deposits				**Depth (m)**	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0	0.5	Compact black fine medium silty sandy highly rooted organic soil.	Sharp boundary Topsoil		
0.5	1.2	Loose light grey yellow f-m sand, light Fe staining from 0.5m. Damp, slightly silty, rare fine gravel (chert and flint, 5mm, SR).	River Terrace (2 ?)		
1.2	1.65	Seen in cone. Band of fine SSR gravels, then light yellow grey fine medium sand with 10% fine 5 - 10mm SASR flint gravels, sand slightly coarse and still silty	River Terrace (2 ?)		
1.65	2.0	Loose light grey yellow fm sand, light Fe staining from 0.5m. Damp, slightly silty, rare fine gravel (chert and flint, 5mm, SR).	River Terrace (2 ?)		
2	3.5	Fairly well consolidated light yellow brown silty fmc sand with fmc SASR flint, chert, chalk gravel, 5-55mm, 15%. Incrementally coarser sand (band of fine). Granular chalk	Fluvial energy increasing, River Terrace (2 ?)		
3.5	3.6	Fairly well consolidated light yellow brown silty	River Terrace (2 ?)		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		fmc sand with fmc SASR flint, chert, chalk gravel, 5-10mm, 10%. Larger coarse fraction of sand.			
4.5	5.5	Fairly well consolidated light yellow brown silty fmc sand with fmc SASR flint, chert, chalk gravel, 5-55mm, 15%. Incrementally coarser sand (band of fine). Granular chalk	River Terrace (2 ?)		
6	6.1	Fmc 5 - 75mm SASR flint, chert, chalk, quartzite, in a light brown yellow coarse granular sand matrix.	River Terrace (2 ?)		
6.5	6.5	Fmc 5 - 75mm SASR flint, chert, chalk, quartzite, in a light brown yellow coarse granular sand matrix.	River Terrace (2 ?)		
7.5	7.5	Fmc 5 - 75mm SASR flint, chert, chalk, quartzite, in a light brown yellow coarse granular sand matrix.	River Terrace (2 ?)		
8.5	8.5	Fmc 5 - 75mm SASR flint, chert, chalk, quartzite in a light brown yellow coarse granular sand matrix. Much gravellier, c. 30%. Occasional flint	River Terrace (2 ?)		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		cobbles, SR 70mm.			
10.5	10.5	Wet. Predom fine gravel with cmf sand (80g/20s). Gravel mostly granule (2.5mm) and pebble (10 - 15mm, A-SA, infrequently rounded.) rare larger pebbles, 20 - 30mm, SA-A. Dark grey brown.	River Terrace (2 ?)		
11	12	Wet. Predom fine gravel with cmf sand (40/60s). Gravel mostly granule (2.5mm) and pebble (10 - 15mm, A-SA, infrequently rounded.) rare larger pebbles, 20 - 30mm, SA-A. Dark grey brown.	River Terrace (2 ?)		
12	12.5	Sandy fine gravel (90g / 10s). Light grey brown, coarse, slightly chalky sand. Gravel heterolithic, predominantly granule/very small pebble (2 - 4mm, SRSA) and small chalk, flint, chert pebbles (10-15mm, SA, infrequent SR/R). Infrequent large pebbles (40 - 50mm) and rare large cobbles (80 - 100mm, SA, flint and chert).	River Terrace (1 ?)		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
12.5	14	Sandy fine gravel (90g / 10s). Light grey brown, coarse, slightly chalky sand. Gravel heterolithic, predominantly granule/very small pebble (2 - 4mm, SRSA) and small chalk, flint, chert pebbles (10-15mm, SA, infrequent. SR/R). Infrequent large pebbles (40 - 50mm)	River Terrace (1 ?)		
14	14.5	Sandy gravel (40s/60g). cm pale-grey brown sand and granules (predominantly chalk, SA - R, w - 3mm) supporting frequent small pebbles (5-10mm, chert SA and chalk SR), infrequent med pebbles (40-30mm, chert and flint SA, chalk SR) and very rare cobbles (100-120mm, SA, flint). Wet and very chalky.	River Terrace (1 ?)		
14.5	15.5	Sandy gravel (40s/60g). CM pale grey brown heterolithic sand with flint and gravel granules (SR-SA, 2 - 4mm), occasional pebbles (20-30mm, SASR flint	River Terrace (1 ?)		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		and SRR chalk). Infrequent large pebbles (flint and chert. 40-60mm, SA). Saturated and very chalky.			
15.5	15.9	Sandy gravel (10s/90g) CM pale grey sand with very frequent granules (predominantly chalk, 2-3mm, SRSA: also flint SA and chert SASR. Occasional small pebbles (30-40mm, SRSA) and cobbles (100-150mm, SR-R chalk, SA flint and chert). Very rare 30-40mm R clods of stiff dark grey clay with fine white chalk granules.	Glaciofluvial Deposit		
15.9	16.15	Sandy gravel (10s/90g) CM pale grey sand with very frequent granules (predominately chalk), 2-3mm, SRSA: also flint SA and chert SASR. Occasional small pebbles (30-40mm, SRSA). Occasional 30-40mm R clods of very stiff dark grey clay with fine white chalk granules.	Glaciofluvial Deposit		
16.15	16.6	Transition somewhere here	Till – Undifferentiated		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		to very stiff dark grey clay with chalk granules (80c/20g).	Lowestoft Formation and Happisburgh Formation		
16.5	16.46	Very stiff dark grey clay with chalk granules (80c/20g).	Till – Undifferentiated Lowestoft Formation and Happisburgh Formation		
17	17.45	Very stiff dark grey clay with chalk granules (80c/20g).	Till – Undifferentiated Lowestoft Formation and Happisburgh Formation		
19.5	19.5	Very stiff dark grey clay with chalk granules (90c/10g).	Till – Undifferentiated Lowestoft Formation and Happisburgh Formation		
21	21.45	Very stiff dark grey clay with chalk granules (80c/20g).	Till – Undifferentiated Lowestoft Formation and Happisburgh Formation		
22.45	22.55	Very stiff dark grey clay with chalk granules (80c/20g) and trace medium sand.	Till – Undifferentiated Lowestoft Formation and Happisburgh Formation		
22.7	23	Dark grey silty clayey gravel with trace medium M sand. Almost all chalk, granule - small pebble (2 - 3mm SRSA)/and very rarely pebble (10 - 20mm, SA). Very rare flint granules and pebbles (SA 3-5mm). Saturated	Glaciofluvial Deposit		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
23	23.5	Dark grey silty / fine sandy polymictic gravel. Frequent chalk and flint granules (2-3mm, SASR) and small pebbles (10-15mm SASR, rarely R); rare cobbles (50-80mm, SASR). 2X belemnite fossils (5mm and 50mm).	Glaciofluvial Deposit		
23.5	23.9	Dark grey silty / coarse sandy polymictic gravel. Frequent chalk and flint granules (2-3mm, SASR) and small pebbles (10-15mm SASR, rarely R); infrequent large cobbles (100-200mm, SASR).	Glaciofluvial Deposit		
24	24.5	Mid grey CM sandy gravel, predominantly granules (2-2.5mm) of flint (SASR) and chalk (SR). Frequent large pebbles (40-60mm, SA) with small R/SR clods of dark grey firm clay with chalk (30-40mm), and rare cobbles.	Glaciofluvial Deposit		
25.3	25.3	CM sandy granule gravel with frequent large R/SR clods of dark grey stiff clay (70-80mm, 80c/20g).	Till - Happisburgh Formation		
25	25.5	Very compact dark grey clay	Till - Happisburgh Formation		

MM_RG_BH_109					
Site Code: EAGW24				**Elevation (mAOD)**	**23.912**
Logger: JS/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609837.49**
				Northing	**279450.062**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		with chalk granules (90c/10g).			
25.5	25.6	Very stiff dark grey clay with chalk granules (80c/20g).	Till - Happisburgh Formation		
26.45	26.55	Very stiff dark grey clay with chalk granules (90c/10g).	Till - Happisburgh Formation		
28	28.5	Very stiff dark grey clay with chalk granules (90c/10g).	Till - Happisburgh Formation		
28.5	29	Very stiff dark grey clay with chalk granules (70c/30g).	Till - Happisburgh Formation		
29	29.45	Very stiff dark grey clay with chalk granules (90c/10g).	Till - Happisburgh Formation		
29	30	Very stiff dark grey clay with chalk granules (90c/10g).	Till - Happisburgh Formation		
31	31.5	Mid grey brown silty fine-medium heterolithic (black and white grains among groundmass) with trace coarse sand and very rare pebbles (3-5mm, SR). Saturated.	Weathered Bedrock		

Figure 14-10: MM_RG_BH_109 15.5 to 15.9m BGL

Table 14-12: MM_RG_BH_110 borehole log

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.0	0.5	Dark brown moist, very fine sandy silty soil. Densely rooted, fine loose peds – friable. Lighter brown down sequence. Abrupt transition.	Topsoil.		
0.5	1.2	Fine mid brown-orange silty sand with large pale-grey-brown mottling, dominant down-sequence. Moist and friable.	River Terrace (3 ?)		
1.2	1.65	MF slightly silty brown-grey sand with 1-2% gravel (granules, flint SA	River Terrace (3 ?)		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		and chalk SR, 1-2mm, rarely up to 5mm).			
1.65	2.0	FMC gravelly heterolithic sand (35G / 65S). Mainly heterolithic M pebbles (10 – 15mm, flint SA, chalk SASR) and granules (1-2mm) with rare cobbles (50-70mm, SRSA).	River Terrace (2 ?)		
2	2.5	Mid-brown slightly gravelly, slightly silty MC sand with occasional pebbles (10-20mm, SRSA) and granules (1-2mm), (90S / 10G).	River Terrace (2 ?)		
3	3.45	Brown FM sand with rare small pebbles (2 – 4mm, SR).	River Terrace (2 ?)		
3.5	4	Mid-brown MF sand with occasional granules (2-3mm SR) and rare small pebbles (5-10mm).	River Terrace (2 ?)		
4	4.45	Mid brown MF sand with very rare pebbles (flint, SA, 4 -6 mm),	River Terrace (2 ?)		
4.5	4.5	Brown fine sand with occasional pebbles (2 – 4mm, SR).	River Terrace (2 ?)		
4.5	4.95	Brown fine sand with occasional pebbles (2 – 4mm, SR).	River Terrace (2 ?)		
5.5	5.6	Dark yellowish brown fine-med sand, with few (10%) small gravel clasts (flint, A – VA) and possibly very few (<5%) shell flecks (<5mm ø). Saturated.	River Terrace (2 ?)		
6.0	6.5	Dark yellowish brown slightly silty sand (fine-coarse, mostly fine) with some gravel (10 – 15%)	River Terrace (2 ?)		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		mostly flint (SA – VA) up to 33mm ø. Few shell flecks (<5%). Saturated in bulk.			
6.5	7.0	Dark yellowish brown slightly silty sand (fine-coarse, mostly fine) with some gravel (10 – 15%) mostly flint (SA – VA) up to 33mm ø. With 5% R-SR chalk granules (<10mm ø). Few shell flecks (<5%). Saturated	River Terrace (2 ?)		
7.0	7.45	Dark yellowish brown very slightly silty sand (fine-med mostly) with very few gravel (flint) granules (<10mm ø, VA-A) and very few small flecks. Rare SA chalk granules (putty consistency, <10mm ø).	River Terrace (2 ?)		
7.5	7.6	Dark yellowish brown very slightly silty sand (fine-med mostly) with black specks, very few gravel (flint) granules (<10mm ø, VA-A) and very few small flecks. Rare SA chalk granules (putty consistency, <10mm ø).	River Terrace (2 ?)		
8.0	8.45	Dark yellowish brown sand (fine-coarse) with few gravels (10%). Flint up to 30mm ø, VA-A, some flakes. Normal below ground saturation. Massive (no obvious structures).	Fluvial		
9.0	9.5	N.A.			
9.5	9.6	Dark yellowish brown gravelly sand (fine-	Increasingly gravelly, 9.6-10m.		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		coarse. Gravels are flint (A-VA.) Granular.			
10.0	10.4	Dark yellowish brown sandy gravel (50%) with some cobbles (70-80mm ø). Gravels are flint SR-VA, few nodules. Sand has black specks. Saturated.	River Terrace (1 ?)		
10.5	10.6	Dark yellowish brown sandy gravel (50%) with some cobbles (70-80mm ø). Gravels are flint SR-VA, few nodules. Sand has black specks. Saturated.	River Terrace (1 ?)		
11.5	11.6	Medium brown sandy gravel (60%). Gravel is mostly flint, SA-VA, but with some other mixed lithologies (sandstone and chalk, R-SR), up to 60m ø. No clear cobbles in this sections: largely finer than above, average size 15-30mm ø.	River Terrace (1 ?)		
12.7	12.8	Pale greyish brown gravelly (35%) sand, fine coarse. Sand has lots of black specks and chalk specks, <1mm, sometimes shell. Gravel is mostly SR-SA. Flint up to 50mm. Less gravel than above. Fining, also chalkier.	Glaciofluvial Deposit		
13.5	13.6	Pale brownish grey slightly gravelly fine-coarse sand, lots of white specks and some black. (<10%). Gravel is A-VA flint (<20mm ø).	Glaciofluvial Deposit		
14	14.45	Pale brownish grey fine to coarse sand with	Glaciofluvial Deposit		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		some gravel (5%) chalk SR – SR and flint (A-VA). Sand has many black and white specks. Sand and gravel coarsen slightly, before abrupt transition.			
15	15.45	Laminated grey and dark grey sand (fine) silt: consolidated and firm.	Glacial-lacustrine and outwash		
15.5	15.5	Transition to very gravelly unit containing some cobble pale grey sand and gravel with few cobbles (50 / 50). Sand is fine-coarse. Gravel is mostly chalk (SR-R) and flint (A-SA). Some whole flint nodules, max size (100mm ø), Rare other lithologies. Lots of white and black specks in sand.	Glacial		
17.5	17.6	Pale grey gravelly sand (40/60). Sand: fine-coarse, with many white specks and some black. Gravel: SR-A, mostly chalk and flint, mostly <30mm ø. Few other mixed lithology clasts.	Glacial-fluvial		
18.20	18.20	Grey, slightly silty, gravelly clay (diamicton). Gravel is fine-med, mostly chalk (<10mm ø, SR) and flint flakes (A-VA, up to 30mm ø.) Firm. Few water stains. Massive.	Till – Lowestoft Formation		
19.0	19.5	Grey gravelly sand (F-C). Gravels are chalk and flint, very slightly silty. Gravels R-SA, up to 30mm ø.	Glaciolacustrine.		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
20	20.45	Grey gravelly sand (M-C). Gravels are mostly chalk SA-R, mostly 10mm ø. Fairly dry. Granular texture. Contains lamina, lenses of laminated silty sand at irregular intervals.	Glaciolacustrine		
21.0	21.45	Grey granular gravelly fine sand (M-C). Gravel is chalk, almost all SR, 5-10mm ø. Rare outsize clasts (up to 25mm ø). Contains silt lamina, to 7mm thickness and massive, without obvious inclusions.	Glaciolacustrine.		
22	22.45	Grey granular gravelly fine sand (M-C), granular. Gravel is chalk, almost all SR, 5- 10mm ø. Rare outsize clasts (up to 25mm ø). Contains silt lamina, to 100mm thickness, massive and firm. Few brownish orange sandy lenses seen in upcast (large, 80mm thick, up to 150mm ø).	Glacial Silt and Clay		
22.5	22.6	Grey / olive grey, very slightly clayey silt. Very few angular flint gravels, F-M, and very few chalk granules. Possible laminations, difficult to discern. Stiff.	Glaciolacustrine - Glacial Silt and Clay		
23.6	23.7	Stiff grey clay with some silty laminations. Very few fine gravel (granules) of white chalk. Very few sandy lenses,	Glaciolacustrine - Glacial Silt and Clay		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
24	24.45	Stiff grey clay with silt laminations / veins. These are fine and anastomosing, occur at irregular intervals.	Glaciolacustrine - Glacial Silt and Clay		
24.6	24.7	Stiff grey clay with silt laminations / veins. These are fine and anastomosing, occur at irregular intervals.	Glaciolacustrine - Glacial Silt and Clay		
25	25.45	Stiff grey clay with chalk gravel. Gravel is angular to 40mm ø. At some point in unit appears to abrupt transition to chalk sand (grey), F-C, containing fine chalk gravel.	Till – Undifferentiated Happisburgh Formation and Lowestoft Formation		
26	27.45	Very stiff dark grey to olive grey clay with chalk gravel. Gravel is chalk (30%) SA-SR, to 35mm ø. Large limestone gravel clast (100mm ø, 40mm thick). Has large shelly fossils. Lincolnshire? Weathered exterior at 26.5mbgl	Till – Undifferentiated Happisburgh Formation and Lowestoft Formation		
27.45	28.0	Very stiff dark grey silty clay. Massive. No inclusions.	Till – Happisburgh Formation		
28	28.45	Olive grey, dark, stiff silty clay with chalk gravel (20%) grey and white chalk SA-SR, up to 30 – 40mm ø. Slightly sandy in places, possible sandy vein.	Till – Happisburgh Formation		
29.45	29.55	Dark grey to olive grey stiff clay with chalk gravel. Gravel (20%) is mostly SR-SA to 10mm ø. Single large clasts, matrix-supported (SR,	Till – Happisburgh Formation		

MM_RG_BH_110					
Site Code: EAGW24				**Elevation (mAOD)**	**24.728**
Logger: PMM/JW					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of River Terrace deposits**				**Easting**	**609955.896**
				Northing	**279378.997**
				Depth (m)	**32.0**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		80mm ø) with weathered exterior. Slightly saturated.			
30	30.45	Firm grey / dark grey slightly sandy clay with gravel and chalk, SR-SA0, to 30mm ø, mostly <10mm (20%). Slightly saturated.	Till – Happisburgh Formation		

Figure 14-11: MM_RG_BH_110 3.0 to 3.45m BGL

Table 14-13: MM_RG_IP_105 infiltration pit log

MM_RG_IP_105					
Site Code: EAGW24				**Elevation (mAOD)**	26.627
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Infiltration Pit** **Reason for monitoring: Presence of river terrace deposits (sands and gravels)**				**Easting**	609842.957
				Northing	279090.968
				Depth (m)	1.65
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.40	Compact dark yellow brown lightly rooted slightly organic silty fine to medium sand.	Topsoil		Holocene
0.40	0.95	Compact mid grey yellow slightly silty, clayey fine to medium sand, with 15% fine to coarse gravel (5 - 55mm, SA-SR); <5% fine SR chalk. Sharp lower boundary.	Fluvial: River Terrace (2 ?)		Holocene
0.95	1.60	Light greyish yellow, fine to medium sandy clay with 15% granular fine to medium (5 – 35mm) SR chalk gravels. Unit contains sand pockets and becomes slightly clayier with depth. There is some mid blue-grey mottling from 1.50mbgl.	Head		Pleistocene
1.60	1.65	Compact, mostly fine to medium sand (contains few coarse granules), with fine to coarse SA flint gravels. End of TP.	Fluvial: River Terrace (1 ?)		Holocene

Figure 14-12: MM_RG_IP_105 section

Table 14-14: MM_RG_TP_108 test pit log

MM-RG-TP108					
Site Code: EAGW24				**Elevation (mAOD)**	**27.226**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Test Pit, excavated with JCB 3cx** **Length: 3.30m, Width: 0.5m, Orientation: N-S** **Reason for monitoring: Presence of Lodge Farm silt and clay member - clay, silt and sand – within wider area of geoarchaeological potential**				**Easting**	**609886.035**
				Northing	**279066.496**
				Depth (m)	**4.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.00	0.30	Under corn stubble, firm dark greyish brown silty fine sand, with occasional fine to medium gravels of flint, chalk, and sandstone (5 – 45mm). Abrupt lower boundary.	Topsoil		Holocene
0.30	0.40	Firm mid brownish yellow fine to medium sandy clayey silt, grading to clayey silty sand. Unit contains dark grey brown peds of soil with worm working.	Colluvium		Holocene
0.40	1.10	From 0.4m, there are frequent (10%) fine SA-SR chalk flecks, and 5% coarse to cobbled SR gravels in mixed deposit of very stiff slightly silty clay.	Head		Pleistocene
1.10	3.85	Firm light blue grey silt grading to sandy silt with mid-orange brown sandy pockets (fine to medium) and ephemerally fine sandy silt, unit is very slightly	Glaciofluvial / Glaciolacustrine Deposit	<101> : bulk from 2.00-2.20mbgl	Pleistocene: Late Anglian Stage-Hoxnian

MM-RG-TP108					
Site Code: EAGW24				**Elevation (mAOD)**	**27.226**
Logger: JS					
Scheme Area: Waveney Valley Crossing **GI Type: Test Pit, excavated with JCB 3cx** **Length: 3.30m, Width: 0.5m, Orientation: N-S** **Reason for monitoring: Presence of Lodge Farm silt and clay member - clay, silt and sand – within wider area of geoarchaeological potential**				**Easting**	**609886.035**
				Northing	**279066.496**
				Depth (m)	**4.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		clayey. Rare (<1%) SA – SR coarse flint and chalk gravel (45-65mm), becoming more bluish from 2.50mbgl ; orange-brown mottling gone by 3.35mbgl, playdough consistency.			
3.85	4.00	Bands of fine light yellow orange sand with 5% chalk flecks (5-15mm) and rare flint (5–15mm). End of Test pit	Till: Glaciofluvial Deposit		Pleistocene: Anglian Stage

Figure 14-13: MM_RG_TP_108 section

Table 14-15: MM_RG_BH_114 borehole log

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
0.0	0.3	Hard dark yellow brown fine sandy silt. Silty is fine-medium, 5%. Rare fine, medium and coarse flint gravel 5 – 55mm, rare flint, 1 coal fragment, granular brick flecks. Sharp boundary.	Agricultural topsoil: Topsoil		Holocene
0.3	0.9	Very dry compact light yellow brown fine-medium sandy clay with 5% fine-medium chalk gravels, 3- 55mm. 5% FMC SA – SR flint gravel, 10 – 55mm.	Subsoil: Head		Holocene
0.9	1.10	Yellow brown gravelly fine medium sand with 5% chalk 5% flint gravel, SA – SR.	Head		Pleistocene
1.10	3.70	Compact mid yellow brown with mid brown grey sandy clay. 5% 5 – 10mm fine chalk, 5% F M C SA – SR flint gravel, 10 – 75mm	Head		Pleistocene
3.70	5.30	Very stiff dark blue grey sandy (F – M) clay with 15% chalk 15 % flint gravel SA-SR, F – C.	Till		Pleistocene: Anglian Stage

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
5.30	6.80	Silty instead of clay – 5% FM chalk.	Till		Pleistocene: Anglian Stage
6.80	8.00	Return to blue grey sandy clay – 5% FM chalk, increasing at 9.00mbgl to c. 15%. predominately SR from chalk gravel with some rare flint.	Till		Pleistocene: Anglian Stage
9.50	9.95	Soft wet dark blue grey fine slightly sandy silt. No visible inclusions.	Glacio-lacustrine: Lodge Farm Silt and Clay Member ?		Pleistocene: Anglian Stage?
9.95	11.50	Medium grey stiff slightly silty clay with few gravel inclusions. Massive. Gravel is fine chalk, generally <5mm. Moderately saturated.	Glacio-lacustrine: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage
11.50	11.95	Dark grey firm silt with some clay. Rare white flecks <2mm – appears to be chalk granules. Massive. Becomes lighter on saturation.	Glacio-lacustrine: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage
11.95	13.50	Medium grey firm silt with some clay. Appears to contain lenses of lighter grey very fine sand – possibly laminated. Has some mica flecks.	Glacio-lacustrine: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
13.50	13.95	Medium grey slightly clayey silt with mica fecks and white CaCO3 flecks – possibly shell. Small 1-3mm. Some olive coloured surface oxidation.	Glacio-lacustrine: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage
13.95	15.00	Medium grey micaceous silt. Moderately firm with some dark grey stiff clay laminations of approx. 2-5cm thickness (silt 85%) contains very few (<1%) gravels (fine to medium) angular and of mixed lithology and very few white CaCO3 granules. There are some olive coloured stains on surface of sediment from 14.40mbgl	Glacio-lacustrine: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage
15.0	15.4	Very stiff, very slightly silty clay, medium grey, with gravel. Gravel A–R, mostly SR flint (10%) and chalk (20%), M–C, very few fine gravels. Very rare Fe stains. A single belemnite fossil found between 15-15.40mbgl.	Till: Lodge Farm Silt and Clay Member		Pleistocene: Anglian Stage
15.4	17.7	Very stiff dark grey slightly sandy silty clay	Till: Lowestoft Till		Pleistocene: Anglian Stage

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		with gravel. Medium grey with 30% gravel, almost entirely chalk, fine to coarse – sand is very fine chalk. Some gravel clasts are very weathered and fissile. From 16mbgl there are also very few dark yellow / ochre lenses (<10mm) and few A – VA flints, F – M (<5%).			
17.7	18.7	Medium grey clay with gravel. Gravel is 40% F – C chalk, mostly <10mm ⌀, sand size, larger clasts SR- R. Very stiff.	Till: Lowestoft Till		Pleistocene: Anglian Stage
18.7	19.4	Dark grey clay with gravel. Gravel is SR chalk fine to medium (40%) chalk, often weathered. Very stiff and consolidated at this depth: some deformation structures present within till matrix.	Till: Lowestoft Till		Pleistocene: Anglian Stage
19.4	20.7	Dark grey to medium grey clay with gravel. Gravel is chalk, F – C, (30 – 40%), SR – SA. Few flints (A – VA,	Till: Lowestoft Till		Pleistocene: Anglian Stage

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		fine). Very stiff and compacted.			
20.7	21.7	Stiff dark grey clay with chalk gravel. Frequently fine (2 – 3mm, SA -SR) and rare pebbles (20 – 40mm, SR – SA.)	Till: Lowestoft Till		Pleistocene: Anglian Stage
21.7	22	Dark grey clay with chalk gravel (30% gravel); SR, 10 – 15mm.	Till: Lowestoft Till		Pleistocene: Anglian Stage
22	23	Stiff, very dark grey clay with chalk gravel (20%): 1-2mm, SA-SR (Freq) and 20 – 30mm, SR in frequent. Very rare flint granules (SA 1 – 2mm).	Till: Lowestoft Till		Pleistocene: Anglian Stage
23	23.45	Stiff, dark grey clay with chalk gravel (40% gravel): 1 – 2mm, SA frequent and 30 – 40mm, SA-SR frequent.	Till: Lowestoft Till		Pleistocene: Anglian Stage
23.45	24.45	Firm, mid-grey clay with chalk gravel granules (30% gravel), 5 – 20mm, SR (very frequent).	Till: Lowestoft Till		Pleistocene: Anglian Stage
24.45	24.45	Stiff dark grey clay with chalk gravel. Granules (4 – 6mm, SR, very frequent of chalk and granules of flint (2 – 3mm, Very rare).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
24.45	25.7	Stiff dark grey clay with very infrequent chalk granules (2 – 3mm, SR).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
25.7	26.45	Dark grey clay with gravel (30 % gravel). Chalk granules (2 – 3mm, SA, Frequent) pebbles (10mm, SR infrequent) and of other lithologies (SR – R, 2mm – 10mm, Very infrequent)	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
26.45	28.7	Firm dark grey clay with gravel (20% gravel). Chalk granules (SR, 2 – 3mm, Frequent).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
28.7	30.7	Mid – dark grey clay with gravel (20% gravel). Chalk granules (2 – 3mm, SA-SR, occasional) and pebbles (25 – 30mm, SR, Infrequent).	Till : Undifferentiated Lowestoft/ Happisburgh Formation		Middle Pleistocene
30.7	31	Firm grey clay with chalk gravel. Granules (SR, 2 – 3mm, very infrequent) and pebbles (Occasional).	Till: Happisburgh Till		Middle Pleistocene
31	31.6	Soft, sandy (medium-coarse, mixed lithologies) slightly silty brown-grey clay with very infrequent	Possible Ingham Sand and Gravel		Early-Middle Pleistocene

MM_RG_BH_114					
Site Code: EAGW24				**Elevation (mAOD)**	**29.956**
Logger: JS/JW/PMM					
Scheme Area: Waveney Valley Crossing **GI Type: Cable Percussion Borehole (+ rotary)** **Reason for monitoring: Presence of Lowestoft Formation - diamicton**				**Easting**	**610034.023**
				Northing	**610034.023**
				Depth (m)	**32.00**
Top (mBGL)	**Base (mBGL)**	**Description**	**Interpretation**	**Finds/ Subsampled**	**Date**
		granules (SR – R, chalk).			
31.6	32.45	Chalk: Soft, plastic, very pale grey putty chalk with strands of trace mid-grey clay and very infrequent chalk granules (2 – 3mm, SR).	Bedrock		

Figure 14-14: MM_RG_BH_114 CPT at 1.65m BGL

14.2. APPENDIX 2 DEPOSIT MODELLING DATA

Lithology Data

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_103	0	0.44	ORGANIC SILT
MM_RG_BH_103	0.44	1.2	SAND
MM_RG_BH_103	1.2	1.3	SANDY SILT
MM_RG_BH_103	1.3	3	SAND
MM_RG_BH_103	3	5	GRAVELLY SAND
MM_RG_BH_103	5	6	GRAVELLY SAND
MM_RG_BH_103	6	7.2	GRAVELLY SAND
MM_RG_BH_103	7.2	9	COBBLEY GRAVELS
MM_RG_BH_103	9	10.55	GRAVELLY CLAY
MM_RG_BH_103	10.55	11.7	SANDY GRAVEL
MM_RG_BH_103	11.7	12	BEDROCK
MM_RG_BH_104	0	0.4	SILTY SAND
MM_RG_BH_104	0.4	0.8	SANDY SILT
MM_RG_BH_104	0.8	2	SAND
MM_RG_BH_104	2	5	SAND
MM_RG_BH_104	5	8.5	SAND
MM_RG_BH_104	8.5	12	SAND
MM_RG_BH_104	12	16.7	SILTY SAND
MM_RG_BH_104	16.7	18.1	SANDY GRAVEL
MM_RG_BH_104	18.1	20	SILT
MM_RG_BH_105	0	0.3	ORGANIC SILT
MM_RG_BH_105	0.3	1.2	ORGANIC SILT
MM_RG_BH_105	1.2	2	PEAT
MM_RG_BH_105	2	3	SANDY SILT
MM_RG_BH_105	3	4	CLAY
MM_RG_BH_105	4	4.3	SILTY SAND
MM_RG_BH_105	4.3	6.45	SAND
MM_RG_BH_105	6.45	6.7	GRAVELLY SAND
MM_RG_BH_105	6.7	7.3	SANDY CLAY
MM_RG_BH_105	7.3	8.5	SILTY SAND
MM_RG_BH_105	8.5	10	GRAVELLY CLAY

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_105	10	10.5	GRAVELLY CLAY
MM_RG_BH_105	10.5	12.9	GRAVELLY SAND
MM_RG_BH_105	12.9	14.4	GRAVELLY SAND
MM_RG_BH_105	14.4	16.5	BEDROCK
MM_RG_BH_106	0	0.5	SAND
MM_RG_BH_106	0.5	1	PEAT
MM_RG_BH_106	1	1.5	ORGANIC SAND
MM_RG_BH_106	1.5	2	SANDY SILT
MM_RG_BH_106	2	2.5	SAND
MM_RG_BH_106	2.5	3.8	SAND
MM_RG_BH_106	3.8	4	SILT
MM_RG_BH_106	4	4.5	SAND
MM_RG_BH_106	4.5	5.5	SAND
MM_RG_BH_106	5.5	10	SAND
MM_RG_BH_106	10	12.2	SAND
MM_RG_BH_106	12.2	12.4	SANDY SILT
MM_RG_BH_106	12.4	13.2	SAND
MM_RG_BH_106	13.2	13.5	SANDY SILT
MM_RG_BH_106	13.5	14.5	SANDY CLAY
MM_RG_BH_106	14.5	15	CLAYEY SILT
MM_RG_BH_106	15	16	SILTY CLAY
MM_RG_BH_106	16	17.5	SILTY CLAY
MM_RG_BH_106	17.5	19	SILTY CLAY
MM_RG_BH_106	19	19.5	SILTY CLAY
MM_RG_BH_106	19.5	20.5	SAND
MM_RG_BH_106	20.5	21.5	GRAVELLY CLAY
MM_RG_BH_106	21.5	25.8	GRAVELLY CLAY
MM_RG_BH_106	25.8	26.5	SILTY SAND
MM_RG_BH_106	26.5	28.5	BEDROCK
MM_RG_BH_107	0	0.5	SANDY SILT
MM_RG_BH_107	0.5	1.6	SAND
MM_RG_BH_107	1.6	2.5	CLAYEY SAND
MM_RG_BH_107	2.5	2.95	SILTY SAND

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_107	2.95	3.5	SILTY SAND
MM_RG_BH_107	3.5	4.05	SILTY SAND
MM_RG_BH_107	4.05	4.5	SILTY SAND
MM_RG_BH_107	4.5	4.95	SAND
MM_RG_BH_107	4.95	5.5	SAND
MM_RG_BH_107	5.5	6.5	SAND
MM_RG_BH_107	6.5	6.95	SAND
MM_RG_BH_107	6.95	7.5	SILTY SAND
MM_RG_BH_107	7.5	7.95	GRAVELLY SAND
MM_RG_BH_107	7.95	8	GRAVELLY SAND
MM_RG_BH_107	8	8.4	SANDY GRAVEL
MM_RG_BH_107	8.4	8.5	GRAVELLY CLAY
MM_RG_BH_107	8.5	8.95	GRAVELLY CLAY
MM_RG_BH_107	8.95	9.5	GRAVELLY CLAY
MM_RG_BH_107	9.5	9.95	CLAYEY SILT
MM_RG_BH_107	9.95	11.5	SILTY CLAY
MM_RG_BH_107	11.5	11.95	SILT
MM_RG_BH_107	11.95	12.5	SILT
MM_RG_BH_107	12.5	13.5	CLAYEY SILT
MM_RG_BH_107	13.5	13.95	CLAYEY SILT
MM_RG_BH_107	13.95	14.5	SILT
MM_RG_BH_107	14.5	14.95	SILT
MM_RG_BH_107	14.95	15	SILT
MM_RG_BH_108	0	0.25	ORGANIC SAND
MM_RG_BH_108	0.25	1.6	PEAT
MM_RG_BH_108	1.6	3.5	SAND
MM_RG_BH_108	3.5	5.5	GRAVELLY SAND
MM_RG_BH_108	5.5	6.5	SAND
MM_RG_BH_108	6.5	7	SILTY SAND
MM_RG_BH_108	7	7.5	SILTY SAND
MM_RG_BH_108	7.5	8.2	SAND
MM_RG_BH_108	8.2	8.95	SILTY SAND
MM_RG_BH_108	8.95	10.95	SAND

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_108	10.95	12.5	SAND
MM_RG_BH_108	12.5	12.9	SAND
MM_RG_BH_108	12.9	13.3	SAND
MM_RG_BH_108	13.3	14.5	GRAVELLY SAND
MM_RG_BH_108	14.5	15.2	GRAVELLY SAND
MM_RG_BH_108	15.2	16	GRAVELLY SAND
MM_RG_BH_108	16	16.7	GRAVELLY SAND
MM_RG_BH_108	16.7	17	GRAVELLY SAND
MM_RG_BH_108	17	17.45	GRAVELLY SAND
MM_RG_BH_108	17.45	17.5	SANDY SILT
MM_RG_BH_108	17.5	18.5	GRAVELLY SILT
MM_RG_BH_108	18.5	19	GRAVELLY SAND
MM_RG_BH_108	19	20	SAND
MM_RG_BH_109	0	0.5	SILTY SAND
MM_RG_BH_109	0.5	1.2	SAND
MM_RG_BH_109	1.2	1.65	GRAVELLY SAND
MM_RG_BH_109	1.65	2	SAND
MM_RG_BH_109	2	3.5	GRAVELLY SAND
MM_RG_BH_109	3.5	4.5	GRAVELLY SAND
MM_RG_BH_109	4.5	5.2	GRAVELLY SAND
MM_RG_BH_109	5.2	6	GRAVELLY SAND
MM_RG_BH_109	6	6.5	GRAVELLY SAND
MM_RG_BH_109	6.5	7.5	GRAVELLY SAND
MM_RG_BH_109	7.5	8.5	GRAVELLY SAND
MM_RG_BH_109	8.5	10.5	GRAVELLY SAND
MM_RG_BH_109	10.5	11	SANDY GRAVEL
MM_RG_BH_109	11	12	GRAVELLY SAND
MM_RG_BH_109	12	12.5	SANDY GRAVEL
MM_RG_BH_109	12.5	14	SANDY GRAVEL
MM_RG_BH_109	14	14.5	SANDY GRAVEL
MM_RG_BH_109	14.5	15.5	SANDY GRAVEL
MM_RG_BH_109	15.5	15.9	SANDY GRAVEL
MM_RG_BH_109	15.9	16.15	SANDY GRAVEL

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_109	16.15	17	GRAVELLY CLAY
MM_RG_BH_109	17	19.5	GRAVELLY CLAY
MM_RG_BH_109	19.5	21	GRAVELLY CLAY
MM_RG_BH_109	21	22.45	GRAVELLY CLAY
MM_RG_BH_109	22.45	22.7	GRAVELLY CLAY
MM_RG_BH_109	22.7	23	CLAYEY GRAVEL
MM_RG_BH_109	23	23.5	SANDY GRAVEL
MM_RG_BH_109	23.5	24	SANDY GRAVEL
MM_RG_BH_109	24	25	SANDY GRAVEL
MM_RG_BH_109	25	25.3	GRAVELLY CLAY
MM_RG_BH_109	25.3	25.5	SANDY GRAVEL
MM_RG_BH_109	25.5	26.45	GRAVELLY CLAY
MM_RG_BH_109	26.45	28	GRAVELLY CLAY
MM_RG_BH_109	28	28.5	GRAVELLY CLAY
MM_RG_BH_109	28.5	29	GRAVELLY CLAY
MM_RG_BH_109	29	29.45	GRAVELLY CLAY
MM_RG_BH_109	29.45	31	GRAVELLY CLAY
MM_RG_BH_109	31	31.5	SILTY SAND
MM_RG_BH_110	0	0.5	SANDY SILT
MM_RG_BH_110	0.5	1.2	SILTY SAND
MM_RG_BH_110	1.2	1.65	SAND
MM_RG_BH_110	1.65	2	GRAVELLY SAND
MM_RG_BH_110	2	3	GRAVELLY SAND
MM_RG_BH_110	3	3.5	SAND
MM_RG_BH_110	3.5	4	SAND
MM_RG_BH_110	4	4.5	SAND
MM_RG_BH_110	4.5	5.5	SAND
MM_RG_BH_110	5.5	7	GRAVELLY SAND
MM_RG_BH_110	7	8	SILTY SAND
MM_RG_BH_110	8	9.5	GRAVELLY SAND
MM_RG_BH_110	9.5	10	GRAVELLY SAND
MM_RG_BH_110	10	11.5	SANDY GRAVEL
MM_RG_BH_110	11.5	12.7	SANDY GRAVEL

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_110	12.7	13.5	GRAVELLY SAND
MM_RG_BH_110	13.5	14	GRAVELLY SAND
MM_RG_BH_110	14	15	SAND
MM_RG_BH_110	15	15.5	SANDY SILT
MM_RG_BH_110	15.5	17.5	COBBLEY GRAVELS
MM_RG_BH_110	17.5	18.2	GRAVELLY SAND
MM_RG_BH_110	18.2	19	GRAVELLY CLAY
MM_RG_BH_110	19	20	GRAVELLY SAND
MM_RG_BH_110	20	21	GRAVELLY SAND
MM_RG_BH_110	21	22.5	GRAVELLY SAND
MM_RG_BH_110	22.5	23.6	CLAYEY SILT
MM_RG_BH_110	23.6	24	SILTY CLAY
MM_RG_BH_110	24	25	SILTY CLAY
MM_RG_BH_110	25	26	GRAVELLY CLAY
MM_RG_BH_110	26	27.45	GRAVELLY CLAY
MM_RG_BH_110	27.45	28	SILTY CLAY
MM_RG_BH_110	28	29.45	GRAVELLY CLAY
MM_RG_BH_110	29.45	30	GRAVELLY CLAY
MM_RG_BH_110	30	30.45	GRAVELLY CLAY
MM_RG_BH_114	0	0.3	SANDY SILT
MM_RG_BH_114	0.3	0.9	SANDY CLAY
MM_RG_BH_114	0.9	1.1	GRAVELLY SAND
MM_RG_BH_114	1.1	3.7	SANDY CLAY
MM_RG_BH_114	3.7	5.3	SANDY CLAY
MM_RG_BH_114	5.3	6.8	SILTY CLAY
MM_RG_BH_114	6.8	8	SANDY CLAY
MM_RG_BH_114	8	9	SANDY CLAY
MM_RG_BH_114	9	9.5	SANDY CLAY
MM_RG_BH_114	9.5	9.95	SANDY SILT
MM_RG_BH_114	9.95	11.5	SILTY CLAY
MM_RG_BH_114	11.5	11.95	CLAYEY SILT
MM_RG_BH_114	11.95	12.5	CLAYEY SILT
MM_RG_BH_114	12.5	13.5	CLAYEY SILT

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_BH_114	13.5	13.95	CLAYEY SILT
MM_RG_BH_114	13.95	15	SILT
MM_RG_BH_114	15	15.4	GRAVELLY CLAY
MM_RG_BH_114	15.7	16	SILTY CLAY
MM_RG_BH_114	16	16.4	GRAVELLY CLAY
MM_RG_BH_114	16.4	16.7	GRAVELLY CLAY
MM_RG_BH_114	16.7	17.45	GRAVELLY CLAY
MM_RG_BH_114	17.45	17.7	GRAVELLY CLAY
MM_RG_BH_114	17.7	18.7	GRAVELLY CLAY
MM_RG_BH_114	18.7	19.4	GRAVELLY CLAY
MM_RG_BH_114	19.4	20.7	GRAVELLY CLAY
MM_RG_BH_114	20.7	21	GRAVELLY CLAY
MM_RG_BH_114	21	21.7	GRAVELLY CLAY
MM_RG_BH_114	21.7	22	GRAVELLY CLAY
MM_RG_BH_114	22	23	GRAVELLY CLAY
MM_RG_BH_114	23	23.7	GRAVELLY CLAY
MM_RG_BH_114	23.7	24.45	GRAVELLY CLAY
MM_RG_BH_114	24.45	25.7	GRAVELLY CLAY
MM_RG_BH_114	25.7	26	CLAY
MM_RG_BH_114	26	26.45	GRAVELLY CLAY
MM_RG_BH_114	26.45	28.45	GRAVELLY CLAY
MM_RG_BH_114	28.45	28.7	GRAVELLY CLAY
MM_RG_BH_114	28.7	29	CLAY
MM_RG_BH_114	29	30.45	GRAVELLY CLAY
MM_RG_BH_114	30.45	30.7	GRAVELLY CLAY
MM_RG_BH_114	30.7	31	GRAVELLY CLAY
MM_RG_BH_114	31	31.6	SANDY CLAY
MM_RG_BH_114	31.6	32.45	BEDROCK
MM_RG_BH_114	32.45	32.5	BEDROCK
MM_RG_IP_102	0	0.3	SAND
MM_RG_IP_102	0.3	0.6	SANDY SILT
MM_RG_IP_102	0.6	1.9	SILTY SAND
MM_RG_IP_102	1.9	2.55	SILTY SAND

BORE	TOP (MBGL)	BASE (MBGL)	KEYWORD
MM_RG_IP_103	0	0.35	CLAYEY SILT
MM_RG_IP_103	0.35	0.95	SAND
MM_RG_IP_103	0.95	1.1	SAND
MM_RG_IP_103	1.1	1.3	MARL
MM_RG_IP_105	0	0.4	SILTY SAND
MM_RG_IP_105	0.4	0.95	CLAYEY SAND
MM_RG_IP_105	0.95	1.6	GRAVELLY CLAY
MM_RG_IP_105	1.6	1.65	GRAVELLY SAND
MM_RG_IP_107	0	0.4	SILTY SAND
MM_RG_IP_107	0.4	0.75	ORGANIC SAND
MM_RG_IP_107	0.75	1.2	SAND
MM_RG_TP_105	0	0.15	SILTY SAND
MM_RG_TP_105	0.15	0.35	SILTY SAND
MM_RG_TP_105	0.35	1.85	SAND
MM_RG_TP_105	1.85	1.9	SAND
MM_RG_TP_108	0	0.3	SANDY SILT
MM_RG_TP_108	0.3	0.4	CLAYEY SILT
MM_RG_TP_108	0.4	1.1	SILTY CLAY
MM_RG_TP_108	1.1	3.85	SANDY SILT
MM_RG_TP_108	3.85	4	GRAVELLY SAND

Stratigraphy Data

BORE	DEPTH1	DEPTH2	FORMATION
MM_RG_BH_103	0	0.44	TOPSOIL
MM_RG_BH_103	0.44	9	RIVER TERRACE - sands and gravels
MM_RG_BH_103	9	10.55	TILL - LOWESTOFT FORMATION
MM_RG_BH_103	10.55	11.7	GLACIOFLUVIAL DEPOSIT 1
MM_RG_BH_103	11.7	12	BEDROCK
MM_RG_BH_104	0	0.4	TOPSOIL
MM_RG_BH_104	0.4	0.8	ALLUVIUM - 1
MM_RG_BH_104	0.8	18.1	RIVER TERRACE - sands and gravels
MM_RG_BH_104	18.1	20	LODGE FARM CLAY AND SILT MEMBER
MM_RG_BH_105	0	0.3	TOPSOIL

BORE	DEPTH1	DEPTH2	FORMATION
MM_RG_BH_105	0.3	1.2	ALLUVIUM - 2
MM_RG_BH_105	1.2	2	PEAT - 1
MM_RG_BH_105	2	4	ALLUVIUM - 1
MM_RG_BH_105	4	6.7	RIVER TERRACE - sands and gravels
MM_RG_BH_105	6.7	10.5	TILL - LOWESTOFT FORMATION
MM_RG_BH_105	10.5	14.4	GLACIOFLUVIAL DEPOSIT 1
MM_RG_BH_105	14.4	16.5	BEDROCK
MM_RG_BH_106	0	0.5	TOPSOIL
MM_RG_BH_106	0.5	1	PEAT - 1
MM_RG_BH_106	1	1.5	ALLUVIUM - 1
MM_RG_BH_106	1.5	13.5	RIVER TERRACE - sands and gravels
MM_RG_BH_106	13.5	17.5	GLACIO-LACUSTRINE AND OUTWASH
MM_RG_BH_106	17.5	19.5	LODGE FARM CLAY AND SILT MEMBER
MM_RG_BH_106	19.5	20.5	GLACIOFLUVIAL DEPOSIT 2
MM_RG_BH_106	20.5	25.5	TILL - UNDIFFERENTIATED HAPPISBURGH TILL AND LOWESTOFT FORMATION
MM_RG_BH_106	25.8	28.5	BEDROCK
MM_RG_BH_107	0	0.5	TOPSOIL
MM_RG_BH_107	0.5	8.4	RIVER TERRACE - sands and gravels
MM_RG_BH_107	8.4	9.5	TILL - LOWESTOFT FORMATION
MM_RG_BH_107	9.5	15	GLACIAL SILT AND CLAY
MM_RG_BH_108	0	0.25	TOPSOIL
MM_RG_BH_108	0.25	1.6	PEAT - 1
MM_RG_BH_108	1.6	13	RIVER TERRACE - sands and gravels
MM_RG_BH_108	13	20	GLACIOFLUVIAL DEPOSIT 2
MM_RG_BH_109	0	0.5	TOPSOIL
MM_RG_BH_109	0.5	14.6	RIVER TERRACE - sands and gravels
MM_RG_BH_109	14.6	16.15	GLACIOFLUVIAL DEPOSIT 2
MM_RG_BH_109	16.15	22.5	TILL - UNDIFFERENTIATED HAPPISBURGH TILL AND LOWESTOFT FORMATION
MM_RG_BH_109	22.7	25.3	GLACIOFLUVIAL DEPOSIT 1
MM_RG_BH_109	25.3	31	TILL - HAPPISBURGH FORMATION
MM_RG_BH_109	31	31.5	BEDROCK
MM_RG_BH_110	0	0.5	TOPSOIL
MM_RG_BH_110	0.5	14.6	RIVER TERRACE - sands and gravels

BORE	DEPTH1	DEPTH2	FORMATION
MM_RG_BH_110	14.6	22	GLACIOFLUVIAL DEPOSIT 2
MM_RG_BH_110	22	25	GLACIAL SILT AND CLAY
MM_RG_BH_110	25	27.45	TILL - UNDIFFERENTIATED HAPPISBURGH TILL AND LOWESTOFT FORMATION
MM_RG_BH_110	27.45	31.5	TILL - HAPPISBURGH FORMATION
MM_RG_BH_114			TILL - LOWESTOFT FORMATION
MM_RG_BH_114	0	0.3	TOPSOIL
MM_RG_BH_114	0.3	3.7	HEAD
MM_RG_BH_114	3.7	9.5	TILL - LOWESTOFT FORMATION
MM_RG_BH_114	9.5	15.4	GLACIAL SILT AND CLAY
MM_RG_BH_114	15.4	31	TILL - UNDIFFERENTIATED HAPPISBURGH TILL AND LOWESTOFT FORMATION
MM_RG_BH_114	31	31.6	INGHAM SAND AND GRAVEL MEMBER
MM_RG_BH_114	31.6	32.45	BEDROCK
MM_RG_IP_102	0	1.9	MADE GROUND
MM_RG_IP_102	1.9	2.55	ALLUVIUM - 1
MM_RG_IP_103	0	0.35	TOPSOIL
MM_RG_IP_103	0.35	1.1	RIVER TERRACE - T1 (EARLY)
MM_RG_IP_103	1.1	1.3	TUFA
MM_RG_IP_105	0	0.4	TOPSOIL
MM_RG_IP_105	0.4	0.95	RIVER TERRACE - sands and gravels
MM_RG_IP_105	0.95	1.65	HEAD
MM_RG_IP_107	0	0.4	TOPSOIL
MM_RG_IP_107	0.4	0.75	PEAT - 1
MM_RG_IP_107	0.75	1.2	RIVER TERRACE - sands and gravels
MM_RG_TP_105	0	0.15	TOPSOIL
MM_RG_TP_105	0.15	0.35	ALLUVIUM - 1
MM_RG_TP_105	0.35	1.9	RIVER TERRACE - sands and gravels
MM_RG_TP_108	0	0.3	TOPSOIL
MM_RG_TP_108	0.3	1.1	HEAD
MM_RG_TP_108	1.1	3.85	LODGE FARM CLAY AND SILT MEMBER
MM_RG_TP_108	3.85	4	GLACIOFLUVIAL DEPOSIT 2

EAGW24

NORWICH TO TILBURY: STOUR VALLEY CROSSING

GEOARCHAEOLOGICAL MONITORING AND RECORDING OF GEOTECHNICAL INVESTIGATION (GI) GROUNDWORKS

commissioned by Arcadis
on behalf of National Grid

May 2025

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

NORWICH TO TILBURY: STOUR VALLEY CROSSING

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This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **EAGW24** / HA Report No **2025-67** / NGR **TM 03826 34933** / Parish **Langham, Stratford St. Mary, Higham** / Local Authority **Babergh District Council, Colchester City Council, and Tendring City Council** / Fieldwork Date **23.07.2024–27.08.2024** / OASIS Ref. **headland1-531325**

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HEADLAND ARCHAEOLOGY
an RSK company

REGISTERED ORGANISATION CIfA

PROJECT SUMMARY

Headland Archaeology were commissioned by Arcadis on behalf of National Grid to undertake geoarchaeological monitoring of geotechnical investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The Scheme Area comprises an approximately 184km linear route for a new electricity transmission connection between existing substations at Norwich (NGR: TG 216023) and Tilbury (NGR: TQ 661762).

This report presents the results of the geoarchaeological monitoring of GI works around the River Stour crossing centred on TM 03826 34933, that were carried out between 23/07/2024–27/08/2024 inclusive.

The principal aim of the geoarchaeological monitoring was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. The purpose of the investigation was to record and advance understanding of the significance of these assets, and to provide data that will inform further mitigation strategies

A total of 10 boreholes and 6. trial pits were designated for monitoring, these were mostly distributed within the River Stour valley between 5.571–9.190m AOD (Above Ordnance Datum), with a single test pit (MM_JC_TP_116) set back from the river above the valley (42.285m AOD).

Modelling revealed a depositional sequence comprising several sedimentary bedrock groups (Chalk group, Lambeth Formation/Thanet Group, Thames Group, Red Crag), that were overlain by Quaternary superficial sedimentary deposits reflecting environments formed by multiple fluvial phases, glacial activity, palaeo-lakes and fluvial adjacent environments.

No archaeological deposits were encountered beneath the made ground.

Further work is recommended on samples collected during the watching brief to ascertain the chronology of key deposits covered in this report, as well as the likely palaeoenvironmental potential of particularly lacustrine and peat deposits. Additional purposive fieldwork and assessment are recommended on the lacustrine and peat deposits that are thought to have the highest palaeoenvironmental and geoarchaeological potential. This should be complemented by dating of river terraces gravels to establish a chronology of deposits in the valley.

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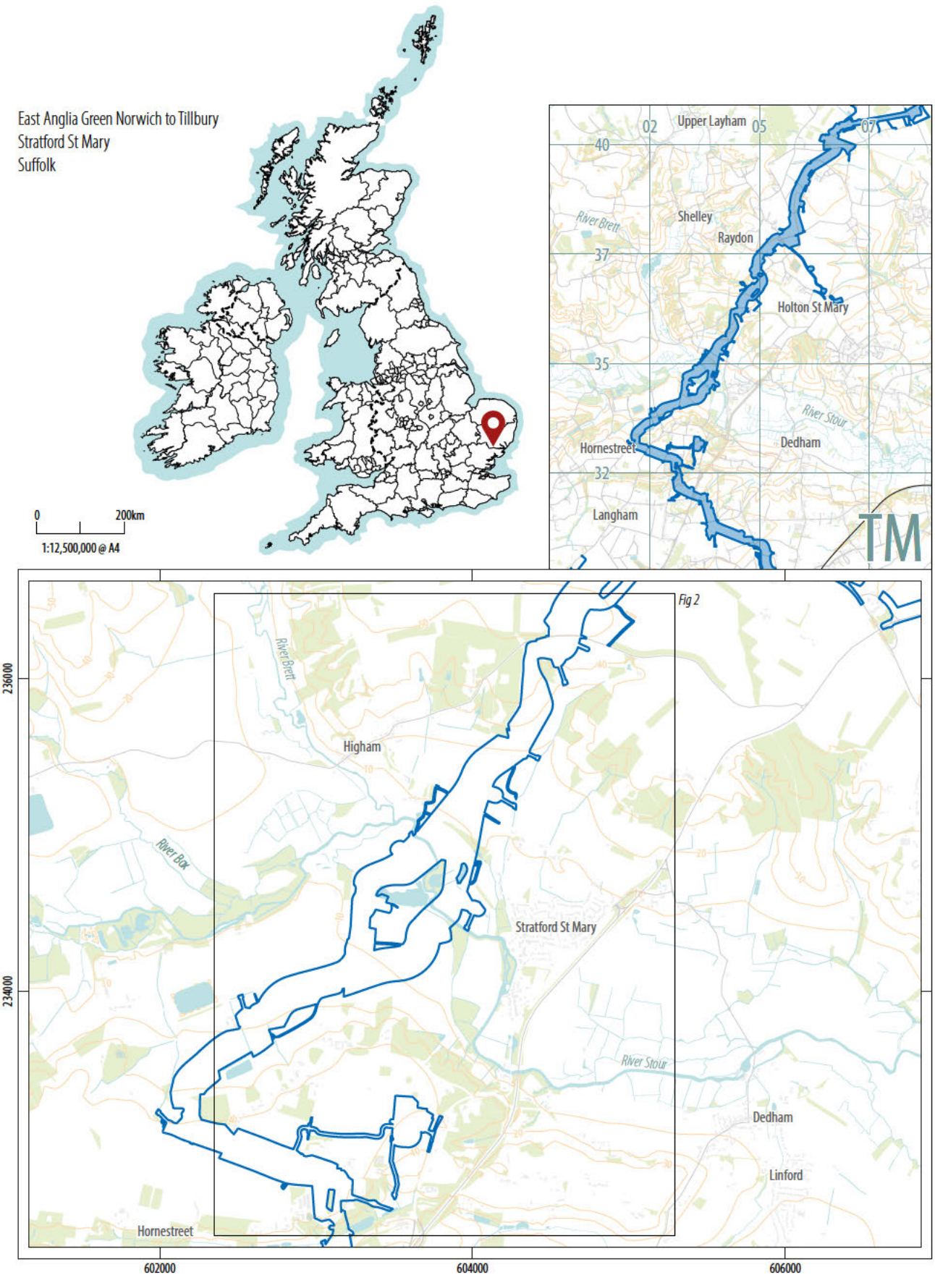

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FIG 1 Site location

NORWICH TO TILBURY: STOUR VALLEY CROSSING

GEOARCHAEOLOGICAL MONITORING AND RECORDING OF GEOTECHNICAL INVESTIGATION (GI) GROUNDWORKS

1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 Headland Archaeology (UK) Ltd. were commissioned by Arcadis on behalf of National Grid (hereafter the 'client') to undertake geoarchaeological monitoring and recording of Geotechnical investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The overarching project comprises a new electricity transmission connection between existing substations at Norwich and Tilbury.

1.1.2 The purpose of the geoarchaeological monitoring of GI was to gather information to inform a future phase of mitigation comprising purposive geoarchaeological investigation. As such, palaeoenvironmental sampling and specialist dating relating to deposits with palaeoenvironmental and geoarchaeological potential will be undertaken during further mitigation, to allow a robust and informed sampling and dating strategy based on this phase of data gathering.

1.1.3 This report describes the results of the geoarchaeological monitoring dated: 23/07/2024 to 27/08/2024 inclusive that was conducted in the Stour Valley Crossing area centred on NGR TM 03826 34933 (Fig 1); as well as the subsequent deposit modelling exercise and provides an assessment of the geoarchaeological and palaeoenvironmental potential of the recorded deposits.

1.1.4 The methodology for geoarchaeological monitoring and predictive deposit modelling follows the approach set out in the WSI (Headland Archaeology, 2024).

1.1.5 This document conforms to current best practice guidelines, including the following: 'Geoarchaeology: using earth sciences to understand the archaeological record' (Historic England 2015), 'Deposit Modelling and Archaeology: guidance for mapping buried deposits' (Historic England 2020), 'Curating the Palaeolithic' (Historic England, 2023) and 'Preserving Archaeological Remains' (Historic England 2016).

2 SCOPE OF THE WORK

2.1 GI works at the Stour Valley Crossing comprised a total of 19 interventions, of which 16 were designated for monitoring:

- 10 cable percussion boreholes
- 6 trial pits

2.2 An overview of the interventions selected for monitoring is provided in Table 2.1.

2.3 This report sits alongside an Archaeological Watching Brief Report (Headland Archaeology, 2025) and provides an assessment of the geoarchaeological potential of these sequences and a suitable reference within which to inform further geoarchaeological works where appropriate.

2.4 All work was carried out in accordance with standard industry guidelines for archaeological excavation (CiFA, 2014a–e) and Historic England guidance (Historic England 2015, 2022, 2023).

TABLE 2.1 Overview of Pits and Boreholes selected for geoarchaeological monitoring at Stour Valley Crossing

LOCATION ID	INTERVENTION TYPE	EASTING	NORTHING	REASON FOR GEOARCHAEOLOGICAL MONITORING
MM_JC_BH_102b	Cable percussion borehole	603991.00	234898.98	Floodplain deposits
MM_JC_BH_102d	Cable percussion borehole	603855.01	235021.00	Floodplain deposits
MM_JC_BH_103	Cable percussion borehole	603816.99	234889.03	Floodplain deposits
MM_JC_BH_103A	Cable percussion borehole	603766.02	234964.01	Floodplain deposits
MM_JC_BH_104	Cable percussion borehole	603720.75	234807.64	Floodplain deposits
MM_JC_BH_104a	Cable percussion borehole	603663.02	234865.53	Floodplain deposits
MM_JC_BH_105	Cable percussion borehole	603858.95	234513.03	Floodplain deposits
MM_JC_BH_105a	Cable percussion borehole	603784.99	234564.02	Floodplain deposits
MM_JC_BH_106	Cable percussion borehole	603800.93	234445.58	Floodplain deposits
MM_JC_BH_106A	Cable percussion borehole	603724.92	234493.58	Floodplain deposits
MM_JC_TP_111	Machine excavated trial pit	603899.40	234866.80	River terrace deposits (sands and gravels)
MM_JC_TP_111a	Machine excavated trial pit	603870.01	234634.99	River terrace deposits (sands and gravels)
MM_JC_TP_112	Machine excavated trial pit	603738.96	234422.56	River terrace deposits (sands and gravels)
MM_JC_TP_113	Machine excavated trial pit	603575.05	234752.53	River terrace deposits (sands and gravels)
MM_JC_TP_114	Machine excavated trial pit	603284.01	234406.61	River terrace deposits (sands and gravels)
MM_JC_TP_116	Machine excavated trial pit	603512.96	233444.62	River terrace deposits (sands and gravels)

3 SITE DESCRIPTION

3.1 LOCATION

3.1.1 The site (hereafter the 'scheme') is located on either side of the county border (River Stour) between Essex (Colchester District) and Suffolk (Babergh District). The scheme is oriented north-south and covers an area of c 90-hectares centred on NGR TM 03826 34933. It is located 1.2km west of Stratford St Mary, 8km north-east of Colchester and 15km south-west of Ipswich. Due to an irregular c 10.7-hectare enclave in the middle of the scheme around a lake, all boreholes and test-pits were taken in two 200m-wide corridors. The land-use in the scheme is a mixture of mostly pastoral grazing and arable fields, is set entirely within the Dedham Vale "Area of Outstanding Natural Beauty."

3.2 TOPOGRAPHY

3.2.1 The scheme encompasses land on the northern (Suffolk) and southern (Essex) banks of the River Stour, which

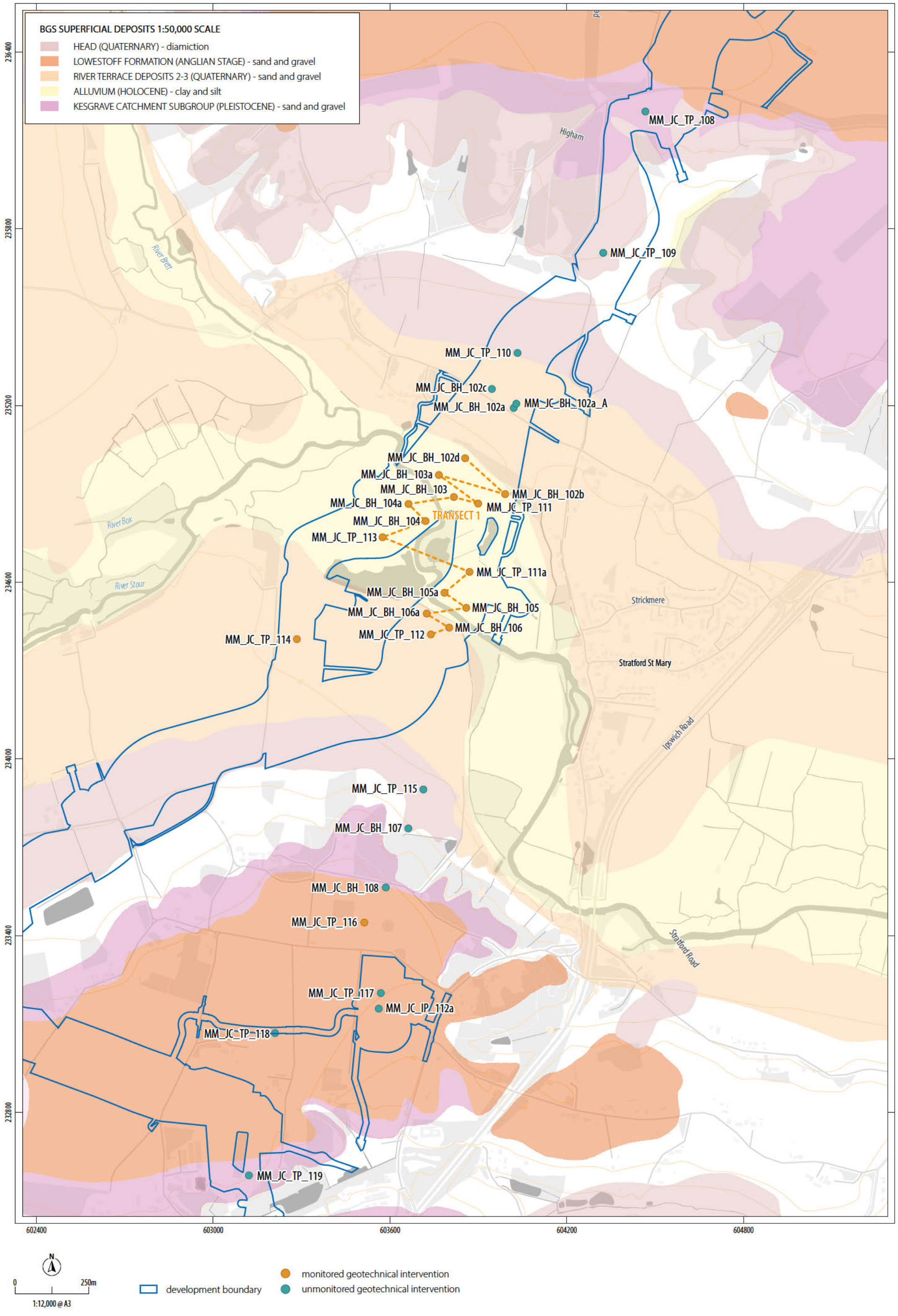

FIG 2 Location of Geotechnical Interventions around the River Stour crossing shown in relation to superficial geology mapped by the British Geological Survey (BGS)

flows through a lowland valley westward to its estuary at Manningtree. The scheme is beyond the tidal limit. The base of the valley is a c 1.5km wide floodplain at 5–6m AOD, through which the Stour now meanders. The valley sides climb very gently over c 2.5km to an elevation of c 40–50m AOD to the north and south.

4 GEOARCHAEOLOGICAL BACKGROUND

4.1 BEDROCK GEOLOGY

4.1.1 At or within 1km of the scheme boundary, four major bedrock units are recorded as out cropping or underlying the Quaternary deposits by the British Geological Survey (BGS) (NERC, 2025).

4.1.2 The 'White Chalk sub-Group' formed in the Late Cretaceous Epoch (100–70Ma BP) and is a coccolithic carbonate rock with sponge-rich flint seams (Mathers et al, 2010). It was deposited in deep oceanic waters (NERC, 2025).

4.1.3 The 'Lambeth Group' (Eocene Epoch: 56–55Ma BP) is formed of three intercalated facies, whose distribution varies laterally (Entwistle et al, 2013: 13):

- The 'Upnor Formation' contains glauconitic fine to coarse sand with rare gravel, deposited under energetic tidal conditions.
- The 'Reading Formation' is of red-brown and blue-grey clay from an estuarine environment.
- The 'Woolwich Formation', of dark grey shelly clay, represents a marginal shore sub-tidal setting (NERC, 2025).

4.1.4 The 'Thames Group' (Eocene Epoch: 55–33Ma BP) comprises low-energy, fossiliferous marine silts and clays that were deposited in environments ranging from the marine shoreface to outer marine shelf (Newman & Hadlow, 2021; NERC, 2025).

4.1.5 The 'Red Crag Formation' (Pliocene Epoch: 3.3–2.5Ma BP) comprises coarse, crossed-bedded shelly and sometimes gravelly sand, which accumulated in a shallow, energetic and wave-dominated coastal environment immediately prior to the Quaternary period (Dixon 1979).

4.2 SUPERFICIAL GEOLOGY

4.2.1 The BGS (NERC, 2025) record six superficial Quaternary deposits at or within 1km of the scheme boundary. The geoarchaeological and palaeoenvironmental potential of these units, as well as other relevant nearby deposits is described below, and summarised in Table 4.1.

4.2.2 The 'Kesgrave Catchment Subgroup' comprises a complex of fluvial sand and gravels, which were deposited by the Ancient Thames between c 1.8–0.4Ma BP, before its diversion by the Anglian Stage glaciation ice sheet (Middle Pleistocene: c 0.46–0.42Ma BP; NERC, 2025). These moderately-well graded gravel deposits are characterised by abundant exotic clasts from the West and Northern Midlands (quartzite and rhaxella chert), and north Wales (felsic igneous; Bridgland, 1994: 7).

4.2.3 The 'Lowestoft Formation' is primarily represented by a diamicton of dark to mid-grey, very stiff clay with frequent flint and chalk gravel clasts that formed during the Anglian Stage glaciation, it is mapped on high ground to the north and west of the Stour valley (Middle Pleistocene, 0.46–0.42 Ma BP; NERC, 2025).

4.2.4 The 'Lowestoft Formation Sands and Gravel' were deposited during and immediately after the Anglian Stage glaciation (Middle Pleistocene, 0.46–0.42Ma BP; NERC, 2025). The scheme is located on the margins of the mapped maximal extent of this glaciation (NERC, 2025), and sand and gravel deposited as outwash by meltwater from the ice sheet are recorded across the Stour valley and its margins. Lowestoft Formation Sands and Gravel can contain a significant fraction of exotic clasts from Scotland and Northern England transported by the ice sheet (NERC, 2025).

4.2.5 'Cover Sands' developed in many lowland areas during periglacial (cold climate) conditions. They are an aeolian deposit formed of fine to very-fine grained sand that may have formed as blankets or dunes and display bedding-structures reflecting this. They are mapped as widespread on raised areas to the south of the scheme

4.2.6 'Marks Tey' -style deposits are in reference to Pleistocene lacustrine sediments found c 15km southwest of the scheme at Marks Tey, that are of national palaeoenvironmental importance because they contain laminated silt and clay deposits that have preserved a complete vegetational record throughout the Hoxnian interglacial, from the Lowestoft Late-glacial to the Gipping Early-glacial periods (Turner, 1970; Tye et al, 2016).

4.2.7 'Head' deposits comprise clay, silt and entrained gravel that has been moved down-slope under the force of gravity, by colluviation or solifluction, during cold climate periods.

4.2.8 'River terraces' typically consist of sand and gravel units which have been deposited by fluvial action and represent old floodplains or braided riverbeds. Changes in base level cause the river to incise and leave flights of abandoned terraces at different elevations. Two terraces are distinguished in Stour Valley (3rd at 11–10m AOD and 2nd at 7–6m AOD). A third, undifferentiated terrace is identified beneath the modern floodplain (Bridgland, 2010: NERC, 2025).

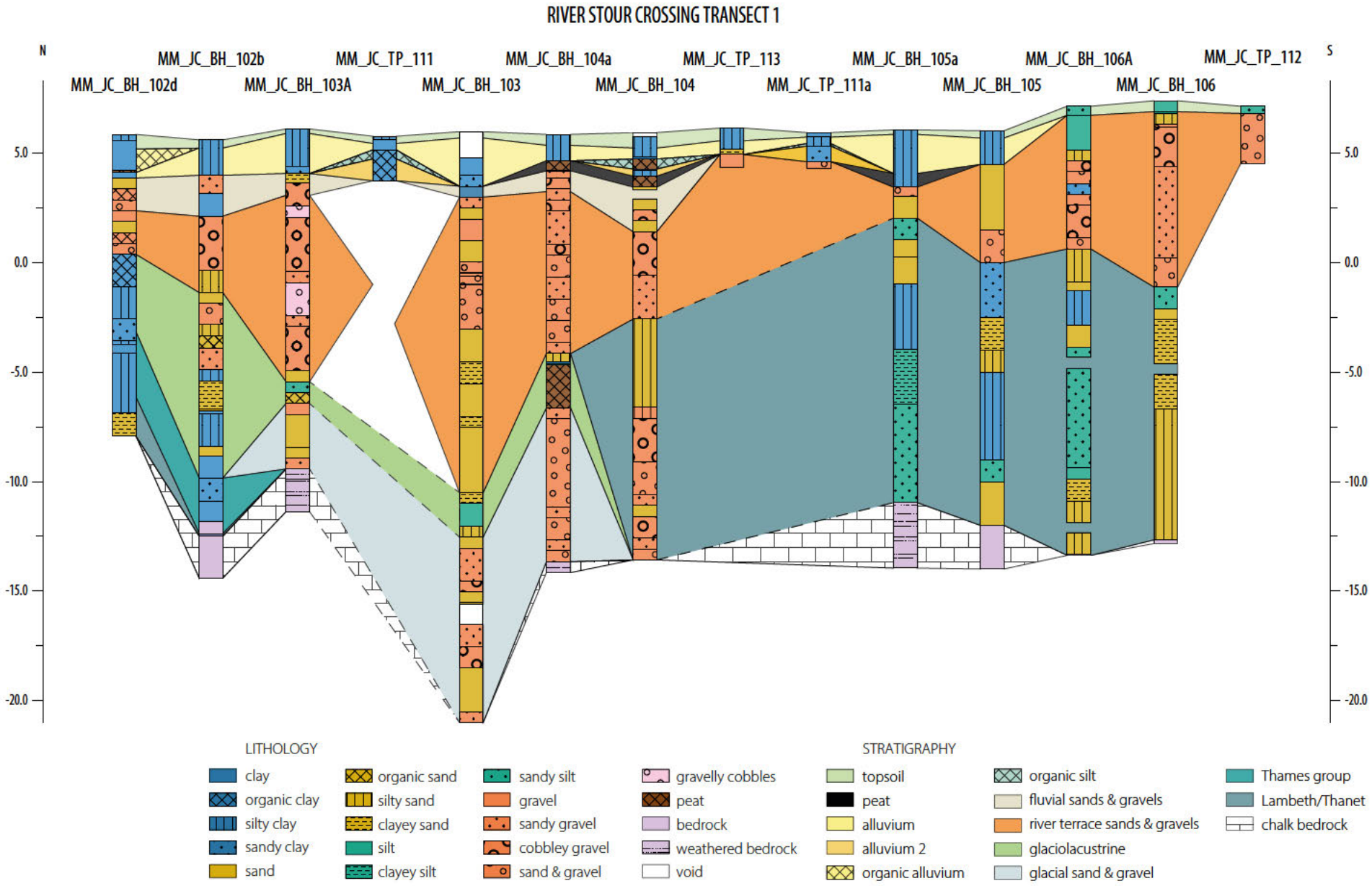

FIG 3 River Stour Crossing Transect

4.2.9 'Peat' deposits are commonly found within river terraces and on flood plains, but as they are discontinuous, and laterally constrained by valleys may be under-mapped. 'Peat' deposits are formed of partially decayed plant matter that has accumulated slowly in waterlogged and anaerobic conditions

4.2.10 'Alluvium' describes the clay, silt or sand deposited by the flowing water of a modern watercourse (NERC, 2025).

4.2.11 The geological units within the scheme may be distributed unpredictably or attributed with low confidence. In particular, the Quaternary superficial deposits are poorly exposed and comprise a series of coarse, water-lain sediments, distinguished primarily by exotic lithologies. This has been a cause for misunderstanding the area's geological history: for example, the Kesgrave Gravels Subgroup was not recognised as a discrete set of fluvial deposits until recently (Bridgland, 1994). Issues with recognising units are further complicated as the younger deposits may have eroded and redeposited older ones.

Modern Soils

4.2.12 Variations in elevation and underlying geology (both bedrock and superficial deposits) across the scheme have created multiple Soilscapes (LandIS, 2025). On the alluvial deposits in proximity to the modern River Stour is 'Soilscape 20: Loamy and clayey floodplain soils with naturally high groundwater' (ibid.). On the rising ground outside the floodplain is 'Soilscape 6: Freely draining slightly acid loamy soils' (ibid.). High ground to the south has 'Soilscape 8: Slightly acid loamy and clayey soils with impeded drainage' recorded, and to the north high ground is also 'Soilscape 7: Freely draining slightly acid but base-rich soils' (ibid.).

4.2.13 The geoarchaeological and/or palaeoenvironmental potential of these units is summarised in Table 4-1.

TABLE 4.1 Summary of the previously recorded superficial deposits with estimated date range and associated geoarchaeological/palaeoenvironmental potential.

DEPOSIT TYPE	DATE	DESCRIPTION	MAPPED ON BGS[1]	POTENTIAL
Kesgrave Catchment Subgroup: sand & gravel	Early-Middle Pleistocene (1.81–0.46Ma BP)	Sand and gravel fluvial deposits of the pre-glacial River Thames that have been subsequently incised through and preserved as former floodplains. The deposits yield Lower and Middle palaeolithic artefacts (usually preserved in non-primary contexts). The older and higher units are characterised by a sequence of palaeosols.	Yes, 1:15000 scale within 1km of scheme boundary.	Moderate-High
Kesgrave Catchment Subgroup: Valley Farm and Barham Arctic Soils	Early-Middle Pleistocene	Valley Farm and Barham Soils are important stratigraphic units representing an Early and/or Middle Pleistocene depositional hiatus within parts of Eastern England (Kemp et al, 1993). The Valley Farm Soil is a rubified and clay-enriched horizon indicating warm interglacial conditions, which is overlain by the Barham Arctic Soil Structure.	No	Low
Lowestoft Formation: *diamicton*	Middle Pleistocene: Anglian Stage (0.478–0.424Ma BP)	Poorly sorted sediments deposited directly by ice sheets in glacial conditions. Unlikely to yield archaeological assemblages but may seal deposits of archaeological and palaeoenvironmental interest.	Yes, beyond scheme boundary	Low
Lowestoft Formation (Glaciofluvial Sand and Gravel).	Middle Pleistocene/ Anglian Stage (0.478–0.424Ma BP)	Sands and gravels deposited by meltwater at the edge of an ice sheet or as subglacial, englacial and supraglacial deposits of the ice sheet itself. May contain secondary archaeological assemblages or seal stratified deposits of archaeological and palaeoenvironmental interest such as kettle holes	Yes, 1:15000 scale within 1km of scheme boundary.	Low
Cover Sand	Pleistocene	Fine grained sand particles that have transported by air (aeolian processes)	No, beyond scheme boundary	Low
Lacustrine "Marks Tey" -style deposits: *Clay and Silt*	Middle Pleistocene: Anglian Stage likely into Hoxnian (0.478–0.424Ma BP)	Fine-grained sediments deposited in low-energy standing-water environments beyond the glacial land-system, and from impounded water in river valleys during the post-glacial period. Laminations can reflect season cycles. They are rich sources of information about past climate change mechanisms and paleoenvironmental change.	No, beyond scheme boundary	Very High
Head	Middle–Late Pleistocene: mostly Wolstonian Stage (0.373–0.144 Ma BP)	Poorly sorted slope deposits deposited by solifluction in peri-glacial environments. Has the potential to bury sediments of geoarchaeological and palaeoenvironmental interest and may contain stratified secondary archaeological assemblages	Yes, 1:15000 scale within scheme boundary	Low-Moderate

DEPOSIT TYPE	DATE	DESCRIPTION	MAPPED ON BGS[1]	POTENTIAL
River Terrace deposits	Late Pleistocene- Holocene	Sands and gravels deposited by fluvial mechanisms that have been incised through and preserved as former floodplains. They are an important source of Lower and Middle palaeolithic artefacts (usually preserved in non-primary contexts) and can also seal organic sediments of palaeoenvironmental significance	Yes, 1:15000 scale within scheme boundary	High
Peat and other organic waterlogged deposits	Holocene	Partially decayed organic matter preserved within waterlogged conditions in lakes bogs and along river valleys: peatlands are a foci for human activity. Excellent preservation potential for palaeoenvironmental resources and cultural remains	Yes, within scheme boundary	Very High
Alluvium	Holocene	Fine-to-coarse grained sediments of Holocene date deposited by fluvial activity in the modern floodplain area. Alluvial environments are a focus for human activity, and an effective trap for artefacts and ecofacts with good preservation potential.	Yes, 1:15000 scale within scheme boundary	High

1 British Geological Survey (BGS) 1:50,000 or 1:625,000 superficial geology mapping (NERC, 2025).

5 ARCHAEOLOGICAL BACKGROUND

5.1 Archaeological background information for the Norwich to Tilbury scheme is provided in a Historic Environmental Baseline Report (Arcadis, on behalf of National Grid 2024) and reproduced within Headland Archaeology's overarching written scheme of investigation (Milne 2024). Each asset has a unique number, which is referrable to the original HEBR.

5.2 This reporting covers Section C (Babergh District Council) and Section D (Colchester City Council), which are summarised below.

5.1 SECTION C: BABERGH DISTRICT COUNCIL, COLCHESTER CITY COUNCIL AND TENDRING DISTRICT COUNCIL

Summary of Archaeological Background

5.1.1 Within and near to the scheme boundary, archaeological evidence for human activity has been discovered for all time-periods excepting the Mesolithic and Neolithic, with several sites containing evidence for multiple phases of human occupation. It is however possible that undiscovered archaeological remains from any period may survive within the scheme boundary. Therefore, any deposits with potential for good environmental preservation could theoretically provide evidence for any period from the Palaeolithic through to the present.

5.1.2 The designated heritage assets in this region of the works comprise various scheduled monuments, listed buildings and conservation areas, as well as a registered park and garden. Non-designated heritage assets comprising findspots, cropmarks, post-medieval farmsteads, moats, and 20th century military assets.

Prehistoric: Palaeolithic and Neolithic

5.1.3 The earliest activity identified is a single findspot of a Palaeolithic axe (3002). These communities left very little physical evidence of their existence other than their stone tools.

Prehistoric: Bronze Age and Iron Age

5.1.4 Potentially Bronze Age activity consists of several ring and boundary ditches identified through cropmarks (3001, 3004, 3006 and 3236) as well as a findspot of a La Tene terret (3013). The crop mark site S of Ardleigh (1002146) marks the location of a multi-period cropmark site, with archaeological investigation in 1995 indicating a middle Bronze Age funerary function as well as six ring ditches producing further urned cremations of a similar type and date. Located immediately to the south of the draft order limits, previously unrecorded remains (including human remains) may extend to the north and be disturbed by the proposed works.

5.1.5 Evidence of Iron Age activity is also sparse and consists of a series of five late Iron Age farmsteads with evidence of metalworking identified as part of archaeological evaluations of the area (3016 and 3017). The site was multi-period with evidence of Roman and Early medieval settlement also identified. There were also several potentially prehistoric groups of cropmarks including 12 ring ditches and elements of a rectilinear system (3239), ditches, trackways, and an oval enclosure (3045) and an enclosure and ring ditch (3225). These cropmarks remain unevaluated and further work is needed to confirm their nature.

Roman and Romano-British periods

5.1.6 The Romano-British period is represented by cropmarks of field boundaries, enclosures, and trackways (3034, 3038, 3237, and 3039) as well as a possible Roman pottery kiln (3040). As these sites have not been investigated

archaeologically their full extent, function and purpose is currently unknown. Additional Romano-British activity includes artefact scatters of coins, pottery, tiles, oyster shell, and a stone figure (3037). A Roman road (2113) transects the works, running roughly north to south.

Early medieval and medieval

5.1.7 The early medieval period is under-represented in the region and evidence of activity consists of a square enclosure cropmark (3186) that indicates a probable moat, and an earthwork of an enclosure (3096). However, it is possible that some of the potentially medieval activity summarised below may relate to the early medieval period upon further investigation.

5.1.8 Medieval activity is more widespread and consists of archaeological remains and scatters of findspots. Finds recorded include artefact scatters, jewellery, tiles, and pottery. Archaeological remains are represented by cropmarks of field boundaries and enclosures (3049), as well as multiple moated sites (3047, 3095 and 3103). These moated sites likely represent a network of manorial sites. Additionally, archaeological excavations in the region revealed a medieval/post-medieval site with a series of field boundary ditches and a trackway.

5.1.9 The Grade I listed building is the Church of St Mary (1223452), located approximately 50m to the west of the draft order limits. Largely built in the 14th century, but with earlier components, the church consists of a west tower, nave, south aisle and chancel which are all constructed from rubble and flint, roman brick in parts, and a stone trim. The church is surrounded on all sides by established woodland which extend into the draft order limits and may be disturbed.

5.1.10 The first Grade II* building is another Church of St Mary (1337175), located approximately 100m to the north-east of the draft order limits. The church was built in the 12th century with 14–16th century additions and was restored in the 19th and 20th centuries. It has an associated churchyard but does not extend into the draft order limits and is unlikely to be disturbed by the works.

5.1.11 The second Grade II* building is Lowe Hill House (1036991), located approximately 100m to the south-east of the draft order limits. Likely constructed in the 15th century, with 16–17th century alterations, the structure has distinct exposed timber frames with white painted render between the timber. The building overlooks agricultural fields to the north, north-east, north-west, west and southwest but lacks associated outbuildings or landscaping. It is therefore unlikely to be disturbed by the works.

Post-medieval and modern

5.1.12 The post-medieval period is largely represented by post-medieval farmsteads and tenement buildings. All currently known buildings are highly unlikely to be directly disturbed by the proposed works. However, the footprint of previously unrecorded outbuildings or related agricultural features such as field boundaries and drainage ditches may extend into the draft order limits and be at risk of disturbance. Additional post medieval activity includes earthworks of three ditches (3018) and a milestone (3026).

5.1.13 Modern activity in the region consists of military sites including a pillbox (3202) and RAF Raydon (3189). RAF Raydon is extensive and will likely be significantly impacted. Additional modern activity is a group of interwar houses (3241) which are still occupied.

5.2 SECTION D: COLCHESTER CITY COUNCIL

Summary of Archaeological Background

5.2.1 Within and near to the scheme boundary, archaeological evidence for human activity has been discovered for all periods from the Late Iron Age to present (except for the Early medieval period), although some of these periods are poorly represented. There is currently no evidence for prehistoric activity earlier than the Late Iron Age. It is however possible that undiscovered archaeological remains from any period may survive within the scheme boundary. Therefore, any deposits with potential for good environmental preservation could theoretically provide evidence for any period from the Palaeolithic through to the present.

5.2.2 The designated heritage assets in this region of the works comprise various scheduled monuments, listed buildings and conservation areas. Non-designated heritage assets broadly comprise findspots, cropmarks, settlements, buildings and ruins, farmsteads, moated sites, roman road, and 20th century military structures. There are also many undated non-designated assets within or adjacent to the draft order limits, that would need archaeological investigation to determine the date, function and extent of the sites. These largely relate to cropmarks of possible enclosures, ring ditches, trackways, and pits.

Prehistoric: Bronze Age and Iron Age

5.2.3 The earliest of these non-designated assets are three excavated archaeological sites relating to Late Iron Age occupation. These range in size and complexity from a single phase of charcoal rich pits (4184) to multiple phases of enclosures and pits (4183 and 4186). All three sites identified evidence for nearby industrial activity, which may be found within the draft order limits.

Roman and Romano-British

5.2.4 The draft order limits intersect the vicinity of Roman Colchester and contain various Romano-British assets. Among these is Fordham Roman villa, this villa site has found evidence of activity from the middle Iron Age through the Roman period into the early medieval (Saxon) period, including structures, high-status finds, and human burials. A Roman road running for 1.8km north to south (4120) through Section E is of relevance to the scheme. Also of note are several excavated archaeological sites which have revealed a likely Roman cemetery site with a complete skeleton (4093), lead coffins (4081), and enclosures and pits (4082) as well as a possible kiln site (4074). The full extent of these sites is still unknown and have the potential to impact the proposed works, particularly if additional human remains are identified.

Early medieval and medieval

5.2.5 The early medieval period is not represented in this section of the works. However, it is likely that many present-day villages and churches have their origins in this era.

5.2.6 Medieval activity consists of excavated archaeological remains, farmsteads, and a possible deserted village. Archaeological remains are limited to a boundary ditch (4006) and two moated sites (4057 and 4104). Medieval farmsteads include Street Farm (4344) and Knaves Farm (4222). The presence of a possible deserted medieval village (4058) has not confirmed by intrusive archaeological works and is currently only theorised due to the isolated nature of a nearby church.

Post-medieval and modern

5.2.7 The post-medieval period is also poorly represented. Activity consists of a known quaker burial ground (4066), garden walls (4344 and 4193), and various buildings. Post-medieval buildings include a demolished farmstead (4222) and Teybrook Farmyard (4225). Two extant settlement centres with post-medieval origins are also present immediately adjacent to the draft order limits at Gallows Green (4212) and Boxted Heath (4211). None of this activity is likely to be disturbed by the proposed works.

5.2.8 The modern period is largely represented by WWII and Cold War military assets including but not limited to ten pillboxes, two mortar emplacements (4040 and 4344), and a nuclear monitoring post (4349). Many of these assets relate to the Eastern Command Line defences built in case of Nazi invasion. Also of note is Boxted Airfield (4063) which transects the proposed works and contains surviving runways and permitter tracks from its WWII operational history.

6 AIMS AND OBJECTIVES

6.1 AIMS

6.1.1 The primary aim of the geoarchaeological monitoring and recording was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. In general, the purpose of the watching brief was to record and advance understanding of the significance of any heritage assets, to create a predictive deposit model for the site, and to inform appropriate mitigation strategies.

6.2 OBJECTIVES

6.2.1 The principal objectives were to:

- Identify, record and characterise the extent and depth of the Pleistocene and Holocene deposit sequence in the vicinity of the scheme;
- Identify significant variations in the deposit sequence indicative of localised features such as palaeochannels, topographic highs or buried 'islands';
- Identify the location and extent of any waterlogged organic deposits and/or buried soils or land-surfaces and address the potential for the preservation of archaeological and palaeoenvironmental remains within these deposits;
- Define zones of landscape stability within the vertical sequence that may have been of sufficient stability for human occupation at various periods in the past;
- Discuss the sequence of sediments within the wider landscape context of known quaternary geology and geomorphology;
- Inform the requirement for further geoarchaeological or paleoenvironmental investigation in the scheme.

6.2.2 These objectives were to be achieved through the monitoring of selected ground investigation works (Table 7.1) and subsequent deposit modelling.

6.3 RESEARCH AGENDA

6.3.1 The following regional research framework agendas are relevant to this work:

- East of England Regional Research Framework (ALGAO East of England 2020) (Research Frameworks, 2024).

6.3.2 In particular, the data collected during the geoarchaeological survey may contribute to these specific research agenda questions:

Palaeolithic-Mesolithic

- Pal-Meso 05: How can East Anglian sites contribute to our understanding of the Upper Palaeolithic and Mesolithic periods nationally?
- Pal-Meso 11: Are deposit modelling and predictive modelling useful tools?
- Pal-Meso 23: What do we know about the scale, distribution and character of occupation in the region?

Neolithic

- Neo 23: How can we better characterize the variability of the Neolithic landscape?

7 METHODOLOGY

7.1 OVERVIEW

7.1.1 All site work was carried out in accordance with the site-specific WSI (Headland Archaeology, 2024a). The fieldwork was undertaken under the supervision of a suitably qualified geoarchaeological specialist.

TABLE 7.1 Summary of geoarchaeological work covered in this report

EXPLORATORY HOLE ID	MAX D (M BGL)	TRANSECT ID	TYPE
MM_JC_BH_102b	20.0	1	Cable percussion borehole
MM_JC_BH_102d	13.8	1	Cable percussion borehole
MM_JC_BH_103	27.0	1	Cable percussion borehole
MM_JC_BH_103A	17.45	1	Cable percussion borehole
MM_JC_BH_104	19.5	1	Cable percussion borehole
MM_JC_BH_104a	20.0	1	Cable percussion borehole
MM_JC_BH_105	20.0	1	Cable percussion borehole
MM_JC_BH_105a	20.0	1	Cable percussion borehole
MM_JC_BH_106	20.2	1	Cable percussion borehole
MM_JC_BH_106A	20.5	1	Cable percussion borehole
MM_JC_TP_111	2.00	1	Machine excavated trial pit
MM_JC_TP_111a	1.60	1	Machine excavated trial pit
MM_JC_TP_112	2.60	1	Machine excavated trial pit
MM_JC_TP_113	1.80	1	Machine excavated trial pit
MM_JC_TP_114	2.10	N/A	Machine excavated trial pit
MM_JC_TP_116	4.00	N/A	Machine excavated trial pit

7.2 TRIAL PITS

7.2.1 Trial pits were excavated using a tracked 360° excavator under direct supervision. A 900mm toothed excavator bucket was used to remove any hard surfaces/demolition deposits, with all soft deposits removed in spits using a flat bladed ditching bucket. Trial pit depths varied between 1.60–4.00mbgl.

7.2.2 During geoarchaeological monitoring of trial pits, the attendant geoarchaeologist logged upcast from the trial pit on the site of the excavation and measured deposit boundaries without entering the pit. Recordings and photographs were taken from the section.

7.3 BOREHOLES

7.3.1 Drilling was conducted using a Dando 3000 cable percussion drilling rig. Boreholes were monitored to a total depth of between 13.8–27.0mbgl.

7.3.2 Boreholes were monitored by the attendant geoarchaeologist until refusal or bedrock was reached, whichever was first. Sequences were photographed and a record made of the depth of each sedimentary unit.

7.3.3 The sediments were described on a summary proforma according to standard methodologies based on Jones (1999) and with the aid of a Munsell soil colour chart. This included a description of colour, compaction, texture, sorting, structure, inclusions (including abundance, shape and material) and contacts.

7.3.4 Grab samples of deposits of geoarchaeological and palaeoenvironmental interest were taken at the discretion of the attendant geoarchaeologist. Samples were labelled using waterproof marker pens and an internal label. An overview of the samples taken is provided in the appendices.

7.4 GEOARCHAEOLOGICAL DEPOSIT MODELLING

7.4.1 A total of 10 borehole records and 6 trial pit records were used to create sub-surface predictive deposit models of selected transects across the scheme.

7.4.2 The geoarchaeological deposit records were entered into industry standard borehole management software (Rockworks™) to create a model of the key Quaternary Age sub-surface strata on site.

7.4.3 A sequence of commonly occurring lithological deposits was identified based on the results of the GI monitoring. These were correlated into stratigraphic units based on their lithological descriptions. The stratigraphy defines distinct depositional processes, associated environments,

and landform types (e.g. palaeo-rivers, glacial outwash, palaeo-lake deposits, cold climate landforms, fluvial activity, floodplains and soil formation). The model indicates, where relevant, the depth of made ground

7.4.4 The following stratigraphic units were assigned, presented in order of deposition:

- Chalk bedrock (oldest)
- Thanet Formation/Lambeth Group
- Thames Group
- Red Crag
- Glacial Sand and Gravel
- Possible glaciolacustrine deposits
- River Terraces
- Fluvial sands and gravels
- Peat
- Alluvium
- Organic silt
- Topsoil

7.4.5 The subsurface geometry of valley deposits is illustrated as a 2D-fence diagram, and the Transect is used to present related constrained linear data sets to provide representative cross sections, illustrating the range of deposits present within the valley and their predicted distribution between intervention points. For TP-116, situated beyond the main area of modelling, these results are present as a separate log.

7.4.6 Deposit modelling allows for the spatial interpretation of the data, identifying probable environments represented, and the determination of areas of higher and lower geoarchaeological/archaeological/palaeoenvironmental potential by extrapolating the thickness and elevation of deposits between given data points. Where deposits are laterally constrained (such as channels) modelling may give an erroneous impression of the distribution of deposits (eg elevation and thickness).

7.4.7 Deposit modelling was undertaken following Historic England guidance (2020) and in compliance with industry best practice.

8 RESULTS

8.1 The results of the geoarchaeological watching and sampling brief for the Stour Valley Crossing scheme are presented below. The stratigraphy is represented in a single fence diagram crossing the valley from the north to the south across the central area of the site (Illustration 3). In total, ten boreholes, and six test-pits were monitored and recorded by qualified geoarchaeologists. A record of the full geoarchaeological descriptions of assessed material is available in Appendix 1. The dataset used in the deposit modelling is available in Appendix 2.

8.1 LOCATIONS

8.1.1 Tables of borehole and test-pit locations for the scheme are given below (Table 8.1, Table 8.2). Locations are also shown in Illustration 2.

8.1.2 The mean surface elevation of boreholes taken from across the site was 6.14m AOD (above ordnance datum), with a minimum elevation of 5.57m AOD at MM_JC_BH_102b, and a maximum elevation of 7.342m AOD at MM_JC_BH_106. The mean surface elevation of trial pits taken from across the site was 12.70m AOD, with a minimum elevation of 5.701m AOD at MM_JC_TP_111 and a maximum elevation of 42.285m AOD at MM_JC_TP_116.

TABLE 8.1 Borehole Locations and Depths

BH ID	TRANSECT ID	MAX D (M BGL)	LOCATION		
			EASTING (X)	NORTHING (Y)	ELEVATION (Z)
MM_JC_BH_102b	1	20.0	603991.001	234898.982	5.571
MM_JC_BH_102d	1	13.8	603855.013	235020.999	5.818
MM_JC_BH_103	1	27.0	603816.99	234889.026	5.938
MM_JC_BH_103A	1	17.45	603766.024	234964.008	6.034
MM_JC_BH_104	1	19.5	603720.751	234807.638	5.875

BH ID	TRANSECT ID	MAX D (M BGL)	LOCATION		
			EASTING (X)	NORTHING (Y)	ELEVATION (Z)
MM_JC_BH_104a	1	20.0	603663.018	234865.527	5.799
MM_JC_BH_105	1	18.0	603858.954	234513.034	5.95
MM_JC_BH_105a	1	20.0	603784.994	234564.017	5.997
MM_JC_BH_106	1	20.2	603800.932	234445.577	7.342
MM_JC_BH_106A	1	20.5	603724.917	234493.578	7.079
	TOTAL	196.45		MEAN ELEVATION	6.14

TABLE 8.2 Trial Pit Locations and Depths

BH ID	TRANSECT ID	MAX D (M BGL)	LOCATION		
			Easting (X)	Northing (Y)	Elevation (Z)
MM_JC_TP_111	1	2.00	603899.4	234866.801	5.701
MM_JC_TP_111a	1	1.60	603870.011	234634.993	5.869
MM_JC_TP_112	1	2.60	603738.955	234422.559	7.068
MM_JC_TP_113	1	1.80	603575.047	234752.532	6.107
MM_JC_TP_114	N/A	2.10	603284.013	234406.605	9.19
MM_JC_TP_116	N/A	4.00	603512.959	233444.619	42.285
	TOTAL	14.1		MEAN ELEVATION	12.70

8.2 OVERVIEW

8.2.1 A broad stratigraphic sequence was identified, comprising a total of 14 units representative of the major depositional phases identified on site (Table 8.3). The thickness of these units is shown in Table 8.4.

8.2.2 The four base units were bedrock of Chalk, Thanet Formation/Lambeth Group, Thames Group and Red Crag. These have been eroded to form the valley of the River Stour so that Red Crag is now only present on the high ground to the north and south.

8.2.3 The Quaternary stratigraphic sequence over the site is more complex with multiple coarse-grained gravel and sand units deposited in association with glacial-interglacial cycles throughout the Pleistocene. These are thickest to the centre of the valley at MM_JC_BH_103 where they are present to 27m bgl. Here and to the north fine grained deposits likely to be glaciolacustrine in nature are present between glaciofluvial gravels and terrace gravels at a thickness of up to 8.45m (MM_JC_BH_102b). The site is mantled by up to 2.5m of silty clay alluvial deposits on which topsoil has formed. On higher and sloping ground (above 7m AOD), the alluvium is absent, and soil has formed on terrace gravel or glaciofluvial gravel.

TABLE 8.3 Overview of stratigraphic units

UNIT	GENERAL DESCRIPTION	ORDER OF DEPOSITION
Topsoil	Friable., dark brownish grey silty clay with occasional dark reddish brown clay patches and occasional rooting. Inclusions vary across site with occasional CBM flecks and subangular to sub rounded white stones.	1 (Youngest)
Organic silt	These are pockets of alluvium with higher organic content and comprise blackish grey humic clay with occasional fragments of degraded chalk giving buff-brown colour to areas. Occasional clasts of black, well-humified peaty material.	3
Alluvium (1 and 2)	Friable., mid greyish brown, very slightly sandy, very slightly silty clay, with rare orange mottling and occasional roots and rare white stone flecks. Lower deposits are fully saturated.	2 and 4
Peat	Black, slightly sandy peat with frequent wood and plants remains and occasional pebbles and rare flecks of red stone.	5
Fluvial sands and gravels	Mid greyish brown coarse sand and subangular to subrounded gravel varying in size. Generally a high clay content with large wood fragments, plant remains and shell inclusions in places.	6
River Terraces	Gravel and/or coarse sand with occasional white shell. Frequent rounded pebbles (1 – 20mm), clasts range from (10 -100mm).	7
Possible glaciolacustrine deposits	Complex of stratified material comprising lenses of light yellowish grey fine sandy silt, mid-bluish grey sandy silt, gravel (1- 20mm) and peaty silt. Rare white shell and occasional desiccated wood inclusions. In places the whole unit comprises dark brown silty humic clay with calcareous laminations.	8
Glacial Sand and Gravel (Lowestoft?)	Typically presents on site as light brown coarse sandy gravel. The larger clasts are generally flint with smaller pebbles of chalk. Contains some shell flecks and is clean but poorly sorted.	9
Kesgrave Catchment Subgroup	Slightly clayey medium-coarse sand and gravel cobbles with polished appearance, and rare manganese pellets and likely ferrous staining.	10
Red Crag	Strong brown slightly clayey medium coarse sand with pebbles and large manganese lenses.	11
Thames Group	Firm dark grey-brown clay.	12
Thanet Formation/ Lambeth Group	Stiff dark grey fine to coarse sand with olive-green and orange tinges.	13
Chalk bedrock (oldest)	Cream coloured chalk and chalk putty with black specks.	14 (Oldest)

TABLE 8.4 Summary of thickness of stratigraphic units

BOREHOLE	EASTING	NORTHING	CHALK BEDROCK	THANET FORMATION & LAMBETH GROUP (UNDIFFERENTIATED)	THAMES GROUP	RED CRAG FORMATION	KESGRAVE CATCHMENT SANDS AND GRAVELS? / LOWESTOFT SANDS AND GRAVEL	BARHAM ARCTIC SOIL? / LOWESTOFT SANDS AND GRAVELS	GLACIAL SAND AND GRAVEL	LOWESTOFT SANDS AND GRAVELS
MM_JC_TP_116	603513	233444.6	–	–	–	0.8	1.4	1.1	–	0.3
MM_JC_BH_102b	603991	234899	1.9	0.1	2.55	–	–	–	–	–
MM_JC_BH_102d	603855	235021	0.01	1.8	3	–	–	–	–	–
MM_JC_BH_103	603817	234889	0.01	–	–	–	–	–	8.5	–
MM_JC_BH_103A	603766	234964	1.95	–	–	–	–	–	3	–
MM_JC_BH_104	603720.8	234807.6	–	–	–	–	–	–	11	–
MM_JC_BH_104a	603663	234865.5	0.5	–	–	–	–	–	7	–
MM_JC_BH_105	603859	234513	2	12	–	–	–	–	–	–
MM_JC_BH_105a	603785	234564	3	13	–	–	–	–	–	–
MM_JC_BH_106	603800.9	234445.6	0.15	11.55	–	–	–	–	–	–
MM_JC_BH_106A	603724.9	234493.6	–	14	–	–	–	–	–	–
MM_JC_TP_111	603899.4	234866.8	–	–	–	–	–	–	–	–
MM_JC_TP_111a	603870	234635	–	–	–	–	–	–	–	–
MM_JC_TP_112	603739	234422.6	–	–	–	–	–	–	–	–
MM_JC_TP_113	603575	234752.5	–	–	–	–	–	–	–	–
MM_JC_TP_114	603284	234406.6	–	–	–	–	–	–	–	–

BOREHOLE	GLACIO-LACUSTRINE	ORGANIC SILT	RIVER TERRACE SANDS AND GRAVELS	PALAEOSOL	PEAT	FLUVIAL SANDS AND GRAVELS	ALLUVIUM 2	ALLUVIUM (ORGANIC)	ALLUVIUM	SUBSOIL	TOPSOIL
MM_JC_TP_116	–	–	–	–	–	–	–	–	–	0.3	0.1
MM_JC_BH_102b	8.45	–	3.5	–	–	1.85	–	–	1.25	–	0.4
MM_JC_BH_102d	3.5	–	2	–	–	1.5	–	1.05	0.25	–	0.7
MM_JC_BH_103	2	–	13.5	–	–	0.5	–	–	2.2	–	0.3
MM_JC_BH_103A	1	–	8.5	–	–	1	–	–	1.8	–	0.2
MM_JC_BH_104	–	0.45	4	–	0.5	2	0.35	–	0.5	–	0.7
MM_JC_BH_104a	2.5	–	7.4	–	0.45	0.95	–	–	0.7	–	0.5
MM_JC_BH_105	–	–	4.5	0	–	–	–	–	1.2	–	0.3
MM_JC_BH_105a	–	–	1.4	–	0.6	–	–	–	1.8	–	0.2
MM_JC_BH_106	–	–	8	–	–	–	–	–	–	–	0.5
MM_JC_BH_106A	–	–	6.1	–	–	–	–	–	–	–	0.4
MM_JC_TP_111	–	0.4	–	–	–	–	1	–	0.3	–	0.3
MM_JC_TP_111a	–	0.1	0.3	–	–	–	0.7	–	0.3	–	0.2
MM_JC_TP_112	–	–	2.3	–	–	–	–	–	–	–	0.3
MM_JC_TP_113	–	–	0.6	–	–	–	–	–	0.6	–	0.6
MM_JC_TP_114	–	–	1.6	–	–	–	–	–	–	–	0.5

Transect One

Overview

8.2.4 Transect 1 is drawn from 14 interventions from the north to the south of the site, (Illustration 3). 10 boreholes and 4 test-pits were monitored and logged by qualified geoarchaeologists.

8.2.5 The maximum depth monitored was to 27m BGL in MM_JC_BH_103.

Lithology

8.2.6 Chalk or chalk putty were observed at the base of all boreholes except MM_JC_BH_104 and MM_JC_BH_106A. To the south this was overlain by thick deposits of up to 11.55m of stiff dark grey fine to coarse sand with olive-green and orange tinges between MM_JC_BH_105a and MM_JC_BH_106. A thinner layer of these was also present to the far north at MM_JC_BH_102d which in turn is overlain by 3m of firm dark grey-brown clay.

8.2.7 Light brown coarse sandy gravel with large clasts of flint, small pebbles of chalk and some shell flecks is present in the centre of the valley between MM_JC_BH_103A and MM_JC_BH_104. These and the above deposits are overlain by a complex of stratified material comprising lenses of light yellowish grey fine sandy silt, mid-bluish grey sandy silt, gravel (1–20mm) and peaty silt to the north of the site between MM_JC_BH_102d and MM_JC_BH_104a. White shell and occasional desiccated wood inclusions and generally high organic content attest to the high organic preservation potential of this unit.

8.2.8 Across the whole of this part of the site are gravel and/or coarse sand with occasional white shell. To the north (between MM_JC_BH_102d and MM_JC_BH_104) these are sealed by mid greyish brown coarse sand and subangular to subrounded gravel varying in size with a high clay content, large wood fragments, plant remains and shell inclusions in places.

8.2.9 Black, slightly sandy peat with frequent wood and plant remains and occasional pebbles and rare flecks of red stone is present at MM_JC_BH_104, MM_JC_BH_104a and MM_JC_BH_105a. This is overlain and preserved by fine grained alluvium described as mid greyish brown, slightly sandy silty clay which is fully saturated at depth. Within this alluvium at MM_JC_BH_102d, MM_JC_TP_111 and MM_JC_BH_104, there are pockets of alluvium with higher organic content and occasional clasts of black, well-humified peaty material. A topsoil has formed at the ground surface across the whole site.

Stratigraphy

Bedrock deposits

8.2.10 The basal stratigraphic unit encountered was the chalk bedrock, likely to be the Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated). This deposit was laid down in the Late Cretaceous Epoch under shallow marine environment conditions. The highest elevation of this unit was -7.98m AOD at MM_JC_BH_102d and the lowest at -21.06m AOD at MM_JC_BH_103 near the course of the present River Stour. This large difference in elevations likely reflects past erosion in the present river valley as a result of glacial-interglacial cycles during the Pleistocene. To the south of the study area the Chalk is overlain by Thanet Formation and Lambeth Group (Undifferentiated), between MM_JC_BH_104 and MM_JC_BH_106 to a maximum elevation of -0.05m AOD at MM_JC_BH_105. It is also present to the north of the study area between MM_JC_BH_102b and MM_JC_BH_102d where it appears to be overlain by the Thames Group deposits which are mapped by BGS on the higher ground either side of the Stour valley. To the centre of the Stour Valley neither the Thanet/Lambeth or Thames Group were identified suggesting that both of these bedrock deposits have been fully eroded here.

Superficial deposits

8.2.11 The stratigraphically lowest, and therefore oldest, superficial deposits identified were glaciofluvial sand and gravel present between MM_JC_BH_103A and MM_JC_BH_104a. These fill the base of the Stour valley at an elevation of -21.06 to -6.46m AOD. The low stratigraphic position of these could place them as Kesgrave Catchment Subgroup. They would have been deposited during high energy conditions likely associated with glacial outwash most likely at the end of the Anglian so may also be part of the Lowestoft Formation. The deposition of these gravels in the valley base possibly blocked the flow of water and led to the formation of a lake to the north. Fine-grained sediments are present at MM_JC_BH_102d to MM_JC_BH_104a at an elevation of -12.56 to 0.32m AOD. Of particular note are organic sediments including peat at -6.70 to -4.20m AOD in MM_JC_BH_104a. These are overlain by terrace sands and gravels which are present across the whole study area (except MM_JC_TP_116) at an elevation of -10.56 to 8.69m AOD. It is probable that these are several different terraces but due to the nature of disturbed samples it is not possible to differentiate them here. It is likely the uppermost of these gravel units in the valley base at 1.38 to 4.15m AOD between 'MM_JC_BH_102d and MM_JC_BH_104 are fluvial gravels associated with the present interglacial. The BGS would map these along with the finer grained sediment as quaternary alluvium. A distinction is made here as the finer grained alluvium has a generally higher preservation potential for organic material than the coarse-grained deposits. Indeed peat appears to have been preserved beneath the fine grained alluvium at MM_JC_BH_104 (3.38 to 3.88m AOD), MM_JC_BH_104 (4.15 to 4.60m AOD), and MM_JC_BH_105a (3.40 to 4.00m AOD) with further organic deposits interbedded in the alluvium at MM_JC_BH_102d, MM_JC_BH_104, MM_JC_TP_111 and MM_JC_TP_111a. The uppermost unit across the study area is topsoil which has formed directly on the alluvium or terrace gravels.

MM_JC_TP_114

Overview

8.2.12 MM_JC_TP_114 is located to the west of the other interventions and is therefore not included in the modelled fence diagram. It was relatively shallow at 2.1m bgl and revelled a topsoil described as dark greyish brown slightly sandy silt with rooting and turf, and occasional/frequent inclusions of subangular to subrounded pebbles and cobbles. This soil has formed on dark-orange brown sandy gravel with iron patches interpreted as terrace gravels.

MM_JC_TP_116

Overview

8.2.13 This intervention sits c 1km to the south of the other interventions on high ground. It therefore presents a notably different lithological and stratigraphic sequence to that seen at other locations.

Lithology

8.2.14 Strong brown slightly clayey medium coarse sand with pebbles and large manganese lenses was present below 3.2m bgl. This was overlain by sticky slightly clayey medium-coarse sand and gravel cobbles, with a polished appearance, and rare manganese pellets and likely ferrous staining. At the upper contact of this unit is possible evidence of a soil formation with a fining up sequence and indicative colour changes with yellowing at 1.5 to 1.7m bgl and reddening up to 0.7m bgl. This is overlain by yellowish brown sandy silt with flint cobbles on which a brown soil has formed at the surface.

Stratigraphy

8.2.15 On the higher ground to the south at MM_JC_TP_116 the basal unit was bedrock of the Red Crag Formation which is mapped here by BGS as well as on the higher ground to the north of the Stour Valley. Here it is present to an elevation of 39.09m AOD.

8.2.16 The Red Crag is overlain by superficial deposits of what is interpreted as the Kesgrave Catchment Subgroup on which there is evidence of the Barham Arctic Soil at 40.49 to 41.59m AOD. This is sealed by Glaciofluvial gravels of the Lowestoft Formation on which a soil has formed.

8.3 RELIABILITY

8.3.1 This deposit modelling exercise relies on deposit records collected during the observation and recording of boreholes and trial pits by a qualified geoarchaeologist. Borehole deposits were largely recorded from bulks collected during cable percussion drilling. This places some unavoidable limits on the spatial resolution of the modelled outputs and should be borne in mind when considering the results presented and when designing any future purposive geoarchaeology works. Confidence in the results of deposit modelling within a given area is determined largely by the number of interventions, their geographical spread in relation to relevant superficial deposits, and the accuracy of deposit descriptions and interpretations.

8.3.2 Confidence in the deposit modelling produced for this study is moderate, as the scheme area was quite small with a relatively high density of boreholes and test pits. However, the sequence revealed a complex of coarse-grained deposits likely to derive from multiple terrace gravels. The interpretation of the fine-grained deposits between gravels as glaciolacustrine is based on what has been identified elsewhere but in a similar geographical location. i.e. Marks Tey on the glacial limit. Further purposive works would be required to differentiate the terrace gravels and date the fine-grained unit (see below).

8.3.3 The difficulty in differentiating the different gravel units is largely due to many of the sequences logged by the attending geoarchaeologist being only available as disturbed bulk samples. Only limited geoarchaeological descriptions can be made from this type of sample. Contacts between different stratigraphic units and evidence of bedding are likely to be lost in such samples, which can make interpreting the nature of the deposit problematic.

8.3.4 Key deposit types such as palaeosols are additionally difficult to identify in boreholes due to their often fine and fragmentary nature. This should be considered in future works particularly where coarse deposits of Pleistocene date are overlain by fine grained deposits.

9 DISCUSSION

9.1 The primary aim of the geoarchaeological monitoring and recording was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. Fourteen stratigraphic units have been identified and the geoarchaeological and palaeoenvironmental significance is presented in Table 4.1 and Table 10.1.

9.2 The Pleistocene and Holocene deposit sequence in the vicinity of the scheme shows the bedrock has been incised to form the Stour Valley in which Quaternary sediments have been deposited. It is likely the most significant erosion/deposition event occurred during the end of the Anglian Stage glacial, dating to MIS12. This was the glaciation that extended furthest south across the British Isles and re-routed the Thames to its present location entering the North Sea at London. Prior to this the Thames flowed along the Vale of St Albans meeting the North Sea near Colchester. The Kesgrave Catchment Subgroup date to this more northerly route of the Thames. These deposits are mapped to the north of the site and are represented to the south at MM_JC_TP_116 where there is also evidence of the Barham Arctic Soil developing.

9.3 The Kesgrave Catchment Subgroup may also form the gravels deposited at the base of the incised channel, although here they are more likely to have been reworked as glaciofluvial gravels at the end of the Anglian glacial (the Lowestoft Formation). The site is located on the edge of the mapped limit of the Anglian and would have been subject to high-energy glacial outwash as the glacier retreated. It seems this deposit of coarse-grained material served to block the valley and impound water as fine-grained sediments associated with low-energy water flow are present to the north of the valley.

9.4 The fine-grained deposits are interpreted here as glaciolacustrine in origin as they are in a similar geographic position to Marks Tey 15km to the southwest that were dated to the Hoxnian interglacial (Turner, 2014; Candy and Horne, 2014). They have the potential for scientific dating and to preserve microfossils from which the past environment can be studied. Recommendations regarding further work on this deposit are made below in Section 10: Statement of Potential and Recommendations for Further Mitigation.

9.5 Following the Anglian glacial the British Isles were subject to further glacial and interglacial cycles. And while the glacial limit did not again extend as far south as the scheme, the associated climatic changes would have resulted in hydrological changes and deposition of coarse-grained sediment as terrace gravels, with potential for the build-up of interglacial deposits between. Such deposits are well-mapped and differentiated in some areas such as the Lower Thames (Bridgland, 2014), and the BGS map Terrace 2 and Terrace 3 in the Stour Valley near the scheme, but additional work would be needed to differentiate these further (see Section 10).

9.6 It has been possible to broadly identify where the sand and gravels are more likely to have been deposited as fluvial material during the present interglacial based on inclusions of organic material and a higher clay content. At three locations peat deposits are present above coarse-grained deposits and are sealed and preserved by the overlying fine-grained alluvium. These peats would have formed in channel edge or backwater locations and are of high potential for scientific dating and preservation of

microfossils for environmental studies. They likely date to the early Holocene and therefore have the potential to improve understanding of the prehistoric environment. Peat has been previously identified further upstream in the River Stour by Oxford Archaeology (2013) and peat deposits at 7.7m bgl in the Box Valley (a tributary to the Stour) were radiocarbon dated to >45,250 BP (TL93NE39).

9.7 Within the alluvium are pockets of organic silts in places. These have lower palaeoenvironmental potential than peat as they are likely to have formed in the presence of gently flowing, rather than standing, water so any microfossils preserved could originate from a wider catchment. They are also less likely to provide suitable material for scientific dating.

10 STATEMENT OF POTENTIAL AND RECOMMENDATIONS FOR FURTHER MITIGATION

10.1 The purpose of this geoarchaeological monitoring was to determine the nature of the superficial geology within the scheme and assess the geoarchaeological and archaeological potential of the depositional sequence. The deposits identified during this work as having geoarchaeological and palaeoenvironmental potential are outlined in Table 10.1.

TABLE 10.1 Archaeological and palaeoenvironmental significance of the main superficial deposits identified across the Scheme.

DEPOSIT TYPE	INTERVENTION	GEOARCHAEOLOGICAL POTENTIAL	DESCRIPTION/SIGNIFICANCE
Organic alluvium	MM_JC_BH_102d, MM_JC_TP_111, MM_JC_BH_104, MM_JC_TP_111a	Moderate to low	Late Pleistocene-Holocene: Fine-to-coarse grained organic sediments deposited by fluvial activity in the modern floodplain area. Organic alluvial environments may have good preservation potential for microfossils and can be an effective trap for artefacts and ecofacts with good preservation potential.
Alluvium	MM_JC_BH_102d, MM_JC_BH_102b, MM_JC_BH_103A, MM_JC_TP_111, MM_JC_BH_103, MM_JC_BH_104a, MM_JC_BH_104, MM_JC_TP_113, MM_JC_TP_111a, MM_JC_BH_105a, MM_JC_BH_105,	Low	Late Pleistocene-Holocene: Fine-to-coarse grained sediments deposited by fluvial activity in the modern floodplain area. Alluvial environments are a focus for human activity, and an effective trap for artefacts and ecofacts with good preservation potential.
Peat	MM_JC_BH_104a, MM_JC_BH_104, MM_JC_BH_105a	High	Late Pleistocene-Holocene: Partially decayed organic matter preserved with excellent preservation potential for palaeoenvironmental resources e.g. microfossil and macrofossils, as well as cultural remains
Fluvial deposits	MM_JC_BH_102d, MM_JC_BH_102b, MM_JC_BH_103A, MM_JC_BH_103, MM_JC_BH_104a, MM_JC_BH_104,	Low	Late Pleistocene-Holocene: Sands and gravels deposited by fluvial mechanisms. They can contain discontinuous deposits of waterlogged organics and peats.
River Terrace Gravel	MM_JC_BH_102d, MM_JC_BH_102b, MM_JC_BH_103A, MM_JC_BH_103, MM_JC_BH_104a, MM_JC_BH_104, MM_JC_TP_113, MM_JC_TP_111a, MM_JC_BH_105a, MM_JC_BH_105, MM_JC_BH_106A, MM_JC_BH_106, MM_JC_TP_112, MM_JC_TP_114	Moderate (surface) Low (body)	Pleistocene: Sands and gravels deposited by fluvial mechanisms (often under cold climate conditions) that have been subsequently incised through and preserved as former floodplains. They are an important source of Lower and Middle palaeolithic artefacts (usually preserved in non-primary contexts, or on the surfaces of terraces) and can contain discontinuous deposits of waterlogged organics and peats.
Glaciolacustrine	MM_JC_BH_102d, MM_JC_BH_102b, MM_JC_BH_103A, MM_JC_BH_103, MM_JC_BH_104a,	High	Pleistocene: Fine-grained sediments deposited in low-energy standing-water environments beyond the glacial land-system, and from impounded water in river valleys during the post-glacial period. Laminations can reflect season cycles. They are rich sources of information about past climate change mechanisms and paleoenvironmental change.
Glaciofluvial	MM_JC_BH_103A, MM_JC_BH_103, MM_JC_BH_104a,	Low with the potential to cap deposits of high significance	Pleistocene: Poorly sorted glaciofluvial outwash deposits. Has the potential to bury sediments of geoarchaeological and palaeoenvironmental interest and may contain stratified secondary archaeological assemblages.
Buried soil (Palaeosol)	MM_JC_TP_116	Moderate to High	Pleistocene: Potential for understanding climate and environment during previous phases of landscape stability. Valley Farm and Barham Soils are important stratigraphic units representing an Early and/or Middle Pleistocene depositional hiatus within parts of Eastern England (Kemp et al., 1993). The Valley Farm Soil is a rubified and clay-enriched horizon indicating warm interglacial conditions, which is overlain by complex the Barham Arctic Soil Structure.
Kesgrave Catchment Sub-Group	MM_JC_TP_116	Low to High	Pleistocene: Ancient Thames river terrace with potential to seal interglacial deposits and for soil formation at surface.

10.2 Subsequent mitigation should focus upon capturing stratigraphic sections that are suitable for differentiating the complex sequence of gravels and potential lake deposits.

10.3 Cable percussion boreholes have thus far allowed the full Quaternary sequence to be identified and modelled but the nature of recording - using disturbed samples - means that it has not been possible to confidently differentiate between some units, e.g. the terrace gravels.

10.4 Machine-excavated pits allow visual inspection of intact lithology and stratigraphy but would need to be shored or stepped for entry once they exceed a metre in depth. This may be appropriate for the study of shallower deposits.

10.5 As significant Pleistocene deposits identified in this report are in excess of 10m bgl, the most suitable method for retrieving intact samples would be through purposive window sampling (boreholes) following geophysical survey to ascertain locations with the greatest potential for deposits of interest. This should be followed by a programme of scientific dating and assessment of palaeoenvironmental proxies to provide a robust framework for further analysis.

10.6 Further sampling priorities are summarised below and in Table 10.1.

- The topsoil recorded at the site is of LOW geoarchaeological potential. There was no evidence of any anthropogenic input, either redeposited or in situ, observed during monitoring and no archaeological artefacts were recorded. No further mitigation works are recommended for these deposits.

- Alluvium deposits recorded at the site are of LOW geoarchaeological potential in themselves but have the potential to contain deposits of MODERATE to HIGH geoarchaeological and palaeoenvironmental significance, such as buried land surfaces and Palaeolithic remains. Targeted mitigation of these deposits is not suggested.

- Organic alluvium deposits are of LOW to MODERATE geoarchaeological potential and should only be targeted if they are believed to date to associated archaeology for which environmental context would be useful.

- Peat was encountered at 3.87–3.37m BGL in MM_JC_BH_104a, 4.59–4.14m BGL in MM_JC_BH_104, and 3.99–3.39m BGL in MM_JC_BH_105a. These deposits are of MODERATE to HIGH geoarchaeological potential as peat can yield valuable information on climate and environment during the early Holocene. A targeted borehole survey consisting of 4 boreholes up to 5m BGL using a tracked window sampler is recommended, with the aim of recovering sleeved cores for palaeoenvironmental assessment and radiocarbon dating.

- Fluvial deposits are of LOW geoarchaeological potential. If organic remains are encountered during further mitigation works, it is recommended that samples are taken and appropriate environmental assessments carried out.

- River Terrace deposits are of LOW preservation potential. During further mitigation, a targeted programme of OSL dating is recommended for the sands and gravels that have been encountered during monitoring to establish a chronology of terrace formation. This would also help to constrain the formation of over and underlying deposits.

- Glaciolacustrine deposits are of HIGH geoarchaeological and palaeoenvironmental potential.

  » During further mitigation it is recommended that the extent of these deposits is spatially mapped through a targeted geophysics programme using ERT (Electrical Resistivity Tomography) or CMD-Explorer (EM conductivity).

  » A borehole survey should then be undertaken using window sampling techniques with interventions placed in areas thought to contain the deepest and most intact palaeo-lake sequences.

  » AAR (Amino Acid Racemization) dating is likely to be the most appropriate dating tool and shells found within silts should be targeted for dating. This method may provide information on past temperature changes (McCoy, 1987).

  » Existing samples from 102d, as well as samples from the purposive borehole survey should also be assessed for preservation of pollen, diatoms, and foraminifera.

  » sedaDNA (sedimentary ancient DNA) has been increasingly successfully used in assessments of freshwater clayey lacustrine sediments and should be strongly considered in any future purposive work, especially considering the potential significance of these deposits.

  » Buried soil surfaces on the Kesgrave's have a MODERATE palaeoenvironmental potential, but due to their Early-Middle Pleistocene positioning within the sedimentary sequence are unlikely to be associated with any archaeology. Recommended further mitigation should involve a programme of targeted test pitting for the collection of samples for thin section soil micromorphology.

  » Kesgrave Catchment Sub-Group sand and gravel deposits are of LOW geoarchaeological potential in themselves, and further examination of these deposits is unlikely to yield material of geoarchaeological or archaeological significance. It should be noted though that Kesgrave's

interglacial deposits which are of higher potential, and if more extensive deposits are found beyond the current scheme area the potential should be reassessed.

10.7 It is recommended that any subsequent GI works undertaken at the site be monitored by a suitably qualified geoarchaeologist and the results added to the deposit model produced in this report.

10.8 A summary of this report should be included in any future publications of geoarchaeological data from the site. It is suggested that further publications of site data are made open access due to the value of this data to the wider archaeological community.

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12 GLOSSARY OF SPECIALIST TERMS

Alluvium Alluvial deposits are unconsolidated material (clay, silt, sand and gravel) deposited by running water e.g. rivers or streams. Material may be sorted or semi-sorted in a stream bed or its floodplain, and gravels are generally rounded.

Bedrock Geology This is sometimes called solid geology. It is the main mass of rocks that form the Earth. The British Geological Survey (BGS) refers to everything older than 2.6 million years as bedrock.

Clast A single constituent part of a sediment deposit produced by fragmentation of a larger part (e.g. gravel).

Clastic Sediments Detrital sediments that are formed of broken rocks (clasts) or sometimes shell fragments, that have been eroded, transported and then redeposited at a new location. They are common in littoral zones where significant redeposition occurs. Particle sizes can range from silt to boulder.

Colluvium Colluvial material or hillwash is unconsolidated material (silt, sand, gravel, and rock) that has been deposited at the base of a hillslope by processes like rainwash and downslope soil creep (erosion and gravity). Material is generally poorly sorted, and gravels are generally angular. May cap paleosols and important paleoenvironmental deposits.

Detrital sediments Fragmented rocky material produced by weathering and then transported from its original site.

Head Unsorted, and generally very consolidated mix of material (clay, silt, sand gravels and boulders) deposited by mass movement.

Holocene The current geological period, beginning 11.7 ka BP. The Holocene has been subdivided into three geological ages. The Greenlandian is the earliest age of the Holocene epoch (11.7 – 8.2 ka BP); this is followed by the middle Holocene age called the Northgrippian (8.2 – 4.2 ka BP), and then the Meghalayan (4.2 ka BP to present).is the second Quaternary period epoch.

Landscape All the visible features of an area of land, its landforms both natural and man-made.

Last Glacial Maximum (LGM) The coldest part of the Last Glacial Period (Devensian) when ice sheets were at their greatest extent, in the UK this was between 27 – 18.5 ka BP.

Last Glacial Period / Devensian This is also called the Devensian Glaciation (in the UK), and was the most recent phase of glaciation to have occurred in Britain, covering the period of 115 – 11.7 ka BP. It had fluctuating interstadial periods (less cold) and stadial periods (cold periods), with the most significant cool period and maximum ice sheet advance occurring in the Late Devensian. The glacial period followed the Ipswichian Interglacial.

Paleosol An ancient soil formed on a past landscape, that has been buried by later sediments such as flood deposits, river terraces, landslides or further soil profiles. They can also be exposed be later erosion of the overlying sediments.

Palaeochannel An abandoned fluvial channel – either a river or a stream – that has been infilled with later sediments.

Peat A brown to black deposit formed of fibrous partially decomposed organic matter that has accumulated in a waterlogged, anoxic environment. It can rapidly form under cool, humid conditions that have been common in the post-glacial British climate.

Pleistocene The Pleistocene epoch occurred between 2.58 Ma to 11.7 ka BP, it was dominated by cycles of glacial and interglacial periods. This was the first Quaternary period epoch.

Quaternary period The most recent geological period from 2.58 Ma to present, including both the Pleistocene epoch (2.58 Ma to 11.7 ka BP), and the Holocene epoch (11.7 ka BP to present).

Regression A fall in relative sea level.

Relative Sea Level The height of the sea relative to a particular location, it is affected by both isostasy and eustasy.

Soil The unconsolidated mixture of organic matter, minerals, gas, water, and organisms in which plants grow.

Superficial Geology The looser surface material. The British Geological Survey (BGS) refers to all geologically recent (Quaternary 2.6 Ma to present) deposits as superficial deposits.

Transgression A rise in relative sea level.

Water lain deposits These are deposited directly in water e.g. lakes, ponds, estuaries, the sea. They are distinct from alluvium and are described by the environment they were deposited in.

13 APPENDICES

APPENDIX 1 GEOARCHAEOLOGICAL LOGS

GUIDE TO SIZES AND ABBREVIATIONS USED IN LOGS

SAND		GRAVELS	
F	fine grains (<0.25mm)	F	Fine pebble clasts (4–8mm)
M	medium grains (0.25–0.50mm)	M	Medium pebble clasts (8–16mm)
C	coarse grains (0.50–1.0mm)	C	Coarse pebble clasts (16–32mm)
Granules	very coarse sand to very fine pebble clasts (1-4mm)	VC	Very coarse pebble clasts (32–64mm)
Cobbles		BOULDERS	
Clasts 64–256mm		Clasts larger than 256mm that are separate from the bedrock	

ANGULARITY-ROUNDNESS INDEX FOR CLASTS	
VA	Very Angular
A	Angular
SA	Sub-Angular
SR	Sub-Rounded
R	Rounded
VR	Very Rounded

TABLE 13.1 MM_JC_TP_111 Test Pit log

MM_JC_TP_111					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	**5.701**
LOGGER: AH				**ELEVATION**	–
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603899.4
				NORTHING	234866.801
				DEPTH (M)	2
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.15	Dark brown silty clay, friable to slightly cohesive, slightly moist, stoneless. Fine, modern rootmat. Mergy base.	Topsoil		–
0.15	0.30	Dark-brown to orange-brown cohesive clay with orange mottling (oxidation?) and massive structure. Moist, stoneless. Mergy but very irregular basal contact.	Subsoil	–	–
0.30	0.60	Grey to olive-grey cohesive clay, commonly mottled, with massive structure, Hints of very-well degraded (humified) organic matter (unidentifiable). Moist.	Alluvium	–	–
0.60	1.00	Blackish grey humic clay with occasional fragments of degraded chalk [SA, fine to coarse], giving buff-brown colour to areas. Massive structure, possibly bedded, with possible well-humified vegetation. Cohesive and moist. Water table at 1.0m.	Organic Alluvium	–	–
1.00	1.70	Slightly sandy, grey cohesive silty clay becoming blue grey below 1.2m. Woody fragments and degraded reeds common (matrix-supported), with white flecks (chalk?).	Alluvium	Sampled at 1.7m	–
1.70	2.00	Very sandy, blue-grey clay with common woody fragments and degraded reeds (matrix-supported). Fine quartz pebbles present but infrequent near base.	Alluvium.	–	–

FIG 13.1 MM_JC_TP_111 at 2m depth

TABLE 13.2 MM_JC_TP_113 Test Pit log

MM_JC_TP_113					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	6.107
LOGGER: RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603575.047
				NORTHING	234752.532
				DEPTH (M)	1.8
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.30	Dark greyish brown, slightly silty clay with fine sand, and frequent rooting/ turf. No inclusions.	Topsoil	–	–
0.30	0.60	Dark greyish brown, slightly silty clay with fine sand, light brown clay lenses, occasional roots and orange staining. Rare SR cobbles (90mm). Friable.	Alluvium/ subsoil	–	–
0.60	0.95	Mid-light brownish grey, slightly silty friable clay with frequent orange brown mottles, frequent patches of desiccated wood and rare rooting.	Alluvium	–	–
0.95	1.20	Mid-orange brown slightly silty, clayey fine sand with light orange-grey mottling. Occasional white flecks and rare SA small cobbles (50–80mm, occasionally up to 100mm) more frequent from 1.0–1.1m. Saturated.	Alluvium	–	–
1.20	1.80	Dark grey fine-coarse gravel with trace silt (2%). Clasts range from 0.2–200mm SA-SR).	Terrace or fluvial deposits	–	–

FIG 13.2 MM_JC_TP_113 at 1.8m

TABLE 13.3 MM_JC_TP_111a Test Pit log

MM_JC_TP_111A					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.869
LOGGER: AH					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603870.011
				NORTHING	234634.993
				DEPTH (M)	2.00
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.20	Dark brown sandy clay, desiccated and friable. Abundant modern rootlets, stoneless. Mergy base.	Topsoil.	–	–
0.20	0.50	Grey, orange-brown silty clay. Common orange and greenish-grey mottles. Cohesive and stoneless. Sharp, planar basal contact.	Alluvium.	–	–
0.50	0.60	Dark brown silty clay with well-humified organic remains (no macros visible) and occasional isolated fragments of burnt wood. Cohesive and moist. Clear mergy basal contact.	Alluvium / Humic	–	–
0.60	1.30	Greenish, orange-grey sandy clay with oxidized patches and rare quartz pebbles (medium-coarse, SR, matrix-supported). Clear planar basal contact.	Alluvium.	–	–
1.30	1.60	Orange-brown medium-coarse sand and gravel (clast-supported: flint, quartz and quartzite). Clean.	Terrace gravel.	–	–

FIG 13.3 MM_JC_TP_111a at 1.6m

TABLE 13.4 MM_JC_TP_112 Test Pit log

MM_JC_TP_112					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	7.068
LOGGER: JW					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED. LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603738.955
				NORTHING	234422.559
				DEPTH (M)	2.00
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.30	Light brown [7.5YR 6/3] slightly sandy (fine-medium) silt. Homogenous, ploughed, well-sorted, dry. Distinct organic transition (wavy).	Topsoil- ploughed	–	–
0.30	0.50	Reddish brown [10YR 5/8] fine to medium sand and gravel (40%) with lenses of deep reddish-brown, slightly silty iron panning (from 5cm); [7/5YR 5/8]/ Gravels up to 100mm, mostly flint (SR-VA) with granules and cobbles (SR-SA), ≥20mm. Poorly Sorted and dry. Gradational into slightly silty iron panning, (0.50m +).	Terrace	–	–
0.50	1.30	Yellowish red [5YR 5/8] slightly clayey fine-coarse sand (60%) and gravel with iron panning. Gravel: pebble-cobble, mostly up to ≤50mm diameter. Mostly flint, SA-A, other lithologies rare, SR-R. Sand has very low silt and low clay, leaves fine residue on fingers. Abrupt transition as iron panning ends (1.30m). Fe throughout, with rare manganese pellets and staining. Manganese panning at 1.2m. Coarsens down-sequence (1.00–1.20m; fine to very coarse sand, slightly silt clay; and gravel up to 80mm diameter; SR-A).	Terrace	–	–
1.30	2.10	Strong brown [7.5YR 5/6; less red] slightly silty sand (medium-coarse) and gravel (up 110mm diameter cobbles). Fining and better sorting down-sequence (1.9–2.05m): slightly lower cobble content, sands and gravels, medium-coarse pebbles. Saturated. Becoming wetter down-sequence (1.3–1.5m).	Terrace or Head - possibly derived from Red Crag?	–	–
2.10	2.60	Strong brown [7.5YR 5/6] silty sand (fine-very coarse) and gravel (50/50.) Few shell (?) fragments. Gravel to (125mm diameter), some "flat" laminar stones, some SR-R mixed lithology gravels. Large A-VA flint clasts. Poorly sorted. Saturated.	Terrace or Head - possibly derived from Red Crag?	–	–

FIG 13.4 MM_JC_TP_112 at 2.6m

TABLE 13.5 MM_JC_TP_114 Test Pit log

MM_JC_TP_114					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	9.19
LOGGER: RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED. LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603284.013
				NORTHING	234406.605
				DEPTH (M)	2.1
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.40	Dark greyish brown slightly sandy silt with rooting and turf, with occasional/frequent SA pebbles and cobbles (50–200mm) and occasional SR pebbles (20–90mm). Slightly saturated.	Topsoil	–	–
0.40	0.50	Slightly greyish, dark orange-brown, slightly gravelly, silty coarse sand. Gravel (10%, 5–30mm) – sub-rounded stones.	Subsoil	–	–
0.50	0.70	Mid-dark orange brown, slightly silty, clayey gravelly coarse sand. Gravel (30–40%. 2–300mm, SA-S). Patches of more fine sand with fewer gravel inclusions.	Terrace	–	–
0.70	1.00	Dark-orange brown, slightly sandy, coarse gravel (20/80%). Gravel (0.1–400mm, large SA boulders approximately 500mm) Frequent iron patches.	Terrace	–	–
1.00	1.50	Brownish yellow, slightly silty, coarse sandy (20/80) gravel with occasional iron patches. Gravel clasts range from 0.5–200mm, 300mm SR and SA also present.	Terrace	–	–
1.50	2.10	Dark reddish brown coarse sandy (10/90) gravel. Clasts range from 1–100mm with occasional cobbles (200–500mm) and large SA-SR stones.	Terrace	–	–

FIG 13.5 MM_JC_TP_114 at 2m

TABLE 13.6 MM_JC_TP_116 Test Pit log

MM_JC_TP_116					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	42.285
LOGGER: JW					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: TEST PIT, MACHINE-EXCAVATED LENGTH: 2.70M, WIDTH: 0.5M				**EASTING**	603512.959
				NORTHING	233444.619
				DEPTH (M)	4
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.10	Light brown [10YR 6/3] fine sandy silt. Slightly stony. Gradational transition	Topsoil - very shallow and dry (pasture).	–	–
0.10	0.40	Brown [10YR 5/3] fine sandy silt with pebbles (SR-R) and flints (VA-A, up to 50mm diameter). Slightly damp. Distinct transition.	Subsoil.	–	–
0.40	0.70	Yellowish brown [10YR 5/6] sandy silt (very fine-fine) with gravel (30%): flint cobbles mostly 100mm, up to 120mm diameter. Slightly damp. Distinct transition (<15mm).	River terrace or glaciofluvial deposit?	–	–
0.70	1.80	Reddish, slightly clayey sand (medium-very coarse) and gravel (up to 90mm diameter) with rare clay lenses (<30mm) and compacted sand ferrous gravels (R-A; in particular, A flints). Coarsens down sequence. At 1.20m max clast size (160mm diameter) – flint. Manganese nodules present in sands from 1.0m Slightly sticky (1.2–1.7m). Slightly damp. Grades to (1.5–1.7m) yellower fine coarse sand with smaller gravel (<40%) (1.7–1.8m).	Glaciofluvial deposit? - Lowestoft	–	–
1.80	3.20	Slightly clayey medium-coarse sand and gravel cobbles (30%; SR-SA, polished appearance) with rare manganese pellets and likely ferrous staining. Slightly sticky. Damp.	Glaciofluvial deposit? - Lowestoft	–	–
3.20	4.00	Strong brown [7.5YR 5/8] slightly clayey medium coarse sand with pebbles (20%, SA-R, <40mm) and large manganese lenses (120mm diameter).	Red Crag	–	–

FIG 13.6 MM_JC_TP_116 at 4m

TABLE 13.7 MM_JC_BH_102d Borehole Log

MM_JC_BH_102D					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.818
LOGGER: AH					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603855.013
				NORTHING	235020.999
				DEPTH (M)	13.8
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown silty clay. Friable, slightly moist, occasional rootlets.	Topsoil (modern)	–	–
0.30	0.70	Dark brown clay with grey and orange mottles and small rootlets.	Subsoil	–	–
0.70	1.65	Dark grey brown cohesive clay with uncommon visible plant remains (unidentifiable). Cohesive.	Organic Alluvium	–	–
1.65	1.75	Very sandy grey-brown clay with small clasts of black, well-humified peaty material.	Organic Alluvium	–	–
1.75	2.00	Brown-grey clay. Fully saturated.	Alluvium	–	–
2.00	2.45	Light brown medium sand. Reasonably clean.	Fluvial deposit	–	–
2.45	2.50	VOID.	–	–	–
2.50	3.00	Fine to coarse gravel (SA flints) in grey-brown mud. Fully saturated.	Fluvial deposit	–	–
3.00	3.45	Brown clayey sand with fine gravel. Fully saturated.	Fluvial deposit	–	–
3.45	3.5	VOID.	–	–	–
3.50	4.00	Medium coarse gravel (70% SA flint, SR-R quartz and quartzite.) Clean.	Terrace?	–	–
4.00	4.50	Buff brown medium-coarse sand. Very clean.	Terrace?	–	–
4.50	5.00	Buff brown M-C clast-supported gravel (Flint, quartzite quartz).	Terrace?	–	–
5.00	5.50	Fine to medium sand and clast-supported gravel.	Terrace?	–	–
5.50	6.00	Dark brown silty humic clay with oxidized areas of sediment, black specks and occasional F-M flint clasts (matrix-supported). Possible organic remains (unidentifiable).	Glaciolacustrine?	Pollen sample (?)	–
6.00	6.45	Dark brown silty humic clay with oxidized areas, black specks and occasional F-M flint clasts. Possible organic remains (unidentifiable).	Glaciolacustrine?	–	–
6.45	7.00	Dark grey, sandy and silty humic clay. Cohesive.	Glaciolacustrine?	Pollen sample(?)	–
7.00	7.45	Dark grey, sandy silty clay. Slightly incohesive/friable, and dry.	Glaciolacustrine?	–	–
7.45	7.55	Dark grey, sandy silty clay. Slightly incohesive/friable, and dry.	Glaciolacustrine?	–	–
7.55	8.00	Dark grey, sandy silty clay. Slightly incohesive/friable, and dry.	Glaciolacustrine?	–	–
8.00	8.45	Dark grey, sandy silty clay. Slightly incohesive/friable, and dry.	Glaciolacustrine?	–	–
8.45	9.00	Greenish grey, sandy clay	Glaciolacustrine?	–	–
9.00	9.45	NO DATA.	–	–	–
9.45	9.60	Grey silty clay. Desiccated, with ped-like fabric.	London clay?	–	–
9.60	10.00	Grey clay. Sticky and cohesive.	London clay?	–	–
10.00	10.45	Grey silty clay. Desiccated, with ped-like fabric.	London clay?	–	–
10.45	11.00	Grey silty clay. Sticky and cohesive.	London clay?	–	–
11.00	11.45	NO DATA.	–	–	–

MM_JC_BH_102D					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.818
LOGGER: AH					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603855.013
				NORTHING	235020.999
				DEPTH (M)	13.8
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
11.45	11.55	Grey silty clay. Desiccated, with ped-like fabric (blocks).	London clay?	–	–
11.55	12.00	NO DATA.	–	–	–
12.00	12.45	Reddish brown, sandy silty clay. Dry and friable.	Thanet?	–	–
12.45	12.70	NO DATA.	–	–	–
12.70	13.80	Dark grey clayey fine sand with olive-green and orange tinges. Indurated(?) Iron pan.	Thanet?	–	–
13.80	13.80	Chalk – end of borehole.	Bedrock	–	–

FIG 13.7 MM_JC_BH_102d at 11.45–11.55m

TABLE 13.8 MM_JC_BH_102b Borehole log

MM_JC_BH_102B					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.571
LOGGER: RT & JS				**ELEVATION**	–
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603991.001
				NORTHING	234898.982
				DEPTH (M)	20
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.30	Dark brownish grey silty clay with occasional dark reddish brown clay patches and occasional rooting. Very rare SA granules (1–5mm). Friable.	Topsoil	–	–
0.30	0.40	NO DATA.	–	–	–
0.40	0.80	Mottled, mid-blush grey silty clay with dark reddish brown clay mottles and very rare white stone (1–2mm).	Alluvium	–	–
0.80	1.00	NO DATA.	–	–	–
1.00	1.20	Dark bluish grey, soft silty clay with frequent lenses of dark brown silty clay and very rare roots. Saturated.	Alluvium	–	–
1.20	1.65	NO DATA.	–	–	–
1.65	2.00	Mid greyish brown coarse sand gravel (20/80%; 50–200mm; frequently SA-SR). Saturated.	Fluvial gravels	–	–
2.00	2.45	NO DATA.	–	–	–
2.45	3.00	Dark brownish-grey, slightly sandy (coarse) gravelly clay (2–300mm; frequently SA-SR).	Fluvial gravels	–	–
3.00	3.50	NO DATA.	–	–	–
3.50	4.00	Coarse gravel (90%; 50–100mm, up to 700mm; SA-SR)	Terrace gravel	–	–
4.00	4.45	NO DATA.	–	–	–
4.45	5.00	Coarse gravel (85/15%; 1 – 500mm; SA -SR) with coarse sand inclusions.	Terrace gravel	–	–
5.00	6.00	NO DATA.	–	–	–
6.00	6.5	Dark greyish brown silty fine sand with occasional small pebbles (SR, 5–10mm) and small cobbles (SA, 100mm). Saturated.	Terrace gravel	–	–
6.45	7.00	NO DATA.	–	–	–
7.00	7.45	Light-mid brownish grey silty fine sand with lenses of light yellowish grey sand, rare desiccated wood fragments, rare white shell (1–5mm) occasional pebbles (SR, 50mm). Saturated.	Glaciolacustrine?	–	–
7.50	7.50	Dark brownish grey silty fine sand with occasional white shell (1–2mm) and frequent large pebbles/cobbles (SA-SR; 50–200mm). Saturated.	Glaciolacustrine?	–	–
7.50	8.45	NO DATA.	–	–	–
8.45	8.55	Dark, bluish-brownish grey silty fine sand with rare lenses of clayey sand and occasional white shell (1–2mm). Rare desiccated wood. Slightly saturated.	Glaciolacustrine?	–	–
8.5	9.00	Dark bluish-brownish grey silty fine sand with white shell (1–5mm) and rare pebbles (SA-SR; 50mm). Saturated.	Glaciolacustrine?	–	–
9.00	9.45	Dark brownish grey silty fine sand with rare shell fragments (1–2mm), rare pebbles (SR, 5–20mm) and occasional desiccated wood.	Glaciolacustrine?	–	–
9.45	9.50	NO DATA.	–	–	–

MM_JC_BH_102B

SITE CODE: EAGW24		**ELEVATION (MAOD)**	5.571
LOGGER: RT & JS		**ELEVATION**	–
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603991.001
		NORTHING	234898.982
		DEPTH (M)	20

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
9.50	10.00	Dark brownish grey fine sandy gravel (30/70%; SA-SR, 5–300mm). Saturated.	Glaciolacustrine?	–	–
10.00	10.45	NO DATA.	–	–	–
10.50	11.00	Mid greyish brown silty soft clay with lenses of black sandy clay, occasional gravel patches (1–2mm) and occasional large pebbles/cobbles (SA-SR, 10–50mm). Saturated.	Glaciolacustrine?	–	–
11.00	11.45	Mid yellowish, orange-brown, slightly silty, clayey medium sand with lenses of black sand and occasional pebbles (SR, 10–50mm). Slightly saturated.	Glaciolacustrine?	–	–
11.45	12.00	Dark purplish grey clayey coarse sand with occasional white shell (1–2mm), lenses of gravelly sand and occasional large pebbles/cobbles (SR, 50–100mm).	Glaciolacustrine?	–	–
12.00	12.30	Soft mid blue grey clayey medium coarse sand.	Glaciolacustrine?	–	–
12.30	12.40	Loose golden light grey yellow medium coarse sand. Pockets of dark blue-grey clayey sand.	Glaciolacustrine?	–	–
12.40	12.50	Soft dark brown grey MC sandy clay. No visible inclusions.	Glaciolacustrine?	–	–
12.50	13.10	Soft mid dark blue to brown grey MC sandy slightly silty clay. Bands of golden coarse sand (c 20mm).	Glaciolacustrine?	–	–
13.10	13.50	NO DATA.	–	–	–
13.50	13.60	Firm light blue grey slightly silty clay with crumbs of compact light yellow fine sand (c 3.5cm in size).	Glaciolacustrine?	–	–
13.60	14.00	Soft light blue grey fine/medium sandy slightly silty clay.	Glaciolacustrine?	–	–
14.00	14.45	Loose coarse light grey tallow sand with rare <1% granular gravel.	Glaciolacustrine?	–	–
14.45	15.0	Firm dark grey brown clay. Incipient pedogenesis?	Glaciolacustrine?	–	–
15.00	15.45	Firm dark grey brown clay. Incipient pedogenesis?	Glaciolacustrine?	–	–
15.45	15.55	Firm light brown grey firm sandy clay (clayey sand) in some places.	Thames Group?	–	–
15.55	16.50	NO DATA.	–	–	–
16.50	17.00	Wet liquid clay.	Thames Group?	–	–
17.00	17.45	Firm mid grey brown clay.	Thames Group?	–	–
17.45	17.55	Poorly formed mudstone. Dark yellowish grey.	Thames Group?	–	–
17.55	18.00	NO DATA.	–	–	–
18.00	18.10	Dark blue grey green fine sandy clay silt.	Thanet?	–	–
18.10	20.00	Chalk putty (off-white) firming @ 18.45m.	Chalk bedrock	–	–

FIG 13.8 MM_RC_BH_102b at 12.5–13m

TABLE 13.9 MM_JC_BH_103a Borehole log

MM_JC_BH_103A					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	6.034
LOGGER: JS & RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603766.024
				NORTHING	234964.008
				DEPTH (M)	17.4
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.20	Dark brownish grey, friable silty clay with occasional red CBM and brick flecks (2mm), and occasional SA white pebbles (5–10mm). Occasional rooting.	Topsoil	–	–
0.20	1.00	Mid-bluish grey soft silty clay with dark reddish-brown mottles, rare desiccated wood fragments (2–10mm) and rare rooting.	Alluvium	–	–
1.00	1.20	Dark bluish grey, soft silty clay with dark reddish brown clay mottles and rare lenses of dark orange-brown silty clay. Very rare white stone flecks (0.2mm).	Alluvium	–	–
1.20	1.65	Mid greyish-brown, soft, slightly sandy silty clay with lenses of dark reddish brown sandy clay, lenses of yellowish brown sandy clay and occasional flecks of white stone (1–2mm).	Alluvium	–	–
1.65	1.70	Mid-yellowish brown, soft, sandy silty clay with rare sub-rounded cobbles (50–100mm). No other inclusions. Saturated.	Alluvium	–	–
1.70	1.80	Mid-yellowish brown, soft sandy clay with lenses of dark orange-brown sandy clay and occasional large pebbles and cobbles (50–150mm; SA-SR). Rare flecks of white chalk.	Alluvium	–	–
1.80	2.00	NO DATA.	–	–	–
2.00	2.45	Mid-yellowish brown clayey loose sand, with lenses of mid bluish-grey clayey sand and occasional large pebbles (SR, 50–80mm). Saturated.	Fluvial gravels	–	–
2.45	2.50	Light yellowish-brown, coarse sandy gravel 85% gravel; SA-SR; 2–300mm). Saturated.	Fluvial gravels	–	–
2.50	2.60	Light yellowish-brown, coarse sandy gravel (10/90%; SA-SR; 2–350mm). Saturated.	Fluvial gravels	–	–
2.60	3.00	NO DATA.	–	–	–
3.00	3.50	Coarse sandy gravel 10/90%; SA-SR; 1–700mm).	Terrace	–	–
3.50	3.60	Coarse sandy gravel (10/90%; SA-SR; 100–700mm).	Terrace	–	–
3.60	4.00	NO DATA.	–	–	–
4.00	4.50	Loose coarse sandy gravel (20/80%; SA-SR; 100–200mm). Saturated.	Terrace	–	–
4.50	4.60	Coarse gravel (10/90%; SA-SR; 50–200mm).	Terrace	–	–
4.60	5.00	NO DATA.	–	–	–
5.00	5.50	Mid brown coarse sandy gravel (5/95%; SA-SR; 5–400mm).	Terrace	–	–
5.50	6.50	NO DATA.	–	–	–
6.50	6.60	Light brown coarse sandy gravel (20/80%; SA; 2–100mm). Saturated.	Terrace	–	–
6.60	7.00	NO DATA.	–	–	–
7.00	7.50	Coarse gravel (2/98%; SA-SR; 200–500mm).	Terrace	–	–
7.50	8.50	NO DATA.	–	–	–
8.50	8.60	Light brown coarse sandy gravel (15/85%; SA-SR, 2–100mm).	Terrace	–	–

MM_JC_BH_103A

SITE CODE: EAGW24		**ELEVATION (MAOD)**	6.034
LOGGER: JS & RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603766.024
		NORTHING	234964.008
		DEPTH (M)	17.4

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
8.60	9.00	NO DATA.	–	–	–
9.00	9.50	Coarse sandy gravel (90%/10; SA-SR; 5 - 300mm).	Terrace	–	–
9.50	9.60	Light brown coarse sandy gravel (85/15%; SA-SR; 2–200mm).	Terrace	–	–
9.60	10.50	NO DATA.	–	–	–
10.50	10.60	Coarse sandy gravel (90/10%; SA-SR; 5–300mm).	Terrace	–	–
10.60	11.00	NO DATA.	–	–	–
11.00	11.50	Light brownish-grey coarse sand with occasional small pebbles (SR, 2–10mm) and frequent white shell (1–2mm). Saturated.	Terrace	–	–
11.50	11.60	Light yellowish grey fine sandy silt with lenses of mid-bluish grey sandy silt and occasional gravel lenses (1–20mm). Slightly saturated.	Glaciolacustrine?	–	–
11.60	12.00	NO DATA.	–	–	–
12.00	12.45	Dark brownish-grey, slightly peaty, silty fine sand with lenses of light grey sand and gravel (1–2mm), rare white shell (1–2mm) and occasional desiccated wood.	Glaciolacustrine?	–	–
12.50	12.60	Rare F-M green-grey sand, FMC SA/SR gravel, 5–50mm. Predom flint some sandstone?	Glaciofluvial gravels	–	–
12.60	13.00	NO DATA.	–	–	–
13.00	13.50	Wet fine-granular golden sand 5–50mm SASR gravel predominantly fine. Largely flint.	Glaciofluvial gravels	–	–
13.50	13.60	Wet light yellow grey MC sand with FMC gravels, + 1 cobble 5x30x70mm. SR gravel.	Glaciofluvial gravels	–	–
13.60	14.50	NO DATA.	–	–	–
14.50	14.60	Wet light yellow grey MC sand (rare).	Glaciofluvial gravels	–	–
15.00	15.50	Wet M C slightly sandy yellow grey FMC SASR gravels. Predominantly flint.	Glaciofluvial gravels	–	–
15.50	16.60	Light whitish grey putty chalk. Slightly clayey silt with 30% fine S R flint + chalk gravel, 5–15mm.	Bedrock	–	–
17.00	17.45	Frost shattered off-white chalk.	Bedrock	–	–

TABLE 13.10 MM_JC_BH_103 Borehole log

MM_JC_BH_103					
SITE CODE: EAGW24				**ELEVATION(MAOD)**	5.938
LOGGER: AH & RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603816.99
				NORTHING	234889.026
				DEPTH (M)	27
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	1.20	Hand-dug test pit - nothing available.	–	–	–
1.20	1.60	Dark brown, wet sticky clay. Cohesive.	Alluvium	–	–
1.60	2.00	NO DATA..	–	–	–
2.00	2.50	Dark grey, sandy clay with common organic fragments (nothing identifiable). Cohesive.	Alluvium	–	–
2.50	2.60	Medium-coarse gravel (flint, SA, abundant; clast-supported?) and grey clay.	Fluvial gravels?	–	–
2.60	3.00	NO DATA..	–	–	–
3.00	3.50	Buff light-brown medium sandy gravel (clast-supported; near 100%flint, SA; mainly fine but 1/3 medium to coarse, with chalk granules). Clean.	Terrace gravels	–	–
3.50	3.60	Light brown gravelly sand (matrix-supported; fine to medium clasts of flint A, quartzite R, and small chalk granules, SR). Clean.	Terrace gravels	–	–
3.60	4.00	NO DATA..	–	–	–
4.00	4.50	Light brown sand and gravel (clast-supported; fine to coarse clasts of flint A, quartzite R, and small chalk granules, SR). Clean.	Terrace gravels	–	–
4.50	4.60	Light brown, fine-coarse sand and gravel (clast-supported; fine to coarse clasts of flint A, quartzite R, and small chalk granules, SR). Clean.	Terrace gravels	–	–
4.60	5.00	NO DATA..	–	–	–
5.00	5.50	Orange-brown medium-coarse sand with occasional fine-medium gravel (flint A, quartzite R, and small chalk granules, SR). Clean Saturated..	Terrace gravels	–	–
5.50	6.45	Orange-brown medium-coarse sand with occasional fine-medium gravel (flint A, quartzite R, and small chalk granules, SR). Clean Saturated..	Terrace gravels	–	–
6.45	6.50	NO DATA..	–	–	–
6.50	6.60	Orange-brown fine-medium sand and gravel.	Terrace gravels	–	–
6.00	7.00	NO DATA..	–	–	–
7.00	7.50	Orange-brown, medium-coarse sand and gravel. Clast supported. Clean.	Terrace gravels	–	–
7.50	8.50	NO DATA..	–	–	–
8.50	8.60	Orange-brown medium-coarse sand with occasional small gravel. Matrix supported.	Terrace gravels	–	–
8.60	9.00	NO DATA..	–	–	–
9.00	9.50	Grey fine to medium sand. Gritty.	Sands	–	–
9.50	9.60	Grey fine to medium sand. Gritty.	Sands	–	–
9.60	10.50	NO DATA.	–	–	–
10.50	10.60	Grey brown, gravelly, clayey fine sand (M-C SA flint clasts).	Sands	–	–
10.60	11.50	NO DATA.	–	–	–

MM_JC_BH_103

SITE CODE: EAGW24		**ELEVATION(MAOD)**	5.938
LOGGER: AH & RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603816.99
		NORTHING	234889.026
		DEPTH (M)	27

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
11.50	11.60	Grey fine to medium sand with very occasional fine gravel. Saturated.	Sands	–	–
11.60	12.50	NO DATA.	–	–	–
12.50	12.60	Grey fine-coarse gravelly sand. (SA flint and R quartzite).	Sands	–	–
12.60	13.00	NO DATA.	–	–	–
13.00	13.45	Grey medium-coarse slightly clayey sand. Gritty, clean.	Sands	–	–
13.45	13.50	NO DATA.	–	–	–
13.50	15.60	Grey fine sand with frequent minute white specks. Saturated.	Sands	–	–
15.60	16.50	NO DATA.	–	–	–
16.50	16.60	Dark grey clayey fine sand with occasional flint clasts (matrix-supported).	Glaciolacustrine?	–	–
16.60	17.00	NO DATA.	–	–	–
17.00	17.50	Black silt with possible shell fragments-possibly laminated. Somewhat firm and desiccated.	Glaciolacustrine?	–	–
17.50	17.60	Black silt with small white specks-possibly laminated. Saturated.	Glaciolacustrine?	–	–
17.60	18.00	NO DATA.	–	–	–
18.00	18.45	Light brownish grey slightly silty coarse-medium sand with occasional shell fragments and very rare white stone flecks (1–3mm).	Glaciolacustrine?	–	–
18.45	18.50	NO DATA.	–	–	–
18.50	18.60	Light grey and dark grey gravel and coarse sand (5/95%; SA-SR; 1 400mm).	Glaciofluvial gravels	–	–
18.60	19.00	NO DATA.	–	–	–
19.00	19.60	Light brownish grey, very slightly silty sandy gravel (30/70%; 5–300mm; SA-SR). Very slightly saturated.	Glaciofluvial gravels	–	–
19.60	20.50	NO DATA.	–	–	–
20.50	20.60	Light brown sandy gravel (15/85% 2–250mm; SA-SR). Saturated.. Saturated.	Glaciofluvial gravels	–	–
21.00	21.50	Light greyish brown, slightly gravelly coarse sand (10/90%) with occasional very small white/orange shell fragments and occasional white clasts, 2–20mm). Slightly Saturated.	Glaciofluvial gravels	–	–
21.5	21.60	Light greyish brown, gravelly coarse sand with occasional shell fragments (70/30%; occasional white clasts, 2–30mm). Saturated.	Glaciofluvial gravels	–	–
21.60	22.50	NO DATA.	–	–	–
22.50	22.60	Light brown coarse sandy gravel (30/70%; SA-SR; 5–200mm). Saturated.	Glaciofluvial gravels	–	–
22.60	23.00	NO DATA.	–	–	–
23.00	23.5	Light brown coarse sandy gravel (30/70%; SA-SR; 5–400mm). Saturated.	Glaciofluvial gravels	–	–
23.50	23.60	Light brown coarse sandy gravel (20/80%; SA-SR; 2–400mm). Saturated.	Glaciofluvial gravels	–	–

MM_JC_BH_103

SITE CODE: EAGW24		**ELEVATION(MAOD)**	5.938
LOGGER: AH & RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603816.99
		NORTHING	234889.026
		DEPTH (M)	27

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
23.60	24.50	NO DATA.	–	–	–
24.50	24.60	Light greyish brown gravelly coarse sand (60/40%; 10–50mm, SA-SR, red, white and brown clasts). Slightly Saturated.	Glaciofluvial gravels	–	–
24.60	25.50	NO DATA.	–	–	–
25.50	25.60	Light brown slightly gravelly coarse sand with frequent shell fragments (80/20%; 2–10mm; SR). Saturated.	Glaciofluvial gravels	–	–
25.60	26.50	NO DATA.	–	–	–
26.50	26.60	Slightly sandy (coarse), slightly chalky light brown gravel with occasional shell fragments (20/80%; 1–300mm SA-SR). Saturated.	Glaciofluvial gravels	–	–
26.60	27.00	NO DATA.	–	–	–
27.00	27.00	Chalk with occasional gravel. Coring ended. Saturated.	Bedrock	–	–

FIG 13.9 MM_JC_BH_104a at 7m

TABLE 13.11 MM_JC_BH_104a Borehole log

MM_JC_BH_104A					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.799
LOGGER: RT & JW					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603663.018
				NORTHING	234865.527
				DEPTH (M)	20
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.20	Dark brownish grey, slightly silty clay with frequent rooting and occasional grass/turf. Friable/soft.	Topsoil	–	–
0.20	0.50	Dark brownish grey, slightly silty clay with frequent rooting and occasional grass inclusions. Friable/soft.	Topsoil	–	–
0.50	1.10	Dark brownish grey, slightly silty, soft clay with occasional patches of light yellowish, greyish-brown clay and occasional desiccated wood fragments. Saturated.	Alluvium	–	–
1.10	1.20	Dark brownish grey, slightly silty, soft clay with occasional patches of light yellowish, greyish-brown clay and occasional desiccated wood fragments. Saturated.	Alluvium	–	–
1.20	1.65	Black, slightly sands peat with frequent wood and plants remains and occasional SA-SR pebbles (50–100mm) and rare flecks of red stone. Slightly saturated.	Peat	–	–
1.65	1.70	Dark greyish brown, gravelly coarse sand (40/60%; frequent SA-SR clasts). Loose. Saturated.	Fluvial sands	–	–
1.70	1.80	Mid-greyish brown, coarse sandy gravel (10/90%; 1–200mm; SA-SR). Loose. Saturated.	Fluvial sands	–	–
1.80	2.00	NO DATA.	–	–	–
2.00	2.50	Mid-greyish brown, coarse sandy gravel (15/85%; 1–250mm; SA-SR). Loose. Saturated.	Fluvial sands	–	–
2.50	2.60	Light greyish-brown, coarse sandy gravel (20–80%; 1–200mm, SA - SR). Loose. Saturated.	Fluvial sands	–	–
2.60	3.00	NO DATA.	–	–	–
3.00	3.50	Coarse gravel (2–255mm, SA-SR; red orange black white and grey clasts).	Terrace	–	–
3.50	3.60	Light, slightly orange-brown , slightly sandy gravel (10/90%; 1–150mm, SA-SR).	Terrace	–	–
3.60	4.00	NO DATA.	–	–	–
4.00	4.50	Medium–very coarse sand and gravel (30/70%; 50% of gravel = flint, A-VA, pebbles and cobbles; other lithologies, SA-R, pebble - cobble). Saturated.	Terrace	–	–
4.50	4.60	Medium to coarse sand [5YR 5/4] and gravel (30/70%; clast-supported. 40% of gravel = flint, A-SA, pebble to cobble; other lithologies SR-R; sometimes elongate clasts from granule to pebble. Saturated.	Terrace	–	–
4.60	5.00	NO DATA.	–	–	–
5.00	5.50	Medium to very coarse sand [10YR 7/3] and heterolithic gravel (20/80%; granules to large cobbles, SA-SR). Saturated.	Terrace	–	–
5.50	5.60	Medium to very coarse sand [10YR 5/3] and fine heterolithic gravel (60/40%; granules to small pebbles R-SR; flints (SA-A). Moderately well-sorted. Saturated.	Terrace	–	–

MM_JC_BH_104A

SITE CODE: EAGW24		**ELEVATION (MAOD)**	5.799
LOGGER: RT & JW			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603663.018
		NORTHING	234865.527
		DEPTH (M)	20

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
5.60	6.50	NO DATA.	–	–	–
6.50	6.6	Slightly silty fine to very coarse sand [10YR 5/3] and fine heterolithic gravel (30/70%, granules to medium pebbles, SA-SR). Poorly sorted. Saturated.	Terrace	–	–
6.60	7.00	NO DATA.	–	–	–
7.00	7.50	Fine to very coarse sand [10YR 4/2] and heterolithic gravel (30/70%; mostly granule to medium/large pebbles, A-SR, rarely R; clasts very rarely up to 70mm). Poorly sorted Saturated.	Terrace	–	–
7.50	7.60	Fine to very coarse sand [10YR 7/3] and gravel (40/60%; granule to pebble, max 50mm; flints A-SA, other lithologies SA-SR). Poorly sorted Saturated.	Terrace	–	–
7.60	8.50	NO DATA.	–	–	–
8.50	8.60	Fine to very coarse sand [10YR 7/2] and fine heterolithic gravel (20/80%; granules with infrequent flint pebbles 10–20mm, SA) and rare pebbles of other lithologies, 25–30mm, SR-SA). Poorly sorted Saturated.	Terrace	–	–
8.60	9.00	NO DATA.	–	–	–
9.00	9.50	Medium-coarse sand [10YR 5/2] and heterolithic gravel (30/70%; granules with SA-A pebbles). Poorly sorted. Saturated.	Terrace	–	–
9.50	9.60	Coarse, slightly silty sand [10YR 7/2] and heterolithic gravel (30/70%; granules with frequent small pebbles of flint (SA-A) and rare large pebbles of other lithologies (up to 60mm, A-SA). Poorly sorted Saturated.	Terrace	–	–
9.60	10.00	NO DATA.	–	–	–
10.00	10.25	Silty, medium coarse sand with trace clay [10YR 4/1] Stratified in cone.	Glaciolacustrine?	–	–
10.25	10.35	Silty, medium coarse sand with trace clay [10YR 4/1] and infrequent flint pebbles (SA, 10–20mm). Stratified in cone.	Glaciolacustrine?	–	–
10.35	10.45	Organic silty clay with trace medium sand. Stratified in cone.	Glaciolacustrine?	–	–
10.45	10.50	Very organic silty mud (10YR 2/2) with trace medium-coarse sand and rare flint granules (SA), infrequent gastropod and mollusc shell fragments, and indistinct calcareous laminations (incipient peat?) Totally saturated.	Glaciolacustrine?	–	–
10.50	11.70	Peat with lenses of more defined peat, within blackish-brown organic clayey silt and very fine sandy clayey silt.	Peat	Samples taken for hydrocarbon testing.	–
11.70	12.00	Void/Sealed.	–	Samples taken for hydrocarbon testing.	–
12.00	12.50	NO DATA.	–	–	–
12.50	12.60	Silty sand [7.5YR 5/2] and medium-coarse gravel (70/30%; mostly granules SA-SR, but up to 60mm diameter, mostly flints. Saturated.	Glaciofluvial gravel	–	–
12.60	13.00	NO DATA.	–	–	–
13.00	13.50	Silty-sandy, fine-medium, heterolithic gravel (40%/50%; SA-A, up to 75mm diameter) with very rare silty clay lenses (2%) and rare shell fragments throughout. Saturated.	Glaciofluvial gravel	–	–

MM_JC_BH_104A

SITE CODE: EAGW24		**ELEVATION (MAOD)**	5.799
LOGGER: RT & JW			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603663.018
		NORTHING	234865.527
		DEPTH (M)	20

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
13.50	13.60	Fine-medium sand [10YR 5/2] and fine heterolithic gravel (60/40%; granule to medium pebble, max 20mm diameter, SA-R, mostly flint,) with rare shell fragments (<1mm). Saturated.	Glaciofluvial gravel	–	–
13.60	14.50	NO DATA.	–	–	–
14.50	14.60	Fine-coarse sand [10YR 5.2] and fine heterolithic gravel (60/40%; granule to med pebbles, max. 40mm diameter, R-SA; flint, chalk and others) with very few shell fragments. Saturated.	Glaciofluvial gravel	–	–
14.60	15.50	NO DATA.	–	–	–
15.50	15.60	Slightly silty, fine-coarse sand [10YR 6/3] and fine heterolithic gravel (50/50%, granule to small pebble, max. 40mm diameter, VA-R; flint, chalk and others). Very little silt. Fully saturated.	Glaciofluvial gravel	–	–
15.60	16.00	NO DATA.	–	–	–
16.00	16.50	Fine-coarse sand [10YR 6/2] and heterolithic gravel (50 /50%; granule to medium pebble, up to 55mm diameter; mostly flint, SA-A; chalk, R; other lithologies SR-R). Saturated.	Glaciofluvial gravel	–	–
16.50	16.60	Silty, fine-coarse sand [10YR 5/3] and fine heterolithic gravel (40/60%; gravel up to 60mm diameter; mostly granule-sized flint and chalk. Saturated.	Glaciofluvial gravel	–	–
16.60	17.00	NO DATA.	–	–	–
17.00	17.50	Silty (5%), fine-coarse sand [2.5YR 5/3] and gravel (60/30%, up to 90mm diameter; flints, some flakey as well as small chalky clasks (<30mm, SR-R). Poorly sorted. Saturated.	Glaciofluvial gravel	–	–
17.50	17.60	Fine-coarse sand (2.5YR 5/2) and heterolithic gravel (60/40, SA-R, up to 80mm diameter; flint (larger clasts) chalk (small and pebbles) and others mixed with SR). Contains some shell flecks (<10mm). Fairly clean, poorly sorted. Saturated.	Glaciofluvial gravel	–	–
17.60	18.50	NO DATA.	–	–	–
18.50	18.60	Slightly chalky, silty fine-medium blackish sand [10YR 7/2] and gravel (70/30%; mostly granules, with small SR-SA pebbles, max 40mm diameter, and rare 90mm flint cobbles). Most chalk appears granular. Very wet.	Thanet?	–	–
18.60	19.00	NO DATA.	–	–	–
19.00	19.50	Slight muddy, sandy (fine-coarse) gravel (60/40;, SR-VA, up to 55mm diameter, with frequent chalk granules). Grassy-contaminated?	Thanet?	–	–
19.50	20.00	Creamy chalk and chalk putty [2.5YR 6/2], with black specks.	Chalk bedrock	–	–

TABLE 13.12 MM_JC_BH_104 Borehole log

MM_JC_BH_104					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.875
LOGGER: RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603720.751
				NORTHING	234807.638
				DEPTH (M)	19.5
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.20	0.30	Mid greyish brown, very slightly sandy, very slightly silty clay, with rare orange mottling and occasional roots and rare white stone flecks. Friable.	Topsoil	–	–
0.30	0.70	NO DATA.	–	–	–
0.70	0.80	Mottled brownish grey, very slightly silty soft clay with mid-yellowish grey and orange brown patches, and lenses of dark grey staining. Rare small SA pebbles (1–4mm). Saturated.	Alluvium	–	–
0.80	1.10	NO DATA.	–	–	–
1.10	1.20	Mid-dark brownish grey, very slightly silty soft clay with lenses of black silty clay and rare patches of dark orange brown sand. No inclusions. Saturated.	Organic alluvium	–	–
1.20	1.65	Dark grey, slightly silty soft clay with patches of black peat, occasional plant remains and occasional fragments of white shell. Saturated.	Alluvium	–	–
1.65	1.70	Dark grey slightly silty clay with lenses of black silty, soft clay. No inclusions Saturated.	Alluvium	–	–
1.70	1.80	Dark, slightly silty soft clay with rare patches of dark orange-brown silty sand. No inclusions. Saturated.	Alluvium	–	–
1.80	2.00	NO DATA.	–	–	–
2.00	2.45	Slightly sandy peat with frequent organics (plant remains and wood), shell fragments (1–5mm) and rare white granules (1–5mm). Slightly saturated. Slightly saturated.	Peat	–	–
2.45	2.50	Dark grey black, slightly silty/ slightly sandy peat, occasional plant remains and occasional white flecks (stone and shell, 1–5mm). Saturated.	Peat	–	–
2.50	2.60	Coarse gravelly (1–15mm, 30/70%) sand with frequent organics (large wood fragments and plant remains), shell and white stone fragments (1–5mm). Saturated.	Fluvial gravels	–	–
2.60	3.00	NO DATA.	–	–	–
3.00	3.50	Slightly silty, coarse gravelly sand (80/20%) with frequent shell fragments and white granules (1–3mm). Gravel ranges from (1–50mm) occasionally up to 200–500mm (SA).	Fluvial gravels	–	–
3.50	3.60	Gravel (0.5–200mm, SA-SR, brown, white, grey and black clasts) with trace coarse sand (95/5%).	Fluvial gravels	–	–
3.60	4.00	NO DATA.	–	–	–
4.00	4.50	Mid-brownish-grey, gravelly coarse sand (70/30%) with occasional white shell. Frequent rounded pebbles (1–20mm), clasts range from (10–100mm).	Terrace	–	–
4.50	5.50	Gravel (0.5–300mm, SR-SA; brown, white, grey and black clasts) with trace sand (95/5%).	Terrace	–	–
5.50	6.50	NO DATA.	–	–	–

MM_JC_BH_104

SITE CODE: EAGW24		**ELEVATION (MAOD)**	5.875
LOGGER: RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603720.751
		NORTHING	234807.638
		DEPTH (M)	19.5

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
6.50	6.60	Coarse sandy (light–mid grey) gravel (70%; 5–500mm, SR-SA) with occasional white shell flecks. Saturated.	Terrace	–	–
6.60	7.00	NO DATA.	–	–	–
7.00	7.50	Coarse sandy (light–mid grey) gravel (80%; 0.2–100mm, SA-SR; brown, white and grey clasts). Slightly saturated.	Terrace	–	–
7.50	7.60	Coarse sandy gravel (80%; 0.3–100mm, SA-SR; brown, white and grey clasts). Slightly saturated.	Terrace	–	–
7.60	8.50	NO DATA.	–	–	–
8.50	8.60	Dark grey-black, slightly silty fine sand with occasional SA pebbles and cobbles (20–80mm) and rare white stone flecks. Saturated.	–	–	–
8.60	9.00	NO DATA.	–	–	–
9.00	9.45	Dark, very slightly bluish-grey, very slightly silty medium sand with occasional white and brown stone flecks. Very slightly saturated.	Lambeth?	–	–
9.45	9.50	Dark grey, very slightly bluish silty fine sand with rare SA pebbles (50mm) and occasional white stone/shell flecks. Very saturated.	Lambeth?	–	–
9.50	9.60	Dark bluish-grey slightly silty fine sand with occasional SA pebbles (10–70mm) and rare white stone/shell flecks.	Lambeth?	–	–
9.60	10.00	NO DATA.	–	–	–
10.00	10.45	Dark brownish grey, slightly silty medium sand with occasional pebbles (SA-SR, 10–50mm) and white stone/shell flecks. Slightly saturated.	Lambeth?	–	–
10.45	10.60	Dark brownish grey slightly silty medium sand with occasional pebbles (30–100mm, SA) frequent white stone and occasional white shell flecks. Saturated.	Lambeth?	–	–
10.60	11.00	NO DATA.	–	–	–
11.00	11.45	Dark grey, slightly silty medium sand with lenses of lighter grey sand, occasional pebbles (SA, 50–80mm), frequent white stone flecks and rare shell fragments. Slightly saturated.	Lambeth?	–	–
11.50	11.60	Dark grey, slightly silty medium sand with occasional pebbles (SA-SR, 10–70mm) and stone/shell flecks. Saturated.	Lambeth?	–	–
11.60	12.00	NO DATA.	–	–	–
12.00	12.45	Mid-slightly brownish grey silty fine sand (very soft) with lenses of light grey sand and frequent white stone/shell flecks. Rare desiccated wood.	Lambeth?	–	–
12.50	12.60	Dark grey, silty, slightly sandy gravel (80%; 1–250mm; SA-SR).	Lambeth?	–	–
12.60	13.00	NO DATA.	–	–	–
13.00	13.50	Dark grey, slightly silty, coarse sandy gravel (85%; 1–300mm, SR). Saturated.	Lambeth?	–	–
13.50	13.60	Mid-grey, slightly silty coarse sandy gravel (90%; 0.2–200m, SA-SR). Saturated.	Lambeth?	–	–

MM_JC_BH_104

SITE CODE: EAGW24		**ELEVATION (MAOD)**	5.875
LOGGER: RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603720.751
		NORTHING	234807.638
		DEPTH (M)	19.5

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
13.60	14.50	NO DATA.	–	–	–
14.50	14.60	Gravel (100% ; 1–400mm, SA-SR; brown, grey, white and black clasts).	Lambeth?	–	–
14.60	15.00	NO DATA.	–	–	–
15.00	15.50	Light greyish-brown, gravelly coarse sandy gravel (50/50%; SA, 300–500mm. Frequent SR clasts, 200mm). Saturated.	Lambeth?	–	–
15.50	15.60	Light greyish-brown, gravelly coarse sand (50/50%; Frequent SA clasts 300–500mm, and frequent SR clasts, 200–250mm). Saturated.	Lambeth?	–	–
15.60	16.50	NO DATA.	–	–	–
16.50	16.60	Light greyish-brown, slightly coarse sandy gravel (90%; frequent SA-SR clasts; red, grey brown and white).	Lambeth?	–	–
16.60	17.00	NO DATA.	–	–	–
17.00	17.50	Mid-greyish brown gravelly coarse sand with occasional gravel (AS-SR; 100–200mm) and frequent white stone/shell flecks.	Lambeth?	–	–
17.50	17.60	Gravel (0.2–300mm, SA-SR; white, brown orange and grey clasts). Saturated.	Lambeth?	–	–
17.60	18.50	NO DATA.	–	–	–
18.50	18.60	Light greyish brown, slightly sandy gravel (70/30; SA-SR, 2–100mm).	Lambeth?	–	–
18.60	19.00	NO DATA.	–	–	–
19.00	19.50	Light greyish brown, coarse sandy gravel (70%; 5–100mm; frequent SA-SR clasts).	Lambeth?	–	–

FIG 13.10 MM_RC_BH_104 at 8.5–8.6m

TABLE 13.13 MM_JC_BH_105a Borehole log

MM_JC_BH_105A					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.997
LOGGER: JS					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603784.994
				NORTHING	234564.017
				DEPTH (M)	20
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.20	Firm dark grey brown to black lightly rooted fine sandy silty clay. Sharp boundary.	Topsoil.	–	–
0.20	1.20	Fine mid-orange brown slightly fine sandy silty clay X1 discus rotundus, <1% calcareous flecks. Becoming mid blue grey with reddish brown mottling from 0.50m, becoming siltier with depth. Water table at 1.00m.	Weathered alluvium.	–	–
1.20	2.00	Firm mid blue grey mottled with reddish brown fine sandy very silty clay.	Alluvium	–	–
2.00	2.60	Soft dark grey brown fine sandy silty clay mixed with some organic, slightly crumbly structure.	Incipient pedogenesis on land surface?	Grab sample taken <100>	–
2.60	3.00	Compact dark yellow brown medium to coarse sand with 5–75mm fine-loose gravels and cobbles.	River terrace	–	–
3.00	4.00	Compact light greyish-yellow medium coarse sand with 30% FMC SASR flint gravels, 5–55mm.	River terrace	–	–
4.00	5.00	Compact light grey green fine sandy silt.	Weathered top of Tertiary Sand, previously logged as Thanet Beds.	–	–
5.00	5.80	Compact mid brown yellow coarse sand with 10% fine gravel. 5–10% flint.	Thanet / Lambeth Beds	–	–
5.80	7.00	Compact light green/yellowish grey coarse granular sand. Glauconitic.	Thanet / Lambeth Beds	–	–
7.00	10.00	Stiff light / dark green grey coarse sandy silty clay.	Thanet / Lambeth Beds	–	–
10.00	12.50	Silty fine medium sandy clay silt grading to silty clay.	Thanet / Lambeth Beds	–	–
12.50	17.00	Fine mid grey brown to brown grey fine medium sand (clay) silt.	Thanet / Lambeth Beds	–	–
17.00	20.00	Off white crumbly and in places putty chalk.	Chalk	–	–

FIG 13.11 MM_JC_BH_15a, bulk sample at 4.5–5m

TABLE 13.14 MM_JC_BH_105 Borehole log

MM_JC_BH_105					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	5.95
LOGGER: JS					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603858.954
				NORTHING	234513.034
				DEPTH (M)	20
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.30	Firm dark grey slightly sandy silty clay light rooted. Sharp boundary.	Topsoil	–	–
0.30	1.50	Firm mid orange brown silty clay grading to mid blue grey mottled with dark reddish brown from 0.80m. Soft from 0.80m.	Alluvium	–	–
1.50	1.50	Compact mid-orange brown manganese-stained medium-coarse sand.	Land surface.	–	–
1.50	4.00	Compact mid orange brown medium coarse sand with flint. Medium SA-SAR flint gravels, 5–35mm from 3m. Sand also granular.	Terrace	–	–
4.00	4.50	Coarse granular sand with 10% fine-medium SR gravels.	Terrace	–	–
4.50	6.00	Compact mid yellow grey coarse sands with medium coarse gravel and few rubble content, 30–70mm flint.	Terrace	–	–
6.00	8.50	Sticky mid grey green coarse sandy clay grading to clayey coarse sand.	Thanet / Lambeth Beds.	–	–
8.50	10.00	Stiff light brown grey medium to coarse sandy clay becoming clayey sand @ 9m.	Thanet / Lambeth Beds.	–	–
10.00	11.00	Firm mid/coarse blue grey silty fine medium sand.	Thanet / Lambeth Beds.	–	–
11.00	15.00	Fine dark blue grey fine sandy silty clay. Sandy silt @3m.	Thanet / Lambeth Beds.	–	–
15.00	16.00	Compact light reddish brown fine sandy silt.	Thanet / Lambeth Beds.	–	–
16.00	18.00	Compact dark blue grey silty fine sand, almost sandstone.	Thanet / Lambeth Beds.	–	–
18.00	20.00	Chalk, well-formed off white.	Bedrock	–	–

FIG 13.12 MM_JC_BH_105 at 3m

TABLE 13.15 MM_JC_BH106a Borehole log

MM_JC_BH_106A					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	7.079
LOGGER: JS & RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603724.917
				NORTHING	234493.578
				DEPTH (M)	20.5
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.40	Light greyish brown, slightly sandy, friable silt with occasional large pebbles/cobbles (SA, 50–200mm; rarely SR, 20–50mm). Dry.	Topsoil	–	–
0.40	0.80	Light yellowish brown, slightly fine, sandy silt with frequent cobbles (SA, 50–200mm; occasionally SR, 50–100mm). Dry.	Terrace	–	–
0.80	1.20	Dark reddish brown, sandy silt (loose) with rare coarse sand inclusions and frequent large pebbles and cobbles (SA-SR, 50–250mm).	Terrace	–	–
1.20	1.50	NO DATA.	–	–	–
1.50	20	Dark greyish-brown sandy silt (loose) with occasional coarser sand and frequent pebbles and cobbles (SA-SR, 20–250mm). Slightly saturated.	Terrace	–	–
2.00	2.50	Mid-, slightly orange-brown silty sand with occasional SA pebbles/small cobbles (SA, 15–100mm; rarely SR, 20–100mm).	Terrace	–	–
2.50	3.00	Mid orange-brown coarse sandy gravel (20/80%; SA-SR; 5–250mm). Saturated.	Terrace	–	–
3.00	3.50	Light yellowish-brown, gravelly coarse sand (loose) (45/55%; frequent SA, 5–200mm; occasional SR, 5–100mm).	Terrace	–	–
3.50	4.00	Light brown coarse sandy gravel (loose) (30/70%; SA-S; 2–300mm).	Terrace	–	–
4.00	4.50	Light brown gravelly coarse sand (loose). (45/55%; frequent SA-SR; occasional SR, 5–300mm). Saturated.	Terrace	–	–
4.50	5.00	Dark brown coarse gravel (5/95%; SA-SR; 5–300mm) with rare coarse sand.	Terrace	–	–
5.00	6.00	NO DATA.	–	–	–
6.00	6.50	Dark orange brown coarse gravelly sand (55/45%; 5–50mm) with frequent white shell (2–10mm). Saturated.	Terrace	–	–
6.50	7.00	Dark yellowish brown silty fine sand with rare flecks of white stone/shell (1mm) and occasional pebbles (SR, 50mm). Saturated.	Thanet / Lambeth Beds.	–	–
7.00	7.45	Dark yellowish brown silty fine sand with rare black sand inclusions white shell flecks (1–2mm). Very slightly saturated.	Thanet / Lambeth Beds.	–	–
7.45	8.00	NO DATA.	–	–	–
8.00	8.40	Compact light grey yellow sand.	Thanet / Lambeth Beds.	–	–
8.40	8.50	Soft light green grey ephemerally fine sand silty clay.	Thanet / Lambeth Beds.	–	–
8.50	9.40	Soft dark grey-green black ephemeral fine sandy silty/slightly silty clay, no organics.	(Thanet?)	–	–
9.40	10.00	Soft dark grey-green black ephemeral fine sandy silty/slightly silty clay, with coarse golden sand inclusions. No organics.	(Thanet?)	–	–
10.00	11.00	Compact, dark green grey, silty to medium coarse sands, with banks of sand and silt (silty clay in places).	(Thanet?)	–	–
11.00	11.45	Compact to indurated dark green grey slightly coarser medium sandy silt.	Tertiary sands	–	–

MM_JC_BH_106A

SITE CODE: EAGW24		**ELEVATION (MAOD)**	7.079
LOGGER: JS & RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603724.917
		NORTHING	234493.578
		DEPTH (M)	20.5

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
12.00	16.00	Soft dark blue grey fine sand silt, no inclusions.	Tertiary sands	–	–
16.00	16.50	Soft dark blue grey fine sandy silt.	Thanet / Lambeth Beds.	–	–
16.50	17.00	Very stiff, dark blue grey, almost poorly formed siltstone.	Thanet / Lambeth Beds.	–	–
17.00	17.45	Dark brownish grey, slightly clayey, silty fine sand. Lenses of mid greyish brown sand. Rare white shell (1mm).	Thanet / Lambeth Beds.	–	–
18.00	18.45	Dark brownish grey, slightly clayey, silty fine sand. Lenses of brown silty sand and mid/dark grey silty sand. Very rare white shell (1mm).	Thanet / Lambeth Beds.	–	–
19.00	19.00	Dark brownish grey, silty fine sand. Friable.. Lenses of dark grey silty sand. Rare white shell (1mm).	Thanet / Lambeth Beds.	–	–
19.00	19.45	Dark bluish grey, hard/firm silty fine sand. Slightly clayey, Lenses of dark greyish brown sand. Occasional white shell (0.2mm).	Thanet / Lambeth Beds.	–	–
19.45	20.00	Dark brownish, bluish grey, silty fine sand. Slightly clayey. Lenses of dark reddish brown silty sand. Rare white shell (0.2mm).	Thanet / Lambeth Beds.	–	–
20.00	20.45	Dark bluish grey, silty fine sand. Occasional medium sand lenses .Rare patches of dark brownish grey sand.	Thanet / Lambeth Beds.	–	–
20.50	–	Borehole terminated.	–	–	–

FIG 13.13 MM_RC_BH_106a at 15–15.45m

TABLE 13.16 MM_JC_BH_106 Borehole log

MM_JC_BH_106					
SITE CODE: EAGW24				**ELEVATION (MAOD)**	7.342
LOGGER: RT					
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.				**EASTING**	603800.932
				NORTHING	234445.577
				DEPTH (M)	20.2
TOP (MBGL)	**BASE (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/SUBSAMPLED**	**DATE**
0.00	0.50	Light yellowish brown silt. Loose occasional SA stones (5–20mm) Rare SR stones (5–10mm).	Topsoil	–	–
0.50	0.60	Light yellowish brown silt. Loose. Frequent SA stones (10–50mm). Occasional SR stones (10–50mm).	Topsoil	–	–
0.60	1.00	Mid reddish brown silty fine sand. Loose very slightly saturated. Occasional SA and SR stones (100–200mm).	Terrace	–	–
1.00	1.10	Mid reddish brown silty fine sand with some coarser sand inclusions. Loose very slightly saturate. Frequent SA and SR stones (10–200mm).	Terrace	–	–
1.10	1.20	Mid greyish slightly yellowish brown coarse sandy gravel. Some rare clay patches. Gravel 60% SA and SR stones (5–300mm).	Terrace	–	–
1.20	1.65	Mid greyish yellowish brown coarse sandy gravel. Rare/occasional clayey sand patches. Gravel 80%. SA and SR stones (5–350mm).	Terrace	–	–
1.65	2.50	Mid yellowish brown coarse sandy gravel. 80% gravel: SA-SR stones (2–250mm). Saturated. Rare flint (1–2mm) occasional white shell (1–2mm).	Terrace	–	–
2.50	3.00	Mid yellowish brown coarse sandy gravel (85%), SA-SR stones (5–240mm). Saturated. Rare flint (1–2mm). Occasional rare SR stones.	Terrace	–	–
3.00	3.50	Mid yellowish brown coarse sandy gravel (70%) SA-SR stones (5–240mm). Saturated. Rare white shell (1–2mm).	Terrace	–	–
3.50	4.00	Mid yellowish brown coarse sandy gravel (70%). Frequent SA-SR stones (5–300mm) Saturated. Occasional larger SR stones.	Terrace	–	–
4.00	4.50	Mid yellowish brown coarse sandy gravel (70%): frequent SA and SR stones (5–100mm) saturated. Rare white shell (1–2mm).	Terrace	–	–
4.50	5.00	Mid yellowish brown coarse sandy gravel (80%). SA-SR (5–100mm). Saturated. Rare white shell (1–2mm).	Terrace	–	–
5.00	5.50	Mid yellowish brown coarse sandy gravel (80%). SA-SR (2–110mm). Saturated. Occasional white shell (1–2mm).	Terrace	–	–
5.50	6.00	NO DATA.	–	–	–
6.00	7.20	Mid yellowish brown coarse sandy gravel (80%). SA-SR stones (1–150mm) Saturated. Occasional white shell (1–2mm).	Terrace	–	–
7.20	7.50	Dark yellowish brown gravelly coarse sand (40% gravel: SR and occasional SA stones, 2–50mm), saturated. Rare white shell (1–2mm).	Terrace	–	–
7.50	8.00	Dark yellowish brown gravelly coarse sand. (Gravel 40%: SA and SR stones, 5–70mm.) Saturated. Occasional white shell. (1–2mm).	Terrace	–	–
8.00	8.50	NO DATA.	–	–	–
8.50	9.50	Mid yellowish brown coarse sandy silt. Saturated. Frequent black stone (0.2mm) Rare white shell (1mm). Rare patches of soft sandy clay.	Thanet / Lambeth Beds.	–	–
9.50	10.00	Dark grey medium coarse sand. Very slightly clayey. Saturated. Lenses of black sand. Loose.	Thanet / Lambeth Beds.	–	–

MM_JC_BH_106

SITE CODE: EAGW24		**ELEVATION (MAOD)**	7.342
LOGGER: RT			
SCHEME AREA: STOUR VALLEY CROSSING GI TYPE: CABLE PERCUSSION. REASON FOR MONITORING: BURIED ORGANIC DEPOSITS.		**EASTING**	603800.932
		NORTHING	234445.577
		DEPTH (M)	20.2

TOP (MBGL)	BASE (MBGL)	DESCRIPTION	INTERPRETATION	FINDS/SUBSAMPLED	DATE
10.00	10.45	Dark, slightly blueish grey, slightly clayey fine sand, compact to loose. Lenses of black sand. Very slightly saturated. Rare red stone (1mm).	Thanet / Lambeth Beds.	–	–
10.45	10.55	Dark blueish grey clayey fine sand. Compact to loose. Occasional red stone (0.9–1.2mm). Lenses of black clayey sand.	Thanet / Lambeth Beds.	–	–
10.55	11.50	NO DATA.	–	–	–
11.50	12.00	Dark bluish brownish grey clayey fine sand. Friable/loose. Lenses of light brownish grey sand. Slightly saturated.	Thanet / Lambeth Beds.	–	–
12.00	12.50	NO DATA.	–	–	–
12.50	13.00	Dark brownish grey clayey fine sand. Compact to loose. Lenses of blueish grey clayey sand. Slightly saturated. Rare white stone (0.5mm).	Thanet / Lambeth Beds.	–	–
13.00	13.50	NO DATA.	–	–	–
13.50	13.95	Dark grey clayey fine sand. Loose. Very saturated. Rate white stone (0.2mm) Lenses of brownish grey sand.	Thanet / Lambeth Beds.	–	–
13.95	14.05	Mid bluish brown grey hard compacted fine sand. Occasional white stone (0.2–0.5mm).	Thanet / Lambeth Beds.	–	–
14.05	15.00	Mid bluish brown grey compact to lose fine silty sand. Dry. No inclusions.	Thanet / Lambeth Beds.	–	–
15.00	15.45	NO DATA.	–	–	–
15.45	15.55	Mid bluish brownish grey compact to loose fine silty sand. No inclusions.	Thanet / Lambeth Beds.	–	–
15.55	16.50	NO DATA.	–	–	–
16.50	16.95	Mid bluish grey/brownish grey, compact to loose, fine silty sand. No inclusions	Thanet / Lambeth Beds.	–	–
16.95	17.95	NO DATA.	–	–	–
17.95	18.05	Mid brownish grey compact fine silty sand. Rare white stone/shell (1mm). Dry.	Thanet / Lambeth Beds.	–	–
18.50	19.00	Dark bluish brown grey, compact fine silty sand. Lenses of lightly white grey silty sand. Patches of brownish red sand (rare). Dry.	Thanet / Lambeth Beds.	–	–
19.00	19.50	NO DATA.	–	–	–
19.50	19.95	Dark bluish grey, compact, fine silty sand. Occasional SA stones (100–200mm). Saturated.	Thanet / Lambeth Beds.	–	–
19.95	20.05	Dark bluish grey compact fine silty sand. Occasional SA stones (100–200mm). Rare large stones (600mm). Saturated.	Thanet / Lambeth Beds.	–	–
20.05	20.20	White chalk, some gravel inclusions.	Bedrock.	–	–

APPENDIX 2 DEPOSIT MODELLING DATA

Appendix 2.1 Lithology Data

BH ID	TOP	BASE	LITHOLOGY
MM_JC_BH_102b	0	1.65	Silty clay
MM_JC_BH_102b	1.65	2.45	Sandy gravel
MM_JC_BH_102b	2.45	3.5	Gravelly clay
MM_JC_BH_102b	3.5	6	Cobbley gravels
MM_JC_BH_102b	6	7	Silty sand
MM_JC_BH_102b	7	7.5	Organic sand
MM_JC_BH_102b	7.5	8.45	Sand & gravel
MM_JC_BH_102b	8.45	9	Silty sand
MM_JC_BH_102b	9	9.5	Organic sand
MM_JC_BH_102b	9.5	10.5	Sandy gravel
MM_JC_BH_102b	10.5	11	Silty clay
MM_JC_BH_102b	11	12.3	Clayey sand
MM_JC_BH_102b	12.3	12.4	Sand
MM_JC_BH_102b	12.4	12.5	Sandy clay
MM_JC_BH_102b	12.5	14	Silty clay
MM_JC_BH_102b	14	14.45	Sand
MM_JC_BH_102b	14.45	15.45	Clay
MM_JC_BH_102b	15.45	16.5	Sandy clay
MM_JC_BH_102b	16.5	17.45	Clay
MM_JC_BH_102b	17.45	18	Bedrock
MM_JC_BH_102b	18.1	20	Bedrock
MM_JC_BH_102d	0	0.3	Silty clay
MM_JC_BH_102d	0.3	1.65	Clay
MM_JC_BH_102d	1.65	1.75	Peat
MM_JC_BH_102d	1.75	2	Clay
MM_JC_BH_102d	2	2.5	Sand
MM_JC_BH_102d	2.5	3	Organic gravel
MM_JC_BH_102d	3	3.5	Sand & gravel
MM_JC_BH_102d	3.5	4	Gravel
MM_JC_BH_102d	4	4.5	Sand
MM_JC_BH_102d	4.5	5	Gravel
MM_JC_BH_102d	5	5.5	Sand & gravel
MM_JC_BH_102d	5.5	7	Organic clay
MM_JC_BH_102d	7	8.45	Silty clay
MM_JC_BH_102d	8.45	9.45	Sandy clay
MM_JC_BH_102d	9.45	9.6	Silty clay
MM_JC_BH_102d	9.6	10	Clay
MM_JC_BH_102d	10	12.7	Silty clay
MM_JC_BH_102d	12.7	13.8	Clayey sand
MM_JC_BH_102d	13.8	13.8	Bedrock
MM_JC_BH_103	0	1.2	Void
MM_JC_BH_103	1.2	2	Clay
MM_JC_BH_103	2	2.5	Sandy clay
MM_JC_BH_103	2.5	3	Gravelly clay
MM_JC_BH_103	3	3.5	Sandy gravel
MM_JC_BH_103	3.5	4	Gravelly sand
MM_JC_BH_103	4	5	Sand & gravel
MM_JC_BH_103	5	6.45	Gravelly sand
MM_JC_BH_103	6	7	Sand & gravel
MM_JC_BH_103	6.45	6.5	Gravelly sand
MM_JC_BH_103	6.5	6.6	Sand & gravel
MM_JC_BH_103	7	9	Sand & gravel
MM_JC_BH_103	9	10.5	Sand
MM_JC_BH_103	10.5	11.5	Clayey sand
MM_JC_BH_103	11.5	13	Gravelly sand
MM_JC_BH_103	13	13.5	Clayey sand
MM_JC_BH_103	13.5	16.5	Sand
MM_JC_BH_103	16.5	17	Clayey sand
MM_JC_BH_103	17	18	Silt
MM_JC_BH_103	18	18.5	Silty sand
MM_JC_BH_103	18.5	19	Gravelly sand
MM_JC_BH_103	19	20.5	Sandy gravel
MM_JC_BH_103	20.5	21	Cobbley gravels
MM_JC_BH_103	21	21.5	Gravelly sand
MM_JC_BH_103	21.5	21.6	Sand
MM_JC_BH_103	22.5	23.5	Sandy gravel
MM_JC_BH_103	23.5	24.5	Cobbley gravels
MM_JC_BH_103	24.5	26.5	Gravelly sand
MM_JC_BH_103	26.5	27	Sandy gravel
MM_JC_BH_103A	0	1.7	Silty clay
MM_JC_BH_103A	1.7	2	Sandy clay
MM_JC_BH_103A	2	2.45	Clayey sand
MM_JC_BH_103A	2.45	3.5	Cobbley gravels

BH ID	TOP	BASE	LITHOLOGY
MM_JC_BH_103A	3.5	4	Gravelly cobbles
MM_JC_BH_103A	4	6.5	Cobbley gravels
MM_JC_BH_103A	6.5	7	Sandy gravel
MM_JC_BH_103A	7	8.5	Gravelly cobbles
MM_JC_BH_103A	8.5	9	Sandy gravel
MM_JC_BH_103A	9	11	Cobbley gravels
MM_JC_BH_103A	11	11.5	Sand
MM_JC_BH_103A	11.5	12	Sandy silt
MM_JC_BH_103A	12	12.5	Organic sand
MM_JC_BH_103A	12.5	13	Gravel
MM_JC_BH_103A	13	14.5	Gravelly sand
MM_JC_BH_103A	14.5	15	Sand
MM_JC_BH_103A	15	15.5	Sandy gravel
MM_JC_BH_103A	15.5	17.45	Weathered bedrock
MM_JC_BH_104	0	0.2	Void
MM_JC_BH_104	0.2	1.1	Silty clay
MM_JC_BH_104	1.1	1.2	Organic clay
MM_JC_BH_104	1.2	1.65	Peat
MM_JC_BH_104	1.65	1.7	Organic clay
MM_JC_BH_104	1.7	2	Silty clay
MM_JC_BH_104	2	2.5	Peat
MM_JC_BH_104	2.5	2.6	Gravelly sand
MM_JC_BH_104	3	3.5	Gravelly sand
MM_JC_BH_104	3.5	4	Cobbley gravels
MM_JC_BH_104	4	4.5	Gravelly sand
MM_JC_BH_104	4.5	6.5	Cobbley gravels
MM_JC_BH_104	6.5	8.5	Sandy gravel
MM_JC_BH_104	8.5	12.5	Silty sand
MM_JC_BH_104	12.5	13	Silty gravel
MM_JC_BH_104	13	15	Cobbley gravels
MM_JC_BH_104	15	16.5	Sand & gravel
MM_JC_BH_104	16.5	17	Sandy gravel
MM_JC_BH_104	17	17.5	Gravelly sand
MM_JC_BH_104	17.5	18.5	Cobbley gravels
MM_JC_BH_104	18.5	19	Sandy gravel
MM_JC_BH_104	19	19.5	Sand & gravel
MM_JC_BH_104a	0	1.2	Silty clay
MM_JC_BH_104a	1.2	1.65	Peat

BH ID	TOP	BASE	LITHOLOGY
MM_JC_BH_104a	1.65	1.7	Gravelly sand
MM_JC_BH_104a	1.7	2	Sandy gravel
MM_JC_BH_104a	2	2.5	Cobbley gravels
MM_JC_BH_104a	2.5	3	Sandy gravel
MM_JC_BH_104a	3	3.5	Cobbley gravels
MM_JC_BH_104a	3.5	5	Sandy gravel
MM_JC_BH_104a	5	5.5	Cobbley gravels
MM_JC_BH_104a	5.5	6.5	Sand & gravel
MM_JC_BH_104a	6.5	7.5	Sandy gravel
MM_JC_BH_104a	7.5	8.5	Sand & gravel
MM_JC_BH_104a	8.5	8.6	Sandy gravel
MM_JC_BH_104a	9	9.5	Sand & gravel
MM_JC_BH_104a	9.5	10	Sandy gravel
MM_JC_BH_104a	10	10.35	Silty sand
MM_JC_BH_104a	10.35	10.45	Organic clay
MM_JC_BH_104a	10.45	10.5	Organic silt
MM_JC_BH_104a	10.5	12.5	Peat
MM_JC_BH_104a	12.5	13	Sandy gravel
MM_JC_BH_104a	13	17	Sand & gravel
MM_JC_BH_104a	17	17.5	Sandy gravel
MM_JC_BH_104a	17.5	18.5	Sand & gravel
MM_JC_BH_104a	18.5	19	Sandy gravel
MM_JC_BH_104a	19	19.5	Sand & gravel
MM_JC_BH_104a	19.5	20	Weathered bedrock
MM_JC_BH_105	0	1.5	Silty clay
MM_JC_BH_105	1.5	1.5	Sand
MM_JC_BH_105	1.5	4.5	Gravelly sand
MM_JC_BH_105	4.5	6	Sand & gravel
MM_JC_BH_105	6	8.5	Sandy clay
MM_JC_BH_105	8.5	10	Clayey sand
MM_JC_BH_105	10	11	Silty sand
MM_JC_BH_105	11	15	Silty clay
MM_JC_BH_105	15	16	Sandy silt
MM_JC_BH_105	16	18	Sand
MM_JC_BH_105	18	20	Bedrock
MM_JC_BH_105a	0	2.6	Silty clay
MM_JC_BH_105a	2.6	3	Sand & gravel
MM_JC_BH_105a	3	4	Gravelly sand

BH ID	TOP	BASE	LITHOLOGY
MM_JC_BH_105a	4	5	Sandy silt
MM_JC_BH_105a	5	5.8	Gravelly sand
MM_JC_BH_105a	5.8	7	Sand
MM_JC_BH_105a	7	10	Silty clay
MM_JC_BH_105a	10	12.5	Clayey silt
MM_JC_BH_105a	12.5	17	Sandy silt
MM_JC_BH_105a	17	20	Weathered bedrock
MM_JC_BH_106	0	0.5	Silt
MM_JC_BH_106	0.5	0.6	Gravelly silt
MM_JC_BH_106	0.6	1.1	Silty sand
MM_JC_BH_106	1.1	1.2	Sand & gravel
MM_JC_BH_106	1.2	3	Cobbley gravels
MM_JC_BH_106	3	7.2	Sandy gravel
MM_JC_BH_106	7.2	8.5	Sand & gravel
MM_JC_BH_106	8.5	9.5	Sandy silt
MM_JC_BH_106	9.5	10	Sand
MM_JC_BH_106	10	12	Clayey sand
MM_JC_BH_106	12.5	14.05	Clayey sand
MM_JC_BH_106	14.05	20.05	Silty sand
MM_JC_BH_106	20.05	20.2	Bedrock
MM_JC_BH_106A	0	0.4	Sandy silt
MM_JC_BH_106A	0.4	2	Gravelly silt
MM_JC_BH_106A	2	2.5	Silty sand
MM_JC_BH_106A	2.5	3	Cobbley gravels
MM_JC_BH_106A	3	3.5	Sand & gravel
MM_JC_BH_106A	3.5	4	Sandy clay
MM_JC_BH_106A	4	4.5	Sand & gravel
MM_JC_BH_106A	4.5	6	Cobbley gravels
MM_JC_BH_106A	6	6.5	Sand & gravel
MM_JC_BH_106A	6.5	8	Silty sand
MM_JC_BH_106A	8	8.4	Sand

BH ID	TOP	BASE	LITHOLOGY
MM_JC_BH_106A	8.4	10	Silty clay
MM_JC_BH_106A	10	11	Sand
MM_JC_BH_106A	11	11.45	Sandy silt
MM_JC_BH_106A	12	16.5	Sandy silt
MM_JC_BH_106A	16.5	17	Silt
MM_JC_BH_106A	17	18	Clayey sand
MM_JC_BH_106A	18	19	Silty sand
MM_JC_BH_106A	19.45	20.45	Silty sand
MM_JC_BH_106A	20.5	20.5	Silty sand
MM_JC_TP_111	0	0.15	Silty clay
MM_JC_TP_111	0.15	0.6	Clay
MM_JC_TP_111	0.6	2	Organic clay
MM_JC_TP_111a	0	0.2	Sandy clay
MM_JC_TP_111a	0.2	0.6	Silty clay
MM_JC_TP_111a	0.6	1.3	Sandy clay
MM_JC_TP_111a	1.3	1.6	Sand & gravel
MM_JC_TP_112	0	0.3	Sandy silt
MM_JC_TP_112	0.3	2.6	Sand & gravel
MM_JC_TP_113	0	0.95	Silty clay
MM_JC_TP_113	0.95	1.2	Clayey sand
MM_JC_TP_113	1.2	1.8	Gravel
MM_JC_TP_114	0	0.4	Sandy silt
MM_JC_TP_114	0.4	0.5	Silty sand
MM_JC_TP_114	0.5	0.7	Gravelly sand
MM_JC_TP_114	0.7	1	Cobbley gravels
MM_JC_TP_114	1	1.5	Sandy gravel
MM_JC_TP_114	1.5	2.1	Cobbley gravels
MM_JC_TP_116	0	0.4	Sandy silt
MM_JC_TP_116	0.4	0.7	Gravelly silt
MM_JC_TP_116	0.7	1.8	Sand & gravel
MM_JC_TP_116	1.8	4	Gravelly sand

Appendix 2.2 Stratigraphy Data

BH ID	TOP	BASE	STRATIGRAPHY
MM_JC_BH_102b	0	0.4	TOPSOIL
MM_JC_BH_102b	0.4	1.65	ALLUVIUM
MM_JC_BH_102b	1.65	3.5	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_102b	3.5	7	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_102b	7	15.45	GLACIOLACUSTRINE
MM_JC_BH_102b	15.45	18	THAMES GROUP
MM_JC_BH_102b	18	18.1	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_BH_102b	18.1	20	CHALK BEDROCK
MM_JC_BH_102d	0	0.7	TOPSOIL
MM_JC_BH_102d	0.7	1.75	ALLUVIUM (ORGANIC)
MM_JC_BH_102d	1.75	2	ALLUVIUM
MM_JC_BH_102d	2	3.5	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_102d	3.5	5.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_102d	5.5	9	GLACIOLACUSTRINE
MM_JC_BH_102d	9	12	THAMES GROUP
MM_JC_BH_102d	12	13.8	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_BH_102d	13.8	13.81	CHALK BEDROCK
MM_JC_BH_103	0	0.3	TOPSOIL
MM_JC_BH_103	0.3	2.5	ALLUVIUM
MM_JC_BH_103	2.5	3	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_103	3	16.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_103	16.5	18.5	GLACIOLACUSTRINE
MM_JC_BH_103	18.5	27	GLACIAL SAND AND GRAVEL
MM_JC_BH_103	27	27.01	CHALK BEDROCK
MM_JC_BH_103A	0	0.2	TOPSOIL
MM_JC_BH_103A	0.2	2	ALLUVIUM
MM_JC_BH_103A	2	3	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_103A	3	11.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_103A	11.5	12.5	GLACIOLACUSTRINE
MM_JC_BH_103A	12.5	15.5	GLACIAL SAND AND GRAVEL
MM_JC_BH_103A	15.5	17.45	CHALK BEDROCK
MM_JC_BH_104	0	0.7	TOPSOIL
MM_JC_BH_104	0.7	1.2	ALLUVIUM
MM_JC_BH_104	1.2	1.65	ORGANIC SILT
MM_JC_BH_104	1.65	2	ALLUVIUM 2
MM_JC_BH_104	2	2.5	PEAT
MM_JC_BH_104	2.5	4.5	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_104	4.5	8.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_104	8.5	19.5	GLACIAL SAND AND GRAVEL
MM_JC_BH_104a	0	0.5	TOPSOIL
MM_JC_BH_104a	0.5	1.2	ALLUVIUM
MM_JC_BH_104a	1.2	1.65	PEAT
MM_JC_BH_104a	1.65	2.6	FLUVIAL SANDS AND GRAVELS
MM_JC_BH_104a	2.6	10	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_104a	10	12.5	GLACIOLACUSTRINE
MM_JC_BH_104a	12.5	19.5	GLACIAL SAND AND GRAVEL
MM_JC_BH_104a	19.5	20	CHALK BEDROCK
MM_JC_BH_105	0	0.3	TOPSOIL
MM_JC_BH_105	0.3	1.5	ALLUVIUM
MM_JC_BH_105	1.5	1.5	PALAEOSOL
MM_JC_BH_105	1.5	6	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_105	6	18	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_BH_105	18	20	CHALK BEDROCK
MM_JC_BH_105a	0	0.2	TOPSOIL
MM_JC_BH_105a	0.2	2	ALLUVIUM
MM_JC_BH_105a	2	2.6	PEAT
MM_JC_BH_105a	2.6	4	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_105a	4	17	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_BH_105a	17	20	CHALK BEDROCK
MM_JC_BH_106	0	0.5	TOPSOIL
MM_JC_BH_106	0.5	8.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_106	8.5	20.05	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_BH_106	20.05	20.2	CHALK BEDROCK
MM_JC_BH_106A	0	0.4	TOPSOIL
MM_JC_BH_106A	0.4	6.5	RIVER TERRACE SANDS AND GRAVELS
MM_JC_BH_106A	6.5	20.5	THANET FORMATION & LAMBETH GROUP (Undifferentiated)
MM_JC_TP_111	0	0.3	TOPSOIL
MM_JC_TP_111	0.3	0.6	ALLUVIUM
MM_JC_TP_111	0.6	1	ORGANIC SILT
MM_JC_TP_111	1	2	ALLUVIUM 2
MM_JC_TP_111a	0	0.2	TOPSOIL

BH ID	TOP	BASE	STRATIGRAPHY
MM_JC_TP_111a	0.2	0.5	ALLUVIUM
MM_JC_TP_111a	0.5	0.6	ORGANIC SILT
MM_JC_TP_111a	0.6	1.3	ALLUVIUM 2
MM_JC_TP_111a	1.3	1.6	RIVER TERRACE SANDS AND GRAVELS
MM_JC_TP_112	0	0.3	TOPSOIL
MM_JC_TP_112	0.3	2.6	RIVER TERRACE SANDS AND GRAVELS
MM_JC_TP_113	0	0.6	TOPSOIL
MM_JC_TP_113	0.6	1.2	ALLUVIUM
MM_JC_TP_113	1.2	1.8	RIVER TERRACE SANDS AND GRAVELS

BH ID	TOP	BASE	STRATIGRAPHY
MM_JC_TP_114	0	0.5	TOPSOIL
MM_JC_TP_114	0.5	2.1	RIVER TERRACE SANDS AND GRAVELS
MM_JC_TP_116	0	0.1	TOPSOIL
MM_JC_TP_116	0.1	0.4	SUBSOIL
MM_JC_TP_116	0.4	0.7	LOWESTOFT SANDS AND GRAVELS
MM_JC_TP_116	0.7	1.8	BARHAM ARCTIC SOIL? / LOWESTOFT SANDS AND GRAVELS
MM_JC_TP_116	1.8	3.2	KESGRAVE CATCHMENT SANDS AND GRAVELS? / LOWESTOFT SANDS AND GRAVEL
MM_JC_TP_116	3.2	4	RED CRAG FORMATION

APPENDIX 3 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID (UID): headland1-531325

Project Name:	GI Monitoring Watching Brief at Norwich to Tilbury
Activity type:	Watching Brief
Sitecode(s):	EAGW
Project Identifier(s):	EAGW24
Planning Id:	[no data]
Reason for Investigation:	Planning; Pre application
Organisation Responsible for work:	Headland Archaeology (UK) Ltd
Project Dates:	17-Jun-2024–27-Jun-2024
HER:	Essex HER
HER:	Suffolk HER
HER:	Norfolk HER
HER Identifiers:	[no data]
Project Methodology:	Headland Archaeology (UK) Ltd was commissioned by Arcadis, on behalf of National grid to undertake a programme of Archaeological and Geoarchaeological monitoring of Geotechnical Investigation (GI) works in support of a proposed Development Consent Order (DCO) application. The works took place from the 17th June 2024–27th January 2025 and involved the monitoring of 43 geotechnical pits within cropmark areas of medium archaeological potential.
Project Results:	A total of 43 geotechnical pits were monitored under archaeological supervision over three geographical sections of the scheme. No archaeological features or deposits were identified during the monitoring works. One fragment of ceramic building material (CBM) was recovered from the topsoil. The CBM is non-diagnostic and likely to be residual material that has been relocated through modern ploughing and therefore have limited to no value for providing insight into the archaeological date or type of activity in the area.
Keywords:	[no data]
Archive:	[no data]

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EAGW24

NORWICH TO TILBURY: NORTH TILBURY

GEOARCHAEOLOGICAL MONITORING AND RECORDING OF GEOTECHNICAL INVESTIGATION (GI) GROUNDWORKS

commissioned by Arcadis
on behalf of National Grid

May 2025

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

NORWICH TO TILBURY: NORTH TILBURY

GEOARCHAEOLOGICAL MONITORING AND RECORDING OF GEOTECHNICAL INVESTIGATION (GI) GROUNDWORKS

commissioned by Arcadis
on behalf of National Grid

May 2025

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **EAGW24** / HA Report No **2025-65** / NGR **TQ 66307 80217** / Parish **Thurrock** /
Local Authority **Thurrock** / Archaeological Advisor **Richard Havis** / Fieldwork Date **25.11.2024–13.12.2024** /
OASIS Ref. **headland1-531325** /

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REGISTERED ORGANISATION CIfA

PROJECT SUMMARY

Headland Archaeology were commissioned by Arcadis on behalf of National Grid to undertake geoarchaeological monitoring of Geotechnical Investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The DCO comprises an approximately 184km linear route for a new electricity transmission connection between existing substations at Norwich (NGR TG 216023) and Tilbury (NGR TQ 661762).

This report presents the results of the geoarchaeological monitoring of GI groundworks at the Proposed Development Area (PDA) in North Tilbury, Thurrock, Essex that is centred on NGR TQ 66307 80217. The site is in an area of arable fields.

The principal aim of the geoarchaeological monitoring was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. The purpose of the investigation was to record and advance understanding of the significance of these assets, and to provide data that will inform further mitigation strategies

A total of 19-no. GI locations that included boreholes, infiltration pits, trial pits and inspection pits were designated for monitoring; these were distributed relatively evenly across the PDA. Modelling revealed a depositional sequence comprising very shallow surface accumulations of topsoil directly overlying Head across most of the site with local outcroppings of terrace gravels underlying the topsoil in some locations. Further gravels were recorded beneath head deposits in the north-eastern area of the site. Bedrock, where present in the sequence, is the Thanet Sands, which were seen to be weathered in places. No archaeological deposits were encountered beneath the made ground.

Potential palaeosol deposits were recorded within the Head across the site, and further work is recommended to understand their presence and how these deposits may contribute to understanding climate and environment change in the Pleistocene.

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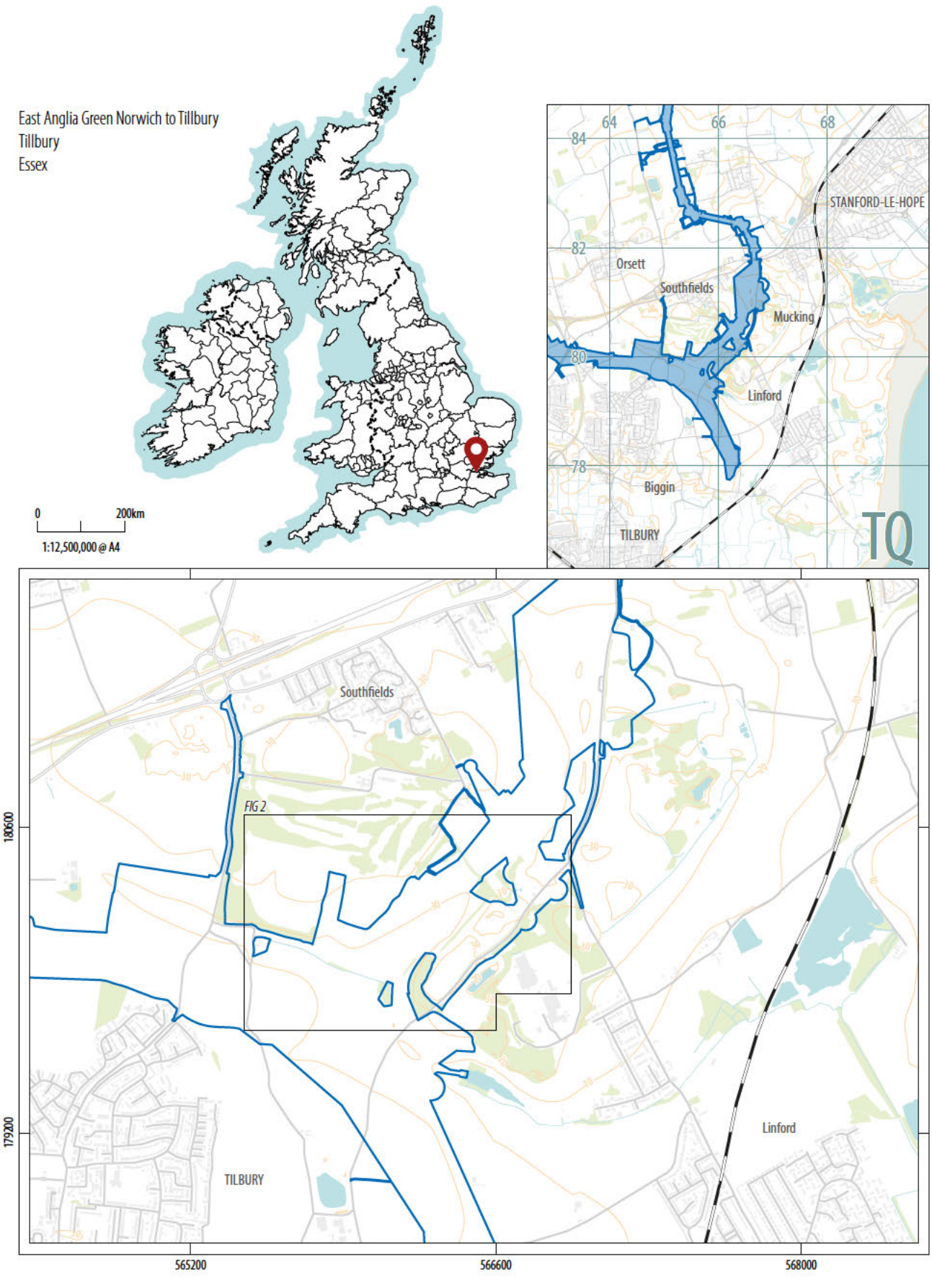

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FIG 1 Site location

NORWICH TO TILBURY: NORTH TILBURY

GEOARCHAEOLOGICAL MONITORING AND RECORDING OF GEOTECHNICAL INVESTIGATION (GI) GROUNDWORKS

1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 Headland Archaeology (UK) Ltd. was commissioned by Arcadis on behalf of National Grid (hereafter the 'client') to undertake geoarchaeological monitoring and recording of Geotechnical investigation (GI) groundworks in support of an application for a proposed Development Consent Order (DCO). The overarching project comprises a new electricity transmission connection between existing substations at Norwich and Tilbury.

1.1..2 The purpose of the geoarchaeological monitoring of GI was to gather information to inform a future phase of mitigation comprising purposive geoarchaeological investigation. As such, palaeoenvironmental sampling and specialist dating relating to deposits with palaeoenvironmental and geoarchaeological potential will be undertaken during further mitigation, to allow a robust, informed sampling and dating strategy based on this phase of data gathering.

1.1..3 This report describes the results of the geoarchaeological monitoring in the Tilbury North area centred on NGR TQ 66307 80217 (Illustration 1); as well as the subsequent deposit modelling exercise and provides an assessment of the geoarchaeological and palaeoenvironmental potential of the recorded deposits.

1.1..4 The methodology for geoarchaeological monitoring and predictive deposit modelling follows the approach set out in the WSI (Headland Archaeology, 2024).

1.1..5 This document conforms to current best practice guidelines, including the following: 'Geoarchaeology: using earth sciences to understand the archaeological record' (Historic England 2015), 'Deposit Modelling and Archaeology: guidance for mapping buried deposits' (Historic England 2020), 'Curating the Palaeolithic' (Historic England, 2023) and 'Preserving Archaeological Remains' (Historic England 2016).

2 SCOPE OF THE WORK

2.2.1 GI works at Tilbury North comprised a total of 22-no. interventions, of which 19-no. were designated for monitoring:

- 4 cable percussion boreholes;
- 8 trial pits;
- 1 infiltration pit; and
- 6 inspection pits for cone penetration testing (CPT).

2.2.2 An overview of the interventions selected for monitoring is provided in Table 2-1.

TABLE 2.1 Overview of Pits and Boreholes selected for table 2.1 geoarchaeological monitoring at Tilbury North

LOCATION NO	INTERVENTION TYPE	EASTING	NORTHING	REASON FOR GEOARCHAEOLOGICAL MONITORING
MM_TN_BH04	Cable percussion borehole	566325.668	180256.331	Scheme rescoping
MM_TN_BH05	Cable percussion borehole	566289.164	180358.897	Scheme rescoping
MM_TN_BH08	Cable percussion borehole	566325.668	180256.331	Scheme rescoping
MM_TN_BH14	Cable percussion borehole	566182.157	180277.571	Scheme rescoping
MM_TN_TP01	Trial pit	566473.784	180216.297	Scheme rescoping
MM_TN_TP02	Trial pit	566347.959	180147.369	Scheme rescoping
MM_TN_TP03	Trial pit	566313.174	180219.941	Scheme rescoping
MM_TN_TP04	Trial pit	566173.09	180257.213	Scheme rescoping
MM_TN_TP05	Trial pit	566221.243	180338.729	Scheme rescoping
MM_TN_TP06	Trial pit	565905.342	180101.678	Scheme rescoping
MM_TN_TP07	Trial pit	565925.325	180031.417	Scheme rescoping
MM_TN_TP09	Trial pit	566096.45	180142.02	Scheme rescoping
MM_TN_IP01	Infiltration pit	566137.426	180104.079	Scheme rescoping
MM_TN_CPT01	CPT inspection pit	566411.136	180249.42	Scheme rescoping
MM_TN_CPT02	CPT inspection pit	566223.727	180178.642	Scheme rescoping
MM_TN_CPT03	CPT inspection pit	566286.209	180151.72	Scheme rescoping
MM_TN_CPT04	CPT inspection pit	566308.645	180233.926	Scheme rescoping
MM_TN_CPT05	CPT inspection pit	566395.913	180318.176	Scheme rescoping
MM_TN_CPT07	CPT inspection pit	566403.725	180171.793	Scheme rescoping

2.2.3 Monitoring was requested to accommodate a change in GI scope and location due to a redesign of the scheme at the Tilbury end. The provisional interventions selected for geoarchaeological monitoring comprised 34-no boreholes and trial pits located within an area to the west of Tilbury, which were chosen due to the potential for deposits of head and alluvium to be present in the PDA, in addition to outcrops of the Taplow Terrace of the Lower Thames.

2.2.4 This report sits alongside an Archaeological Watching Brief Report and provides an assessment of the geoarchaeological potential of these sequences and a suitable reference within which to inform further geoarchaeological works where appropriate.

2.2.5 All work was carried out in accordance with standard industry guidelines for archaeological excavation (CiFA, 2014a-e) and Historic England guidance (Historic England 2015, 2022, 2023).

3 SITE DESCRIPTION

3.1 LOCATION

3.3.1 The site (hereafter 'the PDA') is in the borough of Thurrock, Essex, about 4.5km north-east of Tilbury and 2km west of the Thames at Mucking Flats. The scheme is centred on OSGB NGR TQ 66307 80217 and covers approximately 150 hectares. The area is rectilinear and contains arable farmland, bordered to the south-east by an aggregate quarry and a golf course to the north-east. Approximately 94 hectares of scrub to the west of the PDA show evidence for recent quarrying activity.

3.2 TOPOGRAPHY

3.3.1 The scheme is oriented parallel to a northeast-southwest dry valley. It encompasses the valley's base (17–15m AOD) and sides, which rise steeply to the south-east (17–25m over 100m) and gently to the north-west (17–27m over 200m) to reach a low terrace (28–30m AOD). The valley has been incised through this terrace and, beyond the scheme, goes on to channel an un-named stream from north-east, joining the Thames at East Tilbury.

4 GEOARCHAEOLOGICAL BACKGROUND

4.1 BEDROCK GEOLOGY

4.4.1 At or within 1km of the scheme boundary, four bedrock units crop out or underlie the Quaternary deposits. The Late Cretaceous (90–70mya) chalk formations (Lewes Nodular, Seaford and Newhaven) are primarily coccolithic carbonate rocks and accumulated in pelagic ocean waters (BGS 2025). The overlying Thanet Formation (Palaeocene, 59–56mya) is typically 10–15m thick and is composed of yellow-brown to green glauconitic sand. It typically fines down from silty fine-grained sand through fine sandy silt to basal silty clay. Deposition occurred on the outer marine shelf (BGS 2025).

4.4.2 The Lambeth Group (Eocene, 56–55mya) is formed of three intercalated facies, which vary laterally (Entwistle et al. 2013 13). The Upnor Formation contains glauconitic fine to coarse sand with rare gravel, deposited under energetic tidal conditions. The Reading Formation is of red-brown and blue-grey clay from an estuarine environment and the Woolwich Formation, of dark grey shelly clay, represents a marginal shore sub-tidal setting (BGS 2025). Lastly, the London Clay Formation (Eocene, 54–50mya) is a blue-grey to brown silty clay, often bioturbated or poorly laminated. Its rich, pyritised floral and faunal fossil assemblages indicate a tropical climate and a low-energy, off-shore environment (BGS 2025).

4.2 SUPERFICIAL GEOLOGY

4.2.1 The BGS (2025) records six superficial deposits of Quaternary age at or within 1km of the scheme boundary. The Black Park Gravel (450–423kya) is composed of pebble-grade angular flint gravel (85%) and rounded Tertiary flint clasts (10%) with current-bedded sand channels (Gibbard 1985; Bridgland 1994 141). Geomorphologically, it forms the oldest terrace of the Thames in its current course, deposited by the river when it was still under glacial influence (MIS 12). Palaeolithic Achulean handaxes have only been discovered within this unit in the tributary valleys of the upper Thames catchment (Bridgland 1994 44; White et al. 2018).

4.2.2 The Boyn Hill (or Orsett Heath) Gravel Member (423–363kya BGS 2025) is comprised of poorly-sorted, pebble-grade angular flint gravel (88%, Gibbard 1985) and rare rounded tertiary flint. It is part of the second-oldest Thames terrace and forms a fluvial aggradation sequence with the fine-grained Wantsum and Swanscombe Loams (MIS 12 -11). These are notable in this area for both Achulean and Clactonian lithic assemblages (White et al 2018).

4.2.3 The Lynch Hill Gravel (362–126 kya BGS 2025) consists of pebble-grade angular flint gravel (90–95%, Gibbard 1985). This unit is part of the third-oldest Thames terrace and forms a fluvial aggradation sequence with the Purfleet / Grays deposits (MIS 9), in which Achulean, Clactonian and Levallois Tools have been preserved (White et al. 2018). The Taplow (or Mucking) Gravel Member (352–125kya, BGS 2025) is part of the fourth-oldest Thames terrace and is a clast-support pebble grade angular flint gravel (Gibbard 1995), which was deposited by river during MIS 8–7. The unit has no notable archaeological assemblages.

4.2.4 Within the PDA, head deposits comprise clay with occasional flint clasts that have been moved down-slope under the force of gravity, by colluviation or solifluction. Alluvium refers to clay, silt or sand deposited by flowing water (BGS 2025).

4.2.5 The topsoil of the Scheme is Soilscape 6: a freely draining slightly acidic loamy soil, typically found in neutral and acid pastures and deciduous woodlands draining to local groundwater and rivers (LandIS, 2025).

4.2.6 The geoarchaeological and/or palaeoenvironmental potential of these units is summarised in Table 4-1.

4.2.7 Table 4-1: Summary of the previously recorded superficial deposits with estimated date range and associated geoarchaeological/palaeoenvironmental potential.

TABLE 4.1 Summary of the previously recorded superficial deposits with estimated date range and associated geoarchaeological/palaeoenvironmental potential

DEPOSIT TYPE	DATE	DESCRIPTION	MAPPED ON BGS[1]	POTENTIAL
Black Park Gravel	Quaternary: Late Anglian Stage (0.450–0.423ma yr BP.)	Sand and gravel, locally. This is a glaciofluvial deposit and forms part of the oldest Thames terrace (60–40m AOD; Bridgland 2004).	Yes, 1:15000 scale within 1km of scheme boundary.	Very low.
Boyn Hill Gravel	Quaternary: Hoxnian. 423–363 ma yr BP).	Sand and gravel, locally with lenses of silt, clay or peat. This is a fluvial deposit and forms part of the second-oldest Thames terrace (20–50m AOD; Bridgland 2004).	Yes, 1:15000 scale within 1km of scheme boundary.	Very low but locally high.
Lynch Hill Gravel	Quaternary: 362–126 ma yr BP).	Sand and gravel, locally with lenses of silt, clay or peat. This is a fluvial deposit and forms part of the third-oldest Thames terrace (10–20m AOD; Bridgland 2004).	Yes, 1:15000 scale within 1km of scheme boundary.	Very low but locally high.
Taplow Gravel	Quaternary: Wolstonian Stage (0.374–0,139ma yr BP).	Sand and gravel, locally with lenses of silt, clay or peat. This is a fluvial deposit and forms part of the fourth-oldest Thames terrace (5–15m AOD; Bridgland 2004).	Yes, 1:15000 scale within 1km of scheme boundary.	Very low but locally high.
Head	Pleistocene and Holocene (3–0ma yr BP).	Poorly-sorted slope deposits deposited by solifluction in peri-glacial environments. Sometimes buries sediments of geoarchaeological and palaeoenvironmental interest and may contain stratified secondary archaeological assemblages	Yes, 1:15000 scale within scheme boundary.	Moderate
Alluvium	Holocene	Fine-to-coarse grained sediments of Holocene date deposited by fluvial activity in the modern floodplain area. Alluvial environments are a focus for human activity, and an effective trap for artefacts and ecofacts with good preservation potential	Yes, 1:15000 scale within scheme boundary.	High

[1] *British Geological Survey (BGS) 1:50,000 or 1:625,000 superficial geology mapping (NERC, 2024).*

4.3 GEOARCHAEOLOGICAL CONTEXT

4.3.1 Fluvial Quaternary units within the Thames catchment have been correlated to specific landforms, or "terraces", and the two are usually synonymous (e.g. Black Park Gravel / Terrace). At least twenty terraces have been identified at discrete sets of elevations in the Upper (Moreton-on-Marsh to Oxford), Middle (Slough to Watford) and Lower (Central London to Dartford) Thames, which extend laterally along the northern and southern valley flanks (Bridgland 1999 21–23). The scheme itself is situated in the Lower Thames area: here, a flight of five nested terraces descends from c. 60m - 40m - 20m - 10m - 0m AOD, and from up to 10km distance from the modern river (Bridgland 2004; BGS 2025).

4.3.2 These terraces formed sequentially from Middle Pleistocene (c.500 kya) through to the Ipswichian (c. 80 kya) after the Anglian icesheet diverted the Thames to its current course (Bridgland 2004). The highest and most distant terrace (Black Park) is glaciofluvial (Gibbard 1985) but the succeeding four terraces (Boyn Hill, Lynch Hill, Taplow, Kempton Park) each represent one cycle of river aggradation and incision by the ancient Thames, caused by an oscillation from a cold (glacial) to a warm (interglacial) climate (Bridgland 2004). Succeeding Lower Thames terraces correspond to more recent periods of the Pleistocene (MIS stages). Each discrete river terrace can be further sub-divided into a cold-phase deposit (coarse / gravelly) and a warm-phase deposit (fine / organic "loam"; Bridgland 1994).

4.3.3 The Lower Thames terraces are palaeoenvironmental assets and some contain particularly important Palaeolithic geoarchaeological deposits. Pockets of "loam" in the Boyne and Lynch Hill Terraces have produced rich and well-stratified Lower - Middle Palaeolithic archaeology, including cultural material (lithic styles and find-sites summarised in White et al. 2017), hominid remains (e.g. H heidelbergensis at Swanscombe, Schreve & Bridgland 2002) and paleoenvironmental data (e.g. mammal skeletal remains and pollen at Purfleet and Thurrock; summarised in Bridgland 1994, 220, 233, 237). This has helped to reconstruct the changing extent of hominid radiation during the European Pleistocene (e.g. Hijma et al. 2012) and to refine British regional biostratigraphic frameworks (e.g. Schreve 2001).

4.3.4 In proximity to the study area, major Palaeolithic discoveries have occurred in the Boyn Hill and Lynch Hill Gravels at Purfleet, Greys, and Thurrock (Bridgland 1994) lying c. 10km, 5km and 3.5km to the west. The Boyne Hill Gravel extends to the scheme boundary but, within the study area itself, only one terrace deposit mapped by the BGS at 1:50,000 (2025). This is the Black Park Gravel (I.e. the oldest, glaciofluvial terrace): at this point of the Thames, deposits of this age have not produced Palaeolithic or paleoenvironmental material. Later features may be buried under colluvium (or "head") which is mapped throughout the study area (BGS 2025). There are no extant borehole records for the area to determine this.

4.3.5 On a regional scale, the Lower Thames has been extensively researched and the scheme area is broadly covered by these studies (e.g. summarised in Bridgland 1994). More focused research in Thurrock district have concentrated on the Boyne Hill, Lynch Hill or Taplow Terrace discoveries, and are typically local in scale (e.g. on the Globe Pit by Dewey 1932, Bridgland and Harding 1993; Schreve et al 2003). The Black Park Gravel within the scheme area has not been subject a known specific study the terrace is, itself, quite highly fragmented between its most westerly (c. Slough) and easterly (the scheme area) mapped surface exposures (BGS 2025). Bridgland (1994) provides descriptions of exposures of Black Park Gravel at Highlands Farm, Oxfordshire (ibid. 141) and Wansunt Pit, Dartford, Kent (ibid. 181).

5 ARCHAEOLOGICAL BACKGROUND

5.1 Archaeological background information for the Norwich to Tilbury scheme is provided in a Historic Environmental Baseline Report (Arcadis, on behalf of National Grid 2024) and reproduced within Headland Archaeology's overarching written scheme of investigation (Milne 2024). Sections relevant to the borough of Thurrock, Essex, are summarised below. Each asset has a unique number, which is referrable to the original HEBR.

Overview

5.2 Near to the scheme boundary, archaeological evidence for human activity has been discovered for all time-periods excepting the Mesolithic. As a caveat, this evidence is concentrated within a small number of sites, several of which had multiple phases of human occupation throughout time. However, it is still possible that archaeological remains from any of these phases may survive within the scheme boundary. Any deposits with potential for good environmental preservation could then theoretically provide evidence for any period from the Palaeolithic through to the Medieval.

Prehistoric: Palaeolithic and Neolithic

5.3 The earliest assets are Palaeolithic flint findspots of the Chellean lithic industry (8003) and excavated pits, postholes, and ring ditches (8030). Neolithic activity is represented by findspots of flint arrowheads (8120) and an axe head (8133).

Prehistoric: Bronze Age and Iron Age

5.4 The Bronze Age is represented by excavations at Mucking, Orsett and East Tilbury, at distances of 2.3km east, 2.3km west and 2.1km southeast of the scheme. Three phases of Bronze Age activity (8057-8059) were identified at Mucking from the Beaker period (8057), including a Beaker burial with grave goods, a ring ditch with structural evidence surviving internally, and a "Springfield Enclosure" (two concentric ditches enclosing an area of 0.44ha). Evaluations at Orsett (8119) revealed a hoard of five Bronze Age palstaves while another Bronze Age double enclosure around a cremation burial and three barrows were found at East Tilbury (8025). A phase of Iron Age activity (8060) consisting of at least three roundhouses was also identified at Mucking.

Roman and Romano-British

5.5 The Romano-British period is represented by excavations at Mucking (8061), Mucking-Linford-Holford (8033), and near West Tilbury (8012) (about 1.8km south of the scheme.) The Romano-British phase of activity at Mucking consisted of a building, cemetery, double ditched enclosure, farmstead, granary, metal working site, mortuary enclosure, pottery kiln, round barrow, settlement, and trackway. The excavation at Mucking-Linford-Holford found Romano-British pottery, a pottery kiln, a ditch, and corn drying kilns. The archaeological remains at West Tilbury consisted of a burial site with grave goods.

Early medieval and medieval

5.6 Remains dating to the early medieval period were also recorded during the Mucking excavations (8062 and 8063). The Early to Middle Saxon phase consisted of pits and structures (building, grubenhaus, hearth) as well as varied burial activity (cemetery and a cremation). The Middle to Late Saxon phase consisted of a ditch and two field systems. The medieval period is represented primarily by the current settlement pattern of villages and hamlets, which likely originated in this period. Excavations at Mucking (8064) and Mucking-Linford-Holford (8035) respectively revealed a field system, windmill, and aisled barn and 13th - 14th century pottery.

Post-medieval and modern

5.7 Post medieval activity is represented by a derelict brick works (8139), and a final phase of excavated archaeological remains at Mucking (8065; field boundaries and animal burials). The modern period is represented by military infrastructure.

6 AIMS AND OBJECTIVES

6.1 AIMS

6.1.1 The primary aim of the geoarchaeological monitoring and recording was to determine the potential for deposits of geoarchaeological and paleoenvironmental significance that may be impacted by development. In general, the purpose of the watching brief was to record and advance understanding of the significance of any heritage assets, to create a predictive deposit model for the site, and to inform appropriate mitigation strategies.

6.2 OBJECTIVES

6.2.1 The principal objectives were to:

- Identify, record and characterise the extent and depth of the Pleistocene and Holocene deposit sequence in the vicinity of the PDA;
- Identify significant variations in the deposit sequence indicative of localised features such as palaeochannels, topographic highs or buried 'islands';
- Identify the location and extent of any waterlogged organic deposits and/or buried soils or land-surfaces and address the potential for the preservation of archaeological and palaeoenvironmental remains within these deposits;
- Define zones of landscape stability within the vertical sequence that may have been of sufficient stability for human occupation at various periods in the past;
- Discuss the sequence of sediments within the wider landscape context of known quaternary geology and geomorphology;
- Inform the requirement for further geoarchaeological or paleoenvironmental investigation in the PDA.

6.2.2 These objectives were to be achieved through the monitoring of selected ground investigation works (Table 1) and subsequent deposit modelling.

6.3 RESEARCH AGENDA

6.3.1 The following regional research framework agendas are relevant to this work:

- East of England Regional Research Framework (ALGAO East of England 2020) (Research Frameworks, 2024).

› In particular, the data collected during the geoarchaeological survey may contribute to these specific research agenda questions:

  - Pal-Meso 11: Are deposit modelling and predictive modelling useful tools?
  - Pal-Meso 23: What do we know about the scale, distribution and character of occupation in the region?

6.3.2 The Research Framework for London Archaeology (Nixon et al. 2022) should also be considered. Based on this framework, the following research questions have been highlighted as of potential relevance:

Prehistoric

- P1.02: Carrying out baseline surveys for the Pleistocene in the London region, focusing on reconstructing geomorphology, ecology, ecosystems and climate, hydrology, and vegetational (e.g. building on the simple model of the Holocene vegetational succession in London created by Rackham and Sidell 2000), and faunal development (addressing the bias towards botanical reconstruction, attributed to the preserved evidence)

General

- TL1.01: Conducting baseline surveys, and use these to develop models for understanding the significance of geomorphology, ecology, ecosystems and climate, hydrology, and vegetational and faunal development, on human lives
- TL2.01: Understanding London's hydrology and river systems and tributaries and, in particular, understanding the role of the River Thames (as boundary, communication route, resource, ritual focus, barrier, link, etc.) in shaping London's history, and the relationships between rivers and floodplains.

7 METHODOLOGY

7.1 OVERVIEW

7.1.1 All site work was carried out in accordance with the site-specific WSI (Headland Archaeology, 2024a). The fieldwork was undertaken under the supervision of a suitably qualified geoarchaeological specialist.

TABLE 7.1 Summary of geoarchaeological work covered in this report

EXPLORATORY HOLE ID	MAX. DEPTH (M BGL)	TRANSECT ID	TYPE
MM_TN_BH04	25	1	Cable percussion borehole
MM_TN_BH05	35	1	Cable percussion borehole
MM_TN_BH08	25	–	Cable percussion borehole
MM_TN_BH14	35	1	Cable percussion borehole
MM_TN_TP01	3	1, 3	Trial pit
MM_TN_TP02	3	1	Trial pit
MM_TN_TP03	3	3	Trial pit
MM_TN_TP04	3	1	Trial pit
MM_TN_TP05	3	1	Trial pit
MM_TN_TP06	3	3	Trial pit
MM_TN_TP07	3	3	Trial pit
MM_TN_TP09	1.5	–	Trial pit
MM_TN_IP01	2	3	Infiltration pit
MM_TN_CPT01	1.2	1	CPT inspection pit
MM_TN_CPT02	1.2	3	CPT inspection pit
MM_TN_CPT03	1.2	–	CPT inspection pit
MM_TN_CPT04	1.2	2	CPT inspection pit
MM_TN_CPT05	1.2	1	CPT inspection pit
MM_TN_CPT07	1.2	1, 2, 3	CPT inspection pit

7.2 TRIAL PITS

7.2.1 Trial pits were excavated using a tracked 360° excavator under direct supervision. A toothed excavator bucket was used to remove any hard surfaces/demolition deposits, with all soft deposits removed in spits using a flat bladed ditching bucket.

7.2.2 During geoarchaeological monitoring of trial pits, the attendant geoarchaeologist logged upcast from the trial pit on the site of the excavation and measured deposit boundaries without entering the pit. Recordings and photographs were taken from the section.

7.3 BOREHOLES

7.3.1 Drilling was conducted using a Dando 3000 cable percussion drilling rig. Boreholes comprised 2-no. cable percussion boreholes to 25-metres and 2-no. cable percussion boreholes to 35-metres.

7.3.2 Boreholes were monitored by the attendant geoarchaeologist until refusal or bedrock was reached, whichever was first. Sequences were photographed and a record made of the depth of each sedimentary unit.

7.3.3 The sediments were described on a summary proforma according to standard methodologies based on Jones (1999) and with the aid of a Munsell soil colour chart. This included a description of colour, compaction, texture, sorting, structure, inclusions (including abundance, shape and material) and contacts.

7.4 GEOARCHAEOLOGICAL DEPOSIT MODELLING

7.4.1 A total of 3-no borehole records and 15-no. trial pit records were used to create sub-surface predictive deposit models of selected transects across the PDA. Only superficial strata were evaluated, with deeper deposits of no archaeological potential excluded from the analysis.

7.4.2 The geoarchaeological deposit records were entered into industry standard borehole management software (Rockworks™) to create a model of the key Quaternary Age sub-surface strata on site.

7.4.3 A sequence of commonly occurring lithological deposits was identified based on the results of the GI monitoring. These were correlated into stratigraphic units based on their lithological descriptions. The stratigraphy defines distinct depositional processes, associated environments, and landform types (e.g. head, palaeosol, river terrace). The model indicates, where relevant, the depth of made ground.

7.4.4 The following stratigraphic units were assigned, presented in order of deposition:

- BEDROCK (Lambeth Group, Thanet Sands)
- C-HORIZON: WEATHERED BEDROCK
- HEAD - 2
- PALAEOSOL
- RIVER TERRACE - T1 (Black Park gravel member)
- HEAD - 1
- TOPSOIL/MADE GROUND

7.4.5 The subsurface geometry of deposits is illustrated as 2D-fence diagrams, and the Transects (1,2,3) are used to present related constrained linear data sets to provide representative cross sections, illustrating the range of deposits present within each area and their predicted distribution between intervention points.

7.4.6 Deposit modelling allows for the spatial interpretation of the data, identifying probable environments represented, and the determination of areas of higher and lower geoarchaeological/archaeological/palaeoenvironmental potential by extrapolating the thickness and elevation of deposits between given data points. Where deposits are laterally constrained (such as channels) modelling may give an erroneous impression of the distribution of deposits (e.g., elevation and thickness).

7.4.7 Deposit modelling was undertaken following Historic England guidance (2020) and in compliance with industry best practice.

8 RESULTS

8.1 The results of the geoarchaeological watching brief for the Tilbury scheme are presented below. The stratigraphy is represented in three transects: two from the north-west to the south-east across the northern and central areas of the site (Illustrations 3 and 4), and one perpendicular from the north-east to south-west (Illustration 5). In total, four boreholes, eight test-pits, one infiltration pit and seven CTP pits were monitored and recorded by qualified geoarchaeologists. A record of the full geoarchaeological descriptions of assessed material is available in Appendix 1. The dataset used in the deposit modelling is available in Appendix 2.

8.1 LOCATIONS

8.1.1 Tables of borehole and test-pit locations for the scheme are given below (Table 8-1, Table 8-2). Locations are also shown in Illustration 2.

8.1.2 The mean surface elevation of boreholes taken from across the site was 23.30m AOD (above ordnance datum), with a minimum elevation of 20.401m AOD at MM_TN_BH_04, and a maximum elevation of 26.74m AOD at MM_TN_BH_14.

8.1.3 The mean surface elevation of trial pits taken from across the site was 20.52 m AOD, with a minimum elevation of 16.78 m AOD at MM_TN_TP_02 and a maximum elevation of 27..87m AOD at MM_TN_TP_05.

TABLE 8.1 Borehole Locations and Depths

BH ID	TRANSECT ID	MAX. DEPTH (M BGL)	LOCATION		
			EASTING (X)	NORTHING (Y)	ELEVATION (Z)
MM_TN_BH_14	1	35	566182.157	180277.571	26.737
MM_TN_BH_05	1	35	566325.668	180256.331	20.401
MM_TN_BH_04	1	25	566289.164	180358.897	25.662
MM_TN-BH_08	–	25	566325.668	180256.331	20.401
	TOTAL	120		MEAN ELEVATION	23.300

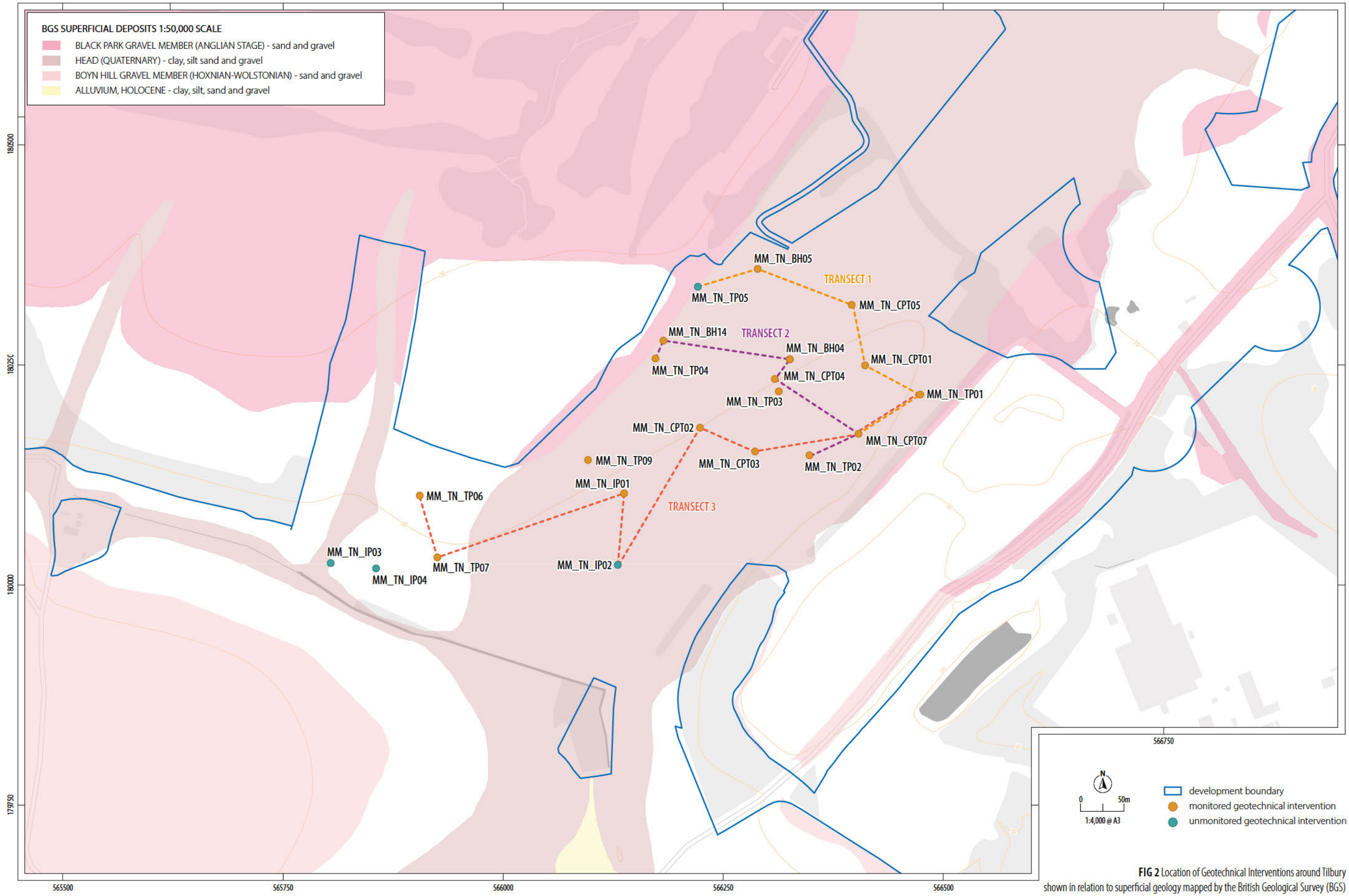

FIG 2 Location of Geotechnical Interventions around Tilbury shown in relation to superficial geology mapped by the British Geological Survey (BGS)

TABLE 8.2 Trial Pit Locations and Depths

BH ID	TRANSECT ID	MAX. DEPTH (M BGL)	LOCATION		
			EASTING (X)	NORTHING (Y)	ELEVATION (Z)
MM_TN_IP_01	3	2	566137.426	180104.079	18.283
MM_TN_TP_01	1,3	3	566473.784	180216.297	19.972
MM_TN_TP_02	1	3	566347.959	180147.369	16.78
MM_TN_TP_03	3	3	566313.174	180219.941	19.365
MM_TN_TP_04	1	3	566173.09	180257.213	26.13
MM_TN_TP_05	1	3	566221.243	180338.729	27.866
MM_TN_TP 06	3	3	565905.342	180101.678	22.22
MM TN TP_07	3	3	565925.325	180031.417	20.2
MM TN_TP_09	–	1.5	566096.45	180142.02	22.133
MM TN CTP 01	1	1.2	566411.136	180249.42	18.501
MM TN CTP 02	3	1.2	566223.727	180178.642	19.594
MM TN CTP 03	–	1.2	566286.209	180151.72	17.296
MM TN CTP 04	2	1.2	566308.645	180233.926	19.936
MM TN CTP 05	1	1.2	566395.913	180318.176	20.961
MM TN CTP 07	1,2,3	1.2	566411.136	180249.42	18.501
	TOTAL	31.7		MEAN ELEVATION	20.516

8.2 OVERVIEW

8.2.1 The stratigraphic sequence was identified, comprising a total of seven units representative of the major depositional phases identified on site, these were: made ground/topsoil, head 2, palaeosol, river terrace 1, head 1, C-horizon: weathered bedrock, bedrock (Table 8-3). The thickness of these units is shown in Table 8-4.

8.2.2 The Quaternary stratigraphic sequence over the site is uniform, usually being thin (2–3m in total) over the bedrock (Thanet Sand): spatial variability conforms closely with the topography. The site is mantled by 0.3m–2m of silty clay head deposits on which topsoil has formed. On lower and more level ground (20–14m AOD) this deposit is thickest and is seen to rest directly on weathered bedrock. On higher and sloping ground (26–20m AOD), the head deposits overlie coarser sand and gravel units which thin rapidly downslope.

TABLE 8.3 Overview of stratigraphic units

UNIT	GENERAL DESCRIPTION	ORDER OF DEPOSITION
Topsoil	An orange-brown to dark-brown rooted sandy silt or clay loam that has developed on top of head deposits. Occasional flint clasts	7 (Youngest)
Head -2	Typically presents on site as yellow-red to light grey-brown clayey silts, silty clays and sandy gravels. Highly variable in composition: mass movement deposits formed in cold climate conditions.	6
Palaeosol	Formed within head deposits, this is a mid-orange-brown to brown-grey clayey silt with trace fine sand with occasional gravel inclusions. Shows evidence for heavy rooting.	5
River Terrace -1 (Black Park Gravel Member)	Sands and gravels from the oldest Thames river terrace, dated to the Anglian Stage. Gravels are mostly angular to sub-angular flints, although there were some other mixed lithology clasts present that were rounded and sometimes polished.	4
Head -1	Yellow to greenish yellow medium to fine sand with some clay. Few flint gravels from mass movement of glacial deposits.	3
C-horizon: weathered bedrock	Weathered Thanet Sand deposits with occasional clay. Flint inclusions in some locations. Presents as a yellow to pale grey-green sand, the latter often with yellow mottling.	2
Bedrock (Thanet Sand)	Sands dated to the Thanetian Age (59.2 to 56 ma). Presents as pale grey to green sand with yellow or brown mottling.	1 (Oldest)

TABLE 8.4 Summary of thickness of stratigraphic units

IDENTIFIER	MG	TOPSOIL	HEAD - 2	PALAEOSOL	RIVER TERRACE - T1	HEAD - 1	WEATHERED BEDROCK	BEDROCK
MM_TN_BH_04	–	0.6	1.85	0.1	3.6	–	–	0.85
MM_TN_BH_05	–	0.35	1.3	0.1	2.3	–	0.2	0.95
MM_TN_BH_08	–	0.35	2.65	–	1.45	–	–	2
MM_TN_BH_14	–	0.5	1.5	–	0.5	–	–	0.45
MM_TN_CPT_01	–	0.3	0.9	–	–	–	–	–
MM_TN_CPT_02	–	0.2	1	–	–	–	–	–
MM_TN_CPT_03	–	0.3	0.9	–	–	–	–	–
MM_TN_CPT_04	–	0.2	1	–	–	–	–	–
MM_TN_CPT_05	–	0.35	0.85	–	–	–	–	–
MM_TN_CPT_07	–	0.35	0.85	–	–	–	–	–
MM_TN_IP_01	–	0.3	1.7	–	–	–	–	–
MM_TN_TP_01	–	0.3	1.9	–	–	–	0.8	-
MM_TN_TP_02	–	0.35	2.65	–	–	–	–	–
MM_TN_TP_03	–	0.3	2.7	–	–	–	–	–
MM_TN_TP_04	–	0.3	–	–	1.4	–	–	1.3
MM_TN_TP_05	0.4	–	–	–	2.4	–	–	0.2
MM_TN_TP_06	–	0.3	0.5	–	1.8	–	–	0.4
MM_TN_TP_07	–	0.35	0.85	–	–	0.9	0.9	–
MM_TN_TP_09	–	0.35	1.15	–	–	–	–	–
MEAN	0.40	0.34	1.43	0.10	1.92	0.90	0.63	0.88

8.3 TRANSECT ONE: THANET SAND, GRAVEL TERRACE AND HEAD

Overview

83.1 Transect 1 is drawn from six interventions from the north-east to the south-west of the site, at its northern end (Illustration 3). One borehole (MM_TN_BH_05), three CPT pits (MM_TN_CPT_05, 01 and 07) and two test-pit (MM_TN_TP01, MM_TN_TP_05) were monitored and logged by qualified geoarchaeologists. The maximum depth monitored was to 5.5m BGL in MM_TN_BH_05.

Lithology

8.3.2 Fine glauconitic sand was encountered at relatively shallow depths from 2m to 4.3m BGL, (23.66m to 21-36m AOD) in MM_TN_TP_05, MM_TN_TP_01 and MM_TN_BH_05. Overlying this to the west of the transect at MM_TN_TP_05 andMM_TN_BH_05 were orange-brown gravelly sand and gravelly clay units, which are absent from the remaining interventions to the east (MM_TN_CPT_10, 05, 07, MM_TN_TP_01). Here, silty brown clay and flint deposits up to 2m thick were found to overlie the sand and to mantle the entire site, with the thickness generally decreasing to the west of the transect, as seen in MM_TN_BH_05, MM_TN_TP_05). A palaeosol deposit was observed in MM_TN_BH_05 at 1.65m BGL (24.01m AOD) but in no other intervention in this section.

Stratigraphy

8.3.3 The fine glauconitic sand at the base of these sequences is likely to represent the Thanet Sand. The quaternary deposits overlying this unit are shallow, generally terminating at between 2 to 2.5m BGL, apart from in MM_TN_BH_05, where River Terrace deposits are identified to 5.5m BGL (21.36m AOD). The upper 0.5m of the Thanet Sand has, arguably, been subject to modification processes during the Quaternary, and possibly at multiple points in time. This unit was observed to be weathered to different depths, where it was overlain by coarse material at higher elevations (MM_TN_BH_05) and by finer material at lower elevations (MM_TN_TP_01). The Thanet Sand is unlithified, very fine grained and already been subject to a chemical

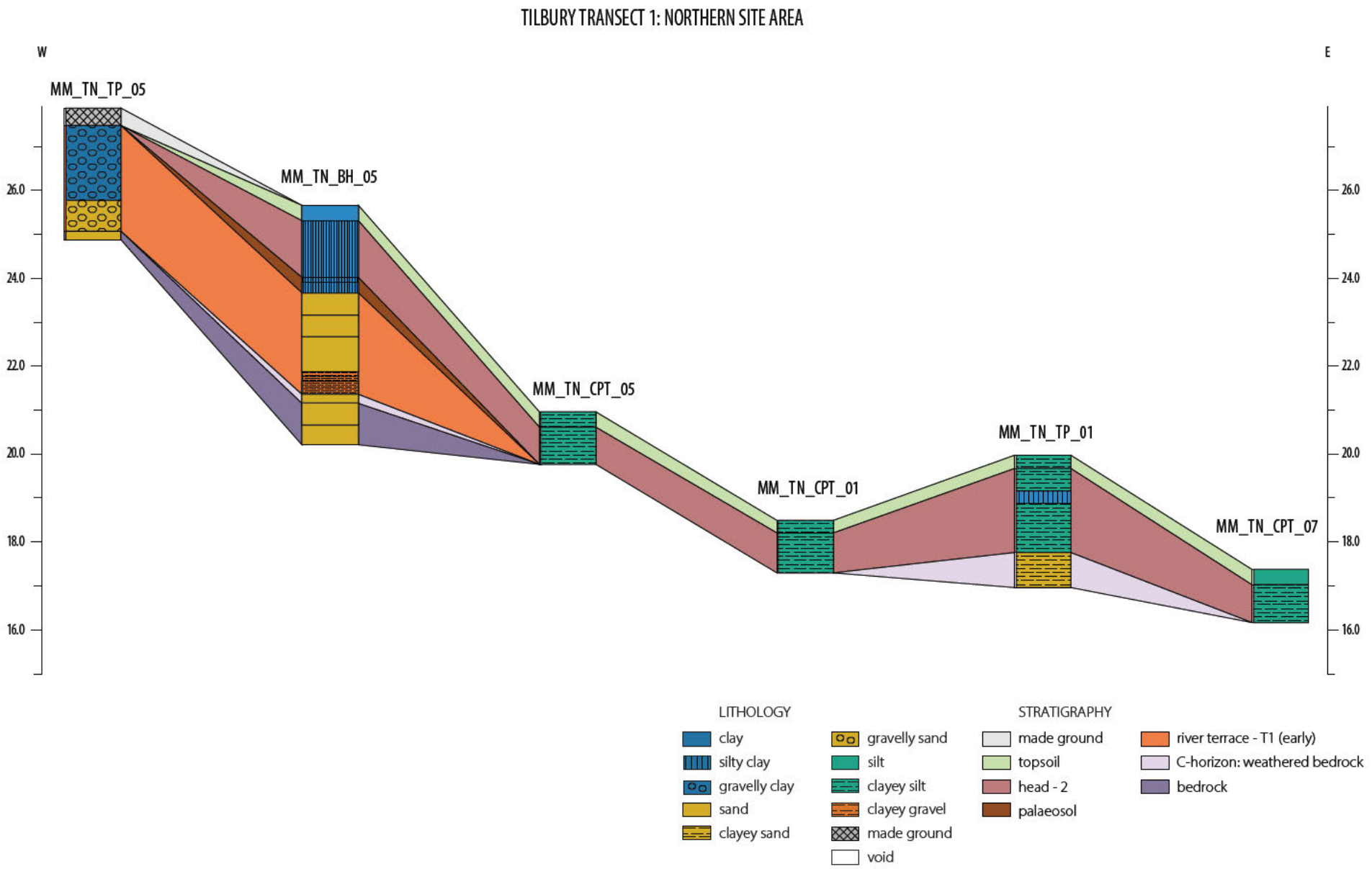

FIG 3 Tilbury Transect 1: Northern Site Area

alteration process. It would therefore be highly susceptible to further alteration or weathering, and this could have occurred after only relatively short exposure times.

8.3.4 At higher elevations to the west of the transect (MM_TN_BH_05, MM_TN_TP_05) the Thanet Sand was overlain by coarse deposits of clayey Tertiary flint gravel and gravelly Tertiary flint clay, with occasional sandy deposits. The texture, elevation and thickness of this unit are consistent with the glaciofluvial-influenced Black Park Gravel, the oldest Thames Terrace deposit. A palaeosol deposit was seen in MM_TN_BH_05 at 1.65–1.75m BGL (24.01 to 23.91m AOD) overlying the coarser units. However, this unit was not found to extend laterally to the neighbouring interventions (MM_TN_TP_05, MM_TN_CPT_05). This unit was situated within, and towards the base of, coarser deposits overlying the Black Park Terrace.

8.3.5 Completing the sequence, a silty brown clay was observed in all interventions within the transect. Its texture, stratigraphic position and changes in thickness with relief are all consistent with a solifluction deposit, or "head". The underlying units (described above) are unlithified and the Thanet Sand, particularly, is fine-grained, thus both would readily mobilise if de-vegetated or otherwise destabilised. It would, therefore, be unwise to assume that the geometry and elevations of the Black Park Gravel, as observed in this transect, are perfectly reflective of the original deposit.

8.4 TRANSECT TWO: THANET SAND, GRAVEL TERRACE, VALLEY FILL AND HEAD

Overview

8.4.1 The transect is drawn from six interventions from the north-west to the south-east of the site, at its centre (illustration 4). Two boreholes (MM_TN_BH_14 and MM_TB_BH_04), two test-pits (MM_TN_TP_04 and MM_TN_TP_02) and two CPT pits (MM_TN_CPT_04 and MM_TN_CPT_07) were monitored and logged by qualified geoarchaeologists. The maximum depth monitored was to 7.5m BGL in MM_TN_BH_04.

Lithology

8.4.2 Very fine glauconitic sand was encountered in three interventions in the north-west of the transect, MM_TN_TP_04, MM_TN_BH_14, MM_TN_BH_04, with the surface of this unit observed at between 1.7 and 7m BGL (24.23m to 13.4m AOD). Overlying this in the west of the transect, and at greater elevation (26.13m to 24.43m AOD to base) were thin orange-brown sand and gravelly clay units (MM_TN_TP_04 and MM_TN_BH_14). In the east, and at lower elevations (19.36 to 16.17 to m AOD), the sequences consisted only of brown silty clay (MM_TN_CPT_04 and MM_TN_CPT_07, MM_TN_TP_02) which was present in all other interventions in the transect. In MM_TN_BH_04, at low elevation (13.8m AOD), the basal glauconitic deposit was overlain by a comparatively deep sequence (3.4m) of sandy deposits (clayey sand, gravelly sand and sandy clay). A palaeosol had formed at a position above these units and is sealed by brown silty clay.

Stratigraphy

8.4.3 The stratigraphic sequence in Transect 2 is similar to that seen in Transect 1, with some caveats. Thanet Sand once again forms the bedrock, as found in the three western-most interventions (MM_TN_TP_04, MM_TN_BH_14, MM_TN_BH_04), and the bedrock surface also slopes steeply eastwards (24.43 to 13.8m AOD). It is likely that Thanet Sand also underlies the ubiquitous brown silty clay ("head") in the three easterly pits (MM_TN_CPT_04, MM_TN_CPT_07, MM_TN_TP_02) but this could not be confirmed due to the shallow depth of the interventions in these locations. The morphology and elevation of the bedrock surface eastwards of MM_TN_BH_04 is therefore unknown, unlike in Transect 1 where it can be superficially inferred to attain a gentler profile with distance eastwards.

8.4.4 Within the Lower Thames, the elevation and geometry of the bedrock surface is of interest to understanding the geology of the region. It signifies fluvial erosion to that level and can be used to constrain the date of the overlying deposits, although the surface architecture is not uniform across the extent of the unit. Moreover, it can show whether those deposits should belong to a particular terrace grouping, which has critical implications for their geoarchaeological potential. As stated earlier, the scheme is located within a dry valley that has been incised through a low plateau (34–30m AOD). Furthermore, both sides of this terrace are mapped as Black Park Gravel by the BGS (2025) which this study potentially corroborates.

8.5 Fluvial down-cutting has evidently occurred in this area after the deposition of the Black Park Gravel. The 7m Quaternary sequence to the Thanet Sand in MM_TN_BH_04 could attain particular significance here, as it might represent a later terrace building cycle that has been buried by solifluction deposits. However, the Boyn Hill Terrace is extensively exposed to the west of the scheme and typically occupies elevations of 29 to 23m AOD. The sandy clay units in MM_TN_BH_04 are lower (19.8 to 13.8m AOD) and are, fundamentally, neither gravelly nor organic-rich. As such, these deposits may represent the oldest water-lain deposits on site (a sandy channel section of the Black Park Gravel) but could, equally, be among the youngest: alluvium belonging the un-named stream that now flows through Linford, deposited at a time of higher surface run-off and when the stream extended further up the valley.

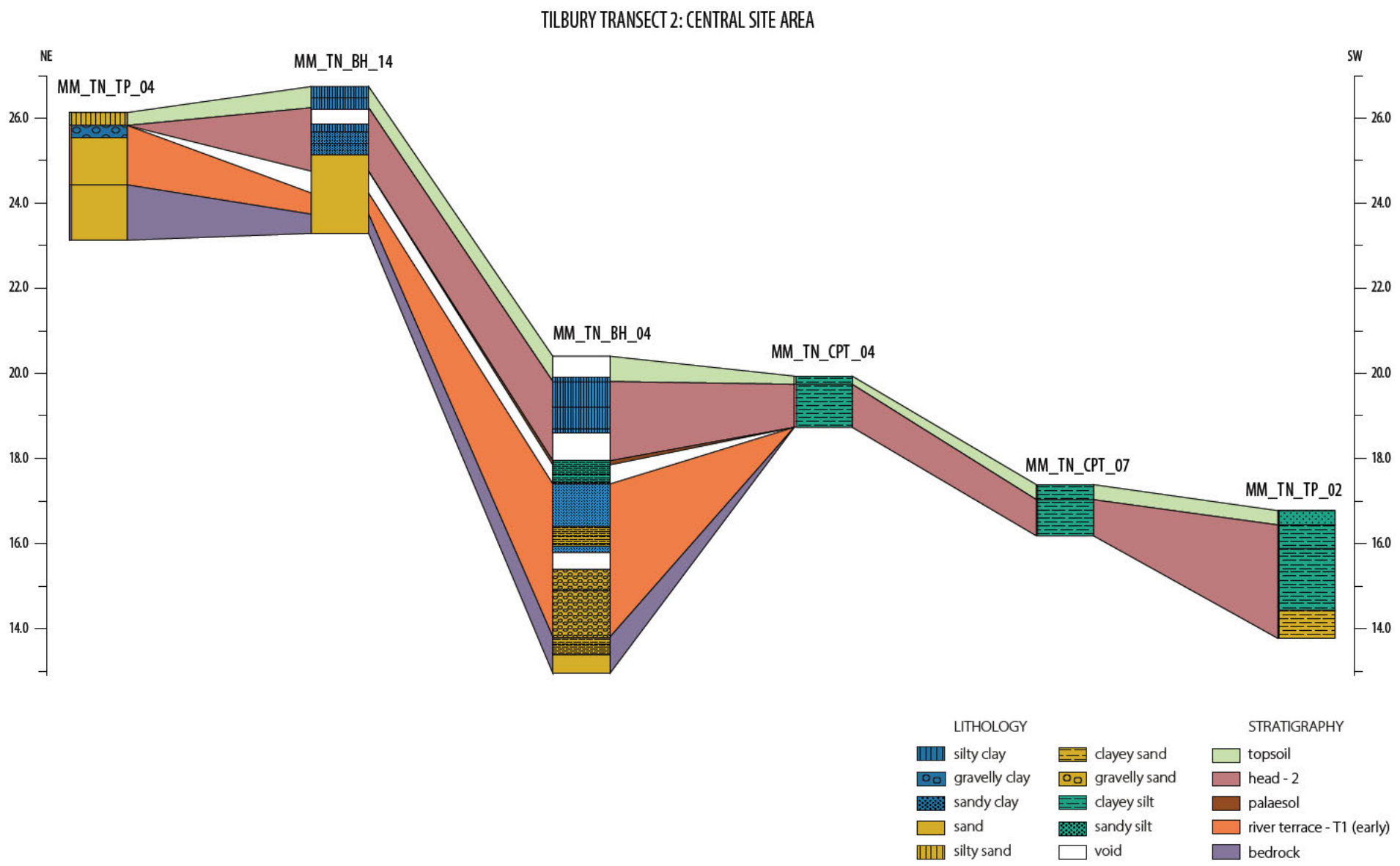

FIG 4 Tilbury Transect 2: Central Site Area

8.5 TRANSECT THREE: THANET SAND, GRAVEL TERRACE, AND HEAD

Overview

8.5.1 The transect is drawn from seven interventions from the north-east to the south-west of the scheme, parallel to the axis of the dry valley (Illustration 5). Four test-pits (MM_TN_TP_06, 07, 03, 01) two CPT pits (MM_TN_CPT_01 and MM_TN_CPT_07) and one infiltration pit (MM_TN_IP_01) were monitored and logged by qualified geoarchaeologists). The maximum depth monitored was to 3m BGL in MM_TN_TP 01, MM_TN_TP_03, MM_TN_TP_06 and MM_TN_TP_07).

Lithology

8.5.2 Very fine glauconitic sand was observed at the base of the sequence in three interventions located at the south-eastern and north-eastern extremes of the transect (MM_TN_TP_06, MM_TN_TP_07 and MM_TN_TP_01), at 19 to 17.7m AOD. In one test pit (MM_TN_TP_06) the glauconitic sand was overlain by a sequence of coarser clayey gravel and sand deposits but was elsewhere overlain by gravelly sand (MM_TN_TP_07) and by silty clay (MM_TN_TP_01). Ultimately, silty clay on which topsoil had formed completed the sequence and was represented in all interventions, and exclusively so in MM_TN_IP_01, MM_TN_CPT_02, MM_TN_TP_03, and MM_TN_CPT_07.

Stratigraphy

8.5.3 The stratigraphy and distribution of deposits in Transect 3 is fundamentally similar that seen in Transects 2 and 1. The coarse deposits (Black Park Gravel) are at relatively greater elevations, have limited lateral extent downslope, and are mantled by a similar thickness of brown silty clay "head" (1–2m). As in Transect 1, the upper surface of the Black Park Gravel has probably been degraded and there is possible evidence of multiple generations of slope movement (MM_TN_TP_06, MM_TN_TP_07.) This supports the interpretation that the palaeosol, as observed in Transects 1 and 2, which occupied a stratigraphic position near to the surface of the coarser deposits, may had formed well after their original deposition.

8.5.4 The overall depth of Quaternary deposits is consistently quite thin (<2.5m) throughout the area. However, as discussed in Transect 2, several interventions (MM_TN_IP_01, MM_TN_CPT_02, MM_TN_TP_07, MM_TN_TP_03) were still too shallow to reach the Thanet Sand bedrock. It was attained on both sides of the dry valley in this transect (MM_TN_TP_06, MM_TN_TP_01) at comparable elevation. As in Transect 1, the bedrock surface evidences a relatively gentle incline between c. 19 to 17m AOD (MM_TN_TP_06 to MM_TN_TP_07). Ultimately, the lack of bedrock altitude data from the intervening interventions does not help to answer the interpretative issues for MM_TN_BH_04, as discussed in Transect 2, nor the extent to which the uneven bedrock surface modelled in Transect 2 reflects the actual surface architecture.

8.6 RELIABILITY

8.6.1 This deposit modelling exercise relies on deposit records collected during the observation and recording of boreholes and trial pits by a qualified geoarchaeologist. Borehole deposits were largely recorded the form of bulks collected during cable percussion drilling. This places some unavoidable limits on the spatial resolution of the modelled outputs and should be borne in mind when considering the results presented and when designing any future purposive geoarchaeology works. Confidence in the results of deposit modelling within a given area is determined largely by the number of interventions, their geographical spread in relation to relevant superficial deposits, and the accuracy of deposit descriptions and interpretations.

8.6.2 Confidence in the deposit modelling produced for this study is good, as the scheme area was quite small with a relatively high density of boreholes and test pits. Results also show a relatively consistent sequence of deposits across the site, which increases confidence in the model.

8.6.3 Several of the sequences logged by the attending geoarchaeologist were available only as disturbed bulk samples, from which limited geoarchaeological descriptions can be made. Contacts between different stratigraphic units and evidence of bedding are likely to be lost in such samples, which can make interpreting the nature of the deposit problematic.

8.6.4 Key deposit types such as palaeosols are additionally difficult to identify in boreholes due to their often fine and fragmentary nature. This should be considered in future works particularly where coarse deposits of Pleistocene date are overlain by fine grained deposits.

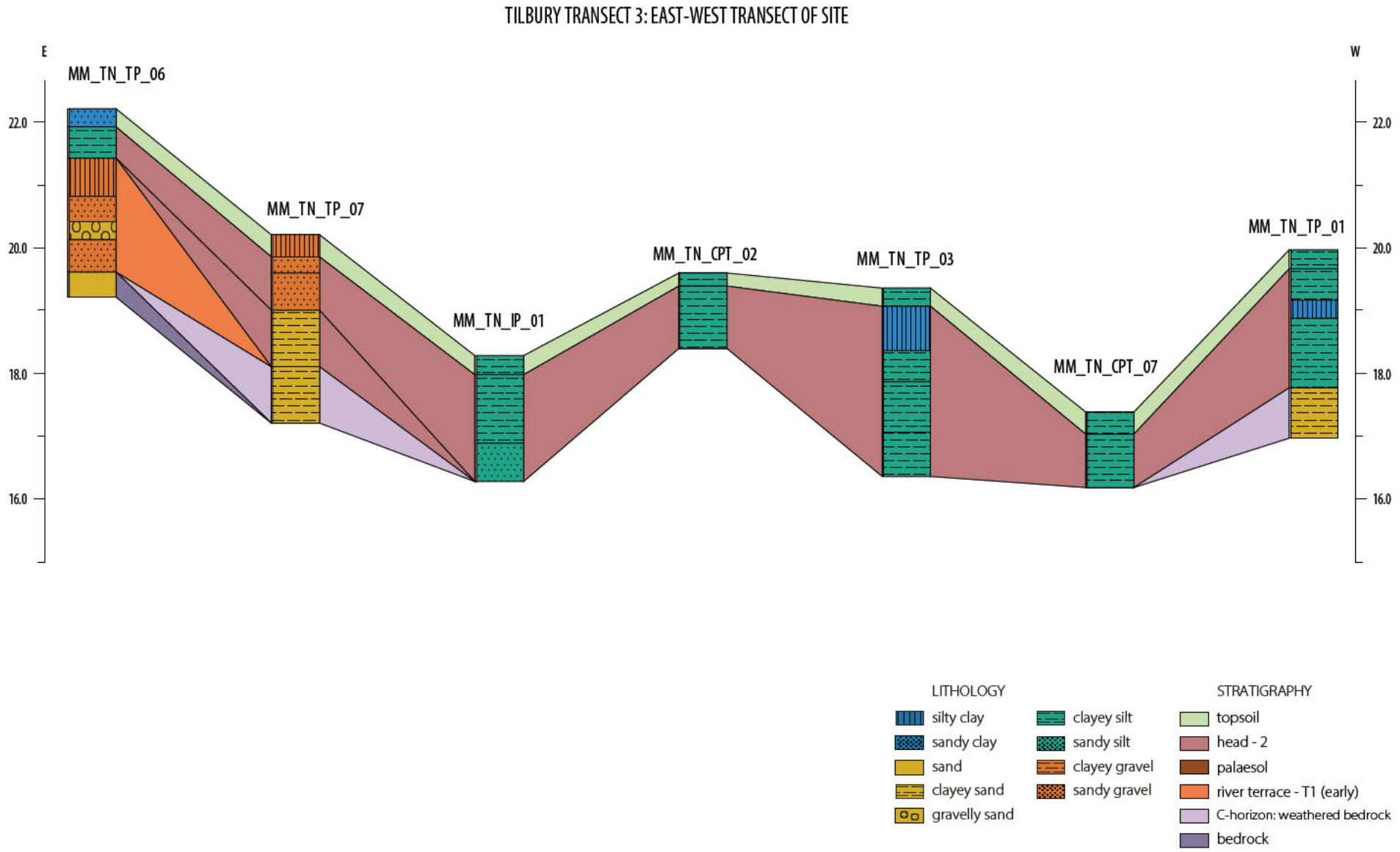

FIG 5 Tilbury Transect 3: East-West Transect of Site

9 SUMMARY

9.1 Geoarchaeological monitoring and recording at Tilbury North revealed a depositional sequence typical for the region (Sumbler, 1996), comprising very shallow surface accumulations of topsoil directly overlying Head across most of the site, with local outcroppings of terrace gravels underlying the topsoil in some locations. Further gravels were recorded beneath head deposits in the north-eastern area of the PDA. Bedrock, where present in the sequence, is the Thanet Sands, which were observed to be weathered in places.

9.2 Head deposits were mapped in all but two of the monitored interventions, MM_TN_TP_04 and MM_TN_TP_05, suggesting that this unit is widely present across the PDA. Head is a mass movement deposit of Pleistocene age and can be highly variable in character depending on the nature of the upslope source material (Fluck *et al*. 2023). Head, whilst not of significant in and of itself, is a reworked deposit which can seal land surfaces that may contain remains of palaeoenvironmental interest as well as Palaeolithic material.

9.3 Weakly developed palaeosols of Pleistocene age were encountered within and buried by head at two locations in the north and east of the PDA (MM_TN_BH_04 and MM_TN_BH_05), largely identified by the presence of preserved calcite-filled root channels. Palaeosols can contain evidence of the environment and climate during the period within which they were formed, which is of particular consequence considering the projected age of the recorded sequence.

9.4 The gravels recorded at MM_TN_BH_04, MM_TN_BH_05, MM_TN_BH_08, MM_TN_BH_14, MM_TN_TP_04, MM_TN_TP05 and MM_TN_TP_06 have been identified in this report as possible outcrops of the Black Park Gravel, the oldest of the Thames Terraces, deposited roughly 400,000 years ago immediately following the retreat of the Anglian Ice Sheet. Locally, there are no known records of artefacts or fossils on the surface of the terrace, and no such remains were observed in the gravels during monitoring. The Black Park Gravel is, however, poorly studied within the wider scheme area and the terrace is known to be highly fragmented between its most westerly (c. Slough) and easterly (the scheme area) mapped surface exposures (BGS 2025).

9.5 Major Palaeolithic discoveries have, however, occurred in the Boyn Hill and Lynch Hill Gravels at Purfleet, Greys, and Thurrock (Bridgland 1994), c. 10km, 5km and 3.5km to the west. The Boyne Hill Gravel extends to the scheme boundary but is not currently recorded in the PDA. Heavily abraded palaeolithic artefacts have been attributed to the Black Park Gravel of the Middle Thames at Wimbledon Common, Hangar Hill and Hillingdon Town (Wymer, 2000).

9.6 All currently known artefacts from the Black Park gravels are significantly abraded and are likely to be reworked. At locations MM_TN_TP_04 and MM_TN_TP-05 in the PDA terrace deposits directly underly topsoil and head deposits are absent. This suggests that the surface of the gravels in these areas is less likely to have been disturbed and presents the greatest potential for the preservation of in situ Palaeolithic material.

10 STATEMENT OF POTENTIAL AND RECOMMENDATIONS FOR FURTHER MITIGATION

10.1 The purpose of this geoarchaeological monitoring was to determine the nature of the superficial geology within the PDA and assess the geoarchaeological and archaeological potential of the depositional sequence. The deposits identified during this work as having geoarchaeological and palaeoenvironmental potential are outlined in Table 10.1.

TABLE 10.1 Archaeological and palaeoenvironmental significance of the main superficial deposits identified across the Scheme

DEPOSIT TYPE	INTERVENTION	GEOARCHAEOLOGICAL POTENTIAL	DESCRIPTION/SIGNIFICANCE
River Terrace Gravel	MM_TN_BH_04, MM_TN_BH_05 MM_TN_BH_08 MM_TN_BH_14 MM_TN_TP_04 MM_TN_TP_05 MM_TN_TP_06	Moderate (surface) Low (body)	Pleistocene: Sands and gravels deposited by fluvial mechanisms under cold climatic conditions that have been subsequently incised through and preserved as former floodplains. They are an important source of Lower and Middle palaeolithic artefacts (usually preserved in non-primary contexts)
Head	MM_TN_BH_04 MM_TN_BH_05 MM_TN_BH_08 MM_TN_BH_14 MM_TN_CPT_01 MM_TN_CPT_02 MM_TN_CPT_03 MM_TN_CPT_04 MM_TN_CPT_05 MM_TN_CPT_07 MM_TN_IP_01 MM_TN_TP_01 MM_TN_TP_02 MM_TN_TP_03 MM_TN_TP_06 MM_TN_TP_07 MM_TN_TP_09 MM_TN_BH_04 MM_TN_BH_05	Low with the potential to cap deposits of high significance	Pleistocene: Poorly sorted slope deposits deposited by solifluction in peri-glacial environments. Has the potential to bury sediments of geoarchaeological and palaeoenvironmental interest and may contain stratified secondary archaeological assemblages.
Buried soil	MM_TN_BH_04 MM_TN_BH_05	Moderate to High	Potential for understanding climate and environment during the Pleistocene.

10.2 Subsequent mitigation should focus upon extending the depth of sequences recorded during monitoring and establishing the spread of superficial deposits across the PDA. Machine-excavated pits were taken to a maximum depth of 3m BGL which failed, in many cases, to capture the interface between the superficial and bedrock deposits. Drilling of additional rotary boreholes may capture further deposits of significance at the site dating to the Pleistocene and help to establish the depth of this interface across a larger area. Specific mitigation recommendations are outlined below:

- The topsoil recorded at the site is of LOW geoarchaeological potential. No evidence of any anthropogenic input, either redeposited or in situ, was observed during monitoring and no archaeological artefacts were observed. No further mitigation works are recommended for these deposits.

- Head deposits recorded at the site are of LOW geoarchaeological potential in themselves but have the potential to contain deposits of HIGH geoarchaeological and palaeoenvironmental significance, such as buried land surfaces and palaeolithic remains. Targeted mitigation of these deposits is not suggested.

- Buried land surfaces (palaeosols) encountered at 1.65 and 2.45m BGL in MM_TN_BH_05 and MM_TN_BH_04 are of MODERATE to HIGH geoarchaeological potential as these deposits can yield valuable information on climate and environment during the Pleistocene. A targeted borehole survey consisting of 4-no boreholes up to 5m BGL using a tracked window sampler is recommended, with the aim of recovering sleeved cores for palaeoenvironmental assessment and dating.

- The surface of the Black Park Terrace in the PDA is considered to be of MODERATE geoarchaeological potential as there is the potential for Palaeolithic material and buried soils to be preserved. Whilst there is the possibility that lithic remains may not be in situ, this material still provides evidence for human activity and environment during the Pleistocene. Due to the shallow surface of the gravels identified at MM_TN_TP_04, MM_TN_TP_05 and MM_TN_TP_06, between 0.3 and 0.8m BGL, a targeted palaeolithic test pitting evaluation is recommended to conform the presence or absence of Palaeolithic material and other deposits of archaeological and geoarchaeological interest on the surface of the gravels. Mapping of the gravel surface using data gathered during test pitting will also add to our understanding of the topography of the Black Park Terrace within the PDA.

- The gravel body itself considered to be of LOW geoarchaeological potential, and further examination of these deposits is unlikely to yield material of geoarchaeological or archaeological significance. No further mitigation is suggested.

10.3 During further mitigation, a targeted programme of OSL profiling is recommended to establish a chronology for the sands and gravels recorded during monitoring.

10.4 It is recommended that any subsequent GI works undertaken at the site be monitored by a suitably qualified geoarchaeologist and the results added to the deposit model produced in this report.

10.5 A summary of this report should be included in any future publications of geoarchaeological data from the site. It is suggested that further publications of site data are made open access due to the value of this data to the wider archaeological community.

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12 GLOSSARY OF SPECIALIST TERMS

Alluvium Alluvial deposits are unconsolidated material (clay, silt, sand and gravel) deposited by running water e.g. rivers or streams. Material may be sorted or semi-sorted in a stream bed or its floodplain, and gravels are generally rounded.

Bedrock Geology This is sometimes called solid geology. It is the main mass of rocks that form the Earth. The British Geological Survey (BGS) refers to everything older than 2.6 million years as bedrock.

Clast A single constituent part of a sediment deposit produced by fragmentation of a larger part (e.g. gravel).

Clastic Sediments *Detrital sediments* that are formed of broken rocks (clasts) or sometimes shell fragments, that have been eroded, transported and then redeposited at a new location. They are common in *littoral zones* where significant redeposition occurs. Particle sizes can range from silt to boulder.

Colluvium Colluvial material or hillwash is unconsolidated material (silt, sand, gravel, and rock) that has been deposited at the base of a hillslope by processes like rainwash and downslope soil creep (erosion and gravity). Material is generally poorly sorted, and gravels are generally angular. May cap paleosols and important paleoenvironmental deposits.

Detrital sediments Fragmented rocky material produced by weathering and then transported from its original site.

Head Unsorted, and generally very consolidated mix of material (clay, silt, sand gravels and boulders) deposited by mass movement.

Holocene The current geological period, beginning 11.7 ka BP. The Holocene has been subdivided into three geological ages. The Greenlandian is the earliest age of the Holocene epoch (11.7–8.2 ka BP); this is followed by the middle Holocene age called the Northgrippian (8.2–4.2 ka BP), and then the Meghalayan (4.2 ka BP to present).is the second Quaternary period epoch.

Landscape All the visible features of an area of land, its landforms both natural and man-made.

Last Glacial Maximum (LGM) The coldest part of the Last Glacial Period (Devensian) when ice sheets were at their greatest extent, in the UK this was between 27–18.5 ka BP.

Last Glacial Period / Devensian This is also called the Devensian Glaciation (in the UK), and was the most recent phase of glaciation to have occurred in Britain, covering the period of 115–11.7 ka BP. It had fluctuating interstadial periods (less cold) and stadial periods (cold periods), with the most significant cool period and maximum ice sheet advance occurring in the Late Devensian. The glacial period followed the Ipswichian Interglacial.

Paleosol An ancient soil formed on a past landscape, that has been buried by later sediments such as flood deposits, river terraces, landslides or further soil profiles. They can also be exposed be later erosion of the overlying sediments.

Palaeochannel An abandoned fluvial channel – either a river or a stream – that has been infilled with later sediments.

Peat A brown to black deposit formed of fibrous partially decomposed organic matter that has accumulated in a waterlogged, anoxic environment. It can rapidly form under cool, humid conditions that have been common in the post-glacial British climate.

Pleistocene The Pleistocene epoch occurred between 2.58 Ma to 11.7 ka BP, it was dominated by cycles of glacial and interglacial periods. This was the first Quaternary period epoch.

Quaternary period: The most recent geological period from 2.58 Ma to present, including both the *Pleistocene* epoch (2.58 Ma to 11.7 ka BP), and the *Holocene* epoch (11.7 ka BP to present).

Regression A fall in *relative sea level*.

Relative Sea Level The height of the sea relative to a particular location, it is affected by both *isostasy* and *eustasy*.

Soil The unconsolidated mixture of organic matter, minerals, gas, water, and organisms in which plants grow.

Superficial Geology The looser surface material. The British Geological Survey (BGS) refers to all geologically recent (*Quaternary:* 2.6 Ma to present) deposits as superficial deposits.

Transgression A rise in *relative sea level.*

Water lain deposits These are deposited directly in water e.g. lakes, ponds, estuaries, the sea. They are distinct from alluvium and are described by the environment they were deposited in.

13 APPENDICES

APPENDIX 1 GEOARCHAEOLOGICAL LOGS

GUIDE TO SIZES AND ABBREVIATIONS USED IN LOGS

SAND		GRAVELS	
F	fine grains (<0.25mm)	F	Fine pebble clasts (4–8mm)
M	medium grains (0.25–0.50mm)	M	Medium pebble clasts (8–16mm)
C	coarse grains (0.50–1.0mm)	C	Coarse pebble clasts (16–32mm)
Granules	very coarse sand to very fine pebble clasts (1–4mm)	VC	Very coarse pebble clasts (32–64mm)

COBBLES	BOULDERS
Clasts 64–256mm	Clasts larger than 256mm that are separate from the bedrock

ANGULARITY-ROUNDNESS INDEX FOR CLASTS

VA	Very Angular
A	Angular
SA	Sub-Angular
SR	Sub-Rounded
R	Rounded
VR	Very Rounded

Table 13.1 MM_TN_TP_01 Test Pit log

MM_TN_TP_01					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	19.972
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	566473.784
				NORTHING	180216.297
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown clayey silt with frequent clasts of flint. Flints are Tertiary and non-Tertiary flints. Non-Tertiary flints 1-6cm, rounded to sub-angular/rolled. Occasional struck flakes, CBM and roots. Loose and unconsolidated. Structureless Abrupt transition.	Topsoil	–	–
0.30	0.80	Yellowish red to reddish brown coarse sandy clay-silt. Some clasts rounded to sub-angular and rolled, <4cm mainly flint. Structureless and pliable. Diffuse transition.	Head - 2	–	Pleistocene
0.80	1.10	Yellowish red to reddish brown coarse sandy silty clay. Some small angular, sharp flints 2-5mm in size. Occasional rounded Tertiary flints. Soft, structureless and pliable. Diffuse transition.	Head - 2	–	Pleistocene
1.10	2.20	Yellow brown to red brown sandy clay-silt. Large flint nodules up to 6cm in size in places. Sub-angular and sharp to rolled. Tertiary flint also present. Firm and compact. With depth clearly bedded with patches of clast free clay-silt and clayey very coarse sand. Abrupt transition.	Head - 2	One possible heavily rolled blade like flint	Pleistocene
2.20	3.00	Brown to reddish-brown becoming yellow with depth very fine sand with some clay. Structureless and very soft. Occasional small Tertiary flints. Sequence of colluvial sediments of probable Pleistocene age on top of weathered Thanet Sand.	C-horizon: weathered bedrock	–	–

FIG 13.1 MM_TN_TP_01

TABLE 13.2 MM_TN_TP_02 Test Pit log

MM_TN_TP_02					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	16.78
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	566347.959
				NORTHING	180147.369
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown slightly sandy silt. Occasional small angular flint clasts (<3cm), occasional struck flakes, red CBM, burnt flint and charcoal. Loose and structureless. Abrupt Transition	Topsoil	–	Holocene
0.50	0.90	Red brown slightly sandy clay-silt. Soft and unconsolidated. Occasional small flint clasts, <1cm, and sub-angular in shape. Occasional small chalk clasts. Structureless. Diffuse Transition	Head - 2	–	Pleistocene
0.90	2.35	Yellow brown clay-silt with some possible charcoal flecks near the top. Compact and structureless. Sand content appears to increase with depth. Slightly blocky texture at the top. Manganese staining common to a depth below 1.70m. Empty root canals both fine and large present. Diffuse Transition	Head - 2	–	Pleistocene
2.35	3.00	Yellow brown sandy clay silt to clayey sand. Very soft and pliable. Occasional small patches of diffuse carbonate. Structureless.	Head - 2	–	Pleistocene

FIG 13.2 MM_TN_TP_02

TABLE 13.3 MM_TN_TP_01 Test Pit log

MM_TN_TP_03					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	19.365
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	566313.174
				NORTHING	180219.941
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark grey brown, very clayey friable silty topsoil with infrequent pebbles (5%; SR–R, 10-15mm, up to 30-40mm, black + bleached and weathered flint. Abrupt transition	Topsoil	–	Holocene
0.30	1.00	Mid orange-brown grey tinged very silty clay with very rare (1%) small pebbles (bleached flint, SA, 6–7mm), finely rooted. From 0.50m, rarely rooted and only very infrequent granules (<1mm, SR) and occasional, very diffuse grey patches. Gradational transition	Head - 2	–	Pleistocene
1.00	1.50	Light grey-brown very firm and friable very clayey slightly sandy (FM) silt with fine rootlets throughout. Very rare granules (chalk 1-2mm, SR, and flint, 1-2mm, SA, bleached). Very weakly fissile (2–4mm thick). Gradational transition	Head - 2	–	Pleistocene
1.50	2.30	Light grey, clayey, slightly sandy (F) silt with frequent very light grey CaCO3 deposits (c. 3–4mm long pseudo-laminations, root-channel fills), and rare light orange sandy lenses (F). Weakly fissile, dry, friable. Gradational transition.	Head - 2	–	Pleistocene
2.30	3.00	Light grey-brown, slightly clayey silt with trace fine sand and occasional CaCO3 deposits. Very rare R pebbles @ 2.8–3m. Friable.	Head - 2	–	Pleistocene

FIG 13.3 MM_TN_TP_03 3m BGL

TABLE 13.4 MM_TN_TP_04 Test Pit log

MM_TN_TP_04					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	26.13
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	566173.09
				NORTHING	180257.213
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown, silty sandy (M) topsoil with occasional (5%) pebbles (R-SR, 10–25 and 40–50mm). Dry.	Topsoil	–	Holocene
0.30	1.00	Mid brown-orange (grey-tinged), very silty gravelly clay (20%) with trace sand (F). Typically pebbles (R-SR, 25–35mm black Tertiary flint and SA, 20-30mm to 30-40mm, white / patinated flint.) @ transition (0.6m) frequent S pebbles (30–40mm, SR -R). Sharp, slightly undulating, erosive contact.	River Terrace -T1 (early)	–	Pleistocene
1.00	1.50	Pale orange-brown, very fine sand. @ 0.6–0.7m Diffuse light gray mottles and c. 1 X 5 - 10cm vertical channels with light grey, clayey-silt fill. Afterwards, light grey-brown groundmass with diffuse orange mottles. Abrupt contact	River Terrace -T1 (early)	–	Pleistocene
1.50	2.30	Very pale grey-green, very fine sand with occasional pale orange-brown mottles.	Bedrock	–	Pre-Quaternary

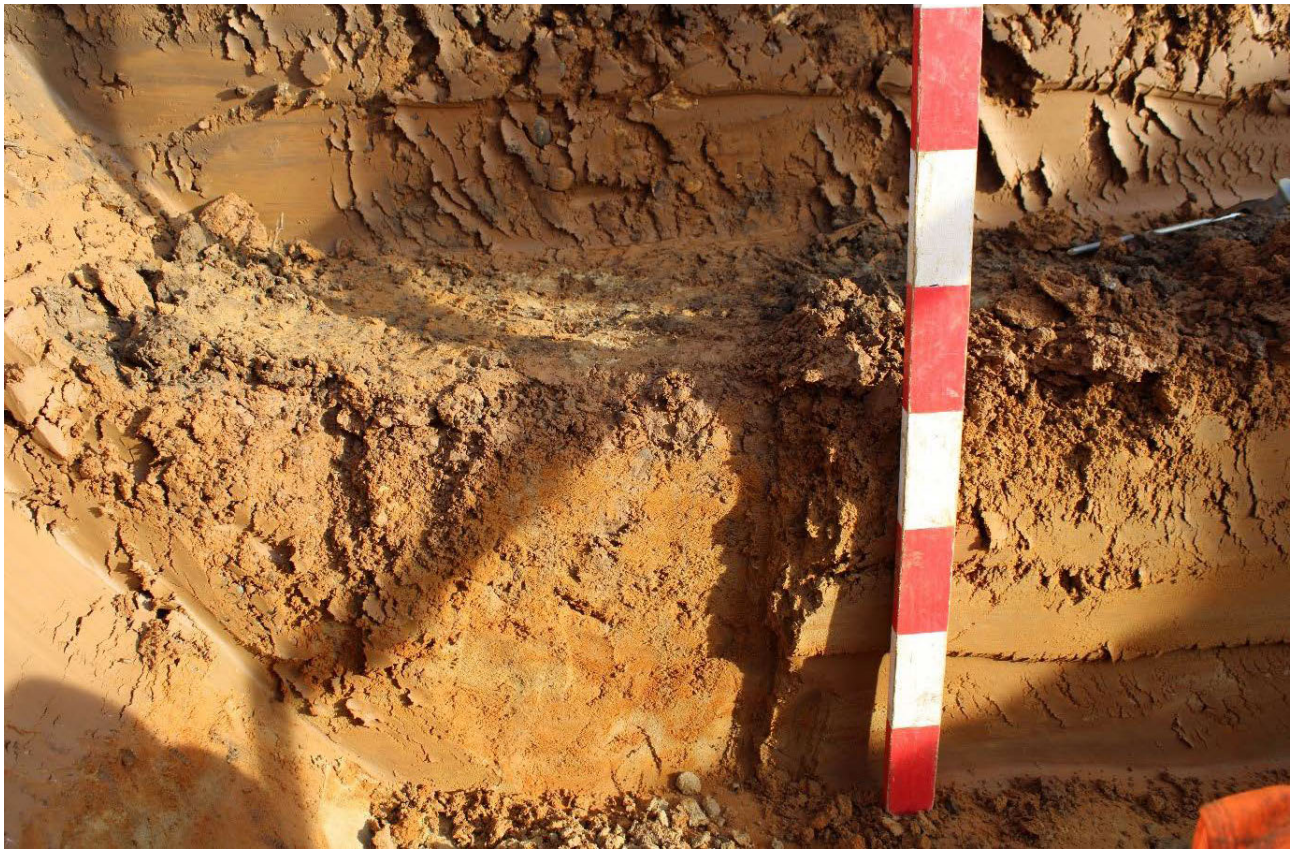

FIG 13.4 MM_TN_TP_04 1m BGL

TABLE 13.5 MM_TN_TP_05 Test Pit log

MM_TN_TP_05					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	27.866
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	566221.243
				NORTHING	180338.729
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.40	Topsoil / made ground.	Made Ground	–	Holocene
0.40	2.10	Sandy gravelly clay	River Terrace -T1 (early)	–	Pleistocene
2.10	2.80	Dark brown clayey very gravelly sand	River Terrace -T1 (early)	–	Pleistocene
2.80	3.00	Light grey very fine sand	Bedrock	–	Pre-Quaternary

FIG 13.5 MM_TN_TP_05 Sample 2.1 to 2.2m BGL

TABLE 13.6 MM_TN_TP_05 Test Pit log

MM_TN_TP_06					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	22.22
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	565905.342
				NORTHING	–
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown, slightly sandy, clayey topsoil with rare pebbles (30-40mm, SR). Friable. Abrupt transition.	Topsoil	–	Holocene
0.30	0.80	Light brown-orange, very clayey silt with occasional pebbles (50-60mm, R-SR, black Tertiary flint). Abrupt, uneven transition (@ c. .80m in E @ .95m in W).	Head -2	–	Pleistocene
0.80	1.40	Clast-supported gravel (70%) with orange-brown, clayey silt matrix (slightly sandy). Well-graded: mostly R-SR, 20–25m and 30–40mm, rarely 60–80mm. From 1.10m, matrix sandy (MC) with rare A-SA pebbles (10-15mm) and granules (<1.5mm, A-SA). Gradational transition.	River Terrace -T1 (early)	–	Pleistocene
1.40	1.80	Clast supported gravel (80%) with orange-brown slightly clayey sand matrix (C.) Typically granules (A-SA, 1–2mm) and M-L pebbles (50–60mm.). Abrupt transition.	River Terrace -T1 (early)	–	Pleistocene
1.80	2.10	Yellow-brown gravelly sand (C; 10% gravel). Granules (R, c.1mm) and pebbles (30-40mm) of black Tertiary flint. Loose. Abrupt transition.	River Terrace -T1 (early)	–	Pleistocene
2.10	2.60	Clast supported gravel (80%) with dark brown, slightly clayey sand matrix. Typically pebbles (R-VR, 40–50mm / SA, 15–25mm). Rarely 60-70mm, A-SA. Abrupt transition.	River Terrace -T1 (early)	–	Pleistocene
2.6	3.00	Light grey-green, very fine sand with diffuse orange-brown mottling.	Bedrock	–	

FIG 13.6 MM_TN_TP_06 3m BGL

TABLE 13.7 MM_TN_TP_07 Test Pit log

MM_TN_TP_07					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	22.02
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI				**EASTING**	565925.325
				NORTHING	180031.417
				DEPTH (M)	3.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown sandy silty gravel. Clasts 1-4cm, very well rounded. Very loose and unconsolidated. Abrupt Transition	Topsoil	–	Holocene
0.35	0.60	Yellowish brown sandy gravel. Matrix supported with medium to coarse sand matrix. Clasts 1-6cm, very well rounded. Occasional large nodules of tabular flint. Loose and unconsolidated. Reworked glacio-fluvial gravels through solifluction in Pleistocene.Gradational Transition.	Head -2	–	Pleistocene
0.60	1.20	Yellowish brown very sandy gravel. Matrix supported with medium to coarse sand matrix. Clasts 1-6cm, very well rounded. Occasional large nodules of tabular flint. Loose and unconsolidated. Reworked glacio-fluvial gravels through solifluction in Pleistocene. Sharp Transition	Head -2	–	Pleistocene
1.20	2.10	Yellow to greenish yellow medium to fine sand with some clay. Moderately compact and firm. Possibly bedded, very rare Tertiary flints present. Weathered top of Thanet Sand or soliflucted Thanet Sand? Diffuse Transition	Head -1	–	Pleistocene
2.10	3.00	Yellow to greenish yellow medium to fine sand with some clay. Becomes greyer towards the base. Moderately compact and firm. Possibly bedded, very rare Tertiary flints present. Weathered top of Thanet Sand?	C-horizon: weathered edrock	–	–

FIG 13.7 MM_TN_TP_07

TABLE 13.8 MM_TN_TP_09 Test Pit log

MM_TN_TP_09					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	22.133
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: TEST PIT REASON FOR MONITORING: GI NOTES: TEST PIT PARTIALLY DOWN SLOPE INTO DRY VALLEY. SEQUENCES ALL LOOK LIKE SLOPEWASH SEDIMENTS. COMPACTION, COLOUR AND THE PRESENCE OF PRECIPITATE MAKES IT LOOK LIKE FROM IN THE PLEISTOCENE. VERY SIMILAR TO SOME OF THE SEQUENCES SEEN IN EBBSFLEET DATED TO THE DEVENSIAN. AGE UNKNOWN. NO BIOLOGICAL MATERIAL PRESENT. PLEISTOCENE SEDIMENTS NOT BOTTOMED.				**EASTING**	566096.45
				NORTHING	180142
				DEPTH (M)	1.50
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Mid brown clay-silt with occasional flint clasts. Clasts are <2cm, sub-angular and rolled. Structureless and unconsolidated. Abrupt Transition	Topsoil	–	Holocene
0.35	0.60	Mid yellowish brown clay-silt with occasional black Mn flecks. Occasional very small flint clasts (<3mm), angular and sharp. Structureless and compact. Possible Pleistocene colluvium (cold climate?) Diffuse Transition	Head -2	–	Pleistocene
0.60	1.40	Mid yellowish brown clay-silt with some sand, possibly becoming sandier with depth. Occasional black Mn flecks. Occasional very small flint clasts (<3mm), angular and sharp. Structureless and compact. Possible Pleistocene colluvium (cold climate?). Abrupt Transition	Head -2	–	Pleistocene
1.40	1.50	Yellow-brown silt with some sand. Common rounded Tertiary flints (black, <3cm) as well as some angular, rolled flints (<4cm). Compact and firm. Common white carbonate precipitate in root canals/weathering cracks. Possible Pleistocene colluvium (cold climate?) with soil formation in secondary context	Head -2	–	Pleistocene

FIG 13.8 MM_TN_TP_09

TABLE 13.9 MM_TN_TP_01 Test Pit log

MM_TN_IP_01					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	18.283
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: INSPECTION PIT REASON FOR MONITORING: GI				**EASTING**	566137.426
				NORTHING	180104.079
				DEPTH (M)	2.00
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown slightly sandy clay-silt. Common Tertiary flints (<2cm), sub-angular flints (<2cm), some chalk clasts. Very loose and unconsolidated. Common roots. Abrupt Transition	Topsoil	–	Holocene
0.30	1.40	Yellow brown sandy clay-silt. Very firm and compact. Very rare Tertiary flints, occasional very small yellow to white coloured flints of sub-angular shape. Structureless. Colluvium? Pleistocene. Diffuse Transition	Head -2	–	Pleistocene
1.40	2.00	Yellow brown sandy silt. Some calcium carbonate in roots and as diffuse patches. Friable texture but structureless. Colluvium, ?Pleistocene, probably subject to weathering and pedogenic processes	Head -2	–	Pleistocene

FIG 13.9 MM_TN_IP_01, 1.50mbgl

TABLE 13.10 MM_TN_CPT_01 Test Pit log

MM_TN_CPT_01					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	18.501
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566411.136
				NORTHING	180249.42
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (<3cm) sub-angular flint clasts and Tertiary flints. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.30	1.20	Red brown to yellow brown sandy clay-silt. Firm to very firm and compact. No structure. Occasional very small flint clasts (2-4mm), sub-angular in shape and heavily rolled.	Head -2	–	Pleistocene

FIG 13.10 MM_TN_CPT_02, inspection pit at 1.20mbgl

TABLE 13.11 MM_TN_CPT_02 Test Pit log

MM_TN_CPT_02					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	19.594
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566223.727
				NORTHING	180178.642
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.20	Dark brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (<3cm) sub-angular flint clasts and Tertiary flints. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.20	1.20	Red brown to yellow brown sandy clay-silt. Firm to very firm and compact. No structure. Occasional very small flint clasts (2-4mm), sub-angular in shape and heavily rolled.	Head -2	–	Pleistocene

TABLE 13.12 MM_TN_CPT_03 Test Pit log

MM_TN_CPT_03					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	17.296
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566286.209
				NORTHING	180151.72
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.30	Dark brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (<1cm) sub-angular flint clasts. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.30	1.20	Yellow brown clay-silt with some sand. Firm to very firm and compact. Occasional black manganese flecks. No structure. Occasional very small flint clasts (1-2cm), sub-angular in shape and heavily rolled. Possible increase in sand content with depth	Head -2	–	Pleistocene

FIG 13.11 MM_TN_CPT_03, inspection pit at 1.20mbgl

TABLE 13.13 MM_TN_CPT_04 Test Pit log

MM_TN_CPT_04					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	19.936
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566308.645
				NORTHING	180233.926
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.20	Dark brown to grey brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (<0.5cm) sub-angular flint clasts. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.20	1.20	Yellow brown clay-silt with some very coarse sand. Firm to very firm and compact. No clear structure, possibly some remnant bedding. Occasional very small flint clasts (<0.5cm), sub-angular in shape and heavily rolled.	Head -2	–	Pleistocene

FIG 13.12 MM_TN_CPT_04, inspection pit at 1.20mbgl

TABLE 13.14 MM_TN_CPT_05 Test Pit log

MM_TN_CPT_05					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	20.961
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566395.913
				NORTHING	180318.176
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (<3cm) sub-angular flint clasts. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.35	1.20	Red brown to yellow brown sandy clay-silt. Firm to very firm and compact. No structure. Occasional very small flint clasts (2-4mm), sub-angular in shape and heavily rolled.	Head -2	–	Pleistocene

TABLE 13.15 MM_TN_CPT_07 Test Pit log

MM_TN_CPT_07					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	17.378
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: PIT FOR CONE PENETRATION TESTING REASON FOR MONITORING: GI				**EASTING**	566403.725
				NORTHING	180171.793
				DEPTH (M)	1.20
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown slightly sandy clay-silt. Loose and unconsolidated. Occasional small (0.5-3cm) sub-angular flint clasts. Roots and straw. Structureless. Abrupt Transition	Topsoil	–	Holocene
0.35	1.20	Red brown to yellow brown sandy clay-silt. Firm to very firm and compact. No structure. Occasional very small flint clasts (<cm), sub-angular in shape and heavily rolled.	Head -2	–	Pleistocene

FIG 13.13 MM_TN_CPT_07

TABLE 13.16 MM_TN_BH_04 Test Pit log

MM_TN_BH_04					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	20.401
LOGGER: MB				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TIPE: CABLE PERCUSSION BOREHOLE REASON FOR MONITORING: GI				**EASTING**	566325.668
				NORTHING	180256.331
				DEPTH (M)	7.45
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.50	0.60	Dark slightly greyish brown silty clay soil with very rare (1%) small pebbles (3–4mm, SR).	Topsoil	–	Holocene
0.60	1.20	Mid-brown orange very silty, very firm clay. Very dry and friable. Rooted. Very rare granules (chalk, <1mm).	Head -2	–	Pleistocene
1.20	1.70	Dark brown-orange, grey-mottled, friable silty clay. Rooted, slightly damp, with very rare granules (2-3mm, SR).	Head -2	–	Pleistocene
1.70	2.45	Dark orange brown, very silty, very firm clay with very diffuse greyish tinge and very rare gravel granules (2-3mm, SR).	Head -2	–	Pleistocene
2.45	3.00	Mid orange-brown, grey-tinged, very clayey silt with trace fine sand and occasional granules (1-2mm, SASR). Frequent CaC03 deposits filling root channels (3-4mm L). Friable and dry.	Palaeosol	–	Pleistocene
3.00	4.00	Dark grey-brown, firm, very silty sandy (FM) clay.	River Terrace -T1 (early)	–	Pleistocene
4.00	4.450	Dark yellow-brown, slightly clayey sand (MC) with occasional diffuse orange-brown mottles (Fe?) and occasional granules (c. 10% |<1.5mm, SR.)	River Terrace -T1 (early)	–	Pleistocene
4.45	4.60	Pale grey, orange-mottled very sandy (FM) clay with very occasional granules (5%, <1.5mm) and very rare small pebbles (black Tertiary flint, R, 20-30mm and bleached flint, SR, 20–25mm).	River Terrace -T1 (early)	–	Pleistocene
5.00	5.50	Mid yellow-brown, slightly clayey, gravelly sand (MC; c.15% gravel). Rare granules (<1.5mm) with occasional SM pebbles (30-40mm, SR and R) and c. 50mm R pellets of pale greenish-grey clay.	River Terrace -T1 (early)	–	Pleistocene
5.50	6.50	Mid brown slightly clayey gravelly sand (M, c. 30% gravel. Predominantly granules (1–2mm, black SR-R and white A-SA) and M pebbles (30–40mm, up to 60-70mm).	River Terrace -T1 (early)	–	Pleistocene
6.50	6.60	Mid brown-orange, slightly clayey fine sand with rare granules (2%, <1.5mm).	River Terrace -T1 (early)	–	Pleistocene
7.00	7.45	Pale grey-green silty very fine sand, with diffuse orange-brown mottling.	Bedrock	–	Pre-quaternary

FIG 13.14 MM_TN_BH_04 4 to 4.45m BGL

TABLE 13.17 MM_TN_BH_05 Borehole log

MM_TN_BH_05					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	25.662
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: ABLE PERCUSSION BOREHOLE REASON FOR MONITORING: GI				**EASTING**	566289.164
				NORTHING	180358.897
				DEPTH (M)	5.45
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown, friable, clayey topsoil. Rooted and dry.	Topsoil	–	Holocene
0.35	1.65	Mid brown-orange silty clay with rare gravel (3-4mm, A-SA, bleached flint.) Dry and rooted.	Head -2	–	Pleistocene
1.75	2.00	Approximate – upcast. Abrupt transition from CaCO3 rich silty clay to loose yellow sand (FM).	Head -2	–	Pleistocene
2.00	2.50	Pale grey-yellow sand (FM) with trace VF sand. Dry and loose.	River Terrace -T1 (early)	–	Pleistocene
2.5	3.00	Mid yellow-brown heterolithic sand (MF) with trace VF sand, and rare granules (<1.5mm, A-SA).	River Terrace -T1 (early)	–	Pleistocene
3.00	3.80	Mid yellow-brown heterolithic sand. Abrupt transition to mid-grey sandy clay (MF) with occasional pebbles (20-25mm, A-SA flint) and light orange-brown sand bands (2-3mm T). Dense, well-developed Fe staining and rare CaCO3 deposits.	River Terrace -T1 (early)	–	Pleistocene
3.80	4.00	Clast-supported gravel (90% G) with yellow-brown sandy (MF) clay matrix. Gravel mostly M pebbles (30-40mm, SR-R black Tertiary flint and SA-A flint). Also occasional sandy clay pellets (R, c. 50mm).	River Terrace -T1 (early)	–	Pleistocene
4.00	4.30	Yellow-brown slightly sandy clayey gravel. Sharp transition.	River Terrace -T1 (early)	–	Pleistocene
4.30	4.50	Pale grey-green sand (VF) with yellow mottling.	C-horizon: weathered bedrock	–	Pre-quaternary
4.50	5.00	Pale grey-green sand (VF).	Bedrock	–	Pre-quaternary
5.00	5.45	Pale grey-green sand (VF) with diffuse light-brown staining.	Bedrock	Pre-quaternary	Pre-quaternary

FIG 13.15 MM_TN_BH_05 1.65 to 1.75m BGL

TABLE 13.18 MM_TN_BH_08 Borehole log

MM_TN_BH_08					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	20.401
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: ABLE PERCUSSION BOREHOLE REASON FOR MONITORING: GI				**EASTING**	566325.668
				NORTHING	180256.331
				DEPTH (M)	6.45
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.00	0.35	Dark brown, friable, silty clay topsoil, with rare pebbles and 20th C. ceramic fragments. Rooted and dry.	Topsoil	–	Holocene
0.35	1.20	Mid orange brown, slightly sandy silty clay with rare small pebbles (15-20mm, R). Rooted, dry and friable.	Head -2	–	Pleistocene
1.20	2.00	Light grey brown silty clay with rare granules (1.5mm, SA) and brown-orange Fe staining. Upcast: mid orange brown silty clay with grey clayey patches and occasional pale grey, very plastic CaCO3 deposits.	Head -2	–	Pleistocene
2.00	2.45	Light brown silty clay with very diffuse orange-brown mottling and infrequent black speckles (charcoal?)	Head -2	–	Pleistocene
2.45	3.00	Light brown-grey silty clay with trace sand.	Head -2	–	Pleistocene
3.00	4.00	Yellow-brown clayey gravelly sand (C; 20% G). Clasts typically 20-30mm, A-SA, rarely black and R-VR.) Rare large pebbles, 50-60mm, SA-A).	River Terrace -T1 (early)	–	Pleistocene
4.00	4.20	Yellow-brown clayey gravelly sand (25% G); gravel VA-A, 30-40mm, flint).	River Terrace -T1 (early)	–	Pleistocene
4.20	4.45	abrupt transition to grey sand (VF) with yellow mottling.	River Terrace -T1 (early)	–	Pleistocene
4.45	5.45	Pale-grey green sand (VF) with diffuse light brown mottling.	Bedrock	–	Pre-Quaternary
6.00	6.45	Pale-grey green sand (VF) with diffuse light brown mottling.	Bedrock	–	Pre-Quaternary
5.00	5.45	Pale grey-green sand (VF) with diffuse light-brown staining.	Bedrock		Pre-quaternary

FIG 13.16 MM_TN_BH_08 2 to 2.45m BGL

TABLE 13.19 MM_TN_BH_14 Borehole log

MM_TN_BH_14					
SITE CODE: EAGW24				**ELEVATION (mAOD)**	26.737
LOGGER: PMM				**ELEVATION**	–
SCHEME AREA: TILBURY NORTH GI TYPE: ABLE PERCUSSION BOREHOLE REASON FOR MONITORING: GI				**EASTING**	566182.157
				NORTHING	180277.571
				DEPTH (M)	6.45
TOP (MBGL)	**BOTTOM (MBGL)**	**DESCRIPTION**	**INTERPRETATION**	**FINDS/ SUBSAMPLED**	**DATE**
0.50	0.50	Mid orange-brown firm silty clay with rootlets and very rare gravel granules (1–2mm, SR) and rare dark grey diffuse mottling. Dry and friable.	Topsoil	–	Holocene
0.50	1.65	Mid orange brown silty firm clay with faint diffuse medium grey mottling, rare rootlets, and very rare granules (3 - 5mm, bleached flint, SA) and pebbles (black, R, 8–10mm. X1 40mm flint, A, bleached.	Head -2	–	Pleistocene
1.65	2.0	Medium grey-brown firm silty clay with trace fine sand. Dry and friable.	Head -2	–	Pleistocene
2.00	2.50	Mid-grey brown firm sandy (F) silty clay. Dry and friable.	Head -2	––	Pleistocene
2.50	3.00	Light brown-grey silty clay with trace sand.	Head -2	–	Pleistocene
2.50	3.00	Dark grey-brown friable sandy clay (FM, 40%) with very rare gravel (10–15mm and 40mm, SA, flint.)	River Terrace – T1 (early)		Pleistocene

FIG 13.17 MM_TN_BH_114

APPENDIX 2 DEPOSIT MODELLING DATA

Appendix 2.1 Lithology Data

BH ID	TOP	BASE	LITHOLOGY
MM_TN_BH_04	0	0.5	VOID
MM_TN_BH_04	0.5	0.6	SILTY CLAY
MM_TN_BH_04	0.6	1.2	SILTY CLAY
MM_TN_BH_04	1.2	1.7	SILTY CLAY
MM_TN_BH_04	1.7	1.8	SILTY CLAY
MM_TN_BH_04	1.8	2.45	VOID
MM_TN_BH_04	2.45	3	CLAYEY SILT
MM_TN_BH_04	3	4	SANDY CLAY
MM_TN_BH_04	4	4.45	CLAYEY SAND
MM_TN_BH_04	4.45	4.6	SANDY CLAY
MM_TN_BH_04	4.6	5	VOID
MM_TN_BH_04	5	5.5	GRAVELLY SAND
MM_TN_BH_04	5.5	6.6	GRAVELLY SAND
MM_TN_BH_04	6.6	7	CLAYEY SAND
MM_TN_BH_04	7	7.45	SAND
MM_TN_BH_05	0	0.35	CLAY
MM_TN_BH_05	0.35	1.65	SILTY CLAY
MM_TN_BH_05	1.65	1.75	SILTY CLAY
MM_TN_BH_05	1.75	2	SILTY CLAY
MM_TN_BH_05	2	2.5	SAND
MM_TN_BH_05	2.5	3	SAND
MM_TN_BH_05	3	3.8	SAND
MM_TN_BH_05	3.8	4	CLAYEY GRAVEL
MM_TN_BH_05	4	4.3	CLAYEY GRAVEL
MM_TN_BH_05	4.3	5	SAND
MM_TN_BH_05	4.5	5	SAND
MM_TN_BH_05	5	5.45	SAND
MM_TN_BH_08	0	0.35	SILTY CLAY
MM_TN_BH_08	0.35	1.2	SILTY CLAY
MM_TN_BH_08	1.2	2	SILTY CLAY
MM_TN_BH_08	2	2.45	SILTY CLAY
MM_TN_BH_08	2.45	3	SILTY CLAY
MM_TN_BH_08	3	4	GRAVELLY SAND
MM_TN_BH_08	4	4.2	GRAVELLY SAND
MM_TN_BH_08	4.2	4.45	SAND
MM_TN_BH_08	4.45	6.45	SAND
MM_TN_BH_14	0	0.5	SILTY CLAY
MM_TN_BH_14	0.5	1.65	SILTY CLAY
MM_TN_BH_14	1.65	2	SILTY CLAY
MM_TN_BH_14	2	2.5	SANDY CLAY
MM_TN_BH_14	2.5	3	SANDY CLAY
MM_TN_BH_14	3	6.45	SAND
MM_TN_CPT_01	0	0.3	CLAYEY SILT
MM_TN_CPT_01	0.3	1.2	CLAYEY SILT
MM_TN_CPT_02	0	0.2	CLAYEY SILT
MM_TN_CPT_02	0.2	1.2	CLAYEY SILT
MM_TN_CPT_03	0	0.3	CLAYEY SILT
MM_TN_CPT_03	0.3	1.2	CLAYEY SILT
MM_TN_CPT_04	0	0.2	CLAYEY SILT
MM_TN_CPT_04	0.2	1.2	CLAYEY SILT
MM_TN_CPT_05	0	0.35	CLAYEY SILT
MM_TN_CPT_05	0.35	1.2	CLAYEY SILT
MM_TN_CPT_07	0	0.35	CLAYEY SILT
MM_TN_CPT_07	0.35	1.2	CLAYEY SILT
MM_TN_IP_01	0	0.3	CLAYEY SILT
MM_TN_IP_01	0.3	1.4	CLAYEY SILT
MM_TN_IP_01	1.4	2	SANDY SILT
MM_TN_TP_01	0	0.3	CLAYEY SILT
MM_TN_TP_01	0.3	0.8	CLAYEY SILT
MM_TN_TP_01	0.8	1.1	SILTY CLAY
MM_TN_TP_01	1.1	2.2	CLAYEY SILT
MM_TN_TP_01	2.2	3	CLAYEY SAND
MM_TN_TP_02	0	0.35	SANDY SILT
MM_TN_TP_02	0.35	0.9	CLAYEY SILT
MM_TN_TP_02	0.9	2.35	CLAYEY SILT
MM_TN_TP_02	2.35	3	CLAYEY SAND
MM_TN_TP_03	0	0.3	CLAYEY SILT
MM_TN_TP_03	0.3	1	SILTY CLAY
MM_TN_TP_03	1	1.5	CLAYEY SILT
MM_TN_TP_03	1.5	2.3	CLAYEY SILT
MM_TN_TP_03	2.3	3	CLAYEY SILT
MM_TN_TP_04	0	0.3	SILTY SAND
MM_TN_TP_04	0.3	0.6	GRAVELLY CLAY

BH ID	TOP	BASE	LITHOLOGY
MM_TN_TP_04	0.6	1.7	SAND
MM_TN_TP_04	1.7	3	SAND
MM_TN_TP_05	0	0.4	MADE GROUND
MM_TN_TP_05	0.4	2.1	GRAVELLY CLAY
MM_TN_TP_05	2.1	2.8	GRAVELLY SAND
MM_TN_TP_05	2.8	3	SAND
MM_TN_TP_06	0	0.3	SANDY CLAY
MM_TN_TP_06	0.3	0.8	CLAYEY SILT
MM_TN_TP_06	0.8	1.4	SILTY GRAVEL
MM_TN_TP_06	1.4	1.8	SANDY GRAVEL
MM_TN_TP_06	1.8	2.1	GRAVELLY SAND
MM_TN_TP_06	2.1	2.6	SANDY GRAVEL
MM_TN_TP_06	2.6	3	SAND
MM_TN_TP_07	0	0.35	SILTY GRAVEL
MM_TN_TP_07	0.35	0.6	SANDY GRAVEL
MM_TN_TP_07	0.6	1.2	SANDY GRAVEL
MM_TN_TP_07	1.2	2.1	CLAYEY SAND
MM_TN_TP_07	2.1	3	CLAYEY SAND
MM_TN_TP_09	0	0.35	CLAYEY SILT
MM_TN_TP_09	0.35	0.6	CLAYEY SILT
MM_TN_TP_09	0.6	1.4	CLAYEY SILT
MM_TN_TP_09	1.4	1.5	SANDY SILT

Appendix 2.2 Stratigraphy Data

BH ID	TOP	BASE	STRATIGRAPHY
MM_TN_BH_04	0	0.6	TOPSOIL
MM_TN_BH_04	0.6	2.45	HEAD - 2
MM_TN_BH_04	2.45	2.55	PALAEOSOL
MM_TN_BH_04	2.55	3	HEAD-2
MM_TN_BH_04	3	6.6	RIVER TERRACE - T1 (EARLY)
MM_TN_BH_04	6.6	7.45	BEDROCK
MM_TN_BH_05	0	0.35	TOPSOIL
MM_TN_BH_05	0.35	1.65	HEAD - 2
MM_TN_BH_05	1.65	1.75	PALAEOSOL
MM_TN_BH_05	1.75	2	HEAD - 2
MM_TN_BH_05	2	4.3	RIVER TERRACE - T1 (EARLY)
MM_TN_BH_05	4.3	4.5	C-HORIZON: WEATHERED BEDROCK
MM_TN_BH_05	4.5	5.45	BEDROCK
MM_TN_BH_08	0	0.35	TOPSOIL
MM_TN_BH_08	0.35	3	HEAD - 2
MM_TN_BH_08	3	4.45	RIVER TERRACE - T1 (EARLY)
MM_TN_BH_08	4.45	6.45	BEDROCK
MM_TN_BH_14	0	0.5	TOPSOIL
MM_TN_BH_14	0.5	2.5	HEAD - 2
MM_TN_BH_14	2.5	3	RIVER TERRACE - T1 (EARLY)
MM_TN_BH_14	3	6.45	BEDROCK
MM_TN_CPT_01	0	0.3	TOPSOIL
MM_TN_CPT_01	0.3	1.2	HEAD - 2
MM_TN_CPT_02	0	0.2	TOPSOIL
MM_TN_CPT_02	0.2	1.2	HEAD - 2
MM_TN_CPT_03	0	0.3	TOPSOIL
MM_TN_CPT_03	0.3	1.2	HEAD - 2
MM_TN_CPT_04	0	0.2	TOPSOIL
MM_TN_CPT_04	0.2	1.2	HEAD - 2
MM_TN_CPT_05	0	0.35	TOPSOIL
MM_TN_CPT_05	0.35	1.2	HEAD - 2
MM_TN_CPT_07	0	0.35	TOPSOIL
MM_TN_CPT_07	0.35	1.2	HEAD - 2
MM_TN_IP_01	0	0.3	TOPSOIL
MM_TN_IP_01	0.3	2	HEAD - 2
MM_TN_TP_01	0	0.3	TOPSOIL
MM_TN_TP_01	0.3	2.2	HEAD - 2
MM_TN_TP_01	2.2	3	C-HORIZON: WEATHERED BEDROCK
MM_TN_TP_02	0	0.35	TOPSOIL
MM_TN_TP_02	0.35	3	HEAD - 2
MM_TN_TP_03	0	0.3	TOPSOIL
MM_TN_TP_03	0.3	3	HEAD - 2
MM_TN_TP_04	0	0.3	TOPSOIL
MM_TN_TP_04	0.3	1.7	RIVER TERRACE - T1 (EARLY)

BH ID	TOP	BASE	STRATIGRAPHY
MM_TN_TP_04	1.7	3	BEDROCK
MM_TN_TP_05	0	0.4	MADE GROUND
MM_TN_TP_05	0.4	2.8	RIVER TERRACE - T1 (EARLY)
MM_TN_TP_05	2.8	3	BEDROCK
MM_TN_TP_06	0	0.3	TOPSOIL
MM_TN_TP_06	0.3	0.8	HEAD - 2
MM_TN_TP_06	0.8	2.6	RIVER TERRACE - T1 (EARLY)

BH ID	TOP	BASE	STRATIGRAPHY
MM_TN_TP_06	2.6	3	BEDROCK
MM_TN_TP_07	0	0.35	TOPSOIL
MM_TN_TP_07	0.35	1.2	HEAD - 2
MM_TN_TP_07	1.2	2.1	HEAD - 1
MM_TN_TP_07	2.1	3	C-HORIZON: WEATHERED BEDROCK
MM_TN_TP_09	0	0.35	TOPSOIL
MM_TN_TP_09	0.35	1.5	HEAD - 2

APPENDIX 3 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID (UID): headland1-531325

Project Name:	GI Monitoring Watching Brief at Norwich to Tilbury
Activity Type::	Watching Brief
Sitecode:	EAGW
Project Identifier(s):	EAGW24
Planning Id:	[no data]
Reason For Investigation:	Planning: Pre application
Organisation Responsible for work:	Headland Archaeology (UK) Ltd
Project Dates:	17-Jun-2024 - 27-Jun-2024
HER:	Essex HER, Suffolk HER, Norfolk HER
HER Identifiers:	[no data]
Project Methodology:	Headland Archaeology (UK) Ltd was commissioned by Arcadis, on behalf of National grid to undertake a programme of Archaeological and Geoarchaeological monitoring of Geotechnical Investigation (GI) works in support of a proposed Development Consent Order (DCO) application. The works took place from the 17th June 2024 - 27th January 2025 and involved the monitoring of 43 geotechnical pits within cropmark areas of medium archaeological potential.
Project Results:	A total of 43 geotechnical pits were monitored under archaeological supervision over three geographical sections of the scheme. No archaeological features or deposits were identified during the monitoring works. One fragment of ceramic building material (CBM) was recovered from the topsoil. The CBM is non-diagnostic and likely to be residual material that has been relocated through modern ploughing and therefore have limited to no value for providing insight into the archaeological date or type of activity in the area.
Keywords:	[no data]
Archive:	[no data]

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EAGW24

NORWICH TO TILBURY MONITORING GEOTECHNICAL INVESTIGATION (GI) WORKS UNDER ARCHAEOLOGICAL SUPERVISION

WATCHING BRIEF

commissioned by Arcadis
on behalf of National Grid

August 2025

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

NORWICH TO TILBURY MONITORING GEOTECHNICAL INVESTIGATION (GI) WORKS UNDER ARCHAEOLOGICAL SUPERVISION

WATCHING BRIEF

commissioned by Arcadis
on behalf of National Grid

August 2025

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **EAGW24** / HA Report No **2025-12** / NGR **TG 216 023 to TQ 661 762** / Parish **Bramford, Higham, Holton St Mary, Palgrave, Stour Valley to Ardleigh, Stratford St Mary** / Local Authority **Mid-Suffolk District Council, Babergh District Council, Colchester City Council and Tendring District Council, Colchester City Council** / Fieldwork Date **17h June 2024 – 27th January 2025** / OASIS Ref. **headland1-531325**

PROJECT TEAM:

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PROJECT SUMMARY

Headland Archaeology (UK) Ltd was commissioned by Arcadis, on behalf of National Grid to undertake a programme of Archaeological and Geoarchaeological monitoring of Geotechnical Investigation (GI) works in support of a proposed Development Consent Order (DCO) application.

The works took place from the 17th June 2024–27th January 2025 and involved the monitoring of 43 geotechnical pits within cropmark areas of medium archaeological potential. No archaeological features or deposits were present within the pits.

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Watching Brief

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ILLUS 1 Location of GI works requiring archaeological monitoring

NORWICH TO TILBURY MONITORING GEOTECHNICAL INVESTIGATION (GI) WORKS UNDER ARCHAEOLOGICAL SUPERVISION

WATCHING BRIEF

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Arcadis, on behalf of National Grid, to undertake a programme of Archaeological and Geoarchaeological monitoring of Geotechnical Investigation (GI) works in support of a proposed Development Consent Order (DCO) application. The overarching project involves the construction of a new electricity transmission connection between current substations at Norwich and Tilbury.

A total of 54 geotechnical pits, across three geographical sections of the route (Illus 1), were identified as having medium archaeological potential several of these pits were removed from the GI works scope and therefore not monitored. The pits were excavated under direct archaeological supervision and the findings are presented within this report. Further geotechnical pits and boreholes were subject to Geoarchaeological monitoring and the results of this are detailed in a separate report.

The archaeological monitoring took place between the 17th June and 27th January 2025. All works were carried out in accordance with the Written Scheme of Investigation (WSI) for the monitoring of geotechnical investigation works (Headland Archaeology 2024a) in addition to the Overarching Written Scheme of Investigation (OWSI) (Headland Archaeology 2024b) for the project.

1.1 SITE LOCATION AND DESCRIPTION

The Proposed Development Area (PDA) comprised an approximately 184km linear route between Norwich and Tilbury, situated between NGR TG 216 023 and TQ 661 762 and split into 8 geographical sections. The archaeological monitoring took across 3 of these sections; Section B: Mid Suffolk District Council, Section C: Section C: Babergh District Council, Colchester City Council, and Tendring City Council, and Section D: Colchester City council. This part of the route was approximately 87km in length and was situated between 15m and 70m AOD. The current land use mainly consisted of arable or pastoral fields. The bedrock geology and superficial deposits varied between the sections and this information is summarised in Table 1.

TABLE 1 Bedrock Geology and Superficial deposits within sections B, C and D (NERC 2025)

SECTION WITHIN ROUTE	BEDROCK GEOLOGY	SUPERFICIAL DEPOSITS
B	Chalk formations between the Waveney Valley to Mellis and the Gipping Valley to west of Somersham; and sands, clays and gravels throughout the rest of the section, with a concentration of sandy deposits within river valleys	Lowestoft Formation Diamicton.
C	Alternating bands of clays, sands and silts, including within the Stour valley	Lowestoft Formation glacial tills with high chalk and flint content. The valleys comprise sand, silt and gravel deposits
D	Almost entirely of London Clay formation clays, sands and silts, with occasional pockets of sand	Diamicton glacial tills (boulder clays), with some sands, silts and clays further north and within the river valleys

1.2 ARCHAEOLOGICAL BACKGROUND

A Historic Environment Baseline Report (HEBR) for the works was produced by Arcadis on behalf of National Grid (2024). This report provided a detailed overview of all designated and non-designated heritage assets contained across each section of the route and the immediate vicinity. A summary of the archaeological potential within the three sections (B, C and D) subject to archaeological monitoring is outlined below, with further details within Table 2.

Section B: Mid Suffolk District Council

Within section B there is moderate potential for Bronze and Iron Age settlement and funerary activity, as well as Roman period settlement. For the medieval period, there is moderate potential for peripheral agricultural activity, however, the potential of encountering other activity is low. The potential for Post-medieval to modern activity within section B is also low.

Section C - Babergh District Council, Colchester City Council, and Tendring City Council

Within section C there is moderate to high potential for Bronze Age funerary activity and Iron Age settlement including metalworking sites, and moderate potential for Roman settlement and industrial activity. The potential for medieval activity is low and is likely to consist of small-scale features or finds. Similarly, the potential for post-medieval and modern features is also low and is likely to relate to extant buildings.

Section D- Colchester City council

Within section D there is moderate to high potential for Iron Age settlement, including industrial activity. There is also moderate to high potential for Roman period settlement and industrial activity relating to the lands around Colchester and high potential for activity relating to Fordham Roman Villa. The potential for medieval, Post-medieval and modern features low.

TABLE 2 Archaeological Background of Project Route

PERIOD	SECTION B	SECTION C	SECTION D
Bronze Age (2400–800 BC)	Cropmarks of potential ring ditches (2028) possibly representing funerary monuments, as well as a possible barrow (2037). Various find spots are also present in the region, including a hoard (2045) of 81 copper alloy artefacts.	Crop mark site south of Ardleigh (1002146) which was subject to archaeological excavation in 1995 and revealed six ring ditches and urned cremations. Other potentially Bronze Age activity consists of several ring and boundary ditches identified through cropmarks (3001, 3004, 3006 and 3236) as well as a findspot of a La Tene terret (3013).	–
Iron Age (800 BC–AD 43)	Scatters and findspots of pottery (2062) and metalwork and a settlement site (2068) consisting of a roundhouse with a central sunken circular hearth.	Series of five late Iron Age farmsteads with evidence of metalworking (3016). Several groups of potentially prehistoric cropmarks are also present in the region and include 12 ring ditches and elements of a rectilinear system (3239), ditches, trackways, and an oval enclosure (3045) and an enclosure and ring ditch (3225).	Three excavated archaeological sites with evidence of Late Iron Age occupation. The sites ranged in size and complexity from a single phase of charcoal rich pits (4184) to multiple phases of enclosures and pits (4183 and 4186).
Romano-British (AD 43–410)	Scatters and findspots of pottery and metalwork. Large concentrations of Romano-British artefacts are suggestive of settlement activity (2166 and 2134) and the locations of buildings of farmsteads (2162). A Roman road (2113) also transects the section and runs east to west.	Cropmarks of field boundaries, enclosures, and trackways (3034, 3038, 3237, and 3039) as well as a possible Roman pottery kiln (3040). Artefact scatters of coins, pottery, tiles, oyster shell, and a stone figure (3037) were also present in the region, in addition to a Roman road (2113) which runs roughly north to south.	The draft order limits intersect the vicinity of Roman Colchester and contain various Romano-British assets. Among these is Fordham Roman villa which is under current archaeological investigation. This villa site found evidence of activity from the middle Iron Age through the Roman period into the early medieval (Saxon) period, including structures, high-status finds, and human burials. There are also several excavated archaeological sites which have revealed a likely Roman cemetery site with a complete skeleton (4093), lead coffins (4081), and enclosures and pits (4082) as well as a possible kiln site (4074).
Medieval (AD 410–1485)	Findspots of pottery and metalwork, as well as 12 moated sites, a medieval farmstead (Wickham Abbey Farm: 2208) and settlement centre at Mendlesham Green (2244). The numerous moated sites in the area likely represent a network of manorial sites and include a moated dovecote (2207), hall (2241) and windmill (2250). Several of the sites are identified from undated cropmarks (2227).	Widespread archaeological remains and scatters of findspots. Finds recorded include artefact scatters, jewellery, tiles, and pottery. Archaeological remains are represented by cropmarks of field boundaries and enclosures (3049), as well as multiple moated sites (3047, 3095 and 3103).	Archaeological remains including a boundary ditch (4006) and two moated sites (4057 and 4104). Medieval farmsteads, include Street Farm (4344) and Knaves Farm (4222) and a possible DMV
Post-Medieval (AD 1485–1750)	Non-designated buildings, structures, and finds derived from metal detector and field walking surveys.	Fifteen post-medieval farmsteads and tenement buildings.	Activity is limited to a known quaker burial ground (4066), garden walls (4344 and 4193), and various buildings. Post-medieval buildings include a demolished farmstead (4222) and Teybrook Farmyard (4225). Two extant settlement centres with post-medieval origins are also present immediately adjacent to the draft order limits at Gallows Green (4212) and Boxted Heath (4211).
Modern (AD 1750–present)			WWII and Cold War military assets including ten pillboxes, two mortar emplacements (4040 and 4344), and a nuclear monitoring post (4349).

1.3 AIMS AND OBJECTIVES

The main objective of the archaeological monitoring was to mitigate the effects of the development on subsurface archaeological deposits through preservation by record and inform the baseline evidence used to determine the archaeological potential of the study area and potential impacts of the scheme.

Specific aims of the archaeological monitoring included:

- Monitoring GI test pit works with medium or high archaeological potential
- Establishing the location, extent, nature and date of archaeological features or deposits present within areas subject to ground works and preserving them by full excavation and creation of a complete record.
- Assessing the condition of features and remains that were investigated
- Informing further stages of mitigation, as required, to mitigate the impacts of the proposed scheme

2 METHODOLOGY

2.1 SITE WORKS

54 Geotechnical pits were identified prior to commencement of work as having medium archaeological potential. Due to changes to the GI works programme, 13 pits were not excavated and therefore descoped from the archaeological requirements. Two additional pits were added to the scope due to changes to the GI programme/locations

A total of 43 pits excavated under archaeological supervision; with two pits (MM_JC_TP_001 and MM-JC-IP-112b) having multiple GI investigations at the same approximate location, accounting for three additional entries. The geotechnical pits were excavated in spits using a flat bladed ditching bucket until the natural or archaeological horizon was reached. All groundbreaking works were monitored by a suitably qualified archaeologist.

2.2 RECORDING

All geotechnical pits and contexts were given unique numbers and recorded using Headland's pro forma digital recording system 'HARK!'. Where stratified deposits were encountered, a 'Harris' matrix was complied. All geotechnical pits were photographed with a graduated metric scale clearly visible. Paper registers were created for all Digital Photography and were then digitised to fit into the HARK! System. A site plan including all identified features, areas of excavation and other pertinent information was recorded using existing scaled plans of the site, which are accurately linked to the British National Grid and heights to AOD.

Finds were recorded by context and were cleaned, packaged and stored in accordance with First Aid for Finds (Watkinson & Neal 1998).

2.3 REPORTING AND ARCHIVES

The assessment report (this document) details the results of the fieldwork and provides an assessment of the finds retrieved. The report has been compiled in accordance with the WSI, the OWSI and the appropriate CIfA standards and guidance, particularly CIfA's 'Standard and guidance for archaeological excavation' (2023) and 'Standard and guidance for the collection, documentation, conservation, and research of archaeological materials' (2014). An online OASIS report has been completed (Appendix 2) and is accompanied by a PDF report and boundary file.

The project archive (finds and records) will be compiled in accordance with the guidelines published by the CIfA on behalf of the Archaeological Archives Forum (AAF 2011). The location for deposition of this archive is yet to be determined, and will require agreement from the relevant council/museum bodies as to a suitable location to house the full archive.

3 RESULTS

3.1 ARCHAEOLOGICAL WATCHING BRIEF

A total of 31 trial pits and 12 infiltration pits were monitored under archaeological supervision across the three geographic sections. Details of each pit monitored, including orientation and dimensions, are provided in Appendix 1. The results are summarised below by district.

Section B: Mid Suffolk District Council

Section B of the scheme extended from the Waveney Valley at the county border with Norfolk, approximately 2.4km to the west of the town of Diss, to Bramford Substation 1.5km to the west of Ipswich. Three trial pits (MM_RG_TP_007, MM_JC_TP_107 and MM_JC_TP_110) and one infiltration pit (MM_RG_IP_002) were monitored within this section (Illus 2).

The topsoil across the area generally consisted of dark orangish or greyish brown fine sandy silt that was 0.3–0.35m thick. The subsoil consisted of orangish brown fine sandy silt with an average thickness of 0.2m. The geological subsoil was a brownish yellow clayey or fine sandy gravel.

MM-RG_TP_007 and MM_RG_IP_002 were the most northern of the pits monitored and were located to the north-east of Bullen Wood, approximately 4km west of Ipswich. The trial pit was located within an area of post-medieval cropmarks. No archaeological features were present within either pit.

MM_JC_TP_107 and MM_JC_TP_110, located to the north-east and east of Higham respectively, were situated within the vicinity of cropmarks. No archaeological features were present within the test pits.

Section C: Babergh District Council, Colchester City Council and Tendring District Council

Section C of the scheme extended between the Bromford Substation to the East Anglia Connection Node (EACN) Substation 2km to the east of Ardleigh, before continuing a further 5km westwards to meet Old Ipswich Road, Colchester. This section was the largest area requiring archaeological monitoring and contained 37 pits (Illus 3) (MM_JC_TP_112, MM_JC_TP_114, MM-JC_TP_115-118, MM_JC_IP_112a, MM_JC_TP_120-124, MM_JC_TP_126, MM_JC_IP_101, MM_JC_IP_103, MM_JC_IP_105, MM_JC_IP_112b, MM_JC_IP_112c, MM_JC_TP_130-133, MM_JP_IP_108-110, MM_JC_TP_001-010, MM_JC_TP_012 and MM_JC_IP_001).

The topsoil observed across the area generally consisted of greyish brown fine sandy silt with an average thickness of 0.3m. Where subsoil was present this consisted of an orangish brown coarse sandy silt was 0.1m thick on average. The geological subsoil generally consisted of brownish orange clayey or coarse sandy gravel.

Trial pits MM_JC_TP_112 and MM_JC_TP_114 were located to the west of Stratford St Mary and were situated within cropmarks. Rare fragments of fired clay were observed in the topsoil (175028) of MM_JC_TP_114. No archaeological features were present within the pits.

Trial pits MM_JC_TP_115–118 (Illus 4) and infiltration pit MM_JC_IP_112a (Illus 5) were located to the south-west of Stratford St Mary and situated within cropmarks. No archaeological features were present within the pits.

Six trial pits (MM_JC_TP_120-124 and MM_JC_TP_126), and five infiltration pits (MM_JC_IP_101, 103, 105, 112b, 112c) were located in the area between Langham and Ardleigh. All of the pits were situated within cropmark locations. No archaeological features were present within the pits.

To the east of Ardleigh, a further four test pits MM_JC_TP_130–133 and three infiltration pits MM_JP_IP_108-110 were located within cropmark areas. Rare fragments of fired clay were observed in the topsoil of pits MM_JC_TP_132, MM_JP_IP_108 and MM_JP_IP_118, with a fragment of ceramic building material noted and retained. No archaeological features were present within the pits.

Directly to the east of test pit MM_JC_TP_133, in the fields directly to the east of Badley Hall, a cluster of 11 test pits MM-JC-TP 001-010 and MM-JC-TP 012, and one infiltration pit MM_JC_IP_001 was present. All of the pits in this area were located within a complex of cropmarks. No archaeological features were present within the pits.

Section D: Colchester City Council

Section D extended from Old Ipswich Road and extended anticlockwise around Colchester to the west, then heading west towards Coggeshall before terminating at the Colchester/Braintree district border. This section of the route measures 18km in length (Illus 6). Two pits (MM_TB_IP_105, MM_TB_TP_107) were monitored in this section.

Infiltration pit MM_TB_IP_105 was located approximately 1km south-west of Great Horkesley and was situated with a cropmark complex. No archaeological features were present within the pit.

Test pit MM_TB_TP_107 was located 600m to the west of MM_TB_IP_105 with no nearby cropmarks identified. No archaeological features were present within the pit.

3.2 FINDS ASSESSMENT

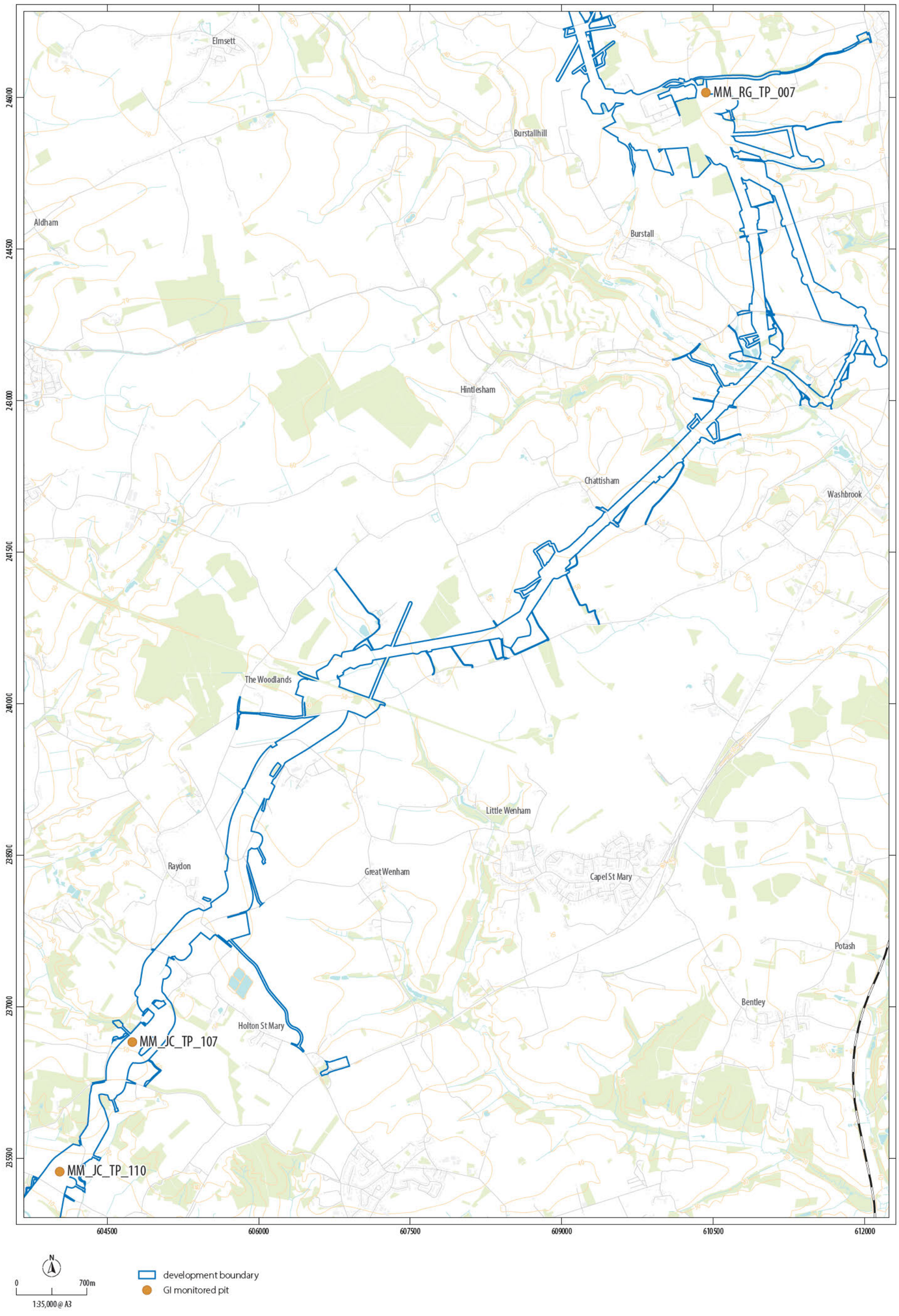
by Sara Machin

The finds assemblage comprised a single fragment (19g) of ceramic building material (CBM) (F-41901). It was recovered from topsoil (419001) within MM_JC_TP_130. It is undiagnostic in form and cannot be dated.

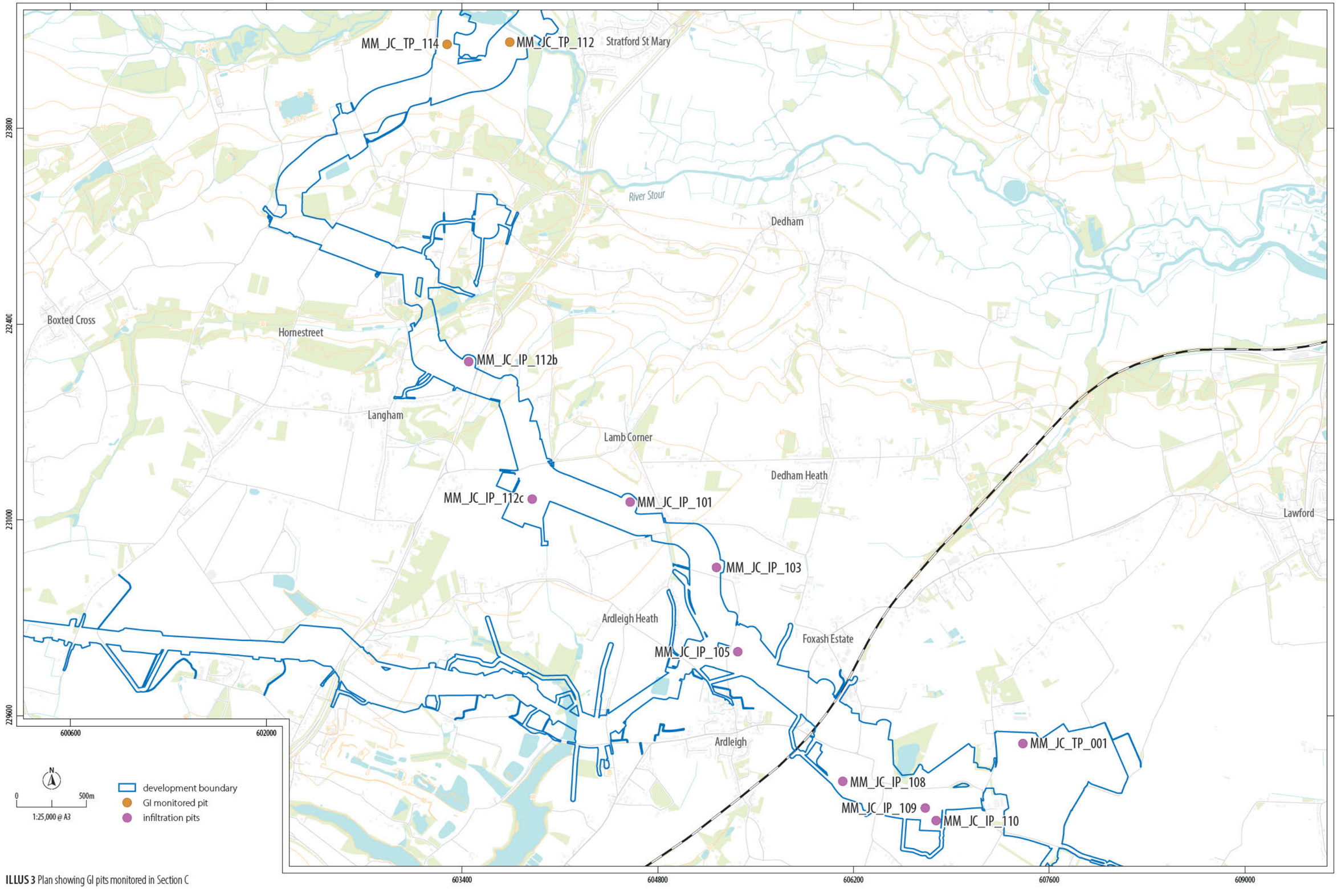
The CBM is of no research potential and no further work is recommended on the material. It is recommended the find be discarded from the project archive.

4 DISCUSSION AND CONCLUSION

A total of 43 geotechnical pits were monitored under archaeological supervision over three geographical sections of the scheme. No archaeological features or deposits were identified during the monitoring works. One fragment of ceramic building material (CBM) was recovered from the topsoil. The CBM is non-diagnostic and likely to be residual material that has been relocated through modern ploughing and therefore has limited to no value for providing insight into the archaeological date or type of activity in the area.



ILLUS 2 Plan showing GI pits monitored in Section B



ILLUS 3 Plan showing GI pits monitored in Section C

ILLUS 4 The archaeological horizon at MM_JC_TP_118
ILLUS 5 Representative section for pit MM_JC_IP_112b

5 REFERENCES

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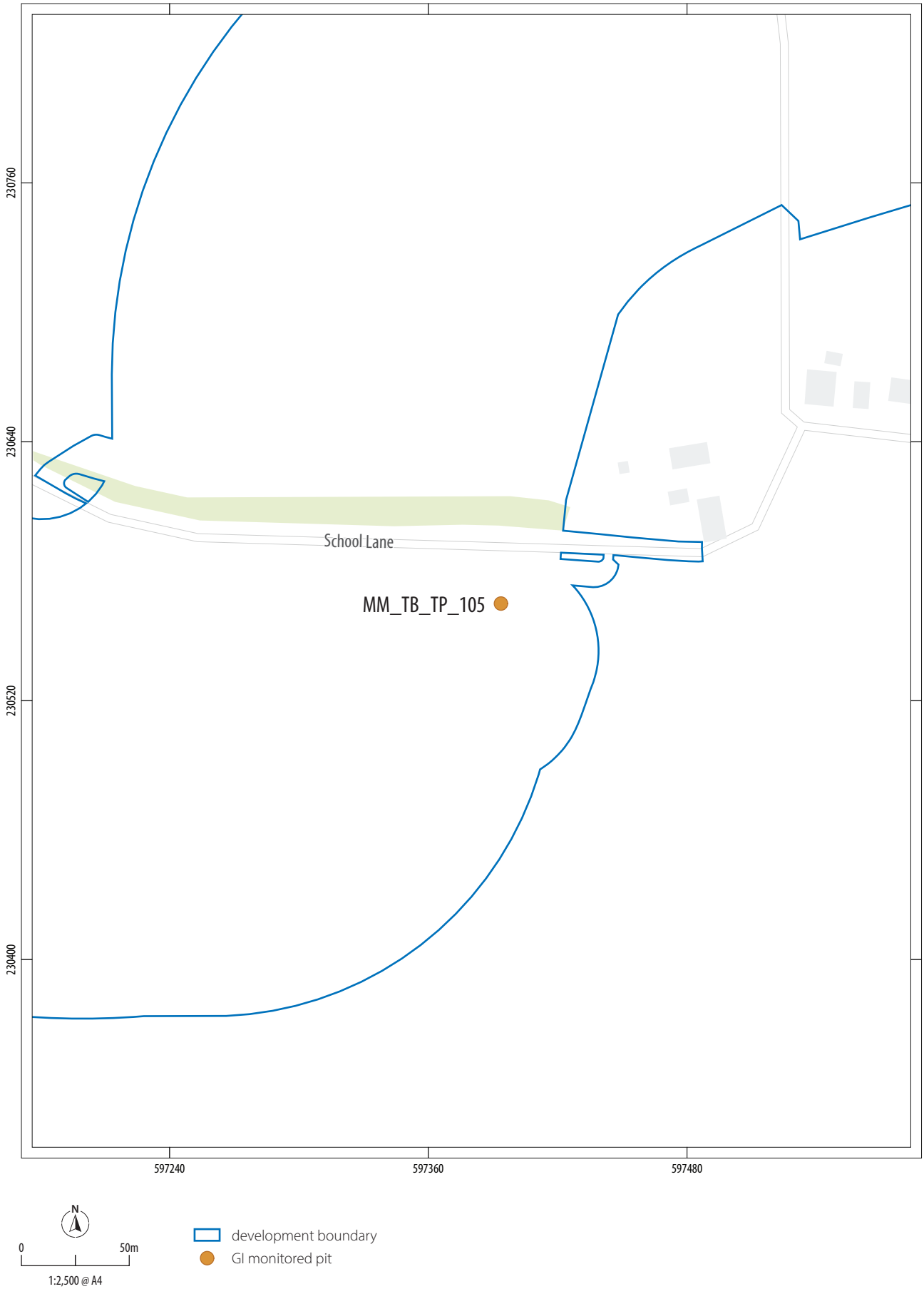

ILLUS 6 Plan showing GI pits monitored in Section D

6 APPENDICES

APPENDIX 1 SITE AND CONTEXT REGISTERS

Appendix 1.1 Trench/Area register

TR MM -JC-TP-001	1.0 X 2.0M, 0.00-1.60M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419004	Topsoil	Mid brown fine sandy silt	0.25m thick
419005	Geological Subsoil	Orangeish brown silty coarse sand. Inclusions: frequent rounded stones	–
419006	Subsoil	Mid brown fine sandy silt	0.1m thick

TR MM_JC_IC_112A	0.5 X 2.3M, 1.00-1.07M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220015	Geological Subsoil	Mid brownish orange coarse sandy silt. Inclusions: frequent rounded stones	0.65m thick
220014	Topsoil	Dark greyish brown gravelly silt. Inclusions: rare angular stones, moderate rounded stones	0.35m thick

TR MM_JC_IP_101	0.5 X 1.4M, YESM DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220028	Topsoil	Light greyish brown silty fine sand. Inclusions: occasional rounded stones	0.3m thick
220029	Geological Subsoil	Light brownish orange silty clay. Inclusions: occasional angular stones, occasional rounded stones	0.35m thick
220030	Geological Subsoil	Mid brownish orange fine sandy clay. Inclusions: moderate angular stones	0.4m thick
220031	Geological Subsoil	Mid greyish blue coarse sandy gravel. Inclusions: moderate sub-angular stones, moderate sub-rounded stones	0.3m thick

TR MM_JC_IP_102	0.5 X 1.7M, YESM DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175025	Topsoil	Light yellowish brown clayey silt. Inclusions: occasional sub-angular stones, occasional angular stones, occasional rounded stones, frequent plant remains	0.3m thick
175027	Geological Subsoil	Dark reddish grey coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, moderate rounded stones, moderate iron pan, frequent manganese	0.8m thick
175026	Subsoil	Mottled blueish grey fine sandy clay. Inclusions: occasional sub-angular stones, occasional sub-rounded stones	0.2m thick

TR MM_JC_IP_103	1.8 X 2.0M, 0.50-1.30M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216021	Subsoil	Mid orangeish brown silty clay	0.1m thick
216020	Topsoil	Dark greyish brown clayey silt	0.25m thick
216022	Geological Subsoil	Mid orangeish brown coarse sandy gravel	0.95m thick

TR MM_JC_IP_105	1.0 X 2.0M, 0.40-1.70M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
134006	Geological Subsoil	Light orangeish brown gravelly fine sand	0.2m thick
134007	Geological Subsoil	Light orangeish brown fine sand	0.9m thick
134008	Geological Subsoil	Mid brownish orange coarse sandy coarse sand	0.2m thick
134005	Topsoil	Mid orangeish brown silty fine sand	0.4m thick

TR MM_JC_IP_106	1.0 X 1.9M, 0.40-2.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
134003	Subsoil	Light orangeish yellow gravelly fine sand	0.4m thick
134004	Geological Subsoil	Light orangeish yellow gravelly coarse sand	1.2m thick
134002	Topsoil	Mid orangeish brown coarse sandy silt	0.4m thick

TR MM_JC_IP_108	0.56 X 1.79M, 0.00-1.68M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175005	Topsoil	Dark greyish brown silty fine sand. Inclusions: occasional sub-angular stones, rare fired clay/cbm	0.21m thick
175007	Geological Subsoil	Brownish orange fine sandy gravel. Inclusions: frequent angular stones, frequent sub-rounded stones, frequent rounded stones, moderate iron pan	0.83m thick
175006	Subsoil	Mid yellowish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional sub-rounded stones, occasional rounded stones	0.65m thick

TR MM_JC_IP_109	0.67 X 2.22M, 1.80-1.90M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175023	Geological Subsoil	Mid brownish orange gravelly coarse sand. Inclusions: moderate sub-angular stones, moderate angular stones, moderate sub-rounded stones, occasional rounded stones	0.3m thick
175024	Geological Subsoil	Mid reddish orange coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent sub-rounded stones, frequent rounded stones, frequent iron pan	0.6m thick
175021	Topsoil	Dark greyish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional angular stones, occasional sub-rounded stones, rare pot, rare glass	0.32m thick
175022	Subsoil	Mid orangeish brown fine sandy silt. Inclusions: moderate sub-angular stones, occasional rounded stones	0.71m thick

TR MM_JC_IP_110	0.5 X 1.9M, 1.23-1.80M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175017	Geological Subsoil	Mottled blueish orange clayey gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones, occasional iron pan	0.81m thick
175016	Subsoil	Mid brownish yellow silty fine sand. Inclusions: occasional angular stones, moderate sub-rounded stones, moderate rounded stones	0.35m thick
175015	Topsoil	Dark greyish brown fine sandy silt. Inclusions: occasional sub-angular stones, moderate angular stones, occasional sub-rounded stones, rare fired clay/cbm	0.44m thick

TR MM_JC_IP_112C	0.67 X 1.67M, YESM DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220006	Topsoil	Light greyish brown silty fine sand	0.1m thick
220007	Subsoil	Light brownish grey silty fine sand	0.2m thick
220008	Geological Subsoil	Light yellowish white fine sandy silt. Inclusions: rare angular stones	0.1m thick
220009	Geological Subsoil	Mid orangeish red coarse sandy loam	1.0m thick

TR MM_JC_TB_116	1.9 X 2.6M, 0.60-4.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175036	Topsoil	Dark brownish grey fine sandy silt. Inclusions: moderate sub-angular stones, occasional angular stones, moderate sub-rounded stones, moderate rounded stones	0.1m thick
175038	Geological Subsoil	Mid reddish orange coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones, moderate manganese	2.5m thick
175039	Geological Subsoil	Dark yellowish yellow clayey coarse sand. Inclusions: moderate sub-angular stones, occasional angular stones, moderate sub-rounded stones, frequent rounded stones, frequent iron pan, moderate manganese	0.8m thick
175037	Subsoil	Mid yellowish brown fine sandy silt. Inclusions: moderate sub-angular stones, moderate angular stones, frequent sub-rounded stones, occasional rounded stones	0.3m thick
175040	Subsoil	Mid brownish yellow fine sandy silt. Inclusions: moderate sub-angular stones, moderate angular stones, occasional sub-rounded stones, moderate rounded stones, occasional manganese	0.3m thick

TR MM_JC_TP_001	0.9 X 4.0M, 1.20-4.02M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175002	Geological Subsoil	Light orangeish yellow gravelly silt. Inclusions: occasional sub-angular stones, occasional rounded stones	0.4m thick
175003	Geological Subsoil	Mottled reddish brown fine sandy gravel. Inclusions: frequent sub-angular stones, frequent sub-rounded stones, frequent rounded stones	1.7m thick
175004	Geological Subsoil	Light blueish grey clayey clay	0.52m thick
175001	Topsoil	Mid yellowish brown fine sandy silt. Inclusions: rare charcoal	0.35m thick

TR MM_JC_TP_003	2.0 X 2.5M, 0.30-3.10M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216009	Subsoil	Mid yellowish brown silty clay	0.1m thick
216010	Geological Subsoil	Mid yellowish brown coarse sandy gravel	2.8m thick
216008	Topsoil	Mid brown clayey silt	0.25m thick

TR MM_JC_TP_007	2.0 X 2.5M, 0.30-4.10M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216002	Subsoil	Mid yellowish brown silty clay	0.1m thick
216003	Geological Subsoil	Mid orangeish brown gravelly clay	3.8m thick
216001	Topsoil	Mid brown clayey silt	0.25m thick

TR MM_JC_TP_010	2.0 X 2.5M, 0.30-3.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216006	Subsoil	Mid yellowish brown silty clay	0.1m thick
216007	Geological Subsoil	Light yellowish orange coarse sandy gravel	2.65m thick
216005	Topsoil	Mid brown clayey silt	0.25m thick

TR MM_JC_TP_110	0.7 X 2.1M, 0.00-3.50M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220032	Topsoil	Mid greyish brown fine sandy silt. Inclusions: rare sub-angular stones	0.3m thick
220033	Geological Subsoil	Mid brownish orange silty fine sand. Inclusions: occasional sub-rounded stones	0.8m thick
220034	Geological Subsoil	Mid brownish yellow clayey gravel. Inclusions: frequent sub-angular stones, frequent sub-rounded stones	2.4m thick

TR MM_JC_TP_114	1.93 X 2.9M, 0.60-2.10M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175030	Geological Subsoil	Mid yellowish orange gravelly coarse sand. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones	0.3m thick
175031	Geological Subsoil	Mid reddish orange coarse sandy gravel. Inclusions: frequent sub-angular stones, moderate angular stones, frequent sub-rounded stones, frequent rounded stones, frequent iron pan	1.4m thick
175029	Subsoil	Mid orangeish brown coarse sandy silt. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones	0.1m thick
175028	Topsoil	Dark greyish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional angular stones, moderate sub-rounded stones, moderate rounded stones, rare fired clay/cbm	0.4m thick

TR MM_JC_TP_117	0.5 X 2.3M, 0.00-4.10M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220010	Topsoil	Mid-greyish-brown silty fine sand. Inclusions: rare rounded stones	0.35m thick
220011	Geological Subsoil	Mid greyish brown coarse sandy silt. Inclusions: rare rounded stones	0.35m thick
220012	Geological Subsoil	Mid brownish orange fine sandy gravel	1.3m thick
220013	Geological Subsoil	Light greyish white fine sandy silt	1.9m thick

TR MM_JC_TP_121	1.9 X 2.9M, 0.00-1.20M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
438002	Subsoil	Mid yellowish brown silty fine sand. Inclusions: occasional sub-angular stones, occasional sub-rounded stones	0.2m thick
438003	Geological Subsoil	Light orangeish brown gravelly fine sand. Inclusions: frequent sub-rounded stones, rare iron pan, occasional manganese	0.6m thick
438001	Topsoil	Dark greyish brown clayey fine sand. Inclusions: frequent sub-rounded stones, moderate plant remains	0.43m thick

TR MM_JC_TP_122	1.9 X 2.4M, 0.60-3.20M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175033	Geological Subsoil	Light greyish yellow clayey silt. Inclusions: moderate sub-rounded stones, moderate rounded stones	0.4m thick
175034	Geological Subsoil	Mid reddish orange coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones, moderate iron pan	0.5m thick
175035	Geological Subsoil	Mottled greyish red clayey coarse sand. Inclusions: occasional sub-angular stones, moderate angular stones, frequent sub-rounded stones, occasional rounded stones, occasional iron pan	1.5m thick
175032	Topsoil	Dark brownish grey fine sandy silt. Inclusions: occasional sub-angular stones, rare angular stones, occasional sub-rounded stones, occasional charcoal, rare pot, moderate fired clay/cbm	0.43m thick

TR MM_JC_TP_123	**0.7 X 2.45M, YESM DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220001	Topsoil	Light greyish brown silty fine sand. Inclusions: rare rounded stones	0.25m thick
220002	Subsoil	Light greyish orange clayey fine sand. Inclusions: rare rounded stones	0.1m thick
220003	Geological Subsoil	Mid brownish red fine sandy clay	1.3m thick
220004	Geological Subsoil	Light blueish grey coarse sandy clay	0.3m thick
220005	Geological Subsoil	Light yellowish grey coarse sandy gravel	1.0m thick

TR MM_JC_TP_124	**1.8 X 3M, 0.00-3.90M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220022	Geological Subsoil	Light greyish brown silty fine sand	0.3m thick
220023	Geological Subsoil	Light orangeish brown silty fine sand	0.4m thick
220024	Geological Subsoil	Mid brownish orange silty fine sand	0.6m thick
220025	Geological Subsoil	Mid brownish orange fine sandy clay	1.3m thick
220026	Geological Subsoil	Mid greyish brown fine sandy gravel	1.0m thick
220027	Geological Subsoil	Dark brownish orange silty coarse sand	0.3m thick

TR MM_JC_TP_126	**1.8 X 2.1M, 0.50-2.10M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216024	Subsoil	Dark orangeish brown silty clay	0.1m thick
216023	Topsoil	Dark greyish brown clayey silt	0.25m thick
216025	Geological Subsoil	Mid orangeish brown gravelly coarse sand	1.75m thick

TRENCH MM_JC_TP_130	**1.9 X 2.9M, 0.60-4.10M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175020	Geological Subsoil	Mid reddish orange coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones, occasional iron pan	3.48m thick
175018	Topsoil	Dark greyish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional angular stones, occasional sub-rounded stones, occasional rounded stones	0.3m thick
175019	Subsoil	Mid brownish yellow fine sandy silt. Inclusions: occasional sub-angular stones, moderate angular stones, occasional sub-rounded stones, occasional charcoal	0.32m thick

TR MM_JC_TP_131	**1.4 X 3.0M, 0.60-3.60M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175008	Topsoil	Dark greyish brown silty fine sand. Inclusions: moderate sub-angular stones, moderate sub-rounded stones	0.2m thick
175010	Geological Subsoil	Mid brownish red coarse sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, moderate rounded stones, moderate iron pan	3.0m thick
175009	Subsoil	Light orangeish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional sub-rounded stones, moderate manganese	0.4m thick

TR MM_JC_TP_132	**1.1 X 2.0M, 0.60-3.00M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
175013	Geological Subsoil	Mid reddish orange fine sandy gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, moderate rounded stones, moderate iron pan	0.25m thick
175014	Geological Subsoil	Mottled blueish yellow silty gravel. Inclusions: frequent sub-angular stones, frequent angular stones, frequent sub-rounded stones, frequent rounded stones	2.2m thick
175011	Topsoil	Dark greyish brown fine sandy silt. Inclusions: occasional sub-angular stones, occasional angular stones, occasional rounded stones, rare fired clay/cbm	0.25m thick
175012	Subsoil	Mid yellowish brown fine sandy silt. Inclusions: occasional angular stones, occasional sub-rounded stones	0.3m thick

TRENCH MM_JC_TP_133	**2.5 X 3.0M, 0.30-3.00M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216012	Subsoil	Mid yellowish brown silty clay	0.1m thick
216013	Geological Subsoil	Light yellowish brown clayey coarse sand	2.6m thick
216011	Topsoil	Mid orangeish brown clayey silt	0.3m thick

TR MM_JC_TP112	1.0 X 3.0M, 0.00-2.60M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220016	Topsoil	Mid greyish brown silty fine sand. Inclusions: moderate rounded stones	0.1m thick
220017	Subsoil	Mid yellowish brown silty fine sand	0.25m thick
220018	Geological Subsoil	Mid yellowish brown silty fine sand	0.25m thick
220019	Geological Subsoil	Mid brownish orange clayey gravel. Inclusions: moderate iron pan	0.6m thick
220020	Geological Subsoil	Mid brownish orange clayey gravel. Inclusions: frequent iron pan	0.2m thick
220021	Geological Subsoil	Light orangeish grey coarse sandy gravel. Inclusions: frequent rounded stones, moderate iron pan	1.7m thick

TR MM_TB_IP_105	1.0 X 2.9M, YESM DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
220036	Subsoil	Mid greyish yellow silty clay	0.2m thick
220035	Topsoil	Dark greyish brown silty clay	0.3m thick
220037	Geological Subsoil	Mottled yellowish orange silty clay	–

TR MM_TB_TP_107	1.8 X 2.1M, 0.40-4.10M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216014	Topsoil	Mid brown clayey silt	0.2m thick
216015	Subsoil	Mid yellowish brown silty clay	0.2m thick
216016	Geological Subsoil	Light yellowish brown coarse sandy clay	3.7m thick

TR MM-JC-IP-112B	1.5 X 3.5M, 0.00-2.20M DEEP		
Context	Interpretation	Description	Dimensions
419004	Topsoil	Light brownish grey fine sandy silt	0.3m thick
419005	Subsoil	Mid brownish orange gravelly fine sand	0.3m thick
419006	Geological Subsoil	Mid brownish orange gravelly coarse sand	–

TR MM-JC-IP-112BA	0.8 X 3.0M, 0.00-2.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419008	Subsoil	Light brownish orange coarse sandy silt	0.3m thick
419009	Geological Subsoil	Mid brownish orange coarse sandy gravel. Inclusions: occasional angular stones, frequent rounded stones	–
419007	Topsoil	Light brownish grey fine sandy silt. Inclusions: moderate angular stones, moderate rounded stones	0.35m thick

TR MM-JC-IP-112BB	0.8 X 3.0M, 0.00-1.20M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419011	Subsoil	Light brown clayey silt. Inclusions: moderate angular stones, moderate rounded stones	0.2m thick
419010	Topsoil	Light brownish grey clayey silt. Inclusions: occasional angular stones, occasional rounded stones	0.3m thick
419012	Geological Subsoil	Mid orangeish brown gravelly clay. Inclusions: frequent sub-angular stones, moderate rounded stones	–

TR MM-JC-TP 008	1.8 X 2.5M, 0.00-2.80M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419012	Geological Subsoil	Mottled greyish orange clayey silt. Inclusions: occasional sub-angular stones, occasional rounded stones	–
419011	Subsoil	Mid orangeish orange fine sandy silt. Inclusions: moderate sub-angular stones, moderate rounded stones	0.2m thick
419010	Topsoil	Mid greyish brown clayey silt. Inclusions: rare rounded stones	0.4m thick

TR MM-JC-TP-002	1.5 X 2.5M, 0.00-3.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419001	Topsoil	Mid brown coarse sandy silt	0.25m thick
419003	Geological Subsoil	Dark orangeish brown silty coarse sand. Inclusions: frequent sub-angular stones, frequent sub-rounded stones	2.4m thick
419002	Subsoil	Mid orangeish brown coarse sandy silt	0.1m thick

TR MM-JC-TP-004	1.8 X 2.5M, 0.00-3.00M DEEP		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419027	Geological Subsoil	Mid orange silty coarse sand. Inclusions: frequent angular stones, moderate rounded stones	–
419025	Topsoil	Mid greyish brown silty fine sand. Inclusions: rare angular stones, rare rounded stones	0.3m thick
419026	Subsoil	Mid orange silty fine sand. Inclusions: occasional angular stones, occasional rounded stones	0.25m thick

TR MM-JC-TP-005	**1.8 X 2.5M, 0.00-3.40M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419007	Topsoil	Mid orangeish brown silt	0.25m thick
419009	Geological Subsoil	Mid brownish orange silty fine sand. Inclusions: occasional sub-angular stones, frequent rounded stones	–
419008	Subsoil	Mid orangeish brown fine sandy silt	0.1m thick

TR MM-JC-TP-006	**0.9 X 2.5M, 0.00-3.00M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419018	Geological Subsoil	Mid orange silty coarse sand. Inclusions: moderate angular stones, moderate rounded stones	–
419017	Subsoil	Light orange silty fine sand. Inclusions: occasional sub-angular stones, occasional rounded stones	0.25m thick
419016	Topsoil	Light greyish brown silty fine sand. Inclusions: rare sub-angular stones, rare rounded stones	0.35m thick

TR MM-JC-TP-009	**1.8 X 2.5M, 0.00-3.10M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419024	Geological Subsoil	Mid orange silty coarse sand. Inclusions: moderate angular stones, moderate rounded stones	–
419023	Subsoil	Light orange silty fine sand. Inclusions: occasional angular stones, occasional rounded stones	0.25m thick
419022	Topsoil	Light orange silty fine sand. Inclusions: rare angular stones, rare rounded stones	0.4m thick

TR MM-JC-TP-012	**0.9 X 2.5M, 0.00-2.80M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419015	Geological Subsoil	Mid orange gravelly coarse sand	2.0m thick
419014	Subsoil	Mid orange silty fine sand. Inclusions: occasional angular stones	0.25m thick
419013	Topsoil	Mid orangeish brown fine sandy silt. Inclusions: rare angular stones	0.4m thick

TR MM-JC-TP-107	**2.0 X 3.0M, 0.00-4.00M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419016	Subsoil	Mid orangeish brown fine sandy silt. Inclusions: moderate angular stones, moderate rounded stones	0.25m thick
419017	Geological Subsoil	Mid orange fine sandy gravel. Inclusions: frequent angular stones, moderate rounded stones	–
419015	Topsoil	Dark orangeish brown fine sandy silt. Inclusions: moderate angular stones, moderate rounded stones	0.35m thick

TR MM-JC-TP-115	**1.6 X 3.0M, 0.00-3.30M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419013	Topsoil	Mid brownish grey fine sandy silt. Inclusions: occasional sub-angular stones, occasional rounded stones	0.3m thick
419014	Geological Subsoil	Mid orange gravelly coarse sand. Inclusions: frequent angular stones, occasional rounded stones	–

TR MM-JC-TP-118	**0.9 X 3.0M, 0.00-3.70M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419002	Subsoil	Light orangeish brown gravelly silt	0.6m thick
419001	Topsoil	Light orangeish brown fine sandy silt	0.25m thick
419003	Geological Subsoil	Light brownish orange silty gravel	3.6m thick

TR MM-JC-TP-120	**1.6 X 3.0M, 0.00-3.10M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
419018	Topsoil	Light orangeish brown fine sandy silt. Inclusions: moderate angular stones, occasional rounded stones	0.3m thick
419019	Geological Subsoil	Mid brownish orange gravelly fine sand. Inclusions: frequent angular stones, moderate rounded stones	–

TR MM_RG_TP_007	**1.8 X 3.0M, 0.30-3.00M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
216026	Topsoil	Dark orangeish brown clayey silt	0.3m thick
216027	Geological Subsoil	Light orangeish brown coarse sandy clay	2.7m thick

TR MM_RG_IP_002	**0.65 X 3.5M, 0.30-0.45M DEEP**		
CONTEXT	INTERPRETATION	DESCRIPTION	DIMENSIONS
213001	Topsoil	Dark greyish brown silty clay. Inclusions: frequent angular stones	0.3m thick
213002	Geological Subsoil	Light brownish orange silty clay. Inclusions: frequent angular stones	0.15m thick

Appendix 1.2 Photographic register

PHOTO	DESCRIPTION	FACING
175001	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	W
175002	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	W
175003	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	N
175004	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	N
175005	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	NW
175006	Context 175001-175004, east-facing section shot . Trench MM_JC_ TP_001.	W
175007	Context Working shot , plan shot of trench . Trench MM_JC_IP_108.	E
175008	Context N/A, working shot of methodology . Trench MM_JC_IP_108. Working shot.	N
175009	Context 175005-175007, plan shot of trench . Trench MM_JC_ IP_108.	W
175010	Context 175005-175007, plan shot of trench . Trench MM_JC_ IP_108.	S
175011	Context 175005-175007, south-facing section. Trench MM_JC_ IP_108.	N
175012	Context N/A, plan shot of trench . Trench MM_JC_IP_108.	E
175013	Context N/A, overview of hazards. Trench MM_JC_IP_108. General shot.	NW
175014	Context 175008-175010, plan shot of trench . Trench MM_JC_ TP_131.	E
175015	Context 175008-175010, south-facing section. Trench MM_JC_ TP_131.	N
175016	Context 175008-175010, overview of progress. Trench MM_JC_ TP_131.	E
175017	Context 175011-175014, overview of progress. Trench MM_JC_ TP_132.	S
175018	Context 175011-175014, trench plan shot . Trench MM_JC_TP_132.	NE
175019	Context 175011-175014, south-facing section. Trench MM_JC_ TP_132.	N
175020	Context 175011-175014, plan shot of trench . Trench MM_JC_ TP_132.	E
175021	Context 175011-175014, plan shot of trench . Trench MM_JC_ TP_132.	E
175022	Context 175011-175014, north-facing section. Trench MM_JC_ TP_132.	N
175023	Context 175015-17517, s-facing section. Trench MM_JC_IP_110.	S
175024	Context 175015-17517, view of trench, s-facing sec. Trench MM_JC_IP_110.	N
175025	Context 175018-175020, working shot of methodology . Trench MM_JC_TP_130. Working shot.	N
175026	Context 175018-175020, e-facing section of trench. Trench MM_JC_TP_130.	W
175027	Context 175018-175020, e-facing section of trench. Trench MM_JC_TP_130.	W
175028	Context 175021-175024, north-facing section. Trench MM_JC_ IP_109.	S
175029	Context 175021-175024, north-facing section. Trench MM_JC_ IP_109.	S
175030	Context 175021-175024, north-facing section. Trench MM_JC_ IP_109.	S
175031	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175032	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175033	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175034	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175035	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175036	Context 175025-175027, e-facing section of trench. Trench MM_JC_IP_102.	W
175037	Context 175028-175031, trench plan shot . Trench MM_JC_TP_114.	S
175038	Context 175028-175031, east-facing section shot . Trench MM_JC_ TP_114.	W
175039	Context 175028-175031, east-facing section shot . Trench MM_JC_ TP_114.	W
175040	Context 175028-175031, east-facing section shot . Trench MM_JC_ TP_114.	W
175041	Context 175028-175031, east-facing section shot . Trench MM_JC_ TP_114.	W
175042	Context 175032-175035, west-facing representative section of topsoil strat.. Trench MM_JC_TP_122.	SE
175043	Context 175032-175035, working shot of methodology . Trench MM_JC_TP_122.	S
175044	Context 175032-175035, working shot of methodology . Trench MM_JC_TP_122.	S
175045	Context 175032-175035, northwest-facing section. Trench MM_JC_TP_122.	SE
175046	Context 175032-175035, northwest-facing section. Trench MM_JC_TP_122.	–
175047	Context 175032-175035, northwest-facing section. Trench MM_JC_TP_122.	–
175048	Context 175036- 175040, plan shot of trench . Trench MM_JC_ TP_116.	S
175049	Context 175036- 175040, east-facing section shot . Trench MM_JC_TP_116.	W
175050	Context 175036- 175040, east-facing section shot . Trench MM_JC_TP_116.	W

PHOTO	DESCRIPTION	FACING
175051	Context 175036- 175040, east-facing section shot . Trench MM_JC_TP_116.	W
175052	Context 175036- 175040, east-facing section shot . Trench MM_JC_TP_116.	W
175053	Context 175036- 175040, east-facing section shot . Trench MM_JC_TP_116.	W
216001	Trench MM_JC_TP_007. Trench Shot.	S
216002	Trench MM_JC_TP_007. Trench Shot.	S
216003	Trench MM_JC_TP_007. Trench Shot.	S
216004	Trench MM_JC_TP_007. Trench Shot.	S
216005	Trench MM_JC_TP_007. Trench Shot.	S
216006	Trench MM_JC_TP_010. Trench Shot.	S
216007	Trench MM_JC_TP_010. Trench Shot.	S
216008	Trench MM_JC_TP_003 . Trench Shot.	E
216009	Trench MM_JC_TP_003 . Trench Shot.	E
216010	Trench MM_JC_TP_003 . Trench Shot.	E
216011	Trench MM_JC_TP_133. Trench Shot.	N
216012	Trench MM_JC_TP_133. Trench Shot.	N
216013	Trench MM_JC_TP_133. Trench Shot.	N
419001	Context 419001, 419002, 419003, tr mm-jc-tp-002. Trench TR MM-JC-TP-002.	NW
419002	Context 419001, 419002, 419003, tr mm-jc-tp-002. Trench TR MM-JC-TP-002.	S
419003	Context 419004, 419005, 419006, tr mm-jc-tp-001. Trench TR MM-JC-TP-001.	NW
419004	Context 419004, 419005, 419006, tr mm-jc-tp-001. Trench TR MM-JC-TP-001.	NW
419005	Context 419007, 419008, 419009, tr mm-jc-tp-005. Trench TR MM-JC-TP-005.	NW
419006	Context 419007, 419008, 419009, tr mm-jc-tp-005. Trench TR MM-JC-TP-005.	NW

PHOTO	DESCRIPTION	FACING
419007	Context 419010, 419011, 419012, tr mm-jc-tp-008. Trench TR MM-JC-TP-008.	E
419008	Context 419010, 419011, 419012, tr mm-jc-tp-008. Trench TR MM-JC-TP-008.	N
419009	Context 419013, 419014, 419015, tr mm-jc-tp-012. Trench TR MM-JC-TP-012.	W
419010	Context 419013, 419014, 419015, tr mm-jc-tp-012. Trench TR MM-JC-TP-012.	N
419011	Context 419013, 419014, 419015, tr mm-jc-tp-012. Trench TR MM-JC-TP-012.	E
419012	Context 419016, 419017, 419018, tr mm-jc-tp-006. Trench TR MM-JC-TP-006.	W
419013	Context 419016, 419017, 419018, tr mm-jc-tp-006. Trench TR MM-JC-TP-006.	N
419014	Context 419022, 410023, 419024, tr mm-jc-tp-009. Trench TR MM-JC-TP-009.	E
419015	Context —, working shot. Trench NA. Working shot.	–
419016	Context 419022, 410023, 419024, tr mm-jc-tp-009. Trench TR MM-JC-TP-009.	E
419017	Context 419025, 419026, 419027, tr mm-jc-tp-004. Trench TR MM-JC-TP-004.	SW
419018	Context 419025, 419026, 419027, tr mm-jc-tp-004. Trench TR MM-JC-TP-004.	SE
213001	Context 213001, id shot. Also shows Contexts 213002. Trench MM_RG_IP_002.	X
213002	Context 213001, pre ex shot of pit. Also shows Contexts 213002. Trench MM_RG_IP_002.	NE
213003	Context 213001, nw facing section of pit. Also shows Contexts 213002. Trench MM_RG_IP_002.	SE
213004	Context 213001, nw facing section of pit. Also shows Contexts 213002. Trench MM_RG_IP_002.	SE
213005	Context 213001, ne facing shot of pit. Also shows Contexts 213002. Trench MM_RG_IP_002.	NE

Appendix 1.3 Finds register

SITE CODE	AREA	TR	FIND NO	RELATED CONTEXT NUMBER	OBJECT TYPE	MATERIAL TYPE	INITIALS	DATE	
EAGW24	EAGW24	MM-JC-TP-118	F-41901	419001	CBM	CBM	MS	8/12/2024	edited by KG 29/4/25 to match finds assesment

APPENDIX 2 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID (UID): headland1-531325

Project Name:	GI Monitoring Watching Brief at Norwich to Tilbury
Activity type:	Watching Brief
Sitecode(s):	EAGW
Project Identifier(s):	EAGW24
Planning Id:	[no data]
Reason for Investigation:	Planning: Pre application
Organisation Responsible for work:	Headland Archaeology (UK) Ltd
Project Dates:	17-Jun-2024–27-Jun-2024
HER:	Essex HER
HER:	Suffolk HER
HER:	Norfolk HER
HER Identifiers:	[no data]
Project Methodology:	Headland Archaeology (UK) Ltd was commissioned by Arcadis, on behalf of National grid to undertake a programme of Archaeological and Geoarchaeological monitoring of Geotechnical Investigation (GI) works in support of a proposed Development Consent Order (DCO) application. The works took place from the 17th June 2024–27th January 2025 and involved the monitoring of 43 geotechnical pits within cropmark areas of medium archaeological potential.
Project Results:	A total of 43 geotechnical pits were monitored under archaeological supervision over three geographical sections of the scheme. No archaeological features or deposits were identified during the monitoring works. One fragment of ceramic building material (CBM) was recovered from the topsoil. The CBM is non-diagnostic and likely to be residual material that has been relocated through modern ploughing and therefore have limited to no value for providing insight into the archaeological date or type of activity in the area.
Keywords:	–
Archive:	–

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