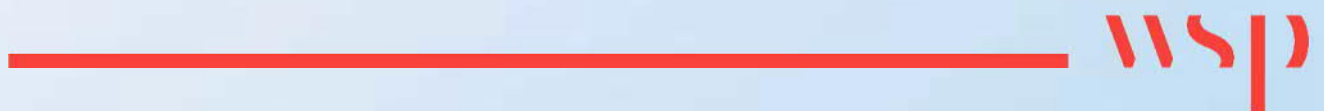


Appendix D

GEOARCHAEOLOGICAL WATCHING BRIEF DURING SI INVESTIGATIONS ON THE ROUTE OF THE PROPOSED A29 REALIGNMENT



**A Geoarchaeological Watching Brief during SI Investigations
on the route of the proposed A29 Realignment at
Eastergate, West Sussex**

NGR: SU 95027 05814

**ASE Project No: 180783
Site Code: ARS18**

ASE Report No: 2019190

**By Matt Pope, Alice Dowsett,
Karine Le Hégarat, Isa Benedetti-Whitton**

Illustrations by Justin Russel

**Archaeology South-East
Units 1 and 2
2 Chapel Place
Portslade
East Sussex
BN41 1DR
Tel: 01273 426830
Email: fau@ucl.ac.uk
Website: www.archaeologyse.co.uk**

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Prepared by:	Matt Pope	Senior Geoarchaeologist	
Reviewed and approved by:	Jon Sygrave	Project Manager	
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**Archaeology South-East
Units 1 & 2
2 Chapel Place
Portslade
East Sussex
BN41 1DR**

**Tel: 01273 426830
Fax: 01273 420866
Email: fau@ucl.ac.uk**

Abstract

Archaeology South-East were contracted by West Sussex County Council to undertake a watching brief on a Geotechnical Site Investigations undertaken by Geotechnics Ltd, along the line of the proposed A29 realignment scheme at Eastergate, West Sussex. The scope of works comprised 9 boreholes, 15 test pits and 3 window samples which were either directly watched by or reviewed by ASE geoarchaeologists. This report comprises a review of this data and provides a provisional interpretation of the significance of the site in terms of the character and likely age of the deposits and their potential for preserving archaeological or palaeoenvironmental evidence.

The watching brief established categorically that the entire route is underlain by a Quaternary Sequence with four broad elements. 1. Marine deposits of likely MIS7 age, which may provide previous palaeoenvironmental, paleoclimate and paleogeographic evidence; 2. High energy fluvial and gelifluction deposits with a likely like resolution archaeological signatures. 3. Low energy 'Brickearth' deposits with possible palaeoenvironmental potential and a high-resolution but very low density archaeological signature. 4. Holocene colluvium, subsoil and possible features with some indication of Roman and Late Prehistoric human activity. In addition at least one ;large circular depression was identified in the field which is thought to represent a solution hollow, this was not evaluated but may provide a capture point and contain localised palaeoenvironment evidence as associated human activity.

CONTENTS

- 1.0 Introduction**
- 2.0 Archaeological Background**
- 3.0 Archaeological Methodology**
- 4.0 Results**
- 5.0 The Finds**
- 6.0 The Environmental Samples**
- 7.0 Discussion and Conclusions**

Bibliography
Acknowledgements

TABLES

- Table 1: Quantification of site paper archive
- Table 2: Quantification of artefact and environmental samples
- Table 3: Summary of observations from all geotechnical interventions
- Table 4: Summary of observed depositional units

FIGURES

- Figure 1: Site Location Map
- Figure 2: Map of the route showing all Geotechnical interventions.

1.0 INTRODUCTION

1.1 Site Background

- 1.1.1 Archaeology South-East were contracted by West Sussex County Council (WSSCC) to undertake a watching brief during Geotechnical Site Investigations undertaken along the line of the proposed A29 realignment scheme at Eastergate, West Sussex (centred on SU 95027 05814), hereafter referred to as 'the site'.
- 1.1.2 The scope of works comprised 9 boreholes, 17 test pits and 3 window samples which were either directly watched by or reviewed by ASE geoarchaeologists. This report comprises a review of this data and provides a provisional interpretation of the significance of the site in terms of the character and likely age of the deposits and their potential for preserving archaeological or palaeoenvironmental evidence.
- 1.1.3 The West Sussex County Archaeologist, John Mills, advised the WSSCC A29 Realignment Project Team and the work was undertaken with his approval and in line with the relevant ClfA (2017) and Sussex Archaeological Standards (2017).

1.2 Geology and Topography

- 1.2.1 The site is situated on the relatively flat and low-lying topography of West Sussex Coastal Plain at around 16m O.D. The landscape, which is currently under a mixed agriculture and woodland, shows no dramatic topography on the ground but inspection of local topographic mapping shows it to lie between two dry valleys which run north to south and ultimately form part of the Lidsey Rife fluvial system. To the west of the site the dry valley comprises the southern continuation of the Slindon Bottom dry valley and, while infilled with colluvial deposits today, would have been a significant post-glacial landscape feature originating within the chalk escarpment some 8km to the north of the site. The dry valley to the immediate east of the site is a far less well-developed landscape feature and represents a very minor tributary originating less than a kilometre to the north of the site.
- 1.2.2 The BGS maps the solid geology as being formed by the London Clay Formation, an Eocene deposit comprising stiff grey-blue to brown clay, sometimes with a little sand.
- 1.2.3 The BGS maps the site as having a superficial geology comprising two separate sets of deposits: Undifferentiated River Terrace and Head Deposits. In reality both form part of the same broad system of Pleistocene sedimentation relating to the deposition of detrital fine and coarse grained sediments eroded by periglacial and subaerial action, deposited as a series of colluvial fans and then reworked through fluvial processes. The BGS mapping should be considered very provisional and does not, for example, consider superficial deposits of less than 3m total depth (Shephard-Thorn et al 1983; Lovell and Nuncarrow 1983; Lake et al 1985)

1.3 Aims and Objectives

1.3.1 The aims of the watching brief were as follows:

RA1: To monitor a relevant proportion of Geotechnical boreholes and test pits being undertaken along the proposed route of the A29 Realignment scheme.

RA2: To use this opportunity to characterise the deposits encountered along the route in terms of depositional environment, age and archaeological/palaeoenvironmental potential.

RA3: To develop a first-order model of geoarchaeological potential for the site and to develop an informed programme for further, purposive geoarchaeological evaluation.

1.3.2 These aims were to be achieved through the following objectives:

RO1: Undertake direct observation and recording of c. 50% of geotechnical interventions along the route of the A29 alignment scheme.

RO2: To engage in active dialogue with the geotechnical team so that both our methods of recording are mutually understood and intelligible to each other.

2.0 ARCHAEOLOGICAL BACKGROUND

2.1 Known Archaeological Site and Monuments.

2.1.1 No formal archaeological Desk Based Assessment has yet been undertaken for the site. However, previous work in the area and a lack of substantial development on the site suggests that it has potential for multi-period human activity and occupation from early prehistory through the present day. The geotechnical watching brief reported on here does not provide a suitable evaluation of the site for such potential archaeology.

2.1.2 The deposits mapped by the BGS across the site form part of a suite of Pleistocene deposits which have previously produced evidence of early human activity in West Sussex.

2.2 Geoarchaeological Background

2.2.1 The lower coastal plain has a long history of geological investigation, led most recently by Dr. Martin Bates. On the basis of correlation from sites investigated at similar altitudes in this landscape the solid geology can be expected to be overlain by marine deposits associated with the 220,000 year old Brighton Raised Beach relating to Marine Isotope Stages MIS 7 and early MIS 6 with overlying Head deposits relating to MIS 6 – 2 cold stage colluvial and fluvial sediments (Bates et al 1997; Bates et al 2003; Bates et al 2009). Colluvial and fluvial deposits relating to the Holocene are also present and well developed within the valleys of fluvial system (Bates et al 2001).

2.2.2 More widely the site can be considered as part of the Sussex and Hampshire Coastal Plain landform (Bates et al 2009, 2010), comprises part of an important landscape scale record of Quaternary climate, sea-level and environmental change. The landform has a long history of both geological and archaeological research extending back to the mid nineteenth century (Mantell 1822; Dixon 1850; Prestwich 1959; Reid 1903; Calkin 1934; Martin 1929; West and Sparks 1960; Hodgson 1964). This record is underpinned by processes of slow tectonic uplift and sea-level rise, the latter driven by c. 100,000 year-cycles of global climate change. These processes have led to the development of discrete marine platforms at elevations from current sea level to around 40m OD. Each platform supports a sedimentary sequence beginning with high and low energy marine deposits (raised beaches), lower energy intertidal and terrestrial deposits dating to the end of interglacials and fine and coarse grained slope deposits (Brickearth and Head Gravel) derived from periglacial weathering during prolonged cold stages. More locally, deposits relating to freshwater pools, marshes and spring deposits can also be found. The oldest of these depositional sequences is the 40m OD Westbourne-Arundel Raised Beach, which spans a 26km east-west corridor at the northern limits of the Coastal Plain with the former cliff line of this beach demarcating the relatively flat landscape to the south from the escarpment of the South Downs. Dating from 480,000 years ago and spanning Marine Isotope Stages 13 and 12 (Roberts and Pope 2009; Roberts and Pope 2017; Schwenninger et al. 2007), the Westbourne-Arundel Raised Beach contains exceptionally well-preserved records of early human activity, revealed through aggregate extraction at Amey's Eartham Pit, Boxgrove (Roberts 1986; Roberts and Parfitt 1999), Slindon (Pope 2001; Roberts and Pope 2009) and the Valdoe (Pope et al

2009).

2.2.3 The time span covered by the sediments across the coastal plain includes periods of demonstrated human occupation by *Homo heidlebergensis*, *Homo neandertalensis* and *Homo sapiens* (Roberts and Parfitt 1999).

3.0 ARCHAEOLOGICAL METHODOLOGY

3.1 Fieldwork Methodology

3.1.1 The fieldwork comprised a watching brief on a programme of geotechnical investigations being carried out along the route of the realignment scheme. This involved working alongside the geotechnical engineers to observe and record the depositional sequence through the Quaternary deposits and prove, where possible, the contact with pre-Quaternary Solid Geology.

3.1.2 Geotechnical interventions comprised cable percussion boreholes, window samples and machine excavated test pits. In each case the arisings were recorded in terms of lithology, colour, consistency, coarse components and nature of organic content. The arisings were also inspected for artefacts and significant ecofacts such as large faunal elements.

3.2 Fieldwork Constraints

3.2.1 The constraints were those usually associated with watching briefs being limited by the nature and position of each intervention. However we were afforded every opportunity to inspect and record sediments during our attendance.

3.3 The Site Archive

3.3.1 The contents of the archive are tabulated below (Table 1).

Context sheets	0
Section sheets	0
Plans sheets	1
Colour photographs	
B&W photos	00
Digital photos	
Context register	1
Drawing register	1
Watching brief forms	5
Trench Record forms	13

Table 1: Quantification of site paper archive

Bulk finds (quantity e.g. 1 bag, 1 box, 0.5 box 0.5 of a box)	0
Registered finds (number of)	2
Flots and environmental remains from bulk samples	0
Palaeoenvironmental specialists sample samples (e.g. columns, prepared slides)	5
Waterlogged wood	0
Wet sieved environmental remains from bulk samples	0

Table 2: Quantification of artefact and environmental samples

- 3.3.2 The finds and environmental samples ultimately deposited as part of the archive are dependent on specialist recommendations and regional archive requirements.

4.0 RESULTS

4.1 Observations

4.1.1 All Geotechnical interventions are listed in Table 2. Those in green were directly observed by ASE geoarchaeologists, those in yellow have been interpreted from geotechnical logs provided (see Appendix 1). The location of each intervention is shown in Figure 2, the interventions below are listed in spatial order along the proposed route of the realignment from the north west to the south east of the site.

	Topsoil	Made G	Subsoil	Brickearth	Decalcified Head	Calcareous Head	Fluvial Gravel	Marine Sands	London Clay	BOH	BE Thickness
GTP2	0		0.2	0.4	0.75	1.2				2.6	0.35
BH1	0			0.2	1	2		5.8	10.5	15.5	0.8
BH2	0		0.1		1.2	1.6		6.5			0
GTP3	0		0.3	0.5	0.85	1.35				2.9	0.35
WS02	0		0.3	0.5							0
BH3	0	0.1			0.9	2.4		5.5		8.5	0
WS03	0		0.3	0.8							0
GTP6	0	0.25		0.2	0.6	1				2.2	0.4
BH4	0			0.2	1	1.6		4.8	9		0.8
GTP7	0				0.2	1.2				2.4	0
GTP8	0				0.2	1				2.3	0
BH05	0		0.2		0.5	2	4			8.5	0
GTP9	0		0.2	0.3	0.8	1.2				3.5	0.5
GTP10	0		0.3	0.5	0.7	1.2				3	0.2
BH06	0				0.3	0.9		5.35	6.7	8	0
GTP11	0		0.2		0.6	1				1.9	0
GTP12	0	0.1			1.2	2.1				3.4	0
BH07	0				0.3	0.5					0
GTP13	0				0.2	0.7				1.6	0
GTP14	0		0.3	0.4	0.8	1.2	1.6			1.6	0.4
BH08	0			0.1		1.2		3.2	5.8	8.5	1.1
GTP15	0			0.35	1.6	2.5				2.9	1.25
GTP18	0	0.2								0.5	0
GTP16	0	0.2			0.6	1		3.1		3.3	0
WS04	0		0.3	1	1.2	1.52				2.6	0.2
BH09	0			0.3	1.4	3		4.5	5.4	15	1.1

Table 3: Summary of observations from all geotechnical interventions

4.1.2 Nine major sedimentary units were observed during the course of the watching brief. These are listed in Table 4 along with very provisional interpretations. The sequence shows a typical Quaternary succession for this part of the Coastal Plain. The Solid Geology comprises the Tertiary London Clay Formation which dates to the Eocene and consequently offers no archaeological potential. This is overlain by sands at around 8-10m O.D. This is very provisionally interpreted as relating to the southerly extent of marine deposits related to the Brighton-Norton Raised Beach.

4.1.3 No fine grained deposits which could relate to conformable, regressive and terrestrial environments were recorded in the survey, instead the marine deposits appeared everywhere overlain by calcareous high-energy gellifluction or fluvial deposits. These grade into their decalcified equivalents at around 1.2m depth, with a contact between the two facies characterised by an irregular solution surface.

- 4.1.4 Overlying this gravel is an irregular thickness of fine-grained head (Brickearth) broadly speaking there was more coverage of Brickearth at either end of the realignment route and relatively less in the central area. A cover of over 1m of Brickearth was only recorded at the adjacent locations of BH08 and GTP15 suggesting a possible localised capture point.
- 4.1.5 Made Ground was recorded locally at GTP6. GTP12. GTP16, GTP18 and BH03, these deposits might relate to either landscape or infill and should be considered as part of any future archaeological evaluation.

Unit	Description	Intepretation
Unit 9	Clayey Sand and humic material.	Topsoil
Unit 8	Clayey Sand. Light Yellow Brown. Rare flint clasts	Subsoil
Unit 7	Sand with clay. Dark Yellow Brown. Variable inclusions including CBM	Madeground
Unit 6	Silty-Clay. Yellow Brown. Firm, structirelss and stone free.	Brickearth
Unit 5	Silty Clay. Yellow Brown. Frequent, Poorly-sorted sub-angular flint pebbles.	Decalcified Head Gravel
Unit 4	Silt. Light Yellow-Brown. Abundant Poorly sorted sub-angular flint pebbles and rounded chalk pellets	Calcareous Head Gravel
Unit 3	Sand with Silt. Yellow-Brown. Abundant sub-rounded flint pebbles.	Fluvial Gravel
Unit 2	Sand with Clay. Reddish-Brown. Occasional rounded flint pebbles.	Marine Sand
Unit 1	Stiff Grey Clay. Stone Free	London Clay

Table 4: Summary of observed depositional units

5.0 THE FINDS

5.1 Summary

- 5.1.1 Only two classes of find were recovered, a single worked flint artefact (flint) and single piece CBM, both came from surface on the west of the route.

5.2 Worked Flint by Karine Le Hégarat

A single flake fragment, the distal end of which is absent, was recovered from Test Pit 3 at 0.3m below ground level. The flake (PF <02>) weights 5g. It displays some signs of weathering, which indicates that it has been subject to some post depositional movement. It is made from a mid-grey flint, but is otherwise undiagnostic; and only a prehistoric date can be allocated for this artefact.

5.3 Ceramic Building Material (CBM) by Isa Benedetti Witton

- 5.3.1 A single fragment of CBM weighing 164g was collected from GTP 2 [2.0]. Based on the thickness and surface treatment this is most probably a fragment of Roman tegula tile, although it may be a piece of post-medieval floor tile. However, floor tile edges are usually bevelled and the edges on this piece of tile are not suggesting it is Roman CBM.

6.0 THE ENVIRONMENTAL SAMPLES

6.1 Five bulk environmental samples were taken during the course of the fieldwork, these were taken to provide a record of sediment variability across the site and also to provide material for assessment of potential if needed.

6.2 In the absence of any direct questions these samples can answer they are currently in storage and no action is being taken on them.

7.0 DISCUSSION AND CONCLUSIONS

7.1 Overview of stratigraphic sequence

7.1.1 The watching brief has determined that the entire site is covered by Quaternary sediments representing marine, fluvial and terrestrial environments preserved within a sediment envelope c.10m thick at the northern end of the route to around 5m at the southern end. The marine deposits at the base of the sequence are likely to date to around 220,000 years before present during the Marine Isotope Stage 7 interglacial. The overlying gravels are as yet undated but could belong to the penultimate or ultimate cold stages, or a combination of the two. The fine-grained 'Brickearth' may date to the last cold stage and this has been reworked in the Holocene through agricultural activity to provide a sub-soil.

7.1.2 The sequence contains localised areas of deep accumulations of both Made ground and Brickearth which may relate to both human and natural capture points in the landscape. The former might comprise archaeological features, the latter erosion or solution driven capture points. A large depression observation of the eastern part of the route (centre point shown on Figure 2) might be the result of large scale solution of the underlying solid geology (Doline). If to be impacted, these deep accumulations of Quaternary sediments should be investigated further.

7.2 Deposit survival and existing impacts and impact on archaeological remains

7.2.1 Much of the site appears to be free of obvious impacts beyond farm buildings and agricultural activity. No obvious significant impacts which would affect buried archaeology were encountered,

7.3 Updated Research Agenda

7.3.1 The watching brief has allowed for the initial characterisation of the route in terms of Quaternary depositional environments. Full development of a research agenda for the site can only be undertaken following the production of a desk-based archaeological assessment of the route, but the following questions relating to the Geoarchaeological record can begin to be framed:

RA1: What is the date and character of the marine sequence and is there regressional and terrestrial environments present within its upper sequence?

RA2: Can the range of depositional environments within the gellifluction and fluvial gravel bodies be mapped and related to the palaeo-topography of the site? Are localised fine-grained deposits with archaeological or palaeoenvironmental potential preserved within the gravels?

RA3: What is the character of the fine grained head (Brickearth) in terms of depositional environment, palaeoenvironmental and archaeological potential? Are areas of deep cover related to an underlying solution feature and do upper parts grade into Holocene colluvium?

RA4: What is the large topographic depression in the eastern part of the route?

Is it a natural capture point (doline) or a humanly-made feature?

RA5: Are observations of deeper Made Ground related to archaeological features?

7.4 Conclusions

7.4.1 The watching brief established categorically that the entire route is underlain by a Quaternary Sequence with four broad components.

1. Marine deposits of likely MIS7 age which may preserve palaeoenvironmental, palaeoclimate and palaeogeographic evidence.
2. High energy fluvial and gelifluction deposits with likely low-resolution archaeological signatures.
3. Low energy 'Brickearth' deposits with possible palaeoenvironmental potential, and a high-resolution but very low density archaeological signature.
4. Holocene colluvium, subsoil and possible features with some indication of Roman and Late Prehistoric human activity.

7.4.2 In addition at least one large circular depression was identified in the field (Figure 2), which is thought to represent a solution hollow. This was not evaluated but may provide a capture point for palaeoenvironmental evidence and associated human activity.

7.4.3 A programme of geoarchaeological sampling could be undertaken alongside trial trench evaluation for near surface archaeology to properly evaluate the geoarchaeological potential and significance of these depositional units.

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Sussex County Council

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APPENDIX 1: Site Investigation Logs

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No BH01 PE181522

Client WSP UK LIMITED

National Grid Coordinates 464677.916E 105946.393N

Ground Level 15.91 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.30 0.40- 0.60 0.60	E B E					Soft to firm light brown slightly sandy silty CLAY. Occasional sub-angular to sub-rounded fine to coarse flint gravel.	G.L.		15.91		
0.90 1.00- 1.20 1.20- 1.70 1.20- 1.65 1.20	E B B D E	0 (DRY)			S8	Firm brown slightly sandy slightly gravelly CLAY. Fine to coarse sand, angular to sub-rounded fine to coarse flint gravel.	1.00		14.91		
2.00 2.00- 2.45	D D	0 (DRY)			S18	Pale creamy brown slightly sandy slightly gravelly CLAY, fine to coarse sand of chalk and flint, angular to sub-rounded fine to coarse flint gravel, calcareous. At 2.40m: brown, gravelly.	2.00		13.91		
3.00 3.00- 3.45	D D	0 (DRY)			S28	At 3.00m: pale creamy brown.					
4.00- 4.45 4.00	D D	0 (DRY)			S23						
5.00- 5.50 5.00 5.00- 5.45 5.40	B D D EW	0 (DRY)			S10						
6.00	D					Brown sandy CLAY. Fine to coarse sand, occasional fine to medium flint gravel.	5.80 6.00		10.11 9.91		
6.50- 7.00 6.50- 6.95	B D	6.50 (5.40)			S16	Medium dense brown fine SAND.					
8.00- 8.45	D	8.00 (6.30)			S15						
9.50- 9.95	D	9.50 (6.50)			S18						

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit		G.I.	0	DRY	08/11/18	08:00	5.40	0		20		Water did not rise.
15.50	0.15	Cable Percussion		15.50	11.0		08/11/18	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 Borehole backfilled with bentonite pellets on completion.

Logged by MK
 Figure 1 of 2
 12/11/2018

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

BOREHOLE RECORD - Cable Percussion

Preliminary

Project **A29 REALIGNMENT, WEST SUSSEX**

Engineer **WSP**

Borehole Project No **BH01 PE181522**

Client **WSP UK LIMITED**

National Grid Coordinates **464677.916E 105946.393N**

Ground Level **15.91 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
10.50-10.95	UT100					Stiff grey silty CLAY. Occasional sand partings and bioturbation.	10.50		5.41	
11.00	D									
12.00-12.45	D	11.00 (DRY)			S27	Between 12.00m and 13.00m: sandy, fine grained sand.				
13.00	D									
13.50-13.95	UT100									
14.00	D									
15.00-15.45	D	11.00 (DRY)			S30					
						End of Borehole	15.50		0.41	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by **MK**

Figure **2 of 2**
12/11/2018

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole BH02
Project No PE181522

Client WSP UK LIMITED

National Grid Coordinates 494743.050E
105922.022N

Ground Level 15.99 m OD

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.30	E					Firm brown slightly sandy silty CLAY. Rare angular fine to medium flint gravel.	G.L.		15.99		
0.40- 0.60	D										
0.60	E										
0.90	E				S14 Firm brown slightly sandy gravelly CLAY. Fine to coarse sand. Angular fine to medium flint gravel.	Firm pale creamy brown slightly gravelly sandy CLAY. Angular to sub-rounded fine to coarse flint gravel. Fine to coarse sand of chalk and flint. Calcareous.	1.20		14.79		
1.00- 1.20	B										
1.20	E										
1.20- 1.65	E	0 (DRY)			S27	Firm pale creamy brown slightly gravelly sandy CLAY. Angular to sub-rounded fine to coarse flint gravel. Fine to coarse sand of chalk and flint. Calcareous.	1.60		14.39		
1.60- 2.00	B										
2.00	D										
2.00- 2.45	D	0 (DRY)			S28	At 3.00m: Light brown, slightly sandy, occasional cobbles of flint.					
3.00	D										
3.00- 3.45	D	0 (DRY)									
4.00	D				S29	At 4.00m: Pale creamy brown, sandy.					
4.00- 4.45	D	0 (DRY)									
5.00- 5.45	D	0 (DRY)									
5.00	D				S12	At 5.00m: Angular to sub-rounded fine to medium flint gravel.					
5.40	EW										
5.40- 6.00	B										
5.90	D				S21	Medium dense brown fine SAND.	6.50		9.49		
5.90	E										
6.50- 7.00	B	6.50 (5.40)									
6.50- 6.95	D				S20	End of Borehole	8.50		7.49		
8.00- 8.45	D	8.00 (5.40)									

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit		G.I.			09/11/18	08:00						
8.50	0.15	Cable Percussion		8.50	8.0	5.4	09/11/18	13:00	5.40	0		20		Water did not rise.

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 Borehole backfilled with bentonite pellets on completion.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Borehole Project No

BH03 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30 0.40- 0.60 0.60	ES B ES					Soft to firm brown slightly sandy silty CLAY. Sand is fine to coarse rare angular fine to medium flint.	G.L.				
0.90 1.00- 1.20 1.20- 1.65 1.60- 2.00	ES B D ES	Nil (Dry)			S16	Medium dense brownish grey slightly clayey sandy angular to subrounded fine to coarse GRAVEL. Sand is fine to coarse. Matrix is brown silty clay.	0.90				
2.00- 2.32	D	Nil (Dry)			S50/170	Below 2.00m, Very dense.					
3.00 3.00- 3.45	D D	Nil (Dry)			S43	Firm pale brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.	2.40				
4.00- 4.45	D	Nil (Dry)			S27						
5.00 5.20- 5.65 5.40	D D W	Nil (Dry)			S12						
6.00- 6.60	B					Medium dense brown fine SAND.	5.50				
6.50- 6.95	D	5.90 (5.40)			S15						
8.00- 8.45	D	5.40 (8.00)			S37	Below 8.00m, Dense.					
						End of Borehole	8.50				

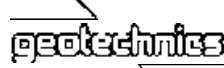
Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			06/11/18	08:00	5.40		5.40	20	No	
8.50	0.15	Cable Percussion	SEDS	2.45	Nil	Dry	06/11/18	18:00						
				2.45	Nil	Dry	07/11/18	08:00						
				8.50	8.00	6.40	07/11/18	18:00						

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found. Borehole terminated at target depth. Backfill details from base of hole: bentonite seal up to ground level. Chiselling: 2.00-2.40m for 30 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by **MK**
Figure **1 of 1**
12/11/2018



BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Borehole Project No

BH04 PE181522

Client WSP UK LIMITED

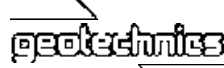
Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30	ES					TOPSOIL: Soft light brown slightly gravelly clay. Gravel is angular fine to medium flint.	G.L.				
0.40- 0.60	B					Soft light brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular fine to medium flint. At 1.00m, Becoming dark brown.	0.20				
0.60	ES										
0.90	ES				S5						
1.00- 1.20	B					Brownish grey clayey sandy angular to subrounded fine to coarse GRAVEL of flint and low flint cobble content. At 2.00m, becoming dense.	1.60				
1.20- 1.65	D	Nil (Dry)									
1.20	ES				S42						
1.60- 2.00	B					End of Borehole	2.50				
2.00- 2.45	D	Nil (Dry)									

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.	Nil	Dry	05/11/18	08:00						Not encountered during boring.
2.50	0.15	Cable Percussion	SEDS	2.50			05/11/18	18:00						

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found. Borehole aborted on refusal - suspected flint band. Backfill details from base of hole: bentonite seal up to ground level. Chiselling: 1.90-2.10m for 45 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018


BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

BH04A PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
						See borehole BH04 for strata, samples and test details.	G.L.				
3.00- 3.10	B										
3.00- 3.45	D	Nil (Dry)			S29	Medium dense pale brown slightly clayey sandy angular to subrounded fine to coarse GRAVEL of flint. Sand is fine to coarse. Matrix of firm brown silty clay.	3.00				
4.00- 4.10	B										
4.00- 4.45	D	Nil (Dry)			S28	At 4.00m, Occasional cobbles of flint.					
4.20	W										
5.00- 5.50	B										
5.00	D						4.60				
5.00- 5.45	D	Damp (5.00)			S15	Soft pale brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to medium flint and chalk. Medium dense brown fine SAND.	4.80				
6.50- 6.95	D	Damp (6.50)			S7	Around 6.50m, Loose.					
8.00- 8.45	D	Damp (8.00)			S46	Below 8.00m, Dense.					
8.30- 8.60	B					At 8.30m, Gravelly subangular to subrounded fine to coarse flint gravel.					
9.00	D										
9.00- 9.45	UT70	9.00 (Dry)				Firm grey slightly sandy (fine grained) silty CLAY with occasional sand partings.	8.90				
9.50	D					Stiff grey silty CLAY.	9.00				
10.00	D										

Boring				Progress				Groundwater						
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			05/11/18	08:00					4.50	Standing at
15.50	0.15	Cable Percussion	SEDS	4.50	Nil	Dry	05/11/18	18:00						4.20m at start
				4.50	Nil	4.20	06/11/18	08:00						of shift.
				15.50	9.00	Dry	06/11/18	18:00						


Remarks  Borehole carried out adjacent to BH04 which refused at 2.50m depth. Inspection pit hand excavated to 1.20m depth and no services were found. Borehole terminated at target depth. A 50mm standpipe piezometer was installed to 8.50m with a slotted section from 1.00m to 8.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 8.50m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level. Chiselling: 3.80-4.60m for 60 minutes.

Figure 1 of 2
12/11/2018

geotechnics

All dimensions are in metres. Logged in accordance with BS5930:2015

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Borehole Project No

BH04A PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend		
10.50-10.95	D	Dry (9.00)			S25					
11.00	D									
12.00	D					Around 12.00-14.00m, slightly sandy (thin bands).				
12.00-12.45	UT100									
12.30	D					Around 12.50-14.00m, Occasional sand partings.				
13.00	D									
13.50-13.95	D	Dry (9.00)			S29					
14.00	D									
15.00	D									
15.00-15.45	UT100	9.00 (Dry)								
15.40	D									
						End of Borehole	15.50			

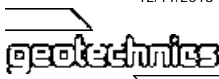
Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 2 of 2
12/11/2018



BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

BH05 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata		Scale 1:50	
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	
0.10	ES					TOPSOIL: Firm light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse flint. Sand is fine to and rootlets.	G.L.		
0.30	ES				0.12				
0.60- 0.70	B				0.50				
0.60	ES								
0.90	ES				Light brown slightly sandy very clayey GRAVEL. Gravel is angular to subangular fine to coarse flint and rare cobbles of flint.				
1.10- 1.20	B								
1.20	ES								
1.20- 1.65		Nil (Dry)			C21	Stiff light brown/ cream gravelly sandy CLAY. Gravel is angular fine to medium flint. Sand is fine to coarse.			
2.00- 2.50	B				C50/285	Firm/ stiff light creamy brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse gravel of flint and chalk, fine to coarse sand of chalk.	2.00		
2.00	B								
2.00	ES								
2.00- 2.44		Nil (Dry)							
3.00	D				S19				
3.00- 3.45	D	Nil (Dry)							
3.80- 4.00	B				S18	At 4.00m, Becoming sandy.			
4.00- 4.50	B								
4.00	D								
4.00- 4.45	D	Nil (Dry)							
4.20	W								
5.00- 5.50	B				C7	Loose light brown slightly gravelly fine SAND with rare shell fragments. Gravel is subangular to subrounded fine to medium flint.	4.90		
5.00- 5.45		5.00 (3.80)							
6.00	D								
6.50- 6.95	D	6.90 (4.20)			S39	Below 6.50m, Dense.			
7.00- 7.50	B					At 7.00m, Gravelly, gravel is subangular to subrounded fine to coarse flint			
8.00- 8.50	B				C30	Dense light brown sandy subangular to subrounded fine to coarse flint GRAVEL with a low flint cobble content.	8.00		
8.00	D								
8.00- 8.45		8.00 (5.10)							
						End of Borehole	8.50		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			30/10/18	08:00			3.00	5		
8.50	0.15	Cable Percussion	SEDS	8.50	8.50	5.10	30/10/18	18:00	4.20	none	3.00	10		
											2.90	15		
											2.70	20		

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 Borehole terminated at target depth.
 Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

BH06 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend		
0.10	ES					Stiff light brown slightly sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint.	G.L.			
0.30	ES						0.50			
0.60- 0.70	B					Stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint. At 0.50m, With frequent cobbles of flint.				
0.60	ES									
0.90	ES					At 1.40m, Firm light creamy brown sand and gravel of flint and chalk.				
1.10- 1.20	B									
1.20- 1.70	B									
1.20	ES									
1.20- 1.65	ES	Nil (Dry)			C17					
1.50	ES					Firm light cream/brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse chalk and flint.	1.70			
2.00- 2.50	B									
2.00	D									
2.00- 2.45	D	Nil (Dry)			S8					
2.00	ES					Medium dense light creamish brown clayey sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse. Gravel is chalk and flint.				
3.00	D									
3.00- 3.45	D	Nil (Dry)			S13					
3.30- 3.50	B									
3.60	W									
4.00	D					At 5.00m, Flint gravel.	4.00			
4.00- 4.45	D	4.00 (2.30)			S26					
5.00	D					Light brown sandy subangular to subrounded fine to coarse GRAVEL of flint.				
5.00- 5.45	D	5.00			S7					
5.50- 6.00	B									
6.50- 7.00	B					Stiff grey silty CLAY with occasional sand partings and rare shell fragments.	6.70			
6.50- 6.95	B	6.50 (6.00)			C17					
8.00	D					End of Borehole				
8.00- 8.45	D	7.00 (Dry)			S21					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			31/10/18	08:00	3.60		3.30	5	6.80	
8.50	0.15	Cable Percussion	SEDS	8.50	7.00	Dry	31/10/18	12:00			3.00	10		
											2.70	15		
											2.10	20		

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. Borehole terminated at target depth. Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1 12/11/2018

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

BH07 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30 0.50	ES D					TOPSOIL: Firm light brown slightly sandy silty clay with frequent rootlets. Sand is fine to medium.	G.L. 0.10				
0.80 1.00	ES D				Firm light brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint. At 0.40m, Gravelly with a low flint cobble content.	1.10					
1.20- 1.70	B				Firm pale brown/ cream slightly sandy gravelly SILT. Sand is fine to coarse chalk. Gravel is subangular to subrounded fine to coarse flint.						
1.20	D										
1.20	D										
1.20- 1.65		Nil (Dry)		C9							
2.00- 2.50	B				At 4.00m, Very gravelly.						
2.00	D										
2.00	ES										
2.00- 2.45		2.00 (1.50)		C7							
3.00	D				At 4.00m, Very gravelly.						
3.00- 3.45	D	3.00 (2.40)		S11							
4.00	B										
4.00	D										
4.00- 4.45		4.00 (3.10)		S9							
5.00	D				Loose multicoloured sandy angular to subrounded fine to coarse GRAVEL of flint. Sand is fine to coarse flint.						
5.00- 5.45	D	5.00 (4.30)		S9							
5.50- 6.00	B										
6.00	D										
6.00	ES				Stiff grey silty CLAY with occasional sand partings and rare shell fragments.						
6.00- 6.45	UT100										
6.50	D										
6.50- 6.95	D	5.30 (Dry)		S19							
7.00	D				At 6.50m, Very stiff.						
7.50- 7.95	UT100										
8.00	D										
8.00- 8.45	D	5.30 (Dry)		S30							
						End of Borehole	8.50				

Boring				Progress				Groundwater						
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			31/10/18	08:00	1.40		1.40	5	5.30	Slow seepage.
8.50	0.15	Cable Percussion	SEDS	5.00	5.00	3.40	31/10/18	18:00			1.30	10		
				5.00	5.00	2.40	01/11/18	08:00			1.20	15		
				8.50	5.30	Dry	01/11/18	18:00			1.20	20		

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. Borehole terminated at target depth.

A 50mm standpipe piezometer was installed to 5.00m with a slotted section from 1.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 5.00m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP



Borehole Project No

BH08 PE181522

Client WSP UK LIMITED

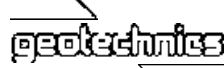
Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30 0.50	ES D					MADE GROUND: Grass over firm reddish brown slightly sandy slightly gravelly silty clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint.	G.L.				
0.80 1.00	ES D										
1.20- 1.70 1.20- 1.65 1.20	B D ES	Nil (Dry)			S29	Stiff pale brown slightly gravelly sandy SILT. Sand is fine to coarse chalk. Gravel is subangular to subrounded fine to coarse flint.	1.25				
2.00 2.00- 2.45 2.00	D D ES	Nil (Dry)			S11						
3.00 3.00- 3.45 3.00 3.20- 3.90	D D W B	Nil (Damp)			S6	Loose brown silty fine SAND.	3.20				
4.00 4.00- 4.45	D D	4.00 (3.00)			S6						
5.00- 5.45	D	5.00 (3.10)			S27	Below 5.00m, Medium dense.					
5.50- 5.00	B										
6.00	D					Firm grey silty CLAY with occasional sand partings and rare shell fragments.	5.80				
6.50 6.50- 6.95	ES UT100	6.00 (Dry)									
7.00 7.00- 7.45	D D	6.00 (Dry)			S27						
7.50- 8.00	B										
8.00- 8.45	D	6.00 (Dry)			S33						
						End of Borehole	8.50				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			01/11/18	08:00	3.00	Nil	3.00	5	6.00	
8.50	0.15	Cable Percussion	SEDS	8.50	6.00	Dry	01/11/18	18:00			2.80 2.70 2.30	10 15 20		

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
 Borehole terminated at target depth.
 Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018


BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

BH09 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30	ES					Grass over firm brownish grey slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium flint. Occasional rootlets. At 0.50m, Orangish brown very silty occasional black staining.	G.L.				
0.50- 0.80	B										
0.50	D										
0.80	ES					Firm pale brown slightly sandy slightly gravelly SILT. Sand is fine to coarse of chalk and flint. Gravel is subangular to subrounded fine flint, rare angular to subrounded fine to coarse gravel of flint.	1.40				
1.00	D										
1.20- 1.65	D	Nil (Dry)		S8							
1.20	ES					At 3.00m, Gravel is angular to subrounded fine to coarse flint occasional fine chalk.	3.60				
1.50- 2.00	B										
2.00- 2.50	B										
2.00- 2.45	D	Nil (Dry)		S7		Medium dense orangish brown fine SAND.	5.30				
2.00	ES										
3.00	D										
3.00- 3.45	D	Nil (Dry)		S7		Below 5.00m, Dense.	5.80				
3.20	W										
3.50- 4.00	B										
4.00- 4.45	D	4.00 (2.50)		S13		Firm greyish brown silty CLAY.	5.80				
4.00	ES										
4.20	ES										
5.00- 5.50	B					Multicoloured subangular to subrounded fine to coarse GRAVEL of flint with medium flint cobble content.	5.80				
5.00	D										
5.00- 5.45	D	5.00 (2.50)		S36							
5.00	D					Stiff grey silty CLAY.	5.80				
6.00- 6.45	D	6.00 (5.50)		S17							
6.50- 7.00	B										
7.00- 7.45	UT100	7.00 (4.30)				At 7.40m, Becoming sandy (fine grained).	5.80				
7.40	D										
8.00	B										
8.00- 8.45	B	7.50 (7.50)		S42		At 8.00m, Very sandy	5.80				
8.50- 8.95	D										
9.00	B										
10.00	D										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	SEDS	G.I.			02/11/18	08:00			3.00	5		Medium Seepage.
15.00	0.15	Cable Percussion	SEDS	15.00	9.00	11.90	02/11/18	18:00	3.20		2.30	10		
											2.30	15		
											2.30	20		

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. Borehole terminated at target depth.

A 50mm standpipe piezometer was installed to 5.00m with a slotted section from 1.00m to 5.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 5.00m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 2
12/11/2018

BOREHOLE RECORD - Cable Percussion

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Borehole Project No

BH09 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
10.00-10.45	UT100	9.00 (11.00)				Between 10.30 and 11.00m, Sandy frequent sand partings.		x			
10.50	D							x			
11.00	D					At 11.00m, Sandy.		x			
11.50-11.95	D	9.00 (9.50)			S40			x			
12.00	B							x			
13.00	D							x			
13.00-13.45	UT100	9.00 (10.60)						x			
13.40	D							x			
14.00	D					Around 14.00-14.50m, Sand not observed.		x			
14.50-14.94	D	9.00 (12.70)			S50/285	At 14.50m, Sandy (fine grained).		x			
						End of Borehole	15.00	x			

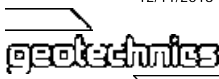
Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 2 of 2
12/11/2018



Samples and Tests				Strata	Scale 1:50				
Depth	Type	Stratum No	Results	Description	Depth	Legend			
0.30	B			<p>MADE GROUND: Grass over firm brown slightly sandy slightly gravelly clayey silt. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse. Occasional cobbles of flint and rare brick fragments (possibly Roman).</p>	G.L.				
0.30	D				0.40				
0.30	ES	PID=0.0						0.80	
0.50	ES	PID=0.0						1.20	
0.90	B			<p>Firm brown slightly sandy gravelly clayey SILT. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.</p>	0.80				
0.90	D				1.20				
1.50	B			<p>At 0.70m, Very gravelly.</p>	1.20				
1.50	D			<p>Brown sandy very clayey angular to subrounded fine to coarse GRAVEL with a low flint cobble content. Firm brown clay matrix.</p>	1.70				
1.50	ES	PID=0.0			1.90				
2.50	B			<p>Pale brown and cream sandy silty angular to subrounded fine to coarse GRAVEL of flint. Low flint cobble content. Sand is fine to coarse.</p>	2.40				
2.50	D			<p>Firm brown slightly sandy gravelly SILT. Gravel is angular to subrounded fine to coarse flint. Low flint cobble content. Sand is fine to coarse.</p>	2.60				
				<p>Brown sandy angular to subrounded silty GRAVEL (fine to coarse) and COBBLES of flint.</p>					
				<p>Pale brown and cream sandy angular to subrounded fine to coarse silty GRAVEL. Sand is fine to coarse. Medium flint cobble content.</p>					
				<p>End of Excavation</p>					

Excavation				Groundwater		
Plant	Wheeled Excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	3.10			
Shoring	None.	Date Backfilled	08/11/2018			Not encountered during excavation.
Stability	stable during excavation.					

Remarks The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by MK

Figure 1 of 1
12/11/2018

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.30	B			TOPSOIL. Grass over firm friable brown slightly sandy slightly gravelly clayey SILT. Gravel is angular to subrounded fine to coarse flint. Some rootlets.	G.L.		
0.30	D				0.25		
0.30	ES		PID=0.0				
0.80	D			Firm friable brown slightly sandy slightly gravelly clayey SILT. Gravel is angular to subrounded fine to coarse flint.			
0.80	ES		PID=0.0				
1.20	B			At 0.30m, Fragment of fire-cracked flint.			
1.20	D			Below 0.35m, Very stiff - unable to penetrate with hand vane.	1.35		
1.20	ES		PID=0.0				
1.60	B			Below 1.00m, Gravelly with a low flint cobble content.			
1.60	D			At 1.20m, Very gravelly.			
1.60	ES		PID=0.0				
2.50	B			Off white sandy angular to subrounded fine to coarse silty GRAVEL. Sand is fine to coarse. Weakly cemented, 5 - 10% voids in places.			
2.50	D			At 1.80m, Becoming harder to excavate.	2.80		
				End of Excavation			

Excavation				Groundwater		
Plant	Wheeled Excavator.	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.80			
Shoring	None.	Date Backfilled	08/11/2018			Not encountered during excavation.
Stability	stable during excavation.					

Remarks Trial pit was terminated upon encountering effective refusal. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit TP06
Project No PE181522

Client WSP UK LIMITED

National Grid 494974.135E
Coordinates 105827.565N

Ground Level 14.78 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
				Firm brown slightly sandy clayey SILT. Fine sand, occasional angular to sub-rounded fine to coarse flint gravel, friable.	G.L.		14.78
0.30	B				0.25		14.53
0.30	D				0.60		14.18
0.30	E	PID=0.0			1.00		13.78
0.35	VN		35				
0.35	VNR		12				
0.70	B						
0.70	D						
0.70	E	PID=0.0					
0.90	B						
0.90	D						
1.20	B						
1.20	D						
1.20	E	PID=0.1					
2.10	B				2.20		12.58
2.10	D						
				At 0.80m: Very gravelly.			
				At 1.40m: Pockets decreased to 100mm.			
				At 1.70m: Becoming harder to excavate.			
				End of Excavation			

Excavation				Groundwater		
Plant	Backhoe excavator.	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.60			
Shoring	None.	Date Backfilled	09/11/2018			Not encountered during excavation.
Stability	Some spalling between 0.0m and 1.0m.					

Remarks Trial pit was terminated upon encountering effective refusal. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP07 PE181522


Client WSP UK LIMITED

National Grid Coordinates 495057.885E 105792.485N

Ground Level 14.09 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		14.09
0.30	B			Firm brown slightly sandy slightly gravelly SILT. Fine to coarse sand. Angular to sub-rounded fine to coarse flint gravel. Friable.	0.20	1	13.89
0.30	D					2	
0.30	E	PID=0.1					
				Firm brown slightly sandy gravelly SILT. Fine to coarse sand. Angular to sub-rounded fine to coarse flint. Occasional cobbles of flint.	0.60	3	13.49
0.90	B						
0.90	D						
0.90	E	PID=0.0		Brown clayey sandy angular to sub-rounded fine to coarse flint GRAVEL and COBBLES. Fine to coarse sand.	1.20		12.89
1.50	B						
1.50	D						
1.50	E	PID=0.1		Pale creamy brown silty sandy angular to sub-rounded fine to coarse flint GRAVEL. Fine to coarse sand. Between 1.20m and 2.10m: Large pockets of brown clayey gravel and cobbles 300-600mm. At 1.50m: Pale creamy brown material becomes hard to excavate.	2.40	4	11.69
					End of Excavation		


Excavation				Groundwater		
Plant	Backhoe excavator.	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	3.00			
Shoring	None.	Date Backfilled	09/11/2018			None encountered during excavation.
Stability	some spalling between 0.20m and 1.20m depth.					

Remarks  The trial pit was terminated upon encountering effective refusal. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018



Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP08 PE181522

Client WSP UK LIMITED

National Grid Coordinates 495117.850E 105760.574N

Ground Level 13.38 m OD

Samples and Tests				Strata	Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend	Level m OD
					G.L.		13.38
0.30	B				0.20		13.18
0.30	D				0.40		12.98
0.30	E		PID=0.1				
0.80	B				1.00		12.38
0.80	D						
0.80	E		PID=0.0				
1.80	B				2.30		11.08
1.80	D						
1.80	E		PID=0.2				
				At 0.80m: Pockets of pale brown silty sandy flint gravel 200mm.			
				At 1.20m: Hard digging.			
				End of Excavation			

Excavation				Groundwater		
Plant	Backhoe excavator.	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	3.00			
Shoring	None.	Date Backfilled	09/11/2018			None encountered during excavation.
Stability	stable during excavation.					

Remarks Trial pit was terminated upon encountering effective refusal. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1 12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP09 PE181522

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend		
				MADE GROUND: Grass over firm brown slightly sandy gravelly clayey silt. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.	G.L.			
0.40	B							
0.40	D							
0.40	ES		PID=0.0	At 0.30m, Medium flint cobble content.	0.70			
0.80	B				0.90			
0.80	D							
1.00	ES		PID=0.0	At 0.60m, Becoming very gravelly.				
				Brown sandy clayey rounded to subangular fine to coarse GRAVEL and COBBLES of flint. Sand is fine to coarse. Occasional flint boulder.	1.20			
1.80	B							
1.80	D							
1.80	ES		PID=0.0	Stiff brown sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse flint. Occasional flint boulder.				
2.50	B							
2.50	D							
				Stiff pale brown and cream sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse flint and frequent cobbles of flint.				
3.30	B							
3.30	D				3.40			
				End of Excavation				

Excavation				Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.80	3.00		Rose to 2.70 in 10 mins, High flow at 3.40m.
Shoring	None.	Date Backfilled	07/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 3.40m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend		
0.30 0.30 0.30	B D ES		PID=0.0	Grass over firm brown slightly sandy gravelly silty CLAY with a low flint cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint. At 0.50m, Becoming very gravelly.	G.L.			
1.00 1.00 1.00	B D ES	PID=0.0						
1.80 1.80 2.00	B D ES	PID=0.0						
2.80 2.80	B D			Light brown sandy slightly clayey angular to subrounded fine to coarse GRAVEL of flint with medium cobble content.	2.50 2.90			
				End of Excavation				

Excavation				Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.20	2.30		Seepage.
Shoring	None.	Date Backfilled	07/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 2.90m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP11 PE181522

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.30	B			Grass over friable brown silty sandy angular to subrounded GRAVEL of flint with medium flint cobble content. Sand is fine to coarse.	G.L.		
0.30	D						
0.30	ES	PID=0.0					
0.80	ES		PID=0.0	Brown sandy very clayey angular to subrounded fine to coarse GRAVEL of flint with medium flint cobble content. Sand is fine to coarse.	0.70		
1.00	B						
1.00	D						
1.90	B			Firm brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint. Low flint cobble content and thin beds/ pockets of black manganese staining.	1.70		
1.90	D						
1.90	ES	PID=0.0					
				End of Excavation	2.30		

Excavation				Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	3.20	1.90		
Shoring	None.	Date Backfilled	07/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 2.30m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by MK

Figure 1 of 1
12/11/2018

Client WSP UK LIMITED

Samples and Tests				Strata	Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend
0.30	B			<p>MADE GROUND: Grass over friable firm brown slightly sandy slightly gravelly silt. Gravel is angular to subrounded fine to coarse flint. Low cobble content. Sand is fine to coarse.</p> <p>At 0.50m, Becoming gravelly.</p> <p>At 1.00m, Becoming clayey.</p>	G.L.	
0.30	D					
0.30	ES		PID=0.0			
0.80	ES		PID=0.0			
1.40	B			<p>Pale brown slightly sandy clayey angular to subrounded fine to coarse GRAVEL with low flint cobble content. Sand is fine to coarse.</p>	1.20	
1.40	D					
1.40	ES		PID=0.0			
2.20	B			<p>Light brown sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse. Pockets of white/cream and dark brown sandy gravelly clay.</p>	2.10	
2.20	D					
3.30	B			<p>Firm off white/ cream sandy gravelly SILT. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.</p> <p>End of Excavation</p>	2.90	
3.30	D				3.40	

Excavation			Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Details
Date		Length (C)	2.60	2.20	
Shoring	None.	Date Backfilled	07/11/2018	3.10	
Stability	Collapsing at depth.				Seepage Flow.

Remarks The Trial Pit was terminated at a depth of 2.30m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP13 PE181522

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.30	B			<p>MADE GROUND: Grass over dark greyish brown slightly sandy slightly gravelly silt. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.</p> <p>Pale brown slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.</p> <p>At 0.40m, Gravelly.</p>	G.L.		
0.30	D				0.25		
0.30	ES		PID=0.0		0.60		
0.70	B				1.25		
0.70	D			<p>Off white and cream sandy angular to subrounded fine to coarse silty GRAVEL of flint. Sand is fine to coarse, weakly cemented.</p> <p>Brown sandy angular to subrounded fine to coarse very clayey GRAVEL of flint. Medium flint cobble content.</p> <p>At 1.40m, Slightly clayey.</p> <p>End of Excavation</p>	1.70		
0.70	ES		PID=0.0				
1.50	B						
1.50	D						
1.50	ES		PID=0.0				

Excavation				Groundwater		
Plant	Wheeled Excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.40	1.40		
Shoring	None.	Date Backfilled	08/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 1.70m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by MK

Figure 1 of 1
12/11/2018

Client WSP UK LIMITED

Samples and Tests				Strata	Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend
0.30	B			Grass over firm brown slightly sandy slightly gravelly SILT. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse.	G.L.	
0.30	D					
0.30	ES		PID=0.0	At 0.20m, Becoming orangish brown.		
0.80	D			Below 0.30m, Gravelly.		
0.80	ES		PID=0.0		0.95	
1.10	B			Light brownish cream sandy angular to subrounded fine to coarse silty GRAVEL with large (500mm) pockets of brown silt. Sand is fine to coarse.	1.40	
1.10	D					
1.10	ES		PID=0.0			
1.60	B			Brown sandy angular to subrounded fine to coarse very clayey GRAVEL of flint. Low flint cobble content..	2.00	
1.60	D					
1.60	ES		PID=0.0			
2.00	B			Below 1.70m, slightly clayey.		
2.00	D			End of Excavation		

Excavation				Groundwater		
Plant	Wheeled Excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	3.00	1.60		
Shoring	None.	Date Backfilled	08/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 2.00m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

Samples and Tests				Strata		Scale 1:50		
Depth	Type	Stratum No	Results	Description	Depth	Legend		
0.30	ES		PID=0.0	Grass over firm brown slightly sandy silty CLAY with rare angular to subrounded fine to coarse flint gravel. Sand is fine to coarse.	G.L.			
0.60	B			Firm pale brown slightly sandy clayey SILT. Sand is fine to coarse.	0.35			
0.60	D							
0.90	D							
0.90	ES							
0.90	HV		Av=64kPa	At 1.20m, Becoming gravelly, angular to subrounded fine to coarse flint.				
0.90			PID=0.00					
1.40	B							
1.40	D							
1.40	ES		PID=0.0	Stiff pale brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium flint and chalk. Sand is fine to coarse.	1.60			
1.90	B							
1.90	D							
1.90	ES		PID=0.0	At 1.60m, Becoming gravelly.	2.50			
2.70	B			Off white/ cream silty sandy GRAVEL. Gravel is angular to subrounded fine to coarse flint and occasional cobbles of flint. Sand is fine to coarse.	2.90			
2.70	D							
				End of Excavation				

Excavation				Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	2.40	2.30		Seepage.
Shoring	None.	Date Backfilled	07/11/2018			
Stability	Collapsing at depth.					

Remarks The Trial Pit was terminated at a depth of 2.90m due to instability of the pit sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Trial Pit Project No

TP16 PE181522

Client WSP UK LIMITED

Samples and Tests				Strata	Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend
0.20	ES		PID=0.5	MADE GROUND: Grass over firm brown slightly sandy slightly gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint, brick rare plastic. Occasional cobbles of granite and brick.	G.L.	
0.50	B				0.60	
0.50	D			Stiff pale brown slightly sandy silty CLAY with rare subangular to subrounded fine to coarse flint gravel.	1.40	
0.60	ES		PID=0.9			
0.75	B					
0.75	D					
1.00	ES		PID=0.4	Stiff pale creamy brown slightly sandy slightly gravelly silty CLAY. Fine to coarse sand of flint and chalk. Gravel is angular to subrounded fine to coarse flint.	3.10	
1.60	B					
1.60	D					
1.60	ES		PID=0.5	Below 2.20m, Becoming gravelly.	3.30	
2.50	B					
2.50	D			Orangish brown fine grained SAND.	3.30	
2.50	ES		PID=0.3			
3.15	D			End of Excavation	3.30	
3.25	B					

Excavation				Groundwater		
Plant	Wheeled excavator	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date	05/11/2018	Length (C)	2.40	3.15		Water Seepage.
Shoring	None.	Date Backfilled	05/11/2018			
Stability	Collapsing below 3.10m depth.					

Remarks The Trial Pit was terminated at a depth of 3.30m due to instability of the pits sides. The trial pit was backfilled with arisings compacted in layers.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Logged by MK
Figure 1 of 1
12/11/2018

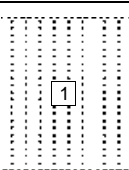
Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Trial Pit Project No

TP18 PE181522

Client WSP UK LIMITED

Samples and Tests				Strata		Scale 1:50	
Depth	Type	Stratum No	Results	Description	Depth	Legend	
0.30	ES			<p>MADE GROUND: Firm to stiff brown slightly sandy slightly gravelly silty clay. Gravel is angular to subrounded fine to coarse flint. Sand is fine to coarse. Occasional cobbles of flint and brick.</p> <p>At 0.50m, Occasional metal and plastic fragments.</p>	G.L.		
0.80	ES	PID=0.3			1.00		
				End of Excavation			

Excavation				Groundwater		
Plant	Hand Tools	Width (B)	0.40	Depth Observed	Depth of Pit	Details
Date		Length (C)	0.40			
Shoring	None.	Date Backfilled	06/11/2018			Not encountered during excavation.
Stability	stable during excavation.					

Remarks  Inspection pit backfilled with arisings on completion.


Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015

Logged by MK

Figure 1 of 1
12/11/2018



BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No WS02 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.20	D					MADE GROUND: Firm orangish brown slightly sandy silty clay with occasional angular fine to medium flint gravel and rare brick fragments.	G.L.				
0.30	ES				0.40						
0.60	ES				S9	Firm brown slightly sandy silty CLAY. Sand is fine to medium and occasional black staining. At 0.40m, Brick fragments. At 1.10m, Slightly gravelly. Gravel is angular to subrounded fine to coarse flint gravel.	1.25				
0.80	D						1.55				
1.10- 1.55	D				S21	Firm brown gravelly silty CLAY. Gravel is angular to subrounded fine to coarse flint. Rare cobbles of flint and gravel content varying with depth.	2.50				
1.20	ES						2.50				
1.30- 1.50	D				S26	Pale cream/ brown slightly gravelly sandy SILT. Gravel is angular to subrounded fine to medium flint. Sand is fine to coarse chalk.	4.00				
1.60- 1.80	D						4.00				
2.00- 2.45	D				C50/ 275	Firm pale brown sandy gravelly CLAY, fine to coarse sand of chalk and flint. Gravel is angular to subrounded fine to coarse flint. Occasional cobbles of flint subvertical contact with unit above.					
2.10- 2.40	D										
2.60- 2.90	D					End of Borehole					
3.00- 4.00	B										
3.00- 3.45	D										
4.00- 4.43											

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit Dynamic Sampler	3D											
4.00	0.10													

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP


Borehole Project No

WS03 PE181522

Client WSP UK LIMITED


Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30 0.50	ES D					MADE GROUND: Grass over light brown slightly sandy silty clay with rare coarse gravel and cobbles of flint. At 0.20m, Orangish brown.	G.L.				
0.80 1.00- 1.40 1.00 1.00- 1.45 1.20 1.40- 2.00	ES B D D ES B				S28	At 0.90m, slightly gravelly angular to subrounded fine to coarse flint and rare fine chalk. Around 1.10m, very gravelly, low flint cobble content.	1.40				
2.00- 2.30 2.00- 2.45	D D				S51	Medium dense becoming dense multicoloured clayey slightly sandy angular to subrounded fine to coarse GRAVEL. Gravel is flint with occasional cobbles of flint. Matrix is brown silty clay.					
2.43- 2.60 2.50- 2.82	D D				C50/ 190	Very dense pale brown silty sandy angular to subrounded fine to coarse GRAVEL. Gravel is flint. Sand is fine to coarse and some chalk.	2.43 2.60				
End of Borehole											

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20 2.60	0.30 0.10	Inspection Pit Dynamic Sampler	3D											

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018


BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project A29 REALIGNMENT, WEST SUSSEX

Engineer WSP

Borehole Project No

WS04 PE181522

Client WSP UK LIMITED

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend			
0.30	ES					MADE GROUND: Firm greyish brown clayey silt with occasional rootlets. Gravel is subangular to subrounded fine to medium gravel of flint.	G.L.				
0.50	D						0.25				
0.60	ES					MADE GROUND: Firm orangish brown silty clay with rare subangular to subrounded fine to medium flint.					
1.20	D					At 1.00m, Fragment of pottery and small piece of plastic.					
1.20- 1.65	D				S6		1.40				
1.20	ES					Soft to firm gravelly silty CLAY. Gravel is angular to subrounded fine to coarse flint.	1.52				
1.60	B										
1.80	ES					Firm pale brown/ cream slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint. Chalk is angular to subrounded.					
2.00- 2.85	B				S18	At 2.20m, Gravelly.					
2.00- 2.45	D										
2.40	B										
2.90	B					Pale brown clayey gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium chalk with occasional angular to subrounded fine to medium flint.	2.85				
3.00- 3.45	D				S9		3.00				
3.30- 3.45	D						3.15				
3.45- 4.00	B					Pale brown sandy subangular to subrounded fine to medium GRAVEL. Gravel of flint and occasional chalk. Sand is fine to coarse chalk.					
4.00- 4.45	D				S26	Medium dense brown slightly silty SAND.					
						At 4.50m, Gravelly subangular to subrounded fine to medium chalk and flint.					
5.00- 5.45	D				S46	End of Borehole	5.00				

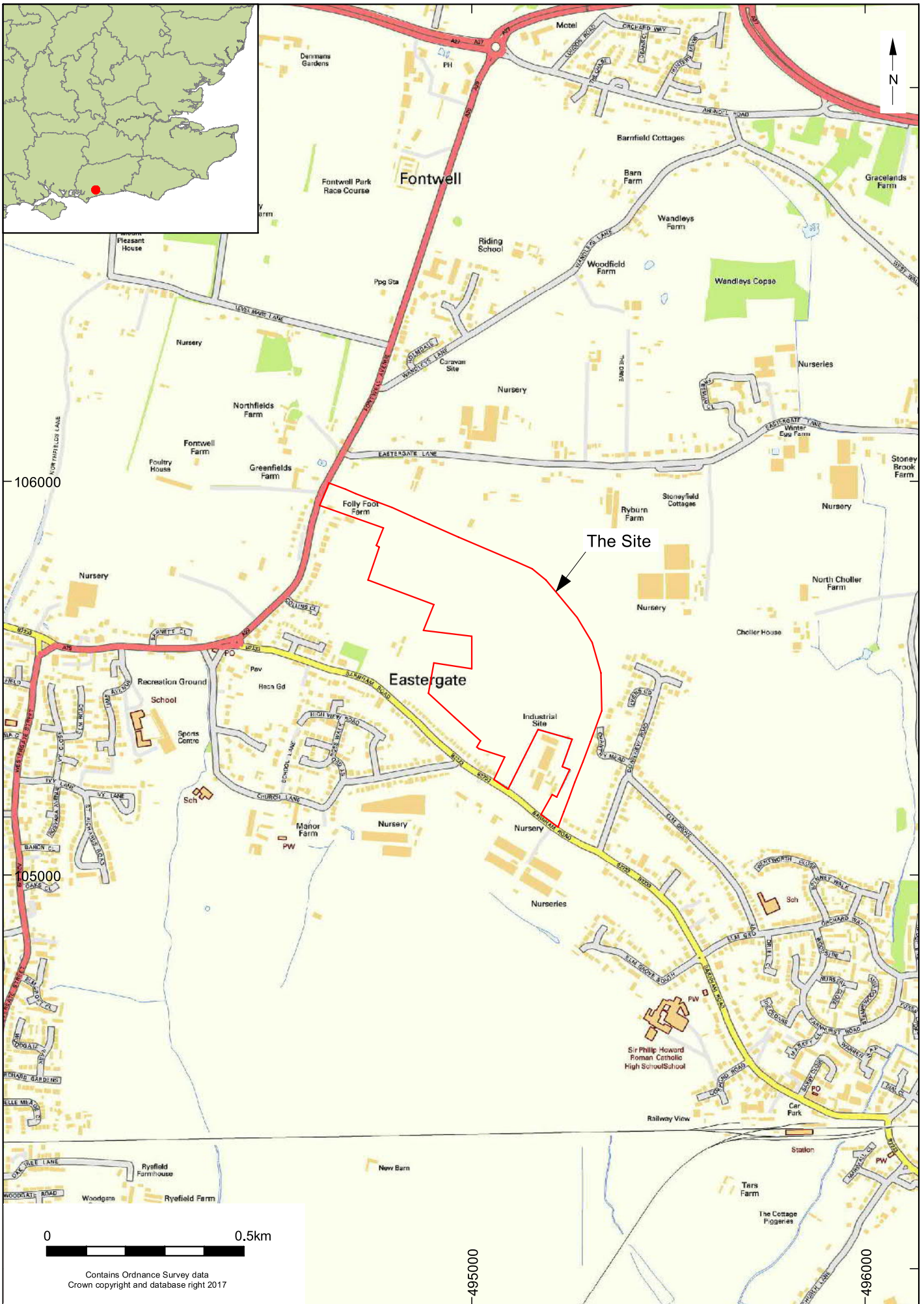
Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	3D	G.I.			31/10/18	08:00						
5.00	0.10	Dynamic Sampler		5.00			31/10/18	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 Backfill details from base of hole: bentonite seal up to ground level.

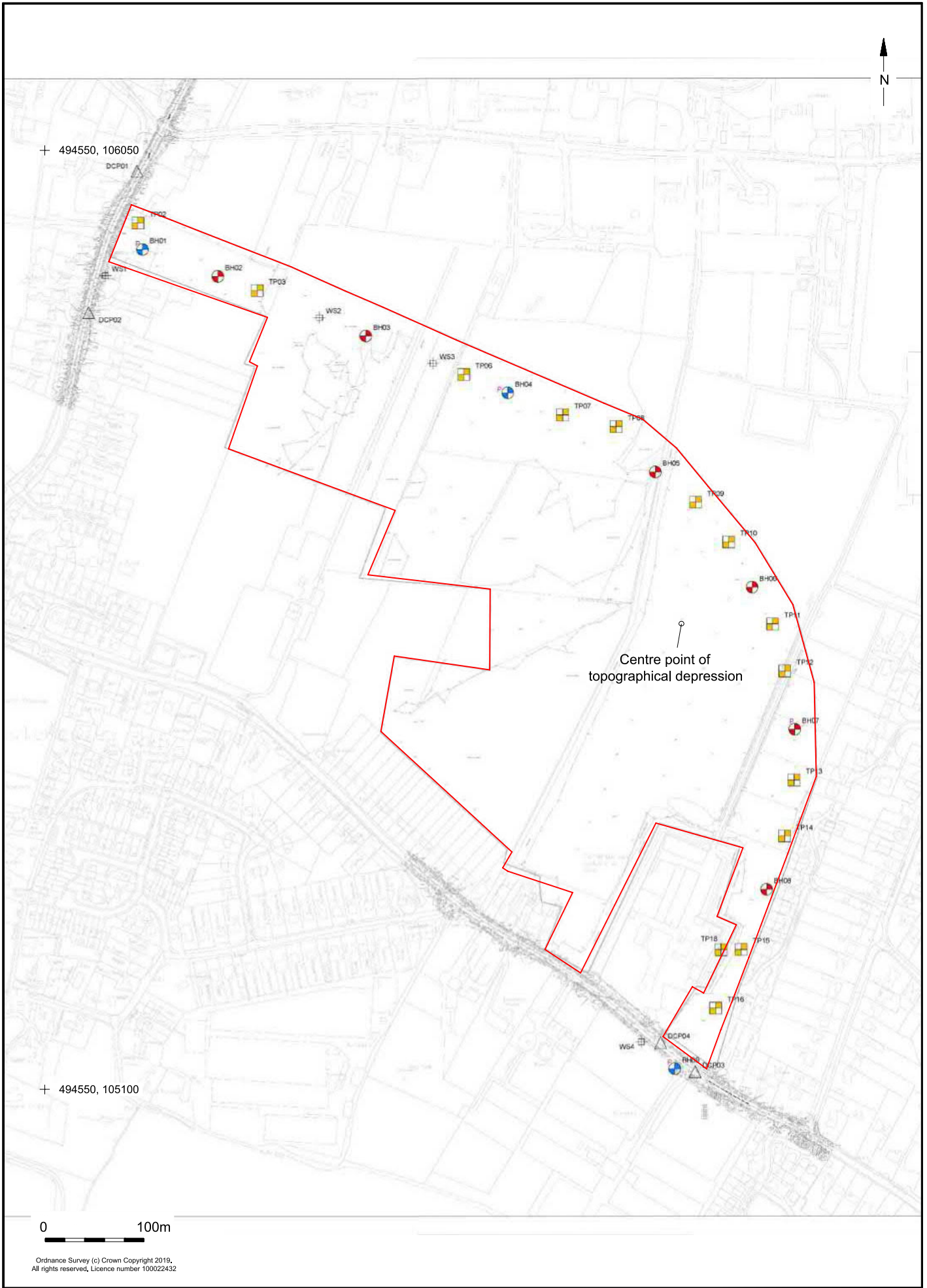
Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015

Figure 1 of 1
12/11/2018



© Archaeology South-East		A29 Realignment Scheme	Fig. 1
Project Ref: 180783	April 2019	Site location	
Report Ref:	Drawn by: JR		



© Archaeology South-East		A29 Realignment Scheme		Fig. 2
Project Ref: 180783	April 2019	Map of the route showing all Geotechnical interventions		
Report Ref:	Drawn by: JR			

Sussex Office

Units 1 & 2
2 Chapel Place
Portslade
East Sussex BN41 1DR
tel: +44(0)1273 426830
email: fau@ucl.ac.uk
web: www.archaeologyse.co.uk

Essex Office

27 Eastways
Witham
Essex
CM8 3YQ
tel: +44(0)1376 331470
email: fau@ucl.ac.uk
web: www.archaeologyse.co.uk

London Office

Centre for Applied Archaeology
UCL Institute of Archaeology
31-34 Gordon Square
London WC1H 0PY
tel: +44(0)20 7679 4778
email: fau@ucl.ac.uk
web: www.ucl.ac.uk/caa



Appendix E

A29 REALIGNMENT, EASTERGATE, WEST SUSSEX DETAILED GRADIOMETER SURVEY REPORT





A29 Realignment, Eastergate, West Sussex

Detailed Gradiometer Survey Report

Report Ref.: 235270.03
September 2020



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Portway House
Old Sarum Park
Salisbury
Wiltshire
SP4 6EB

www.wessexarch.co.uk

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County	West Sussex
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Project management by	Tom Richardson
Document compiled by	Alexander Schmidt
Contributions from	Nicholas Crabb
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Contents

Summary	ii
Acknowledgements.....	ii
1 INTRODUCTION	1
1.1 Project background.....	1
1.2 Scope of document.....	1
1.3 The site.....	1
2 ARCHAEOLOGICAL BACKGROUND.....	2
3 METHODOLOGY	3
3.1 Introduction.....	3
3.2 Aims and objectives.....	3
3.3 Fieldwork methodology.....	4
3.4 Data processing.....	4
4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION	4
4.1 Introduction.....	4
4.2 Gradiometer survey results and interpretation	5
5 DISCUSSION	6
REFERENCES	7
Bibliography.....	7
Cartographic and documentary sources.....	7
Online resources.....	7
APPENDICES	8
Appendix 1: Survey Equipment and Data Processing.....	8
Appendix 2: Geophysical Interpretation.....	10
Appendix 3: OASIS form	11

List of Figures

Figure 1	Site location and survey extents
Figure 2	Detailed gradiometer survey results: greyscale plot (Section 2)
Figure 3	Detailed gradiometer survey results: interpretation (Section 2)
Figure 4	Detailed gradiometer survey results: greyscale plot (Section 3 - North)
Figure 5	Detailed gradiometer survey results: interpretation (Section 3 - North)
Figure 6	Detailed gradiometer survey results: greyscale plot (Section 3 - South)
Figure 7	Detailed gradiometer survey results: interpretation (Section 3 - South)
Figure 8	Detailed gradiometer survey results: greyscale plot (Section 4)
Figure 9	Detailed gradiometer survey results: interpretation (Section 4)



Summary

A detailed gradiometer survey was conducted over land at Eastergate, West Sussex (centred on NGR 495250 105650). The project was commissioned by WSP UK with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site for the A29 realignment works.

The site comprises four sections of arable fields located along the proposed route, with a proposed total survey area of 9 ha. The geophysical survey was undertaken on 17 and 18 June 2020 and has demonstrated the presence of a number of anomalies of potential archaeological interest. Section 1 was deemed unsuitable for survey due to over growing vegetation. Section 2 was cut prior to survey but the section of cut vegetation did not correspond to the proposed survey area. As much as was possible was surveyed in this area. Section 3 and 4 were surveyed in their entirety.

The detailed gradiometer survey has been successful in identifying anomalies considered likely to be archaeological in origin. A distinct parallel alignment of positive anomalies has been identified in Section 3 that could indicate a former trackway. It is possible that this defined a former field system that could relate to the Iron Age and Roman-British activity noted in the surrounding area.

Several further ditch-like anomalies have been identified in the survey results in Section 2 and 3. However, these cannot be confidently interpreted as archaeological in origin and are as likely to relate to modern agricultural activity. Similarly, numerous pit-like anomalies have been identified throughout all sections of the survey. It is not possible to confirm an archaeological origin for these, and they may simply relate to localised variations in the underlying superficial deposits.

In addition, a former field boundary noted on historical OS mapping dating to 1875 has been identified in Section 3 along with another weaker alignment that may indicate an earlier, unrecorded field boundary.

The remaining anomalies are likely to be modern in provenance, pertaining to modern agricultural activity, a trackway as well as a former road visible in aerial imagery.

Acknowledgements

Wessex Archaeology would like to thank WSP UK for commissioning the geophysical survey. The assistance of Paul Riggott is gratefully acknowledged in this regard.

The fieldwork was undertaken by Brett Howard and Scott Chaussee. Alexander Schmidt processed and interpreted the geophysical data, wrote the report and prepared the illustrations. The geophysical work was quality controlled by Nicholas Crabb. The project was managed on behalf of Wessex Archaeology by Tom Richardson.



A29 Realignment, Eastergate, West Sussex

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by WSP UK to carry out a geophysical survey at Eastergate, West Sussex (centred on NGR 495250 105650) (**Figure 1**). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the construction of a new 1.2km-long single carriageway road as part of the A29 realignment works.

1.1.2 The geophysical survey was requested by John Mills, West Sussex County Archaeologist, as the initial stage of archaeological evaluation, which will be followed by trial trenching.

1.2 Scope of document

1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

1.3.1 The site is located on the north-east side of the village of Eastergate, 8.8 km east of Chichester and 7.1 km north-west of Littlehampton in the county of West Sussex.

1.3.2 The scheme comprises a 'L-shape' route running from Fontwell Avenue in the north-west towards Downview Road and Ewens Gardens in the east, then turning south towards Barnham road (B2233). The survey area covers sections of four arable fields located along the route, with a proposed total survey area of 9 ha. In the north-western extent it is bounded by the road at Fontwell Avenue and an area of woodland is located to the east (Section 1). Section 2 has open agricultural land to the north and south, with woodland to the east and west. Section 3 is bounded by woodland to the east and residential properties at Downview Road and Ewens Gardens to the east. The southern portion of the route (Section 4) leads onto the village of Eastergate and is bounded by industrial buildings.

1.3.3 The site is on a gradual south/south-east facing slope, rising from 11 m above Ordnance Datum (aOD) at the southern-most area (Section 4) to 16 m aOD at the northern-most area (Section 1).

1.3.4 The solid geology comprises clay, silt, and sand of the London Clay Formation with overlying superficial geological deposits of gravel, sand, silt, and clay (Head), forming a dry river valley along the western edge of the site (BGS 2020). In the north-western and southern extent of the site, River Terrace Deposits are recorded in geotechnical investigations showing a typical Quaternary succession for this part of the coastal plain (ASE 2019).

1.3.5 The soils underlying the site are likely to consist of typical argillic brown earths of the 5711 (Charity 1) association (SSEW SE Sheet 6 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.



2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 A draft archaeological desk-based assessment (DBA) has been prepared by WSP UK for the site, which examined the potential for the survival of buried archaeological remains within the development area and a 1 km study area (WSP 2020). The following background is not exhaustive but is summarised from aspects of the DBA considered relevant to the interpretation of the geophysical survey data.

2.2 Summary of the archaeological resource

- 2.2.1 The site is located on the West Sussex lower coastal plain, which is of considerable geological and archaeological interest with regard to the Pleistocene and Palaeolithic periods. A Palaeolithic axe has been recorded on Walberton Lane, 1.2 km to the north-east of the site. A number of Mesolithic flints were found during an evaluation at Fontwell Avenue, 800 m north of the site. Further finds of Mesolithic flint flakes have been discovered at Norton Spinney, 1 km south-west of the site, and at Croft Cottages, 1.1km south-west of the site, which may represent flint working sites.
- 2.2.2 In the western part of the site, a single flint flake fragment of late pre-historic date was found during archaeological monitoring of a geotechnical investigation (ASE 2019).
- 2.2.3 Two pits possibly dating the Neolithic were recorded during an evaluation at Westergate, 350 m to the west of the site. Neolithic flints were found during an evaluation at Fontwell Avenue and on a ploughed field 1.2 km to the south-west of the site. A flint blade of late Neolithic or Bronze Age date was also found in Barnham Nurseries, 800 m south-east of the site.
- 2.2.4 There is some evidence for Bronze Age activity in the area. A post-hole has been recorded during evaluations at Westergate Community College 650m to the south-west of the site. In addition, residual bronze finds were recorded at Ivy Lane, 850 m to the south-west of the site and Late Bronze Age ditches were revealed during an evaluation at Westergate. At Arundel Road, 1.3 km north-east of the site, a possible late Bronze Age or early Iron Age ditch is recorded. Closer to the site, a Late Bronze Age urn was discovered at Eastergate Lane, 100 m north of the site.
- 2.2.5 Early Iron Age pottery was recorded during an evaluation at Westergate Community College, 650 m to the south-west of the site. At Arundel Road, 1.2 km north of the site, part of a linear ditch was also exposed which contained some early Iron Age pottery.
- 2.2.6 At Barnham Road, 650 m to the south-east of the site, there are linear cut features dating to the Iron Age and Romano-British period. Further Iron Age and Romano-British gullies have also been identified at Barnham Manor, 200 m to the south-east of the site and cut features of Romano-British date were also recorded at Westergate Community College. In addition, A Roman roof tile was recorded at Church Lane, 500 m south-west of the site and the geoarchaeological monitoring of the geotechnical investigations on the site in 2018 (ASE 2019) recorded a prehistoric flint flake and possible Roman tile.
- 2.2.7 The site lies 400 m to the south of the presumed route of the Roman road from Chichester to Arundel. Recent work using LiDAR images and aerial photographs has identified sections of road 950 m to the north of the site. The site of a possible Roman villa has been suggested in the field to the south of St. George's Church, Eastergate, 750 m to the south-west of the site, where finds of Romano-British date and crop marks indicate the site of a Roman building.
- 2.2.8 Early medieval settlement at Eastergate is thought to have been in the area of St. George's Church, 700 m to the south-west of the site. Saxo-Norman features were recorded at



Westergate Community College. Saxo-Norman pits, ditches, and pottery were revealed at Ivy Lane, 850 m to the south-west of the site.

- 2.2.9 Later medieval features were recorded at Westergate Community College and at Ivy Lane. Ditches containing pottery dated to the 11th to 13th centuries were revealed at Church Lane. A manor house was recorded at Eastergate in 1379, in the location of the later Manor Farmhouse, 675 m to the south-west of the site. The Northfield, between Barnham Road and Fontwell Avenue, which would likely have included the area of the site, was open fields during the later medieval period.
- 2.2.10 There are numerous Grade I, II and II* Listed buildings noted throughout the settlements of Eastergate to the south-west of the site and Walberton to the north-east. The 18th century Choller Farmhouse is the closest, being located 350 m east of the eastern portion of the scheme. Cartographic evidence suggests that during the 20th century the site was limited to agricultural management features, such as boundary ditches or quarrying pits. Any buried remains of the early 19th century Eastergate Workhouse, in the western part of the site will have been removed by later quarrying.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 17 and 18 June 2020. Field conditions at the time of the survey were generally good throughout and an overall coverage of 8.4 ha was achieved. Section 1 was unsuitable for survey due to overgrown vegetation and although Section 2 was cut prior to survey, this did not correspond to the proposed survey area, but an area slightly to the south was surveyed. Section 3 and 4 were surveyed in their entirety, aside from minor reductions owing to present field boundaries and other obstacles.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to that set out in the Written Scheme of Investigation (WSP 2020), as well as to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
 - To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.
- 3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:
- To conduct a geophysical survey of the proposed site area, covering as much of the specified area as possible, allowing for on-site obstructions.
 - To provide a fully illustrated survey report which will set out the project background, identify the presence and extent of any geophysical anomalies.



- To determine the general nature of anomalies, and where possible provide an interpretation and commentary on their archaeological potential (qualified by 'possible', 'probable' or 'known') and likely heritage significance.
- To provide accompanying digital survey data.

3.3 Fieldwork methodology

3.3.1 The cart-based gradiometer system used a Leica Captivate RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS) and Leica Geosystems. Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

3.3.2 The detailed gradiometer survey was undertaken using four Bartington Grad-01-1000L gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart. Data were collected with an effective sensitivity of 0.03 nT at a rate of 10 Hz, producing intervals of 0.15 m along transects spaced 4 m apart.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. This included a High Pass Filter with uniform median weighting (600 point diameter), applied to remove low frequency noise associated with variation between the sensors along and between adjacent traverses. An interpolation used to grid the data and discard overlaps where transects have been collected too close together.

3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the site. Results are presented as a series of greyscale plots and archaeological interpretations at a scale of 1:1500 (**Figures 2 to 9**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image.

4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figure 3, 5, 7 and 9**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.



4.2 Gradiometer survey results and interpretation

- 4.2.1 The geophysical survey has identified a number of features that are considered to be possible archaeological remains. These are predominantly located in Section 3 and are associated with linear ditch features.
- 4.2.2 Two parallel positive, linear anomalies have been identified traversing the northern portion of Section 3 on a north-west to south-east alignment at **4000** and **4001** (**Figure 5**). The anomalies are weak and highly fragmented, but in total traverse the survey area for a distance 232 m. The two anomalies are spaced 6 m apart and are 1 m wide. These indicate parallel ditches either side of a possible trackway. Several perpendicular trends are noted to the north-east and south-west of the anomalies, which could represent further ditch-like features associated with this, but these are too weak to confidently interpret.
- 4.2.3 Towards the southern extent of the scheme, several further linear anomalies have been identified. To the south of Section 3, at **4002** (**Figure 7**), a weakly positive anomaly is located perpendicular to the projected alignment of **4000/4001** and could indicate a further ditch-like feature. It is possible that collectively these anomalies form part of a wider field system of unknown date, but further investigation would be required to confirm this.
- 4.2.4 In the centre of Section 2, a short positive linear anomaly at **4003** (**Figure 3**) has been identified parallel to the anomalies at **4000/4001**. In addition, further weakly positive linear anomalies have also been identified throughout Section 2 and 3 (**4004 – 4006**). These are interpreted as possible archaeology and could indicate further ditch-like features associated with those in Section 3. However, these anomalies could equally relate to modern agricultural activity or natural variations in the underlying deposits.
- 4.2.5 A large, weakly positive discrete anomaly has been identified in the west of Section 3 at **4007** (**Figure 5**). This is 11 m in diameter. It is poorly defined, which suggests that it is associated with natural variation in the underlying superficial deposits. However, the circular form suggests that it could be associated with an archaeological feature. For example, it may relate to a large pit-like feature possibly associated with material extraction recorded in the wider surrounding area. The anomaly corresponds with a circular depression observed during archaeological monitoring of ground investigation works carried out by Archaeology South East (2019). This has been supposed as a possible sink hole, the fills of which may contain deposits of palaeoenvironmental interest.
- 4.2.6 Numerous discrete positive anomalies have been identified throughout the survey results. These are 1 – 2 m in diameter and indicate pit-like features. Notable examples of these are seen at **4008** and **4009** in the south of Section 3, which could in turn be associated with wider archaeological activity. However, similar to the anomaly at **4007**, it is equally possible these are natural in origin, pertaining to localised variation in the magnetic susceptibility of the underlying superficial deposits.
- 4.2.7 A weakly dipolar, fragmented linear anomaly has been identified traversing the northern portion of Section 3 on a west-north-west to east-south-east alignment at **4010** (**Figure 5**). This anomaly corresponds to a former field boundary visible on historical OS mapping (1875). A parallel alignment of increased magnetic responses is noted 80 m to the north at **4011**. It is possible this also indicates the position of a former field boundary due to its alignment, although this is not recorded on any available mapping.
- 4.2.8 Three areas of increased magnetic response have been identified across the site. The first is located in the south-east of Section 2 at **4012**, the second is located to the south of Section 3 at **4013**, and the third is located in Section 4 at **4013**. These anomalies are thought to be modern. The anomaly at **4012** corresponds to an access point to the land parcel and is likely associated with compacted ground. The anomaly at **4013** is stronger and corresponds to a former road or trackway visible on aerial images (Google Earth 2020). The



anomaly at **4014**, is a stronger, dipolar anomaly and is noted traversing Section 4 on a north-north-east to south-south-west alignment, corresponding with a modern trackway.

5 DISCUSSION

- 5.1.1 The detailed gradiometer survey has been successful in identifying anomalies considered possible archaeology. A distinct parallel alignment of positive anomalies has been identified in Section 3 that could relate to a former trackway. It is possible that this defines a former field system and could be part of the wider Romano-British landscape surrounding the Roman road noted north of the site, although an earlier origin is also possible.
- 5.1.2 Several further ditch-like anomalies have been identified in the survey results in Section 2 and 3. However, these cannot be confidently interpreted as archaeological in origin and are as likely to indicate modern agricultural activity. Similarly, numerous pit-like anomalies have been identified throughout all sections of the survey that may indicate wider settlement activity, but it is not possible to confirm an archaeological origin for these, and they may simply relate to localised variations in the underlying superficial deposits.
- 5.1.3 In addition, a former field boundary noted on historical OS mapping dating to 1875 has been identified in Section 3 along with another weaker alignment that may indicate an earlier, unrecorded field boundary.
- 5.1.4 The remaining anomalies are likely to be modern in provenience, pertaining to modern agricultural activity, a trackway as well as a former road visible in aerial imagery.



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APPENDICES

Appendix 1: Survey Equipment and Data Processing

Survey methods and equipment

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

Data were collected with an effective sensitivity of 0.02 nT at a rate of 20 Hz, producing intervals of 0.08 m along transects spaced 4 m apart.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Viva system with rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the detail survey are downloaded for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

The cart-based system generally requires a lesser amount of post-processing than the handheld fluxgate gradiometer instrument. This is largely because mounting the gradiometers on the cart reduces the occurrence of operator error; caused by inconsistent walking speeds and deviation in traverse position due to varying ground cover and topography.

Typical data and image processing steps may include:

- GPS DeStripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- High Pass Filter - Uses either a uniformly or Gaussian weighted window to remove high or low frequency components in a survey.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).
- High-pass filter – calculates the mean/median of all the values within a specified window and subtracts the mean from the centre value resulting in the removal of low frequency noise.



- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies. XY plots are available upon request.
- Greyscale – Presents the data in plan using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.



Appendix 2: Geophysical Interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3: OASIS form

Project Details:

Project name		A29 Realignment, Eastergate, West Sussex			
Type of project		Detailed gradiometer survey (Field evaluation)			
Project description		<p>The detailed gradiometer survey has been successful in identifying anomalies considered likely to be archaeological in origin. A distinct parallel alignment of positive anomalies has been identified in Section 3 that could indicate a former trackway that in turn may be associated with the Roman road noted north of site. Numerous examples of Romano-British finds are noted in the surrounding landscape. Several further ditch-like anomalies have been identified in the survey results in Section 2 and 3. However, due to their discrete nature, these cannot be confidently interpreted as archaeological in origin and are as likely indicate modern agricultural activity.</p> <p>Numerous pit-like anomalies have been identified throughout all sections of the survey that may indicate wider settlement activity such as extraction or refuse pits. However, it is equally possible these anomalies are natural in origin pertaining to localised variation in the underlying deposits.</p> <p>In addition, a former field boundary noted on historical OS mapping dating to 1875 has also been identified in Section 3 along with another weaker alignment that may indicate an earlier, unrecorded field boundary. However, this is not clear from the survey results.</p> <p>The remaining anomalies are likely to be modern in provenience, pertaining to modern agricultural activity, a trackway as well as a former road visible in aerial imagery.</p>			
Project dates		Start: 17-06-2020		End: 18-06-2020	
Previous work		Yes			
Future work		Not known			
Project Code:	235270	HER event no.	N/A	OASIS form ID:	wessexar1-
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.					
Site Status		None			
Land use		Cultivated Land 3			
Monument type			Period		

Project Location:

Site Address	Barnham Road, West Barnham, Westergate			Postcode	PO22 0ES
County	West Sussex	District		Parish	
Study Area	9 ha	Height OD	11 – 16 m aOD	NGR	495250 105650

Project Creators:

Name of Organisation		Wessex Archaeology			
Project brief originator		WSP UK	Project design originator		Wessex Archaeology
Project Manager		Tom Richardson	Project Supervisor		Brett Howard
Sponsor or funding body		WSP UK	Type of Sponsor		Client

Project Archive and Bibliography:

Physical archive	N/A	Digital Archive	Geophysical survey and report	Paper Archive	N/A
Report title	A29 Realignment, Eastergate, West Sussex Detailed Gradiometer Survey Report			Date	2020
Author	Wessex Archaeology	Description	Unpublished report	Report ref.	235270.03