

**Geoarchaeological Investigations of Proposed Biomass Plant Location,
Ridham Dock, Iwade, near Sittingbourne, Kent.**

**Report on Field Investigations
(Test Pits and Borehole)**

NGR 592267 168223

**Project No. 5737
Site Code: RD12**

ASE Report No. 2012264

Dr Matt Pope and Liz Chambers

November 2012

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Abstract

A geoarchaeological test pit survey and borehole investigation was undertaken on land at Ridham Dock, Kent. The modern land use comprised former railway yards and industrial areas currently partially buried under Made Ground. The results of previous geotechnical assessments were consulted and the possibility of preserved land surfaces with associated archaeological remains was considered possible within the upper parts of the alluvial sequence. Previous borehole surveys suggested a deep and well preserved alluvial sequence associated with the River Swale and Thames River systems.

Seven geoarchaeological test pits were excavated to 3.5m depth, they showed an entirely uniform sequence across the site of made ground, weathered alluvium and a lower organic alluvium with high palaeoenvironmental potential. A single Borehole was undertaken to recover a complete profile through the alluvial sequence. This was achieved with samples taken at 0.5m intervals throughout the entire 12.5m alluvial sequence to the surface of the London Clay.

No indications of human structures or artefactual material were encountered below made ground. While full interpretation will only be possible after detailed examination of the recovered sediments (as part of a post-excavation analysis programme), it is thought probable that the site occupied a low-lying position on the estuary margin which would have been uninhabitable or marginal land for much of the Holocene.

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OASIS FORM

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Figure 1: Site location

Figure 2: Location of geotechnical investigations (Test Pits and Borehole)

1.0 INTRODUCTION

- 1.1 Archaeology South-East (ASE) was commissioned by SLR Consulting Ltd (hereafter 'SLR') to undertake a geoarchaeological investigation of land at Ridham Docks Iwade. The work was undertaken on behalf of SLR, ahead of construction of a Biomass Energy Plant, to address condition 16 of the planning consent.
- 1.2 Through consultation between ASE, SLR and Simon Mason of the Kent County Council Heritage Conservation Group, a Written Scheme of Investigation was produced by SLR to undertake the mechanical excavation of up to eight geoarchaeological test pits (SLR 2012). The results of this fieldwork would inform on the next phase of work, which was anticipated to be undertaking up to two geoarchaeological boreholes.
- 1.3 The test pits were undertaken in October 2012 and following a further period of consultation between ASE, SLR and Simon Mason of the Kent County Council Heritage Conservation Group a single geoarchaeological borehole was undertaken in November 2012. A written Scheme of Investigation for the latter was produced after the fieldwork and outlined in detail the proposals for detailed analysis (ASE 2012).
- 1.4 This report, compiled with reference to the Written Scheme of Investigation (WSI) produced by SLR Consulting LTD (SLR 2012), the pre-existing Geotechnical Assessment (SLR Consulting LTD 2009) and the WSI prepared by ASE (ASE 2012), comprises the results from these field investigations, discussion of their significance and recommendation for further analytical work.

2.0 SITE LOCATION AND GEOLOGICAL CONTEXT

- 2.1 The site comprises a sub-rectangular parcel of former industrial land with an access road from the west, totalling approximately 2.5ha in size and centred on NGR 592267 168223 (Figure 1). The site is bounded on its north, west and south sides by further industrial units within the Ridham Dock complex, while the eastern boundary abuts the 19th century Ridham Wall flood defence adjacent to the Swale. The site is centred at NGR 592199, 168230 to the south of Ridham Dock and immediately adjacent to the River Swale.
- 2.2 The site is roughly rectangular in plan approximately 200m by 100m at its widest points. The general topography of the area is roughly level with a lower area on the site that is currently occupied by reed beds. The site is accessed via the main access road to Ridham Dock. The northeast corner of site is approximately 1m lower than remainder, which appears to have been levelled up with fill material as part of the concrete recycling/aggregate works on the neighbouring site. The lower area comprises approximately 0.75ha of low-lying marsh land, with standing water at 1.18m AOD. The ground level rises to around 2.2-2.6m AOD along the southern site boundary and around 2-2.4m AOD to the west. A large warehouse building is situated on the western part of site, with extensive stockpiled crushed aggregate materials to the east of the building and concrete hardstanding to the west.
- 2.3 The local authority is Swale District Council and the Planning Authority is Kent County Council
- 2.4 Reference to British Geological Survey (BGS) Map 272, 'Chatham' and the eMapsite GroundSure GeolInsight report indicates the site to be underlain by Alluvium (associated with the River Swale) generally comprising silty, peaty, sandy, clay which is in-turn underlain by the London Clay. The London Clay is stiff, over-consolidated clay of very high plasticity which weathers to a characteristic reddish brown colour where it outcrops.

3.0 ASSESSMENT OF PREVIOUS WORK

- 3.1 Geotechnical investigations were undertaken in August and September 2009 by SLR. These comprised 3 cable percussion boreholes to 25m depth and 16 cone penetration tests. The boreholes (BH01-03) ran in a line across the site from west to east.
- 3.2 The borehole sequences recorded through Geotechnical investigation (SLR Consulting LTD 2009) demonstrated the following general ground make-up at the site:

Made Ground

Where present, a thin topsoil (0.1-0.15m) overlies reworked alluvium with modern brick, wood, metal and plastic (0.8m). Little or no made ground was encountered by cone penetration testing in the marshy area to the north east as here there had been no recent emplacement of materials.

Alluvium

Beneath the made ground this comprises desiccated/weathered and oxidised alluvium of firm clay up to 1.5m deep, below which is very soft grey silty sandy clay and silt. Significant thickness of silty sand was encountered at the eastern edge of the site coinciding with a groundwater strike. Where recorded by the cone penetration

tests, inferred soil type of the alluvium from the sleeve friction results was 'very soft organic material'.

Bedrock

London Clay was encountered at 10-12m bgl.

Groundwater

Groundwater strikes were encountered at 3m (BH01), 1m (BH02) and 8.2m (BH03). Hydrogeological assessment of the alluvium suggests that groundwater in this layer is likely to be recharged through tidal intrusion, with groundwater flow highly influenced by tidal variations. The assessment of impact on the groundwater flow regime concluded that the likelihood of the development altering or reducing groundwater recharge and flow would be negligible.

3.3 Borehole Records (depths expressed in metres below ground level)

BH01

- modern made ground to 0.55m bgl
- Firm sandy silty organic clay with organic odour to 3.7m
- Very soft black clay w/ organic odour to 6.5m
- Very soft light grey sandy clayey silt to 10.7m onto London Clay

BH02

- Modern made ground to 1.25m bgl
- Silty clay with black silt and organic odour to 1.6m
- Soft black sandy silty clay with organic odour to 6.1m
- Soft to firm grey sandy silty clay to 8.05m
- Soft sandy clay to 8.15m
- Loose clayey sand to 9.25m
- Soft sandy clay to 12.8 onto London Clay

BH03

- Made ground to 1.5m, lower 0.15m comprising soft black clay with decaying vegetation.
- Firm mottled clay with organic odour to 2.3m
- Soft grey silty clay with slight organic odour and laminations of grey sand to 7.8m
- Very loose sand to 11.2m
- Very soft sandy clay to 12m onto London Clay

3.4 The observations match those previously for the estuarine margins of the Lower Thames River system which have been summarised usefully by Gibbard (1994) and Bridgland (1994) with reference to the key regional borehole sequence (Devoy 1979) sequence. Typically Holocene alluvial sedimentation overlies earlier Pleistocene sedimentation relating to the Late Pleistocene Shepperton Terrace sequence (MIS 4-2). While no evidence for the presence of these gravels was noted in the geotechnical works, the possibility that the earliest part of the sequence relates to the Late Pleistocene must be borne in mind.

3.5 The sequence appears to indicate an increase in organic material towards the top of the sequence, especially between 1.5m and 2.5m depth. No lower organic horizons were firmly documented suggesting the potential for early Holocene, pre-transgression land surfaces are low.

- 3.6 The upper organic horizons within the firmer alluvial deposits of clay rather than sand lithology are of more significance. 2km to the south west of the site at Kemsley and occupying a similar channel edge position showed evidence for preserved Late prehistoric (Neolithic-Bronze Age-Romano British) occupation surfaces with in-situ archaeology including burning horizons and kilns (Bates et al in prep).
- 3.7 Given the more proximal position to the main Thames estuarine area and the potential for more high energy tidal process the scope for preserved landsurface is considered to be less at Ridham Dock due to the higher turnover of sediments. Furthermore the indication of mobile tidal groundwater (see below) suggests greater potential for loss of sediment structure and mixing at the Ridham Dock site.

4.0 GEOARCHAEOLOGICAL INVESTIGATION: METHODS AND RESULTS

4.1 Test Pit Methodology

4.1.1 The geoarchaeological investigation in this area consisted of seven machine excavated test pits – 1.8m x 2-3m x 4m (maximum depth).

4.1.2 All test pit areas were scanned prior to excavation using a Cable Avoidance Tool (CAT). Due to the wartime activity within this area the discovery of unexploded ordnance (UXO) was anticipated. Therefore the pits were dug under constant supervision by the Geoarchaeologist and the BACTEC engineer (Ray Williams).

4.1.3 Detailed sediment logs were made and all units and unit boundaries were fully described following the methodology of Jones *et al.* (2000) and Tucker (1996) and are tabulated below.

4.2 Geoarchaeological Test Pits: Results

4.2.1 Test Pit 1

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-0.70	Made Ground			Chalk rubble, metal, CBM, tyres, concrete, etc.	Landfill
0.70-1.30	Alluvium	Silty Clay	Light brown		Consistent line of grey in south of pit running E-W
1.30-2.50	Alluvium		Light blue-grey	Smears of organics, mollusca (including oyster shell noted further down in sequence) [hydrocarbons noted]	Intertidal marine sediments
2.50-3.50	Alluvium	Soft clay	Light-mid blue grey	Much fewer organics	
3.50-4.00	Alluvium	Clay with fine sand	Dark grey	organics	

4.2.2 Test Pit 2

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-1.00	Made Ground			Organics, stone, metal, tarmac, etc..	Landfill
1.00-1.95	Weathered alluvium	Clay (with some traces of sand further down sequence)	Light grey-orange	Very occasional mollusca	
1.95-2.50	Alluvium	Clay	Mid grey, increasing to dark grey with increase in organics	Increasing organics	Intertidal marine sediments

4.2.3 Test Pit 3

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-2.30	Made Ground			Chalk and flint rubble, occasional CBM	Landfill/raising ground
2.30-2.60		Clay	Black	organics	Old reed beds – growing in alluvium below
2.60-3.50	Weathered alluvium	Clay	Light brown		Rooted by reeds above
3.50-4.00	Alluvium	Clay	Light-mid blue (increasing to dark further down sequence)	organics	Intertidal marine sediment

4.2.4 Test Pit 4

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-1.90	Made Ground			Chalk and flint rubble, occasional CBM	Landfill/raising ground
1.90-2.10		Clay	Black	organics	Old reed beds – growing in alluvium below
2.10-3.10	Weathered alluvium	Clay	Light brown	Occasional organic flecks	Rooting from reed beds?
3.10-3.60	Alluvium	Clay	Dark blue grey	organics	Intertidal marine sediment

4.2.5 Test Pit 5

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-1.50	Made Ground			Chalk and flint rubble, occasional CBM	Landfill/raising ground
1.50-1.70		Clay	Black	organics	Old reed beds – growing in alluvium below
1.70-2.90	Alluvium with occasional weathered areas showing	Clay	Blue-grey with occasional brown patches	Occasional organics	Some plastic noted
2.90-4.00		Clay	Dark grey	organics	Intertidal marine sediment

4.2.6 Test Pit 6

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-0.10	Topsoil	Silty clay	Black		
0.10-1.20	Weathered alluvium	Clay	Light brown	Occasional Mollusca, possible organics	
1.20-2.50	Alluvium	Clay	Light-mid blue grey (increases in darkness as progresses down sequence)	Organic flecks and patches	Possible desiccation cracking traces
2.50-3.00		Clay	Dark blue-grey		Intertidal marine sediment

4.2.7 Test Pit 7

Depth (m)	Stratigraphy	Lithology	Colour	Clast	Notes
0-1.70	Made Ground			CBM, concrete, flint, metal,	Landfill/raising ground
1.70-1.90		Clay	Black	Organics	Old reed beds
1.90-3.30	Alluvium	Clay	Grey (with occasional brown mottling)	Organics	
3.30-4.00	Alluvium	Clay	Dark grey	Organics	Intertidal marine sediment

4.3 Geoarchaeological Borehole: Results

- 4.3.1 A single geoarchaeological borehole (Figure 2, GB1) was undertaken using a percussion augur in order that a complete palaeoenvironmental profile could be obtained through the alluvial sequence. Where possible, samples were to be retained in sealed U100 cores.
- 4.3.2 Undertaking this borehole was technically challenging due to the need for constant monitoring for buried ordinance and the saturation levels of tidal groundwater. Below 4m the sediment was very sandy and cohesive although still demonstrated potential for palaeoenvironmental preservation. The sampling methodology switched from sealed U100 recovery to bulk sampling directly from the clay cutter.
- 4.3.3 Given the sealed nature of the sampling, the entire sequence cannot be reported on here and full characterisation will have to await the results of further analysis as set out in the WSI (ASE 2012). It is however possible to say that observations matched those made in the earlier Geotechnical borehole survey in suggesting a sequence which comprises Made Ground, organic Alluvium, Alluvial Sand with a contact with the underlying London Clay at c.12m

5.0 CONCLUSIONS AND RECOMMENDATIONS

- 5.1 To summarise, seven geoarchaeological test pits were excavated to 3.5m depth and showed an entirely uniform sequence across the site of Made Ground, Weathered Alluvium and a Lower organic alluvium with high palaeoenvironmental potential. A single borehole was undertaken to recover a complete profile through the alluvial sequence. This was achieved with sample taken at 0.5m intervals throughout the entire 12.5m alluvial sequence to the surface of the London Clay.
- 5.2 No indications of human structures or artefactual material were encountered below Made Ground. While full interpretation will only be possible after detailed examination of the recovered sediments (as part of a post-excavation analysis programme), it is possible to say that the site appears to occupy a low-lying position on the estuary margin which would have been uninhabitable or marginal land for much of the Holocene.
- 5.3 It is recommended that a targeted programme of palaeoenvironmental assessment and dating is undertaken on the samples recovered from the borehole. Given the inability of the sediments to be retained in a U100 tube, and the evident effects of tidal groundwater on sediment mixing and deformation, only a coarse scale of vertical sampling is warranted. An analytical programme which comprises palynological, micropalaeontological and, where possible, radiometric dating will be able to deliver a sequence of palaeoenvironmental change and indication of human activity in the landscape for correlation with other regional sequence (e.g., Devoy 1979)

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OASIS ID: archaeo6-139538

Project details

Project name	Ridham Dock, Iwade
Short description of the project	<p>A geoarchaeological test pit survey and borehole investigation was undertaken on land at Ridham Docks, Kent. The modern land use comprised former railway yards and industrial areas currently partially buried under Made Ground. The results of previous geotechnical assessments were consulted and the possibility of preserved land surfaces with associated archaeological remains was considered possible within the upper parts of the alluvial sequence. Previous borehole surveys suggested a deep and well preserved alluvial sequence associated with the River Swale and Thames River systems. Seven geoarchaeological test pits were excavated to 3.5m depth, they showed an entirely uniform sequence across the site of Made Ground, Weathered Alluvium and a Lower organic alluvium with high palaeoenvironmental potential. A single Borehole was undertaken to recover a complete profile through the alluvial sequence. This was achieved with samples taken at 0.5m intervals throughout the entire 12.5m alluvial sequence to the surface of the London Clay. No indications of human structures or artefactual material were encountered below Made Ground. While full interpretation will only be possible after detailed examination of the recovered sediments (as part of a post-excavation analysis programme), it is thought probable that the site occupied a low-lying position on the estuary margin which would have been uninhabitable or marginal land for much of the Holocene.</p>
Type of project	Field evaluation
Current Land use	Industry and Commerce 1 - Industrial

Project location

Country	England
Site location	KENT SWALE SITTINGBOURNE Ridham Docks
Site coordinates	TQ 592267 168223 50 0 50 55 41 N 000 15 57 E Point

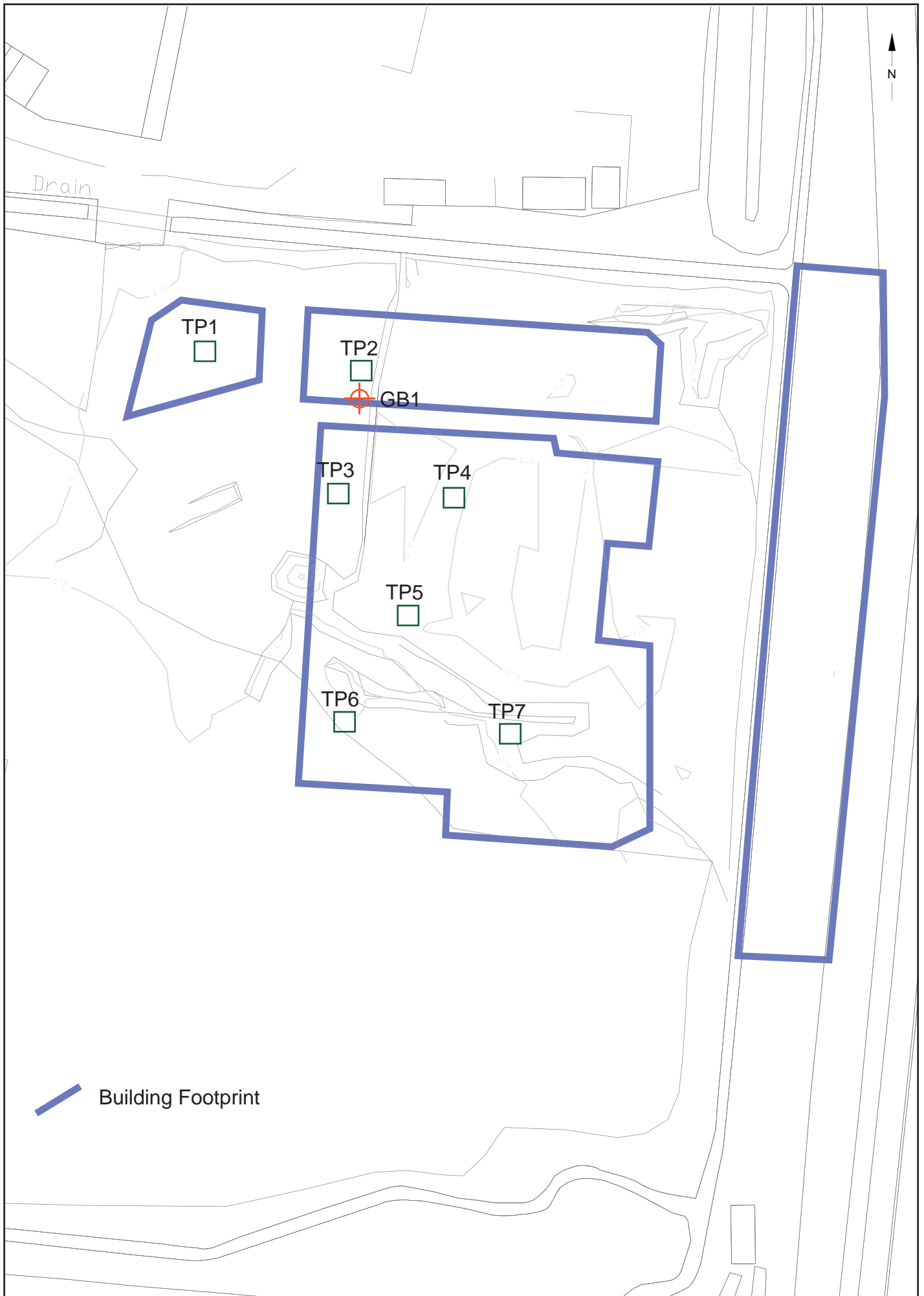
Project creators

Name of Organisation	Archaeology South-East
Project brief originator	Private Client
Project design originator	Kent County Council
Project director/manager	Neil Griffin
Project supervisor	Matt Pope
Type of sponsor/funding body	Developer

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Entered on 17 December 2012



© Archaeology South-East		Ridham Docks GA		Fig. 1
Project Ref: 5737	December 2012	Site location		
Report Ref:	Drawn by: RHC			



© Archaeology South-East		Ridham Docks GA	Fig. 2
Project Ref: 5737	December 2012	Location of Geotechnical Investigations	
Report Ref:	Drawn by: RHC		

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