

A417 Missing Link
TR010056

6.4 Environmental Statement
Appendix 9.3 Ground Investigation
Factual Report
Part 1 of 5

Planning Act 2008

APFP Regulation 5(2)(a)
Infrastructure Planning (Applications: Prescribed Forms and
Procedure) Regulations 2009

Volume 6

May 2021

Infrastructure Planning

Planning Act 2008

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

A417 Missing Link

Development Consent Order 202[x]

**6.4 Environmental Statement
Appendix 9.3 Ground Investigation Factual Report
Part 1 of 5**

Regulation Number:	5(2)(a)
Planning Inspectorate Scheme Reference	TR010056
Application Document Reference	6.4
Author:	A417 Missing Link

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C01	May 2021	Application Submission

Contents

Phase 1 Ground Investigation Factual Report (final)

Phase 2A Ground Investigation Factual Report



HE551505 A417 MISSING LINK GROUND INVESTIGATION

FACTUAL REPORT ON
GROUND INVESTIGATION

Prepared for OSBORNE

Report Ref: 34888

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HE551505 A417 MISSING LINK GROUND INVESTIGATION

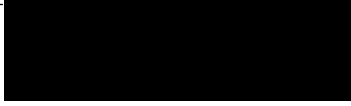
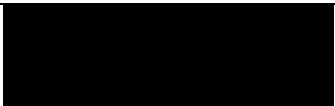
FACTUAL REPORT ON GROUND INVESTIGATION

Prepared for OSBORNE

Report Ref: 34888

PROJECT: Road realignment

CONSULTANT: Mott MacDonald Sweco JV

VOLUME - VERSION	STATUS	ORIGINATOR	CHECKER	APPROVED	DATE
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ORIGINATOR			APPROVER		
					
E LEIVERS Senior Engineering Geologist			C THOMAS Geotechnical Consultant		

The report is not to be used for contractual or engineering purposes unless this sheet is signed and the report designated "Final".

The report has been prepared for the sole use and reliance by Osborne. GEL accepts no liability as a result of the use or reliance of this report by any other parties.



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1. INTRODUCTION

It is proposed to realign the A417 carriageway at Birdlip, Gloucestershire. Geotechnical Engineering Limited (GEL) was instructed by Osborne (the Client) to carry out an investigation to determine the ground conditions.

The scope of works and terms and conditions of appointment were specified by the Client and GEL correspondence reference T29042 dated 24th October 2018. The investigation was carried out under the direction and supervision of the Client. Mott MacDonald Sweco Joint Venture (the Consultant) provided the specification and technical support to the Client.

This report describes the investigation and presents the findings.

2. SITE LOCATION AND GEOLOGY

The site is situated adjacent to the A417 carriageway between the Air Balloon roundabout in the north and the Cowley roundabout to the south between National Grid co-ordinates SO 935 162 and SO 936 139 respectively.

British Geological Survey (BGS) England and Wales (Sheet No. 234, Gloucester 1:50,000, dated 1975) and the BGS online geology (1:50,000) indicate the site is underlain by the Inferior Oolite Group across much of the site and the Great Oolite Group over the Inferior Oolite Group in the south. Landslip material is shown to the west and multiple faults trending northwest-southeast are shown to dissect the site. Made Ground was anticipated at surface due to existing land use.



3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015 during the period 7th January to 12th February 2019 and comprised eight boreholes.

The exploratory hole locations were selected by the Consultant and set out by this Company and are shown on Figure 1. The ground level and co-ordinates at each exploratory hole were established by this Company using GPS techniques.

The boreholes, referenced DSRC404, DSRC406, DSRC408, DSRC415 and DSRC419 (Appendix A), were formed using a track-mounted Geotechnical Pioneer Rig. Initially, the surface hardstanding at boreholes DSRC404 and DSRC419 was rotary core drilled. An inspection pit was hand excavated at each borehole location to a maximum depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and glass jars. Heavy duty dynamic sampling techniques were then employed to produce a continuous disturbed sample of 112mm nominal diameter. The samples were recovered in semi-rigid plastic liner.

On refusal to dynamic sampling, the boreholes were continued by Geobor S wireline rotary drilling techniques utilising a water flush. An inner barrel assembly, incorporating a semi-rigid plastic liner, is deployed down the borehole and is latched onto the outer barrel/casing to recover continuous cores of 102mm diameter. The outer barrel acts as the casing ensuring the hole is fully cased at all times. Borehole DSRC404 was rotary core drilled to 36.00m and then continued using rotary open-hole drilling techniques to 100.50m.

The dynamic samples and rotary core were extracted horizontally from the sampler and core barrel respectively, the semi-rigid liner was cut to length and caps placed at each end to retain



moisture content. All samples and core were retained in sequence in labelled, wooden coreboxes.

Clean drilling techniques were required in DSRC415 to protect the underlying formation. Initially, 200mm diameter casing was installed and a 2.20m thick bentonite seal placed within the casing. The bentonite was allowed to cure for an hour prior to sampling through the bentonite with a 168mm diameter casing string and advancing the borehole.

Standard penetration tests (SPT) were carried out within the superficial deposits in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel was used and the split barrel samples retained in airtight jars. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

The boreholes, referenced OH405, OH407 and OH416 (Appendix A), were formed using a track-mounted Geotechnical Pioneer Rig. Initially, the surface hardstanding at OH416 was rotary core drilled. An inspection pit was then hand excavated at each borehole location to a maximum depth of 1.20m to check for buried services. Disturbed samples were taken and retained in a combination of plastic tubs, bags and glass jars. The boreholes were then continued by rotary open hole drilling techniques utilising a water flush.

All boreholes were monitored for groundwater ingress as the boreholes were advanced. Upon encountering water in DSRC415 and DSRC419, drilling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.



A down-hole wireline geophysical survey was undertaken in boreholes DSRC404, DSRC406, DSRC408, DSRC415, DSRC419 and OH417 on completion of drilling. The work was undertaken on behalf of this Company by European Geophysical Services Limited and the results are presented in their report referenced MAR 2019/GENG1901_rpt/SO91 in Appendix D.

On completion, each borehole was flushed with clean water and a slotted standpipe installed. Each standpipe consisted of a 50mm ID HDPE slotted tube set in a granular filter medium and sealed above and below with a cement:bentonite plug (OH416 was sealed above only). The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole log. Subsequent water level readings are tabulated in Appendix A.

Prior to water sampling, the water monitoring standpipes were purged until at least three well volumes of water had been removed. Temperature, dissolved oxygen levels, pH, resistivity, conductivity, dissolved solids, salinity and redox potential readings were also taken at various levels during well development and the readings are presented in Appendix A.

Diver type data loggers were installed within the monitoring wells of each borehole. The data logger is designed to measure pressure and temperature at regular intervals for extended periods. The measurements are subsequently stored within the internal memory of the data logger. Readings downloaded from the instrument are summarised in Appendix A.

Samples for chemical analyses were dispatched daily to i2 Analytical Limited under a Chain of Custody. The remaining samples were brought to this Company's laboratory for storage.

3.2 Logging

The logging of soils and rocks was carried out by an Engineering Geologist in general accordance with BS5930:2015. A key to the exploratory hole logs is presented in Appendix A.



Detailed descriptions of the core and samples are given in the borehole logs, Appendix A, along with details of sampling, in situ testing, groundwater ingress, installations and relevant comments on drilling techniques. Where open hole drilling techniques were utilised, driller's descriptions only have been provided.

Suitable core subsamples were selected by the logging engineer. The core was carefully logged and prepared prior to preserving the subsample by wrapping in clingfilm and tinfoil and coating with at least three layers of wax. The sample was further protected by a covering of waxed cheesecloth, labelled and transported horizontally in padded, wooden coreboxes.

Prior to logging, photographs of the core were taken and are presented separately.

3.3 Laboratory Testing

A schedule of laboratory tests was prepared by the Consultant, the following tests being carried out in accordance with BS1377:1990, unless stated otherwise. The number in brackets refers to the test number given in that standard. The results are presented in Appendix B.

The natural water content was determined on nine selected samples in accordance with BS EN ISO 17892-1:2014.

Liquid limit, plastic limit and plasticity index tests [Part 2:4.3, 5.3 and 5.4] were carried out on nine selected samples. An Atterberg line plot has also been presented.

Particle size distributions were determined in accordance with BS EN ISO 17892-4:2016 for four samples by wet sieving [5.2]. The fine fractions of all of these samples were further analysed by sedimentation using the pipette method [5.4]. The results are presented as grading curves.



Two specimens were prepared from samples remoulded at received moisture content by Geolabs Limited. Three sub-specimens, each 60mm square in plan, were tested at different normal stresses, specified by the Consultant, in the small shear box apparatus [Part 7:4]. Following consolidation, the samples were sheared under drained conditions to give the peak effective shear strength parameters.

The following tests on rock samples were carried out in accordance with ISRM (2007) unless stated otherwise. Test results are presented in Appendix B.

The natural moisture content of rock was determined on seven selected cores.

The porosity/density was determined on two selected cores by Geolabs Limited.

The indirect tensile strength was determined on one selected core by Geolabs Limited.

The slake durability index was determined on one selected core by Geolabs Limited.

Eleven rock cores were tested for their unconfined compressive strength.

One rock core was tested for its unconfined compressive strength with axial and radial strain measurement to enable Young's modulus to be calculated by Geolabs Limited.

Point load index tests were carried out on seventy-two selected lengths of core.

The shear strength by direct shear on rock was determined on one selected core by Geolabs Limited.

Three samples were examined petrographically in accordance with ISRM suggested methods (1981) by Sandberg LLP.



3.4 Chemical Analyses

Selected soil and water samples were despatched to i2 Analytical Limited, where chemical analyses were carried out to in-house methods for a suite of contaminants. The results are presented in Appendix B.

GEOTECHNICAL ENGINEERING LIMITED



4. REFERENCES

British Standards Institution (2015): Code of practice for ground investigations. BS 5930:2015.

British Standards Institution (2016): Methods of test for soils for civil engineering purposes – Part 1: General requirements and sample preparation. BS1377-1:2016.

British Standards Institution (1990): Methods of tests for soils for civil engineering purposes. BS 1377 Parts 2-9.

British Standards Institution (2014): Geotechnical investigation and testing – Laboratory testing of soil. Part 1: Determination of water content. BS EN ISO 17892-1:2014.

British Standards Institution (2016): Geotechnical investigation and testing – Laboratory testing of soil. Part 4: Determination of particle size distribution. BS EN ISO 17892-4:2016.

British Standards Institution (2012): Geotechnical investigation and testing. Field testing. Standard penetration test. BS EN ISO 22476-3:2005+A1:2011.

International Society for Rock Mechanics (2007). The complete ISRM suggested methods for rock characterization, testing and monitoring: 1974-2006, edited by R Ulusay & J A Hudson. Ankara, Turkey: Turkish National Group of the International Society for Rock Mechanics.

International Society for Rock Mechanics (1981). Rock Characterisation and Monitoring.



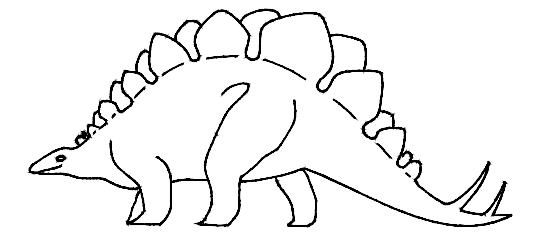
Key.



Borehole Location

Notes:

Drawing supplied by the Consultant



geotechnical
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Client:

OSBORNE

Consultant:

MOTT MACDONALD SWECO JV

Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION PLAN

Drawn By:

ELe

Checked By:

EC

Paper Size:

A3

Scale:

1:10,000

Date:

Feb 2019

Contract:

34888

Figure:

01



APPENDIX A

FIELDWORK DATA



Sample type

D Small disturbed	U Undisturbed	L Dynamic	ES Environmental - soil	Cs Core subsample (prepared)
B Bulk disturbed	UT Undisturbed thin wall	C Core	EW Environmental - water	Ls Dynamic subsample (prepared)
LB Large bulk disturbed	P Piston	W Water		

Test type

- S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value
- C SPT - Solid cone followed by uncorrected SPT 'N' Value
- (*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration)
- H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal
- M Mackintosh probe - number of blows to achieve 100mm penetration
- Mx Mexe cone - average reading of equivalent CBR value in %
- PP Pocket penetrometer - direct reading in kg/sq.cm
- Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with Isobutylene, using a 10.6eV bulb)

Sample/core range/l_i

| Dynamic sample

|

█ Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

x x = Total Core Recovery (TCR) as percentage of core run

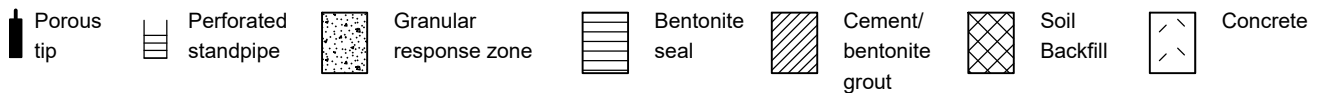
y y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter.

z z = Rock Quality Designation (RQD). The amount of solid core greater than 100mm expressed as percentage of core run.

Where SPT has been carried out at beginning of core run, disturbed section of core excluded from SCR and RQD assessment.

l_i - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are given. NI = non-intact core NA = not applicable

Instrumentation



Stratum boundaries



Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015.

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identifiable when, within the material make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General Comments

The process of drilling and sampling will inevitably lead to disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphic names/geological rock units are for guidance only and may not be wholly accurate.

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	12C	4.50 - 6.00	4.50		100 100 100						
	13Cs	5.60 - 6.00						5.40 - 5.90m: Frequent shell fragments (up to 30mm).			
	14C	6.00 - 7.50	6.00		100 91 91	40 230 420		Weak to medium strong thinly laminated to very thinly bedded light yellowish brown medium and coarse oolitic LIMESTONE with frequent thin and thick laminae of light grey limestone. Fractures are subhorizontal to 10° very closely to medium spaced planar smooth and rough frequently stained dark orangish brown. (BLPL) 6.00 - 6.10m: Subvertical planar rough fracture stained dark orangish brown.	5.90	263.10	
	15C	7.50 - 9.00	7.50		85 68 63			6.70 - 6.80m: 50° planar rough fracture. 7.30 - 7.40m: 60° planar rough fracture. 7.50 - 8.10m: Subvertical to 80° undulating rough fracture stained dark orangish brown.			
	16Cs	8.40 - 8.80						8.30 - 8.40m: 60° planar rough fracture stained dark orangish brown.			
Continued Next Page									{9.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:30 JC EL

water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	17C	9.00 - 10.50	9.00		93 57 25		NI 120 270	Weak to medium strong light yellowish brown frequently mottled light greyish white LIMESTONE with frequent shell fragments (up to 30mm) and rare burrows (up to 30mm) infilled with sparitic calcite. Fractures are subhorizontal to 20° very closely to medium spaced undulating rough locally stained dark orangish brown and locally infilled with yellowish brown clay. (BLPL) 9.05 - 9.20m: 60° planar rough fracture. 9.05 - 9.40m: Fractures are randomly orientated extremely closely to very closely spaced planar rough. 9.50 - 9.60m: Frequent veins and pockets of dark orangish brown ironstone (up to 30mm).	9.05	259.95	
	18C	10.50 - 12.00	10.50		100 100 76			10.45 - 10.50m: 40° planar smooth fracture. 10.60 - 10.75m: Subvertical undulating rough fracture.			
	19Cs	10.90 - 11.15									
	20C	12.00 - 13.50	12.00		69 40 23			11.45 - 11.50m: 45° planar rough fracture. 12.00 - 12.15m: 80° planar rough fracture. 12.20 - 12.30m: Subvertical planar rough fracture. 12.55 - 12.65m: 80° planar rough fracture.			
	21C 22Cs	13.50 - 15.00 13.60 - 13.95	13.50		96 80 75			12.70 - 12.90m: Stained orangish brown. Rare angular dark orangish brown ironstone. Fractures are randomly orientated extremely closely to closely spaced undulating rough infilled with dark orangish brown cement. 12.90 - 13.50m: Assessed zone of core loss. 13.50 - 13.65m: 70° planar rough fracture. 13.60 - 13.70m: Rare thin laminae of dark orangish brown limestone. 13.60 - 14.60m: Burrow mottled grey.			
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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
								14.10 - 14.15m: 30° undulating rough fracture. 14.15 - 14.35m: 80° planar rough fracture.			
								14.40 - 14.60m: 80° planar rough fracture.			
								14.55 - 14.60m: Frequent veins and pockets of dark orangish brown ironstone (up to 30mm). 14.55 - 14.80m: Locally weak stained dark orangish brown.	14.70	254.30	
	23C	15.00 - 16.50	15.00		38 9 9	NI NI NI 140		Weak to medium strong dark orangish brown medium and coarse grained LIMESTONE with abundant shell fragments (up to 5mm). Fractures are subhorizontal to subvertical very closely and closely spaced planar rough. (BLPL)	15.00	254.00	
								Weak to medium strong light yellowish brown medium and coarse grained bioclastic LIMESTONE recovered non intact. (BLPL)			
								NO RECOVERY. Assessed zone of core loss (assumed core scrubbed).	15.60	253.40	
	24C	16.50 - 18.00	16.50		43 43 43	130 130 360		Weak to medium strong light yellowish brown medium and coarse grained bioclastic LIMESTONE with rare greyish brown limestone intraclasts (up to 40mm). Bioclasts are whole and fragmented shells, corals and peloids. Bedding fractures are subhorizontal to 20° closely to medium spaced undulating rough. (BLPL)	16.50	252.50	
								16.50 - 17.35m: Subvertical to 80° undulating rough fracture.			
								NO RECOVERY. Assessed zone of core loss (assumed core scrubbed).	17.10	251.90	
	25C	18.00 - 19.50	18.00		32 19 19	NI NI 350		Medium strong light greyish brown fine and medium grained oolitic LIMESTONE. (BLPL)	18.00	251.00	
								18.00 - 18.15m: Recovered non intact (assumed drilling disturbed). 18.25 - 18.35m: 70° planar rough fracture.			
								NO RECOVERY. Assessed zone of core loss (assumed core scrubbed).	18.50	250.50	
								Continued Next Page	{19.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 21

Start Date 7 January 2019

Easting 393207.0

Scale 1 : 25

End Date 17 January 2019

Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	26C	19.50 - 21.00	19.50		97 83 0		NI NI 130	Weak to medium strong light yellowish brown medium grained LIMESTONE locally disintegrated to firm dark yellowish brown gravelly clay. Gravel is subangular to rounded fine to coarse limestone lithorelicts. Abundant shell fragments (up to 20mm), subrounded peloids (up to 15mm) and subrounded ooids (up to 10mm). Fractures are subhorizontal to 20° and 80° to subvertical extremely closely to closely spaced planar and undulating rough. (BLPL)	19.50	249.50	
	27C	21.00 - 22.50	21.00		81 65 35			20.45 - 20.70m: 80° very closely spaced planar rough fractures.			
09/01/19 1620hrs Dry	28C	22.50 - 24.00	22.50		100 95 78		NI 70 340	Medium strong thinly to medium bedded light yellowish brown medium and coarse LIMESTONE with frequent shell fragments (up to 5mm), frequent rounded peloids (up to 5mm) and frequent burrows (up to 40mm) infilled with dark orangish brown clay. Locally disintegrated to dark yellowish brown gravelly clay. Gravel is subrounded fine and medium limestone. Fractures are subhorizontal to 20° very closely to medium spaced planar and undulating rough locally weakened (up to 30mm). (BLPL)	21.85	247.15	
10/01/19 0800hrs Dry	29Cs	23.65 - 24.00			70 280 510			22.05 - 22.10m: 80° planar rough fracture.	23.65	245.35	
Continued Next Page									{24.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	30C	24.00 - 25.50	24.00		97 97 93			subhorizontal to 20° closely to widely spaced planar rough and undulating rough locally weakened (up to 10mm) and stained dark orangish brown. (BLPL) 23.65 - 24.00m: Dark orangish brown with frequent elongated voids (up to 10mm).			
	31C	25.50 - 27.00	25.50		100 97 87			24.75m: Subhorizontal undulating rough incipient fracture. 25.90 - 26.30m: 80° intersecting incipient fractures. 26.30 - 26.50m: Subvertical planar rough fracture. 26.55 - 26.70m: Frequent subrounded and elongated voids infilled with dark orangish brown clay cement. 26.90 - 26.95m: Coarse grained with abundant shells (up to 5mm).			
	32C 33Cs	27.00 - 28.50 27.00 - 27.50	27.00		99 91 87			27.50 - 27.90m: 80° to subvertical undulating rough fracture stained dark orangish brown. 27.90 - 28.00m: Locally disintegrated to dark orangish brown clay.	27.50	241.50	
	34C	28.50 - 30.00	28.50		85 82 69			28.40 - 29.30m: 80° to subvertical undulating rough fracture stained dark orangish brown.			
							NI 150 400	Medium strong light yellowish brown medium grained oolitic LIMESTONE locally with subrounded burrows (up to 30mm) infilled with dark orangish brown cemented clay. Fractures are subhorizontal to 10° very closely to medium spaced planar rough locally stained dark orangish brown. (BLPL)			
								Continued Next Page	{29.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:30 JC EL

water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	35C	30.00 - 31.50	30.00		99 97 91			29.75 - 29.80m: Subvertical planar rough fracture. Medium strong to strong light yellowish brown fine and medium shelly LIMESTONE with abundant interconnected burrows (up to 40mm) infilled with dark orangish brown clay cement. Shells are whole and fragmented (up to 60mm). Fractures are subhorizontal to 10° closely to medium spaced undulating rough locally infilled with dark orangish brown clay. (BLPL)	29.80	239.20	
	36Cs	30.95 - 31.50			750			Strong light yellowish brown medium and coarse oolitic LIMESTONE. (BLPL) 30.95 - 31.05m: Frequent spherical voids (up to 30mm) infilled with dark orangish brown clay.	30.95	238.05	
	37C	31.50 - 33.00	31.50		100 96 96			31.60 - 31.70m: Rare spherical voids (up to 20mm) infilled with dark orangish brown cement.	31.70	237.30	
	38C	33.00 - 34.50	33.00		94 94 81			32.60 - 32.80m: Extremely weak to weak dark orangish brown calcareous fine sandstone. 32.90 - 33.10m: Extremely weak to weak dark orangish brown calcareous fine sandstone.			
	39Cs	33.65 - 34.10									
Continued Next Page									{34.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks
				Groundwater not encountered prior to use of water flush.

	CONTRACT	CHECKED
	34888	CT

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	40C 41Cs	34.50 - 36.00 34.50 - 34.80	34.50		91 75 37				34.90	234.10	
	42C	36.00 - 37.50	36.00		99 69 41			Extremely weak thinly and thickly laminated dark grey, light grey and dark yellowish brown MUDSTONE with closely spaced thin laminae and pockets (up to 20mm) of reddish brown and orangish brown ironstone. Locally tending to very stiff clay. Incipient bedding fractures are subhorizontal to 10° extremely closely and very closely spaced planar smooth. Fractures are subhorizontal to 10° very closely to closely spaced planar smooth. (BDS) 34.90 - 35.30m: Thinly and thickly laminated with yellowish brown fine sand and ironstone. 35.50 - 35.60m: 80° to subvertical extremely closely spaced undulating smooth fractures. 35.75m: Thin lamination of fragmented ironstone. 36.05m: 30° planar smooth fracture with dark orangish brown penetrative staining (20mm from fracture surface). Extremely weak and weak thinly bedded dark orangish brown and orangish brown fine SANDSTONE locally disintegrated to dark orangish brown and orangish brown sand. Bedding fractures are subhorizontal to 10° closely spaced planar rough. (BDS) 36.65 - 36.85m: Stiff orangish brown slightly sandy clay. 36.85 - 36.95m: Thinly cross laminated. 36.85 - 37.30m: 80° to subvertical very closely spaced planar smooth fractures locally stained dark orangish brown infilled with ironstone. 37.00m: Very thin bed of orangish brown clayey fine sand. 37.30 - 37.40m: Subvertical planar smooth fracture recovered non intact. 37.45m: Thin lamination of dark reddish brown ironstone.	36.15	232.85	
10/01/19 1610hrs Dry									37.50	231.50	
11/01/19 0800hrs Dry	C	37.50 - 39.00	37.50		0			OPEN HOLE DRILLED. Driller notes clay with mudstone bands.	{39.00}		

Continued Next Page

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 21

Start Date 7 January 2019

Easting 393207.0

Scale 1 : 25

End Date 17 January 2019

Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	39.00 - 40.50	39.00		0						
	C	40.50 - 42.00	40.50		0						
	C	42.00 - 43.50	42.00		0						
	C	43.50 - 45.00	43.50		0						
Continued Next Page									{44.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	45.00 - 46.50	45.00		0						
	C	46.50 - 48.00	46.50		0						
	C	48.00 - 49.50	48.00		0						
Continued Next Page									{49.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	49.50 - 51.00	49.50		0						
	C	51.00 - 52.50	51.00		0						
	C	52.50 - 54.00	52.50		0						
Continued Next Page									{54.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
11/01/19 1620hrs 40.11m 14/01/19 0800hrs 43.81m	C	54.00 - 55.50	54.00		0						
	C	55.50 - 57.00	55.50		0						
	C	57.00 - 58.50	57.00		0						
	C	58.50 - 60.00	58.50		0						
Continued Next Page									{59.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT	CHECKED
				Groundwater not encountered prior to use of water flush.		34888	CT

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
14/01/19 1500hrs 41.00m											
15/01/19 0830hrs 42.60m	C	60.00 - 61.50	60.00		0						
	C	61.50 - 63.00	61.50		0						
15/01/19 1520hrs 39.00m											
16/01/19 0800hrs 38.63m	C	63.00 - 64.50	63.00		0						
Continued Next Page									{64.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 14 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	64.50 - 66.00	64.50		0						
	C	66.00 - 67.50	66.00		0						
	C	67.50 - 69.00	67.50		0						
Continued Next Page									{69.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



CONTRACT
34888

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BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 15 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	69.00 - 70.50	69.00		0						
	C	70.50 - 72.00	70.50		0						
	C	72.00 - 73.50	72.00		0						
	C	73.50 - 75.00	73.50		0						
Continued Next Page									{74.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 16 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
16/01/19 1630hrs 16.85m											
17/01/19 0820hrs 22.10m	C	75.00 - 76.50	75.00		0						
	C	76.50 - 78.00	76.50		0						
	C	78.00 - 79.50	78.00		0						
Continued Next Page									{79.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 17 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	79.50 - 81.00	79.50		0						
	C	81.00 - 82.50	81.00		0						
	C	82.50 - 84.00	82.50		0						
Continued Next Page									{84.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC404

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 18 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	84.00 - 85.50	84.00		0						
	C	85.50 - 87.00	85.50		0						
	C	87.00 - 88.50	87.00		0						
	C	88.50 - 90.00	88.50		0						
Continued Next Page									{89.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:32 JC EL

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 19 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	90.00 - 91.50	90.00		0						
	C	91.50 - 93.00	91.50		0						
	C	93.00 - 94.50	93.00		0						
Continued Next Page									{94.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 20 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	C	94.50 - 96.00	94.50		0						
	C	96.00 - 97.50	96.00		0						
	C	97.50 - 99.00	97.50		0						
Continued Next Page									{99.00}		

Geotechnical Engineering Ltd, Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:33 JC EL

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC404

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 21 of 21

Start Date 7 January 2019 Easting 393207.0

Scale 1 : 25

End Date 17 January 2019 Northing 215566.0 Ground level 269.00mOD

Depth 100.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
17/01/19 1220hrs 40.90m	C	99.00 - 100.50	99.00		0				100.50	168.50	
Borehole completed at 100.50m.									{104.00}		
water strike (m) casing (m) rose to (m) time to rise (m) remarks Groundwater not encountered prior to use of water flush.											
									CONTRACT 34888		CHECKED CT

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:33 JC EL

BOREHOLE LOG



DSRC406

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
								3.70 - 4.10m: 70° undulating rough fracture.			
	17C	4.50 - 6.00	4.50		100 55 40			4.40 - 4.65m: 70° planar rough fracture infilled with orangish brown calcite cement (up to 1mm).			
								5.25 - 5.90m: 70° to subvertical undulating rough fracture locally infilled (up to 20mm) with dark orangish brown sandy clay.			
								5.60 - 5.90m: 70° to subvertical undulating rough fracture.			
	18C	6.00 - 7.50	6.00		100 67 55			5.90 - 6.00m: Orangish brown. 6.00 - 6.15m: Coarse grained.			
								6.25 - 6.35m: 70° planar rough fracture.			
								6.45 - 6.85m: 80° to subvertical planar rough fracture locally infilled (up to 10mm) with light orangish brown sandy clay.			
	19Cs	6.95 - 7.25						6.85 - 6.90m: Recovered non intact as subangular fine and medium limestone gravel.			
	20C	7.50 - 9.00	7.50		97 55 55			7.50 - 7.90m: 80° to subvertical undulating rough fracture stained dark orangish brown.			
								8.35 - 8.40m: 80° planar rough fracture.			
	21Cs	8.45 - 8.75						8.60 - 8.75m: Frequent elongated burrows (up to 10mm).	8.75	229.90	
						NI 160 300		Weak to medium strong thinly laminated to thinly bedded light orangish brown oolitic LIMESTONE. Fractures are subhorizontal to 20° very closely to medium spaced planar			
								Continued Next Page	{9.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:40 JC EL

water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
34888

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BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	22C	9.00 - 10.50	9.00		97 76 58			rough and locally infilled (up to 30mm) with orangish brown sandy clay. (BLPL) 8.75 - 9.25m: Subvertical planar rough fracture infilled (30mm) with dark orangish brown sandy clay.			
	23Cs	9.35 - 9.65						9.50 - 9.65m: Frequent elongated burrows (up to 40mm). 9.65 - 9.70m: Subvertical planar rough fracture.			
	24C	10.50 - 12.00	10.50		100 55 48			10.10 - 10.15m: 80° planar rough incipient fracture. 10.15 - 10.35m: Frequent 70° to subvertical white calcite veins (up to 5mm thick). 10.65 - 10.70m: 80° planar rough fracture. 10.85 - 10.95m: Disintegrated to firm orangish brown slightly gravelly sandy clay. Gravel is subangular fine and medium limestone. 10.95 - 11.30m: Locally recovered non intact.	11.30	227.35	
	25C	12.00 - 13.50	12.00		97 17 17		NI 250 250	Medium strong light greyish brown LIMESTONE with frequent shell fragments (up to 10mm). Fractures are subhorizontal to 20° closely and medium spaced planar rough. (BLPL) 11.30 - 11.50m: 60° planar rough fracture. 11.45 - 11.55m: Recovered non intact (assumed drilling disturbed). 11.65 - 11.90m: 70° planar rough fracture. 12.15 - 12.25m: Recovered non intact (assumed drilling disturbed). 12.25 - 12.55m: 70° to subvertical undulating rough fracture.	12.55	226.10	
	26C	13.50 - 15.00	13.50		93 61 37		NI NI 100	Weak to medium strong light brown fine and medium LIMESTONE with frequent shells and shell fragments (up to 20mm) including bivalves. Locally disintegrated to orangish brown clayey angular to subrounded fine to coarse limestone gravel. Fractures are subhorizontal to 10° extremely closely to closely spaced planar rough and 70° to subvertical planar rough. (BLPL) 12.75 - 13.35m: Frequent elongated burrows (up to 20mm) infilled with orangish brown sandy clay.			
Continued Next Page									{14.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	27Cs	14.35 - 14.60						14.20 - 14.25m: Firm orangish brown slightly sandy clay.	14.25	224.40	
								Weak to medium strong light yellowish brown medium and coarse shelly LIMESTONE with frequent burrows (up to 15mm) locally infilled with orangish brown sandy clay. (BLPL)			
	28C	15.00 - 16.50	15.00		87 34 25			14.80 - 15.40m: Fractures are subhorizontal to 20° extremely closely to closely spaced planar rough.			
								15.15 - 15.25m: Disintegrated to dark orangish brown clayey subangular fine to coarse limestone gravel.	15.40	223.25	
								Medium strong light yellowish brown and orangish brown LIMESTONE with abundant burrows (up to 40mm) frequently infilled with dark orangish brown sandy clay and frequently disintegrated to dark orangish brown clayey angular and subangular fine to coarse limestone gravel. Fractures are subhorizontal to 20° very closely to medium spaced planar rough. (BLPL)			
	29C	16.50 - 18.00	16.50		83 43 27			16.25 - 16.85m: Recovered non intact (assumed drilling disturbed).			
								17.75 - 18.10m: Assessed zone of core loss.			
	30C	18.00 - 19.50	18.00		91 94 59			Medium strong yellowish brown shelly ooidal and peloidal LIMESTONE. Shells are whole and fragmented (up to 30mm) and peloids are locally stained dark orangish brown. Fractures are subhorizontal to 20° very closely and closely spaced planar and undulating rough. (BLPL)	18.10	220.55	
								18.10 - 18.35m: 70° to subvertical undulating rough fracture with a veneer of dark orangish brown sandy clay.			
								18.80 - 18.90m: 50° planar rough fracture.			
								Continued Next Page	{19.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	31Cs	19.25 - 19.45						19.15 - 19.25m: Abundant shells (up to 30mm).			
	32C	19.50 - 21.00	19.50		95 49 24				19.70	218.95	
						NI 60 160		Weak to medium strong light yellowish brown and orangish brown peloidal LIMESTONE. (BLPL) 19.70 - 20.00m: Recovered non intact. Fractures are randomly orientated extremely closely to closely spaced planar rough. 20.10 - 22.10m: Frequently disintegrated to light brown and orangish brown clayey subrounded fine and medium peloids and subangular fine to coarse limestone gravel. 20.40 - 20.55m: 80° planar rough fracture stained dark orangish brown.			
	33C	21.00 - 22.50	21.00		82 31 26		NR	20.90 - 21.30m: Assessed zone of core loss.			
						NI		21.30 - 21.80m: Recovered non intact (assumed drilling disturbed).			
	34Cs	22.10 - 22.50					400	22.10 - 24.00m: Abundant burrows (up to 30mm) infilled with orangish brown sandy clay.			
	35C	22.50 - 24.00	22.50		88 45 35		NI 200 320	22.50 - 24.00m: Fractures are subhorizontal to 20° very closely to medium spaced planar rough and locally stained dark orangish brown. 22.60 - 22.95m: 80° to subvertical undulating rough fracture.			
									24.00	214.65	
								Continued Next Page	{24.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



DSRC406

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 13

Start Date 22 January 2019

Easting 393384.0

Scale 1 : 25

End Date 28 January 2019

Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	36C	24.00 - 25.50	24.00		100 100 100		NI 420 570	Strong light greyish brown and light yellowish brown oolitic and peloidal LIMESTONE with abundant whole and fragmented shells (up to 40mm) and local burrows (up to 10mm) infilled with dark orangish brown sandy clay. Fractures are subhorizontal to 20° closely to medium spaced planar rough and stepped rough. (BLPL)			
	37Cs	24.65 - 25.10									
	38C	25.50 - 27.00	25.50		95 72 61			25.60 - 25.65m: Recovered non intact. Fractures are probably randomly orientated very closely spaced planar rough. 25.75 - 25.80m: Greenish grey.			
								26.25m: Fracture infilled with orangish brown sandy clay (40mm).			
	39C	27.00 - 28.50	27.00		99 99 75		40 110 270	26.80m: Fracture infilled with orangish brown sandy clay (30mm).	26.85	211.80	
								Medium strong light yellowish brown shelly LIMESTONE with frequent ooids, peloids and burrows infilled with orangish brown sandy clay. Shells are whole and fragmented (up to 50mm) including bivalves. Fractures are subhorizontal to 20° very closely to medium spaced planar and undulating rough locally infilled (up to 3mm) with orangish brown sandy clay. (BLPL)			
	40Cs	28.15 - 28.50					500	Strong bluish grey fine to coarse shelly LIMESTONE. (BLPL)	28.15	210.50	
23/01/19 1700hrs 25.00m											
24/01/19 0820hrs 26.81m	41C	28.50 - 30.00	28.50		100 94 87		NI 200 200	Strong yellowish brown and dark yellowish brown shelly LIMESTONE with abundant burrows (up to 30mm) infilled with dark orangish brown sandy clay. Fractures are subhorizontal to 10° closely spaced planar rough. (BLPL)	28.65	210.00	
								Continued Next Page	{29.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC406

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
								28.85 - 28.95m: Disintegrated to dark orangish brown sandy gravelly clay. Gravel is subrounded fine to coarse limestone lithorelicts. 29.15m: 10° planar rough fracture with a veneer of dark orangish brown sandy clay.	29.35	209.30	
						200		Strong bluish grey shelly LIMESTONE. (BLPL)			
						800		29.55m: Subhorizontal undulating rough fracture with a veneer of dark orangish brown sandy clay and orangish brown penetrative staining (up to 80mm).			
	42C	30.00 - 31.50	30.00			100 78 71			30.35	208.30	
						NI 250 650		Medium strong light yellowish brown shelly LIMESTONE with frequent burrows (up to 30mm) frequently infilled with dark orangish brown sandy clay. Fractures are subhorizontal to 20° medium and widely spaced planar rough. (BLPL) 30.35m: Subhorizontal planar rough bedding fracture infilled with brown sandy clay (up to 40mm).			
						500		31.00m: Subhorizontal undulating rough fracture infilled (40mm) with dark orangish brown sandy gravelly clay. Gravel is subangular fine to coarse limestone. 31.05 - 31.30m: Abundant burrows with frequent shells (up to 50mm). 31.25 - 31.40m: Recovered non intact.	31.40	207.25	
	43C	31.50 - 33.00	31.50			100 91 89		Medium strong dark grey locally shelly LIMESTONE. (BLPL)			
	44Cs	31.50 - 31.90						31.70m: Flame structures (up to 30mm).	31.90	206.75	
						NI 50 100		Medium strong orangish brown LIMESTONE with frequent shells and shell fragments (up to 20mm) and frequent burrows (up to 10mm) infilled with dark orangish brown sandy clay. Fractures are subhorizontal to 30° extremely closely to closely spaced undulating rough infilled (up to 10mm) with dark orangish brown sandy clay. (BLPL)	32.20	206.45	
						950		Strong light grey and dark bluish grey locally shelly LIMESTONE. (BLPL)			
	45C	33.00 - 34.50	33.00			100 60 60					
						400		33.15m: Subhorizontal to 20° undulating rough fracture with a veneer of dark grey clay.			
						250		33.55m: Subhorizontal stepped rough fracture. 33.55 - 33.80m: Abundant shells and shell fragments (up to 60mm).	33.80	204.85	
	46D	33.90 - 34.00				NA		Very stiff fissured thinly and thickly laminated dark grey CLAY locally tending to extremely weak mudstone with			
								Continued Next Page	{34.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	47C	34.50 - 36.00	34.50		100 43 43			frequent partings of light grey silt. Fissures are subhorizontal extremely closely to very closely spaced planar smooth. (WHM) 34.05m: Very thin bed of cross laminated grey fine sand.			
	48D	34.90 - 35.00						34.80 - 34.95m: Frequent very weak subrounded and tabular light brown phosphatic nodules (up to 30mm). 35.05m: Very thin bed of dark grey silt.	35.20	203.45	
	49Cs	35.30 - 35.70			600			Very weak to weak dark greenish grey sandy SILTSTONE with rare shells (up to 20mm). (WHM)			
	50C	36.00 - 37.50	36.00		100 23 23			Bluish grey SILT. (WHM) 35.85 - 35.90m: Medium strong light grey siltstone cobble. 35.95 - 36.00m: Clayey.	35.85	202.80	
								Very stiff dark grey clayey SILT. (WHM)	36.35	202.30	
								Very weak to weak dark grey SILTSTONE with rare partings of grey silt and local wisps of white gypsum. No natural fractures observed. (WHM) 36.95 - 37.05m: Disintegrated to dark grey silty subangular fine to coarse siltstone lithorelicts. 37.10m: Frequent phosphatic nodules (up to 60mm).	36.75	201.90	
	51C	37.50 - 39.00	37.50		93			Very stiff dark grey locally sandy clayey SILT with rare thin laminae and pockets (up to 20mm) of light grey silt. (WHM)	37.35	201.30	
	52D	37.55 - 37.65						37.50 - 37.70m: Very stiff dark grey silty clay.			
	53D	38.50 - 38.60									
Continued Next Page									{39.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	54C	39.00 - 40.50	39.00		100 23 23			39.00m: Very thin bed of weak grey siltstone.			
						150		39.15m: Very thin bed of weak grey siltstone.			
						NA		39.20 - 39.35m: Medium strong thickly laminated light grey siltstone.			
	55D	39.70 - 39.80									
	56C	40.50 - 42.00	40.50		100						
	57D	41.40 - 41.50									
	58C	42.00 - 43.50	42.00		99			42.20 - 43.50m: Fissured. Fissures are subhorizontal to 10° very closely to closely spaced planar smooth.			
	59D	42.50 - 42.60									
	60C	43.50 - 45.00	43.50		100 20 20	150 150		Extremely weak to weak dark grey SILTSTONE with frequent weak tabular and rounded dark greyish brown phosphate nodules. Fractures are subhorizontal to 10° closely spaced planar smooth. (WHM)	43.50	195.15	
						NA		43.75m: Flame structures (up to 50mm).	43.80	194.85	
								Continued Next Page	{44.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
34888

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BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
24/01/19 1640hrs 32.14m 25/01/19 0815hrs 31.25m	61D	44.00 - 44.10						Very stiff dark grey locally slightly sandy clayey SILT with rare partings and pockets (up to 10mm) of light grey silt. (WHM) 43.85m: Frequent weak dark greenish brown tabular and rounded phosphate nodules (up to 50mm). 44.35m: Thin bed of dark grey fine sand.			
	62C	45.00 - 46.50	45.00		99						
	63D	45.50 - 45.60									
	64C	46.50 - 48.00	46.50		100				46.55 - 47.30m: Grey.		
	65D	47.10 - 47.20									
	66C	48.00 - 49.50	48.00		99						
	67D	48.60 - 48.70									

Continued Next Page

{49.00}

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	68C	49.50 - 51.00	49.50		100			49.50m: Very thin bed of dark grey cross bedded fine sand.			
	69D	50.20 - 50.30						50.50m: Thin bed of dark grey silty fine sand.			
	70C	51.00 - 52.50	51.00		100			51.20 - 51.60m: Frequent weak light grey subrounded and tabular calcareous siltstone nodules (up to 40mm). 51.25m: Thin lamination of weak light grey calcareous siltstone.			
	71D	51.70 - 51.80									
	72C	52.50 - 54.00	52.50		100			52.80 - 53.30m: Abundant pockets (up to 20mm) of white silt.			
	73D	53.20 - 53.30									
Continued Next Page									{54.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	74C	54.00 - 55.50	54.00		100						
	75D	54.50 - 54.60						54.75m: 20° undulating rough fissure.			
								55.10m: Very thin bed of dark grey clayey silt.			
								55.30m: Thick lamination of light grey fine silty sand.			
	76C	55.50 - 57.00	55.50		97			55.50 - 55.60m: Very stiff dark grey clay.			
								55.70m: Very thin bed of grey silty fine sand.			
								55.85m: Thin bed of grey silty fine sand.			
	77D	56.10 - 56.20									
								56.55m: Very thin bed of very stiff dark grey clay.	56.60	182.05	
								Dark grey locally slightly sandy SILT locally tending to extremely weak siltstone and locally with partings and pockets (up to 10mm) of white silt. (WHM)			
	78C	57.00 - 57.50	57.00		98						
	79D	57.10 - 57.20						57.20m: Very thin bed of stiff dark grey clay.			
25/01/19 1630hrs 32.00m									57.50	181.15	
28/01/19 0730hrs 32.09m	80C	57.50 - 59.00	57.50		81 10 0			Very stiff dark grey silty CLAY. (WHM)			
	81D	57.70 - 57.80						Dark grey SILT with frequent pockets (up to 20mm) of light grey silt. (WHM)	57.85	180.80	
	82D	58.20 - 58.30									
								58.50m: Very thin bed of medium strong light grey siltstone.			
								58.60m: Thin bed of medium strong light grey siltstone.			
								Continued Next Page	{59.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:42 JC EL

water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
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BOREHOLE LOG



CLIENT OSBORNE

DSRC406

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 13

Start Date 22 January 2019 Easting 393384.0

Scale 1 : 25

End Date 28 January 2019 Northing 216009.0 Ground level 238.65mOD

Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
28/01/19 1705hrs 31.83m	83C	59.00 - 60.00	59.00		71 40 35			Very stiff dark grey locally gravelly silty CLAY. Gravel is subangular fine and medium siltstone. (WHM) 59.10m: Weak light grey siltstone cobble.	59.05	179.60	x x x x
	84D	59.10 - 59.20							59.25	179.40	x x x x
						NI 200 200		Extremely weak to very weak dark grey SILTSTONE with frequent weak light grey subangular siltstone clasts and locally tending to dark grey silt. Fractures are subhorizontal to 10° closely spaced planar smooth. (WHM) 59.70 - 60.00m: Assessed zone of core loss.			x x
						NR			60.00	178.65	x x x x x x x x x x x x
Borehole completed at 60.00m.											

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:42 JC EL

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
30/01/19 1215hrs	1B	0.10 - 0.20						Grass over soft dark brown silty CLAY with frequent rootlets. (MADE GROUND)	0.10	232.40	
	1ES	0.10 - 0.20						Stiff orangish brown very gravelly CLAY with frequent pockets (up to 10mm) of dark brown fine sand. Gravel is subangular fine to coarse limestone and calcite. (MADE GROUND)			
30/01/19 1330hrs Dry	2B	0.30 - 0.40						0.50 - 0.60m: High subangular limestone cobble content.	0.65	231.85	
	2ES	0.30 - 0.40						Very weak yellowish grey LIMESTONE recovered non intact as clayey subangular fine to coarse gravel.			
04/02/19 1300hrs Dry	3B	0.60 - 0.70									
	3ES	0.60 - 0.70									
	4L	0.85 - 1.20									
	5D	1.20 - 1.65	1.20	S 28							
	6L	1.20 - 2.20									
	7D	1.70 - 1.80						Firm yellowish brown and orangish brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone.	1.55	230.95	
	8D	2.20 - 2.55	2.20	S*75				Yellowish brown slightly sandy subangular and subrounded fine to coarse limestone GRAVEL.	1.90	230.60	
	9C	2.20 - 3.20			80 18 0	NI NI 90		Weak yellowish brown oolitic LIMESTONE. Fractures are vertical, 45° and 80° extremely closely to closely spaced stepped undulating rough stained orangish brown. (BLPL)	2.15	230.35	
	10C	3.20 - 4.70	3.20		67 15 15			2.70 - 4.90m: Limited recovery. Probable washout of weathered material. Recovered as gravel and cobble sized fragments.			
								Continued Next Page	{4.00}		

EQUIPMENT: Geotechnical Pioneer rig.
 METHOD: Hand dug inspection pit 0.00-0.85m. Dynamic sampled (128mm) 0.85-2.20m. Waterflush rotary core drilled (146mm wireline) 2.20-75.20m.
 CASING: 168mm diam to 2.20m and 140mm to 75.20m.
 BACKFILL: On completion, downhole geophysical survey carried out. Borehole backfilled with gravel 75.20-34.00m and cement-bentonite pellets 34.00-24.00m. A slotted standpipe (50mm) was installed to 23.50m, granular response zone 24.00-20.00m, bentonite seal 20.00-19.00m, cement:bentonite grout 19.00-9.00m, gravel 9.00-5.00m, cement:bentonite grout 5.00-0.50m, concrete and stopcock cover 0.50-0.00m.
 REMARKS: Driller notes loss of flush returns 4.70-75.20m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC408

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	11C	4.70 - 6.20	4.70		93 49 49			Medium strong light grey and yellowish brown oolitic LIMESTONE with frequent fine and medium gravel sized voids and frequent fine and medium gravel sized shell fossils. Fractures are horizontal and 45° rarely randomly orientated and intersecting stained orangish brown and locally weathered to orangish brown fine to coarse sand and subangular fine to coarse gravel sized fragments up to 50mm either side of fracture. (BLPL) 5.20 - 5.50m: Probable washout of weathered material. Recovered as gravel and cobble sized fragments.	4.90	227.60	
	12Cs	5.50 - 6.00			500						
	13C	6.20 - 7.70	6.70		100 71 53						
	14C	7.70 - 9.20	7.70		100 63 55				7.60 - 8.60m: Subvertical undulating rough fracture stained orangish brown.		
Continued Next Page									{9.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



DSRC408

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 16

Start Date 30 January 2019

Easting 393605.0

Scale 1 : 25

End Date 12 February 2019

Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
04/02/19 1620hrs Dry	15Cs	9.00 - 9.20						Strong light grey LIMESTONE with frequent fine to coarse gravel sized shell fragments and frequent burrows (up to 10x60mm) stained orangish brown and locally infilled with calcite. Fractures are subhorizontal rarely 45° very closely to medium spaced stepped undulating rough stained orangish brown. (BLPL)			
	16C	9.20 - 10.70	9.20		100 53 38						
	17Cs	10.30 - 10.50									
	18C	10.70 - 12.20	10.70		93 63 49						
	19C	12.20 - 13.70	12.20		100 59 59	40 170 390				12.30	
05/02/19 0820hrs 10.64m	20Cs	12.48 - 12.70						12.90 - 12.95m: Fracture infilled with orangish brown slightly clayey sandy subangular fine to coarse gravel.			
	21C	13.70 - 15.20	13.70		80 80 63	40 170 390		13.30 - 13.45m: Orangish brown sandy silt tending to extremely weak siltstone. 13.45 - 13.70m: Subvertical curved stepped rough fracture.			
Continued Next Page									{14.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	22Cs	15.02 - 15.20									
	23C	15.20 - 16.70	15.20		43 90						
						NA		Limited recovery. Recovered as orangish brown sandy gravelly clay with a low subangular limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (BDS) 15.85 - 16.70m: Assessed zone of core loss.	15.85	216.65	
	24C	16.70 - 18.20	16.70		43						
								17.35 - 18.20m: Assessed zone of core loss.			
	25C	18.20 - 19.70	18.20		100						
						NA		Stiff thinly laminated brownish grey silty CLAY. (WHM)	18.30	214.20	
								Stiff fissured grey micaceous silty CLAY with frequent partings of light grey fine sand (up to 1mm). Fissures are randomly orientated intersecting extremely closely spaced undulating and smooth. (WHM)	18.50	214.00	
		18.80		H 104							
								Continued Next Page	{19.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



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DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	26Cs	19.45 - 19.60						19.10 - 19.25m: Thinly laminated. Laminae are fine grey sand orientated at 45° (up to 1mm). Fissures are smooth and polished. 19.25 - 19.85m: Thinly laminated. Laminae are fine grey sand orientated at 45° (up to 1mm)			
	27C	19.70 - 21.20	19.70		100 35 35			19.60 - 19.85m: Fissures are subhorizontal.			
								19.85 - 20.00m: Very stiff brownish grey silty clay with frequent orangish brown silt partings (up to 1mm)	20.00	212.50	
								Very stiff orangish brown sandy micaceous SILT locally tending to extremely weak siltstone. (MRB)	20.10	212.40	
	28Cs	20.88 - 21.20						Medium strong orangish brown and bluish grey fine SANDSTONE. Fractures are subhorizontal medium spaced undulating smooth. (MRB)			
	29C	21.20 - 22.70	21.20		78 47 47	NA		Extremely weak orangish brown fine SANDSTONE. Drilling disturbed, recovered as slightly sandy clayey subangular and subrounded fine to coarse sandstone gravel. (MRB) 21.20 - 21.55m: Assessed zone of core loss.	21.20	211.30	
									22.00	210.50	
								Extremely weak orangish brown and bluish grey fine SANDSTONE with frequent 20-30° undulating yellowish brown and reddish brown thick laminae. Fractures are 20-30° closely and medium spaced undulating rough. (MRB)			
	30C	22.70 - 24.20	22.70		93 28 15	NI NI 160		Extremely weak greenish brown fine micaceous SANDSTONE locally disintegrated to a subangular fine and medium gravel. Fractures are horizontal and 80° undulating rough stained reddish brown. (DYS)	22.55	209.95	
								23.25 - 24.10m: Bluish grey locally mottled orangish brown with frequent grey greenish grey horizontal laminae (up to 1mm).			
								Continued Next Page	{24.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	31C	24.20 - 25.70	24.20		100		NA	Very stiff fissured grey clayey SILT locally tending to extremely weak siltstone. Frequent light grey sand lenses (up to 2mm). Fissures are horizontal and 80° very closely spaced to closely spaced planar smooth and polished. (DYS)	24.10	208.40	
	32C	25.70 - 27.20	25.70		98						
	33Cs	25.90 - 26.05									
	34C	27.20 - 28.70	27.20		100						
05/02/19 1630hrs 15.14m	35C	28.70 - 29.00	28.70		100						

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	47C	39.20 - 40.70	39.20		100						
	48C	40.70 - 42.20	40.70		100						
	49C	42.20 - 43.70	42.20		100 87 70	40 210 310		Extremely weak to very weak dark grey SILTSTONE with frequent partings of light grey calcitic material. Fractures are subhorizontal closely to medium spaced undulating rough. (CHAM)	42.40	190.10	
	50C	43.70 - 45.20	43.70		100 100 91			43.30 - 44.85m: Frequent lenses (up to 5mm) of light grey calcitic fine sandstone.			
								43.90 - 44.90m: Very weak.			
								Continued Next Page	{44.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



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DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	51C	45.20 - 46.70	45.20		100 53 45			45.35 - 45.45m: Stiff grey clay with frequent white fine sand partings (up to 1mm).			
	52Cs	45.75 - 45.93						45.90 - 46.05m: Frequent lenses (up to 5mm) of light grey calcitic fine sandstone.			
	53C	46.70 - 48.20	46.70		100	NA		Very stiff fissured dark grey silty CLAY locally tending to extremely weak siltstone with rare fine to coarse gravel sized shell fragments and rare brown trace fossils (up to 2x10mm) possible burrows. Fissures are 45-60° closely and medium spaced planar smooth. (CHAM)	46.40	186.10	
	54C	48.20 - 49.70	48.20		100						
Continued Next Page									{49.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



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DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
06/02/19 1600hrs 23.48m 07/02/19 0840hrs 21.63m	55C	49.70 - 51.20	49.70		100			51.20m: Rare fine to coarse gravel sized shell fragments.			
	56Cs	49.70 - 49.90									
	57C	51.20 - 51.55	51.20		100						
	58C	51.55 - 52.70	51.55		100						
	59C	52.70 - 54.20	52.70		93						

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
07/02/19 1630hrs 21.06m	67Cs	59.02 - 59.40					[Patterned area representing soil/coring data]				[Legend symbols]
08/02/19 0815hrs 21.76m	68C	60.20 - 61.70	60.20		100						[Legend symbols]
	69C	61.70 - 63.20	61.70		93			61.50m: Subangular grey limestone cobble with frequent reddish brown and white mineral veins (up to 10mm).			[Legend symbols]
	70Cs	62.30 - 62.70									[Legend symbols]
08/02/19 1120hrs 20.04m	71C	63.20 - 63.40	63.20		100			Very stiff fissured dark brownish grey CLAY locally tending to extremely weak mudstone locally with frequent shell fragments (up to 1mm). Fissures are subhorizontal to 20° very closely and closely spaced planar rough and smooth. (CHAM)	63.20	169.30	[Legend symbols]
11/02/19 1010hrs 21.76m	72C	63.40 - 64.70	63.40		93				63.75 - 64.00m: Subvertical planar smooth fissure.		
								Continued Next Page	{64.00}		[Legend symbols]

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC408

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 14 of 16

Start Date 30 January 2019

Easting 393605.0

Scale 1 : 25

End Date 12 February 2019

Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	73C	64.70 - 66.20	64.70		100			65.00m: Medium strong light grey subangular limestone cobble.			
	74D	65.70 - 65.80				65.20 - 65.30m: Frequent nodules of fine grained pyrite (up to 10mm). 65.25 - 66.45m: 80° to subvertical planar smooth fissure.					
	75C	66.20 - 67.70	66.20		100	65.60 - 65.70m: 50° planar smooth fissure. 65.70m: Frequent weak light brown subrounded phosphatic nodules (up to 50mm).		65.75	166.75		
	76C	67.70 - 69.20	67.70		100	Very stiff fissured dark grey locally slightly sandy silty CLAY locally tending to very weak siltstone. Fissures are subhorizontal to 30° very closely to medium spaced planar rough and smooth. (CHAM) 66.15 - 66.25m: 50° planar smooth fissure.					
	77Cs	68.75 - 69.10				66.50m: Medium strong light bluish grey subrounded limestone cobble. 66.70 - 66.85m: 80° to subvertical planar smooth fissure. 66.85m: 20mm band of fine and medium subangular pyrite gravel.					
								67.70 - 67.75m: Frequent fine to coarse pyrite sand. 67.75 - 67.85m: Frequent subrounded pyrite nodules (up to 15mm). 68.00 - 68.10m: 80° to subvertical planar smooth fissure. 68.15 - 68.35m: Frequent subrounded pyrite nodules (up to 30mm). 68.35 - 68.40m: 40° planar smooth fissure. 68.45m: Thin lamination of abundant white shells (up to 10mm).			
Continued Next Page									{69.00}		

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:50 ED/JC JH

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC408

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 15 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend	
11/02/19 1615hrs 20.25m	78C	69.20 - 70.70	69.20		100			68.85 - 68.90m: Frequent weak light brown subrounded phosphate nodules (up to 30mm). 69.00 - 69.20m: 50° planar smooth fissure.				
	79D	70.20 - 70.30						69.50 - 69.60m: Frequent pyrite nodules (up to 10mm). 70.10m: Weak light brownish grey subrounded limestone cobble. 70.50m: Thin band (20mm) of abundant pyrite nodules (up to 30mm).				
12/02/19 1000hrs 21.78m	80C	70.70 - 72.20	70.70		99			71.10 - 71.15m: Subvertical planar smooth fissure.				
81C	72.20 - 73.70	72.20			100			72.15 - 72.25m: Frequent medium strong light bluish brown subrounded limestone coarse gravel and cobbles. 72.25 - 72.35m: 60° planar smooth fissure. 72.55m: Thick lamination of greyish green sandy clay. 72.80m: Thin lamination of extremely weak light grey siltstone.				
82D	73.20 - 73.30							73.20 - 73.30m: Frequent medium and coarse subrounded gravel of medium strong light grey limestone.				
83C	73.70 - 75.20	73.70			100							
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Geotechnical Engineering Ltd, Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:50 ED/JC JH

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC408

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 16 of 16

Start Date 30 January 2019 Easting 393605.0

Scale 1 : 25

End Date 12 February 2019 Northing 216240.0 Ground level 232.50mOD

Depth 75.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
12/02/19 1150hrs 21.02m	84Cs	74.10 - 74.55						74.50 - 75.20m: Frequent shell fragments (up to 10mm) and local partings of white silt.	75.20	157.30	
								Borehole completed at 75.20m.			

Geotechnical Engineering Ltd, Tel. 01452 527743 34888.GPJ PROJECT_MASTER.GPJ GEOTECH2.GLB 02/07/2019 15:47:50 ED/JC JH

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC415

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
15/01/19 0900hrs	1B	0.20 - 0.30						MADE GROUND comprising dark grey TARMACADAM.	0.15	287.05	
	1ES	0.20 - 0.30						Dark yellowish brown slightly sandy subrounded and rounded fine to coarse limestone GRAVEL. (MADE GROUND)	0.30	286.90	
15/01/19 1100hrs Dry	2B	0.60 - 0.70						MADE GROUND comprising dark grey TARMACADAM.	0.60	286.60	
	2ES	0.60 - 0.70						Dark yellowish grey gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse limestone. (MADE GROUND)	0.75	286.45	
15/01/19 1425hrs Dry	3L	0.90 - 2.20	0.90					Firm light yellowish brown frequently greenish brown slightly gravelly CLAY. Gravel is angular tabular fine to coarse mudstone. (FE)	0.90	286.30	
								Stiff light brown calcareous CLAY. (FE)	1.30	285.90	
	4D	1.50 - 1.60						Stiff locally very stiff orangish brown mottled bluish grey calcareous CLAY. (FE)	1.75	285.45	
							Stiff light brown locally orangish brown and greyish brown gravelly calcareous CLAY. Gravel is angular and subangular fine to coarse weak dark reddish grey calcareous mudstone lithorelicts. (FE)				
21/01/19 1550hrs 1.38m	5D	2.20 - 2.65	0.90	S 24							
22/01/19 1425hrs Dry	6L	2.20 - 3.20	2.20						2.45	284.75	
	7D	2.80 - 2.90									
	8D	3.20 - 3.65	2.20	S*51							
	9C	3.20 - 4.70	3.20		100	NA		3.20m: Thick lamination of bluish grey mudstone.			
									Continued Next Page		{4.00}

EQUIPMENT: Geotechnical Pioneer rig.
 METHOD: Hand held hydraulic breaker 0.00-0.60m. Hand dug inspection pit 0.60-0.90m. Dynamic sampled (128mm) 0.90-3.20m. Rotary core drilled utilising a water flush (146mm wireline) 3.20-51.00m.
 CASING: 200mm diam to 1.70m, 168mm diam to 2.20m and 140mm diam to 51.00m.
 BACKFILL: On completion, downhole geophysical survey carried out. Borehole backfilled with bentonite-cement pellets 51.00-50.00m. A slotted standpipe (50mm) was installed to 49.00m, granular response zone 50.00-25.50m, bentonite seal 25.50-24.00m, cement-bentonite grout 24.00-14.00m, gravel 14.00-5.00m, cement-bentonite grout 5.00-0.50m, concrete and stopcock cover 0.50-0.00m. REMARKS: Driller notes reduced flush returns between 6.20-15.00m (80% returned) and 19.50-22.50m (60% returned). Driller notes loss of flush returns between 22.50-51.00m. Bentonite seal for aquifer protection installed 0.00-2.20m. Seal cured for 15hr prior to progressing hole through seal at reduced casing diameter.
 EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



DSRC415

CLIENT OSBORNE

Sheet 5 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1 : 25

Start Date 15 January 2019 Easting 393527.0

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
23/01/19 1650hrs 1.88m 24/01/19 0900hrs 2.03m	22C	19.50 - 21.00	19.50		100 100 100			19.25m: Subhorizontal to 10° planar rough fracture.	19.70	267.50	
	23Cs	20.60 - 20.90			160 240 1270		Weak thinly bedded brownish yellow bioclastic LIMESTONE locally tending to very stiff sandy clay. Abundant shell fragments (up to 20mm) infilled with white calcite. Fractures are subhorizontal medium to widely spaced undulating smooth. (SALS)				
	24C	21.00 - 22.50	21.00		100 99 98			21.70 - 21.80m: Abundant shell fragments (up to 10mm). 21.85 - 21.90m: Abundant shell fragments (up to 10mm).	22.05	265.15	
	25C	22.50 - 24.00	22.50		99 88 53		Weak and medium strong brownish yellow peloidal LIMESTONE locally with abundant shell fragments (up to 80mm). Fractures are subhorizontal to 30° closely and medium spaced undulating smooth infilled (2mm) with orangish brown sandy clay. (ASLS)				
						NI 130 370		22.70m: Shell fragment (20mm) replaced with light grey calcite. 23.20 - 24.10m: Subvertical very closely spaced undulating rough fractures.			
Continued Next Page									{24.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC415

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	26C	24.00 - 25.50	24.00		100 57 37			24.00 - 24.45m: Recovered non intact as fine to coarse gravel sized fragments with abundant brachiopods and bivalves. 24.75 - 25.10m: Frequent shell fragments (up to 10mm).			
	27C	25.50 - 27.00	25.50		100 93 85				26.30	260.90	
	28C	27.00 - 28.50	27.00		95 78 39		NI 270 310	27.00 - 27.25m: 40° to subvertical stepped incipient fracture. 27.20 - 27.25m: Abundant shell fragments (up to 35mm) replaced with white calcite.			
	29C	28.50 - 30.00	28.50		99 78 54		NI 110 290	Strong light yellowish grey bioclastic LIMESTONE with abundant shell fragments (up to 20mm) replaced by white calcite and abundant burrows (up to 20mm) stained brownish orange. Fractures are subhorizontal to 30° closely and medium spaced undulating rough stained brownish orange. (BLPL) 28.20m: Burrow (110mm) infilled with grey calcite.	27.65	259.55	
Continued Next Page									{29.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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DSRC415

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 11

Start Date 15 January 2019

Easting 393527.0

Scale 1 : 25

End Date 28 January 2019

Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	30C	30.00 - 31.50	30.00		100 71 45			29.20m: 40° undulating rough fracture stained brownish orange. 29.30 - 29.50m: Subhorizontal incipient fractures. 29.75m: Subhorizontal to 20° stepped fracture infilled (3mm) with brownish orange sandy clay.	30.45	256.75	
	31Cs	31.20 - 31.50					NI 200 590	Weak light brownish yellow bioclastic LIMESTONE locally oolitic with abundant shell fragments (up to 30mm). Fractures are subhorizontal to 20° mainly medium spaced undulating rough stained dark brownish orange. (BLPL) 30.50 - 30.90m: 40° to subvertical undulating incipient fracture. 30.80 - 30.90m: Frequent shell fragments (up to 70mm) replaced by white calcite. 31.10 - 31.15m: Yellowish brown.			
	32C	31.50 - 33.00	31.50		100 91 91			31.50 - 31.65m: 70° to subvertical undulating incipient fracture. 32.20 - 32.30m: Yellow brown with abundant shell fragments (up to 10mm). 32.65 - 33.70m: 50° to subvertical undulating rough fracture stained dark brownish orange locally infilled (up to 3mm) with white calcite.			
	33C	33.00 - 34.50	33.00		100 86 54						
Continued Next Page									{34.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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DSRC415

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend	
24/01/19 1630hrs 35.09m	34C	34.50 - 35.25	34.50		100 96 96			34.70 - 34.90m: 80° to subvertical incipient undulating fracture.				
	35Cs	34.90 - 35.25										
	25/01/19 0800hrs Dry	36C	35.25 - 36.00	35.25		100 96 84						
		37C	36.00 - 37.50	36.00		100 97 91			36.10m: Shell fragment (20mm) infilled with white calcite.			
		38Cs	36.40 - 36.80						36.40 - 36.95m: Locally grey.			
	39C	37.50 - 39.00	37.50		100 99 93		36.95m: Subhorizontal vein of grey and white calcite (up to 10mm). 36.97 - 37.06m: Grey. 37.05m: Brachiopod with lower valve infilled with micrite cement and upper valve replaced by white calcite. 37.40m: Subvertical vein of grey to white calcite (up to 10mm). 37.55 - 38.10m: Grey.					
									38.10	249.10		
								Medium strong light brown bioclastic LIMESTONE with abundant shell fragments (up to 40mm) and ooids. Fractures are subhorizontal to 30° closely and medium spaced stepped rough infilled with white calcite and brown slightly sandy clay. (BLPL)	38.50	248.70		
								Weak light brownish yellow LIMESTONE locally with abundant shell fragments (up to 20mm) locally replaced by calcite. Fractures are subhorizontal medium and widely spaced undulating smooth stained brownish orange. (BLPL)				
								Continued Next Page	{39.00}			

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend	
	40C	39.00 - 40.50	39.00		100 100 100			38.50 - 39.25m: 80° to subvertical undulating incipient fracture.				
	41C	40.50 - 42.00	40.50		100 100 100							
	42Cs	41.50 - 41.90										
	43C	42.00 - 43.50	42.00		100 100 100							
	44Cs 45C	43.50 - 43.90 43.50 - 45.00	43.50		100 99 87							
Continued Next Page									{44.00}			

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
25/01/19 1610hrs 35.89m											
28/01/19 0915hrs 44.17m	46C	45.00 - 46.50	45.00		97 97 97			44.25 - 44.60m: Abundant shell fragments (up to 10mm).			
	47C	46.50 - 48.00	46.50		100 100 100						
	48Cs	46.70 - 47.00									
	49C	48.00 - 49.50	48.00		100 100 96						
Continued Next Page									{49.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 11

Start Date 15 January 2019 Easting 393527.0

Scale 1 : 25

End Date 28 January 2019 Northing 213994.0 Ground level 287.20mOD

Depth 51.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	50C	49.50 - 51.00	49.50		100 100 98					
	51Cs	50.60 - 51.00					50.65m: 25° very closely spaced planar rough fractures stained yellowish orange.			
28/01/19 1220hrs 48.24m							Borehole completed at 51.00m.	51.00	236.20	
								{54.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	11Cs	3.98 - 4.28									
	12C	4.60 - 6.10	4.60		100 87 78			4.60 - 4.70m: 60° planar smooth fracture.			
								5.20 - 5.40m: Subvertical undulating rough fracture stained orangish brown.			
	13C	6.10 - 7.60	6.10		100 96 81		Ni 150 490	Medium strong thinly laminated to very thinly bedded light brownish yellow medium and coarse oolitic LIMESTONE with closely spaced thin beds of light grey limestone. Fractures are subhorizontal to 20° closely and medium spaced undulating rough frequently stained dark orangish brown. (BLPL)	5.90	263.00	
	14C	7.60 - 9.10	7.60		95 78 70			7.50 - 7.60m: 40° planar smooth fracture stained orangish brown.			
	15Cs	8.02 - 8.30						7.90 - 8.00m: Frequent elongated voids (up to 10mm) stained orangish brown.			
								8.50 - 9.10m: 80° to subvertical undulating rough fracture stained orangish brown.			
								Continued Next Page	9.00	259.90	
									{9.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	16C	9.10 - 10.60	9.10		91 35 14	NI 40 130		Medium strong and strong light yellowish brown LIMESTONE with frequent shell fragments (up to 30mm) and burrows (up to 80mm) infilled with calcite. Fractures are subhorizontal to 20° very closely and closely spaced undulating rough stained orangish brown locally infilled (up to 5mm) with orangish brown clay. (BLPL)			
	17C	10.60 - 12.10	10.60		100 47 8			9.60 - 9.75m: Frequent elongate voids (up to 30mm) stained dark brownish orange.			
08/01/19 1630hrs Dry						NI 40 100		Weak to medium strong brownish orange medium and coarse grained LIMESTONE with closely spaced zones of extremely weak highly fractured limestone recovered as claybound gravel. Abundant shell fragments (up to 20mm) and frequent white calcite crystals (up to 20mm). Fractures are subhorizontal to 20° very closely spaced undulating rough infilled (up to 2mm) with orangish brown clay. (BLPL)	11.45	257.45	
10/01/19 0850hrs Dry	18C	12.10 - 13.60	12.10		17 7 0			12.40 - 13.60m: Assessed zone of core loss (assumed core scrubbed).			
	19C	13.60 - 15.10	13.60		83 49 29	NI 60 110		Strong light yellowish brown medium and coarse grained bioclastic LIMESTONE with frequent ooids and burrows (up to 20mm) infilled with orangish brown clay. Fractures are subhorizontal to 20° closely spaced undulating smooth and rough stained orangish brown. (BLPL)	13.60	255.30	
								Continued Next Page	{14.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	20C	15.10 - 16.60	15.10		81 79 48			Strong light brownish yellow medium and coarse grained bioclastic LIMESTONE with frequent ooids and peloids. Fractures are subhorizontal to 20° mainly closely spaced undulating smooth and rough stained light orangish brown. (BLPL)	14.65	254.25	
	21C	16.60 - 18.10	16.60		97 97 97						
	22Cs	17.17 - 17.50			80 230 230			Weak to medium strong light yellowish brown fine to coarse grained bioclastic LIMESTONE with frequent ooids and peloids. Fractures are subhorizontal to 20° closely and medium spaced planar smooth and rough stained orangish brown. (BLPL)	17.00	251.90	
	23C	18.10 - 19.60	18.10		95 88 63						
								Strong light yellowish brown fine and medium grained bioclastic LIMESTONE with frequent ooids. Fractures are subhorizontal to 20° closely spaced undulating rough infilled (up to 3mm) with brownish orange clay. (BLPL)	18.45	250.45	
Continued Next Page									{19.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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BOREHOLE LOG



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DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	24C	19.60 - 21.10	19.60		91 61 51			Strong light yellowish brown medium and coarse grained bioclastic LIMESTONE locally disintegrated to orangish brown clayey angular to rounded fine to coarse limestone gravel sized fragments. Frequent shell fragments (up to 30mm), peloids and ooids and frequent burrows (up to 60mm) infilled with light orangish brown clay. Fractures are subhorizontal to 20° mainly medium spaced undulating rough infilled (up to 5mm) with orangish brown sandy clay. (BLPL)	19.35	249.55	
	25C	21.10 - 22.60	21.10		71 37 23						
	26C	22.60 - 24.10	22.60		53 33 27						
								Medium strong thinly to medium bedded light brownish grey fine to coarse grained LIMESTONE with frequent shell fragments (up to 10mm), ooids and peloids and frequent burrows (up to 60mm) stained orangish brown. Fractures are subhorizontal to 20° closely spaced undulating rough stained brownish orange and infilled (up to 5mm) with brownish orange sandy clay. (BLPL)	21.80	247.10	
								23.30 - 24.10m: Assessed zone of core loss.			
Continued Next Page									{24.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



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DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	27C	24.10 - 25.60	24.10		87 82 76			24.20 - 24.40m: Subvertical undulating rough fracture stained orangish brown. 24.55 - 24.95m: Subvertical undulating rough fracture stained orangish brown.			
	28C	25.60 - 27.10	25.60		93 80 49						
10/01/19 1630hrs 26.47m											
11/01/19 0815hrs Dry	29C	27.10 - 28.60	27.10		95 61 46			27.10 - 27.50m: Subvertical fracture planar and undulating rough stained orangish brown.	27.50	241.40	
								Medium strong to strong thinly to medium bedded light brownish grey fine to coarse grained LIMESTONE with frequent shell fragments (up to 10mm), ooids and peloids. Abundant burrows (up to 100mm) stained orangish brown locally infilled with orangish brown sandy clay. Fractures are subhorizontal to 20° mainly medium spaced undulating rough stained brownish orange and infilled (up to 5mm) with brownish orange sandy clay locally weakened up to 20mm from fracture surface. (BLPL) 27.50 - 27.90m: Subvertical conjugate fractures planar and undulating rough stained orangish brown. 27.90 - 28.00m: Extremely weak highly fractured limestone recovered as claybound subangular fine and medium gravel.			
	30C	28.60 - 30.10	28.60		100 99 80						
								Continued Next Page	{29.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



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DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	31Cs	29.20 - 29.60									
	32C	30.10 - 31.60	30.10		97 85 67				30.90	238.00	
	33Cs	31.20 - 31.60					NI 130 300	Medium strong and strong light grey and light brownish grey fine and medium grained oolitic LIMESTONE locally disintegrated to clayey sandy angular to subrounded fine to coarse gravel sized fragments. Frequent shell fragments (up to 25mm) and peloids. Rare burrows (up to 50mm) infilled with orangish brown slightly sandy clay. Fractures are subhorizontal to 30° closely and medium spaced undulating rough infilled (up to 5mm) with orangish brown sandy clay. (BLPL)			
	34C	31.60 - 33.10	31.60		99 94 83						
	35C	33.10 - 34.60	33.10					32.60 - 32.75m: Abundant voids (up to 40mm) infilled with orangish brown sandy clay.	32.75	236.15	
	36Cs	33.20 - 33.60			97 87 86		NI 330 760	Weak greenish brown fine grained LIMESTONE. (BLPL)			
								Medium strong light yellowish brown fine and medium locally shelly LIMESTONE with abundant locally interconnected burrows (up to 50mm) infilled with dark orangish brown slightly sandy clay. Fractures are subhorizontal to 20° medium and widely spaced stepped rough locally stained dark orangish brown. (BLPL)	33.15	235.75	
								Continued Next Page	{34.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



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DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
								34.20 - 34.60m: Extremely weak orangish brown calcareous fine sandstone.			
	37C	34.60 - 36.10	34.60		95 81 61						
								Extremely weak thinly and thickly laminated dark grey, light grey and dark yellowish brown MUDSTONE with closely spaced thin laminae and pockets (up to 20mm) of reddish brown and orangish brown ironstone. Locally tending to very stiff clay. Incipient bedding fractures are subhorizontal to 10° extremely closely to very closely spaced planar smooth. Fractures are subhorizontal to 10° very closely to closely spaced planar smooth. (BDS)	35.10	233.80	
	38C	36.10 - 37.60	36.10		77 26 16			Extremely weak and very weak thinly bedded dark orangish brown and orangish brown fine SANDSTONE locally disintegrated to dark orangish brown and orangish brown sand. Bedding fractures are subhorizontal to 10° closely spaced planar rough. (BDS)	36.05	232.85	
	39C	37.60 - 39.10	37.60		43 31 7						
								Very stiff thinly and thickly laminated light grey locally orangish brown slightly sandy clayey SILT. (WHM) 38.25 - 39.10m: Assessed zone of core loss (assumed core scrubbed).	38.25	230.65	
								Continued Next Page	{39.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	40C	39.10 - 40.60	39.10		80	NA					
	41C	40.60 - 42.10	40.60		81			41.10 - 41.50m: Relict subvertical fracture stained orangish brown.	42.00	226.90	
	42C	42.10 - 43.60	42.10		90			Very stiff fissured thinly and thickly laminated brown silty CLAY. Fissures are 40° planar and undulating smooth. (WHM)			
	43C	43.60 - 45.10	43.60		100				43.85	225.05	
								Continued Next Page	{44.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT	CHECKED
				Groundwater not encountered prior to use of water flush.		34888	CT

BOREHOLE LOG



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
11/01/19 1610hrs 35.60m								Very stiff thickly laminated and very thinly bedded grey clayey SILT with very closely spaced thick laminae and very thin beds of dark grey clayey silt. (WHM)			
14/01/19 0830hrs 39.21m	44C	45.10 - 46.60	45.10		60			44.50 - 44.70m: Frequent subangular to rounded fine to coarse gravel sized clasts of light grey siltstone.	45.20	223.70	
	45C	46.60 - 48.10	46.60		100						
	46C	48.10 - 49.60	48.10		81						
Continued Next Page									{49.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



CLIENT OSBORNE

DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
	47C	49.60 - 51.10	49.60		97						
	48C	51.10 - 52.60	51.10		100			50.80m: Very thin bed of weak grey siltstone.			
	49C	52.60 - 54.10	52.60		100			52.80m: Very thin bed of weak grey siltstone.			
Continued Next Page									{54.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



CLIENT OSBORNE

DSRC419

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 13

Start Date 7 January 2019 Easting 393213.0

Scale 1 : 25

End Date 15 January 2019 Northing 215564.0 Ground level 268.90mOD

Depth 60.20 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	lf	instru -ment	description	depth (m)	reduced level (m)	legend
14/01/19 1450hrs 41.52m	50C	54.10 - 54.67	54.10		44				55.20	213.70	
	51C	54.67 - 55.20	54.67		80						
15/01/19 0830hrs 39.11m	52C	55.20 - 55.70	55.20		100			Fissured grey SILT with very closely spaced thin and thick laminae of light grey and dark grey silt. Fissures are 60° to subvertical locally subhorizontal planar rough stained orangish brown. (WHM)			
	53C	55.70 - 57.20	55.70		88						
	54C	57.20 - 58.70	57.20		100						
	55C	58.70 - 60.20	58.70		100						

Continued Next Page

{59.00}

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
Groundwater not encountered prior to use of water flush.



CONTRACT
34888

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CT

STANDARD PENETRATION TEST



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (m)	bottom depth (m)	casing depth (m)	water level (m)	seating drive		test drive				test type	N	energy ratio (%)
						blows	pen (mm)	blows		pen (mm)				
DSRC404	1.00		1.45	1.00	0.60	1 4	75 75	4 4 4 6	75 75 75 75	S	18	74		
DSRC406	1.20		1.65	Nil	Dry	4 4	75 75	3 3 4 5	75 75 75 75	S	15	74		
DSRC406	2.00		2.45	2.00	1.97	5 6	75 75	6 6 9 9	75 75 75 75	S	30	74		
DSRC406	3.00		3.38	3.00	2.29	6 11	75 75	13 16 19 2	75 75 75 0	S	67	74		
DSRC408	1.20		1.65	1.20	Dry	8 7	75 75	12 6 5 5	75 75 75 75	S	28	73		
DSRC408	2.20		2.55	2.20	1.18	10 10	75 75	18 23 9	75 75 50	S	75	73		
DSRC415	2.20		2.65	0.90	1.38	2 2	75 75	6 6 6 6	75 75 75 75	S	24	58		
DSRC415	3.20		3.65	2.20	2.79	5 6	75 75	9 9 13 19	75 75 75 70	S	51	58		
DSRC419	1.20		1.65	Nil	Dry	1 0	75 75	1 0 0 2	75 75 75 75	S	3	58		
DSRC419	2.20		2.64	Nil	Dry	2 2	75 75	12 31 5 2	75 75 75 65	S	52	58		
DSRC419	3.20		3.26	3.20	0.72	25	30	50	25	S	600	58		

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT

34888

CHECKED

CT

BOREHOLE LOG



OH405

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 30 January 2019

Easting 393388.0

Scale 1 : 50

End Date 4 February 2019

Northing 215997.0 Ground level 239.50mOD

Depth 40.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
30/01/19 1500hrs	1ES	0.00 - 0.10					Stiff red and reddish brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone, mudstone, siltstone and crystalline. (MADE GROUND)	0.15	239.35	
	2B	0.30 - 0.40					Firm brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone, limestone and brick. (MADE GROUND)	0.90	238.60	
	3B	0.30 - 0.40								
	2ES	0.50 - 0.60					Firm orange slightly gravelly CLAY with rare pockets (up to 10mm) of dark orange silt. Gravel is subangular to rounded fine and medium mudstone and limestone.	1.20	238.30	
	4B	0.50 - 0.60								
	3ES	1.00 - 1.20					NO RECOVERY. Rotary open hole drilled. Sandy brown CLAY (Driller's description).			
	5B	1.00 - 1.20								
	4ES	1.20 - 2.00		1.20		0				
	C	2.00 - 3.50		2.00		0	NO RECOVERY. Rotary open hole drilled. Grey/white LIMESTONE (Driller's description).	2.20	237.30	
	C	3.50 - 5.00		3.50		0				
C	5.00 - 6.50		5.00		0					
30/01/19 1610hrs Dry										
31/01/19 0830hrs Dry	C	6.50 - 8.00	6.50		0					

Continued Next Page

{8.00}

EQUIPMENT: Geotechnical Pioneer rig.
 METHOD: Hand dug inspection pit 0.00-1.20m. Waterflush rotary open hole drilled (146mm wireline) 1.20-40.00m.
 CASING: 168mm diam to 3.00m and 140mm diam to 40.00m.
 BACKFILL: On completion, borehole backfilled with cement:bentonite pellets 40.00-35.00m, gravel 35.00-28.00m, cement:bentonite pellets 28.00-18.00m, gravel 18.00-17.00m. A slotted standpipe (50mm) with geosock was installed to 17.00m, granular response zone 18.00-11.00m, bentonite seal 11.00-10.00m, cement:bentonite grout 10.00-0.50m, concrete and stopcock cover 0.50-0.00m. Installation completed on 05/02/2019.
 REMARKS: Driller notes loss of flush returns 1.20-40.00m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH405

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 30 January 2019

Easting 393388.0

Scale 1 : 50

End Date 4 February 2019

Northing 215997.0 Ground level 239.50mOD

Depth 40.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	C	8.00 - 9.50	8.00		0					
	C	9.50 - 11.00	9.50		0					
	C	11.00 - 12.50	11.00		0					
	C	12.50 - 14.00	12.50		0					
	C	14.00 - 15.50	14.00		0					
	C	15.50 - 17.00	15.50		0					
	C	17.00 - 18.50	17.00		0					
Continued Next Page								{18.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH405

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 30 January 2019

Easting 393388.0

Scale 1 : 50

End Date 4 February 2019

Northing 215997.0 Ground level 239.50mOD

Depth 40.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
	C	18.50 - 20.00	18.50		0					
	C	20.00 - 21.50	20.00		0					
	C	21.50 - 23.00	21.50		0					
	C	23.00 - 24.50	23.00		0					
	C	24.50 - 26.00	24.50		0					
	C	26.00 - 27.50	26.00		0					
	C	27.50 - 29.00	27.50		0					
Continued Next Page								{28.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



OH405

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 30 January 2019

Easting 393388.0

Scale 1 : 50

End Date 4 February 2019

Northing 215997.0 Ground level 239.50mOD

Depth 40.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
	C	29.00 - 30.50	29.00		0					
	C	30.50 - 32.00	30.50		0					
	C	32.00 - 33.50	32.00		0					
	C	33.50 - 34.50	33.50		0					
31/01/19 1640hrs Dry	C	34.50 - 36.00	34.50		0					
04/02/19 0815hrs Dry	C	36.00 - 37.50	36.00		0					
	C	37.50 - 39.00	37.50		0					

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{38.00}

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH405

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 5

Start Date 30 January 2019

Easting 393388.0

Scale 1 : 50

End Date 4 February 2019

Northing 215997.0 Ground level 239.50mOD

Depth 40.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
04/02/19 0940hrs Dry	C	39.00 - 40.00	39.00		0			40.00	199.50	
							Borehole completed at 40.00m.			

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT	CHECKED
				Groundwater not encountered prior to use of water flush.		34888	CT

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
06/02/19 0900hrs	1B	0.10 - 0.20					Grass over dark brown sandy SILT. Frequent rootlets. (MADE GROUND)	0.10	231.65	
	1ES	0.10 - 0.20					Brown and light brown slightly gravelly clayey fine and medium SAND with frequent pockets (up to 30mm) of brown silty clay. Gravel is subangular and subrounded fine and medium limestone and rare crystalline. (MADE GROUND)			
	2B	0.30 - 0.40								
	2ES	0.30 - 0.40								
	3B	0.50 - 0.60								
	3ES	0.50 - 0.60								
	4B	1.00 - 1.20								
	4ES	1.00 - 1.20								
	C	1.20 - 2.00	1.20			0	Yellowish brown clayey gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse limestone.	1.20	230.55	
	C	2.00 - 3.50	2.00			0	NO RECOVERY. Rotary open hole drilled. Grey LIMESTONE (Driller's description).			
C	3.50 - 5.00	3.50			0					
C	5.00 - 6.50	5.00			0					
C	6.50 - 8.00	6.50			0					

Continued Next Page

{8.00}

EQUIPMENT: Geotechnical Pioneer rig.
 METHOD: Hand dug inspection pit 0.00-1.20m. Waterflush rotary open hole drilled (146mm wireline) 1.20-21.50m. Wireline system withdrawn to unblock bit. Waterflush rotary open hole drilled (146mm conventional) 21.50-55.00m.
 CASING: 168mm diam to 3.00m and 140mm diam to 21.50m (withdrawn and then reamed to 19.50m).
 BACKFILL: On completion, downhole geophysical survey carried out 0.50-50.00m. Borehole backfilled with gravel 55.50-25.50m, cement:bentonite pellets 25.50-15.50m, gravel 15.50-15.00m. A slotted standpipe (50mm) with geosock was installed to 15.00m, granular response zone 15.50-6.00m, bentonite seal 6.00-5.00m, cement:bentonite grout 5.00-0.50m, concrete and stopcock cover 0.50-0.00m. Installation completed on 13/02/2019.
 REMARKS: Driller notes reduced flush returns 1.20-45.00m (approx 50% returned) and loss of flush returns 45.00-55.00m.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	C	8.00 - 9.50	8.00		0					
	C	9.50 - 11.00	9.50		0					
	C	11.00 - 12.50	11.00		0					
	C	12.50 - 14.00	12.50		0					
	C	14.00 - 15.50	14.00		0					
	C	15.50 - 17.00	15.50		0		NO RECOVERY. Rotary open hole drilled. Grey LIMESTONE with clay bands (Driller's description).	15.50	216.25	
	C	17.00 - 18.50	17.00		0					
Continued Next Page								{18.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
	C	18.50 - 20.00	18.50		0		NO RECOVERY. Rotary open hole drilled. Grey CLAY (Driller's description).	18.50	213.25	
	C	20.00 - 21.50	20.00		0					
	C	21.50 - 23.00	21.50		0					
	C	23.00 - 24.50	23.00		0					
	C	24.50 - 26.00	24.50		0					
	C	26.00 - 27.50	26.00		0					
	C	27.50 - 29.00	27.50		0					
								{28.00}		

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water strike (m) casing (m) rose to (m) time to rise (m) remarks
 Groundwater not encountered prior to use of water flush.



CONTRACT
34888

CHECKED
CT

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
	C	29.00 - 30.50	29.00		0					
	C	30.50 - 32.00	30.50		0					
	C	32.00 - 33.50	32.00		0					
	C	33.50 - 35.00	33.50		0					
	C	35.00 - 36.50	35.00		0					
	C	36.50 - 38.00	36.50		0					
Continued Next Page								{38.00}		

Geotechnical Engineering Ltd, Tel. 01452 527743 34888.GPJ TRIAL.JH.GPJ GEOTECH2.GLB 02/07/2019 16:04:57 CT

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	C	38.00 - 39.50	38.00		0					
	C	39.50 - 41.00	39.50		0					
	C	41.00 - 42.50	41.00		0					
	C	42.50 - 44.00	42.50		0					
	C	44.00 - 45.50	44.00		0					
06/02/19 1550hrs Dry	C	45.50 - 47.00	45.50		0					
07/02/19 0805hrs Dry	C	47.00 - 48.50	47.00		0					

Continued Next Page

{48.00}

Geotechnical Engineering Ltd. Tel. 01452 527743 34888.GPJ TRIAL.JH.GPJ GEOTECH2.GLB 02/07/2019 16:04:57 CT

water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT	CHECKED
				Groundwater not encountered prior to use of water flush.		34888	CT

BOREHOLE LOG



OH407

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 6

Start Date 5 February 2019 Easting 393596.0

Scale 1 : 50

End Date 11 February 2019 Northing 216246.0 Ground level 231.75mOD Depth 55.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru -ment	description	depth (m)	reduced level (m)	legend
	C	48.50 - 50.00	48.50		0					
	C	50.00 - 51.50	50.00		0					
	C	51.50 - 53.00	51.50		0					
	C	53.00 - 54.50	53.00		0					
	C	54.50 - 55.50	54.50		0					
07/02/19 1530hrs 24.65m								55.50	176.25	
							Borehole completed at 55.50m.			
								{58.00}		

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water strike (m)	casing (m)	rose to (m)	time to rise (m)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

BOREHOLE LOG



OH416

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 31 January 2019

Easting 393538.0

Scale 1 : 50

End Date 31 January 2019

Northing 213990.0 Ground level 286.85mOD

Depth 5.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	instru-ment	description	depth (m)	reduced level (m)	legend
15/01/19 1230hrs	1B	0.15 - 0.25	0.90				MADE GROUND compromising TARMACADAM.	0.15	286.70	
	1ES	0.15 - 0.25					0.25	286.60		
15/01/19 1400hrs Dry	2B	0.55 - 0.75	0.90				Yellowish brown sandy GRAVEL. Gravel is subrounded and rounded fine to coarse limestone. (MADE GROUND)	0.55	286.30	
	3B	0.75 - 0.90					0.75	286.10		
	3ES	0.75 - 0.90					0.90	285.95		
31/01/19 1025hrs Dry	C	0.90 - 2.40	0.90				Light brownish grey very gravelly SAND with frequent lumps of firm clay. Gravel is subangular and subrounded fine to coarse limestone. (MADE GROUND)	1.50	285.35	
							NO RECOVERY. Rotary open hole drilled. Grey LIMESTONE (Driller's description).			
	C	2.40 - 3.90	0.90		0		NO RECOVERY. Rotary open hole drilled. Brownish yellow silty gravelly CLAY (Driller's description).	3.25	283.60	
							NO RECOVERY. Rotary open hole drilled. Grey CLAY (Driller's description).			
	C	3.90 - 5.00	0.90		0			5.00	281.85	
31/01/19 2100hrs Dry							Borehole completed at 5.00m.			

EQUIPMENT: Geotechnical Pioneer rig.
 METHOD: Hand dug inspection pit 0.00-0.90m. Waterflush rotary open hole drilled (146mm) 0.90-5.00m.
 CASING: 168mm diam to 0.90m.
 BACKFILL: On completion, borehole backfilled with gravel 5.00-4.50m. A slotted standpipe (50mm) with geosock was installed to 4.50m, granular response zone 5.00-2.50m, bentonite seal 2.50-2.00m, cement:bentonite grout 2.00-0.50m, concrete and stopcock cover 0.50- 0.00m.
 REMARKS: Flush returns maintained throughout borehole.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks		CONTRACT 34888	CHECKED CT
				Groundwater not encountered prior to use of water flush.			

Geotechnical Engineering Ltd. Tel. 01452 527743 34888 GPJ TRIALJH.GPJ GEOTECH2.GLB 02/07/2019 16:04:59 CT

Geotechnical Engineering Limited
GROUNDWATER LEVELS



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	installation depth (m)	response zone (m)	date	time	water level (m - bgl)	reduced water level (m)	remarks
DSRC404	33.50	23.00 - 34.00	31/01/2019	15:45	Dry.		Water level below 235.50mOD.
DSRC404	33.50	23.00 - 34.00	04/02/2019	14:00	Dry.		
DSRC404	33.50	23.00 - 34.00	05/02/2019	09:15	Dry.		
DSRC404	33.50	23.00 - 34.00	06/02/2019	09:21	Dry.		
DSRC404	33.50	23.00 - 34.00	07/02/2019	08:08	Dry.		
DSRC404	33.50	23.00 - 34.00	08/02/2019	14:10	Dry.		
DSRC404	33.50	23.00 - 34.00	11/02/2019	10:05	Dry.		
DSRC404	33.50	23.00 - 34.00	12/02/2019	08:47	Dry.		
DSRC404	33.50	23.00 - 34.00	14/02/2019	10:20	Dry.		
DSRC404	33.50	23.00 - 34.00	28/02/2019	14:20	Dry.		
DSRC404	33.50	23.00 - 34.00	19/03/2019	12:00	Dry.		
DSRC404	33.50	23.00 - 34.00	21/03/2019	09:15	Dry.		
DSRC404	33.50	23.00 - 34.00	02/05/2019	11:11	Dry.		
DSRC404	33.50	23.00 - 34.00	30/05/2019	12:30	Dry.		
DSRC406	34.00	20.50 - 35.00	04/02/2019	15:00	31.94	206.71	Diver installed at 33.00m. Serial number BP319.
DSRC406	34.00	20.50 - 35.00	05/02/2019	10:02	31.95	206.70	
DSRC406	34.00	20.50 - 35.00	06/02/2019	10:02	31.94	206.71	
DSRC406	34.00	20.50 - 35.00	07/02/2019	08:38	31.94	206.71	

general remarks:

CONTRACT 34888	CHECKED CT
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Geotechnical Engineering Limited
GROUNDWATER LEVELS



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	installation depth (m)	response zone (m)	date	time	water level (m - bgl)	reduced water level (m)	remarks
DSRC406	34.00	20.50 - 35.00	08/02/2019	14:34	31.95	206.70	
DSRC406	34.00	20.50 - 35.00	11/02/2019	09:08	31.96	206.69	
DSRC406	34.00	20.50 - 35.00	12/02/2019	09:17	31.96	206.69	
DSRC406	34.00	20.50 - 35.00	14/02/2019	08:25	31.98	206.67	
DSRC406	34.00	20.50 - 35.00	28/02/2019	13:30	31.96	206.69	
DSRC406	34.00	20.50 - 35.00	02/05/2019	13:00	31.92	206.73	
DSRC406	34.00	20.50 - 35.00	30/05/2019	13:00	31.90	206.75	
DSRC408	23.50	20.00 - 24.00	14/02/2019	16:35	Dry.		Water level below 209.00mOD.
DSRC408	23.50	20.00 - 24.00	28/02/2019	13:50	Dry.		
DSRC408	23.50	20.00 - 24.00	19/03/2019	12:30	22.12	210.38	Diver installed at 23.00m. Serial number AN815
DSRC408	23.50	20.00 - 24.00	21/03/2019	10:00	22.10	210.40	
DSRC408	23.50	20.00 - 24.00	02/05/2019	13:44	22.80	209.70	
DSRC408	23.50	20.00 - 24.00	31/05/2019	10:30	22.10	210.40	
DSRC415	49.00	25.50 - 50.00	05/02/2019	09:30	Dry.		Water level below 238.20mOD.
DSRC415	49.00	25.50 - 50.00	06/02/2019	09:50	Dry.		
DSRC415	49.00	25.50 - 50.00	07/02/2019	08:58	Dry.		
DSRC415	49.00	25.50 - 50.00	08/02/2019	14:20	Dry.		
DSRC415	49.00	25.50 - 50.00	11/02/2019	09:43	Dry.		

general remarks:

CONTRACT 34888	CHECKED CT
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Geotechnical Engineering Limited
GROUNDWATER LEVELS



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	installation depth (m)	response zone (m)	date	time	water level (m - bgl)	reduced water level (m)	remarks
DSRC415	49.00	25.50 - 50.00	12/02/2019	09:01	Dry.		
DSRC415	49.00	25.50 - 50.00	28/02/2019	14:05	Dry.		
DSRC415	49.00	25.50 - 50.00	19/03/2019	13:35	Dry.		Diver installed at 48.50m. Serial number AN817.
DSRC415	49.00	25.50 - 50.00	21/03/2019	09:30	Dry.		
DSRC415	49.00	25.50 - 50.00	02/05/2019	12:07	Dry.		
DSRC415	49.00	25.50 - 50.00	30/05/2019	15:00	Dry.		
DSRC419	41.50	36.00 - 42.00	31/01/2019	15:40	39.09	229.81	
DSRC419	41.50	36.00 - 42.00	04/02/2019	14:10	39.24	229.66	
DSRC419	41.50	36.00 - 42.00	05/02/2019	09:08	39.17	229.73	
DSRC419	41.50	36.00 - 42.00	06/02/2019	09:26	39.12	229.78	
DSRC419	41.50	36.00 - 42.00	07/02/2019	08:10	38.95	229.95	
DSRC419	41.50	36.00 - 42.00	08/02/2019	14:12	38.70	230.20	
DSRC419	41.50	36.00 - 42.00	11/02/2019	10:09	38.12	230.78	
DSRC419	41.50	36.00 - 42.00	12/02/2019	08:52	38.07	230.83	
DSRC419	41.50	36.00 - 42.00	14/02/2019	09:44	38.00	230.90	
DSRC419	41.50	36.00 - 42.00	28/02/2019	14:30	38.69	230.21	
DSRC419	41.50	36.00 - 42.00	19/03/2019	12:05	37.37	231.53	Diver installed at 40.00m. Serial number AN824.
DSRC419	41.50	36.00 - 42.00	21/03/2019	09:00	37.38	231.52	

general remarks:

CONTRACT 34888	CHECKED CT
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Geotechnical Engineering Limited
GROUNDWATER LEVELS



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	installation depth (m)	response zone (m)	date	time	water level (m - bgl)	reduced water level (m)	remarks
DSRC419	41.50	36.00 - 42.00	02/05/2019	11:52	38.50	230.40	
DSRC419	41.50	36.00 - 42.00	30/05/2019	08:45	39.32	229.58	
OH405	17.00	11.00 - 18.00	06/02/2019	10:05	Dry.		Water level below 222.50mOD.
OH405	17.00	11.00 - 18.00	07/02/2019	08:42	Dry.		
OH405	17.00	11.00 - 18.00	08/02/2019	14:38	Dry.		
OH405	17.00	11.00 - 18.00	11/02/2019	09:13	Dry.		
OH405	17.00	11.00 - 18.00	12/02/2019	09:20	Dry.		
OH405	17.00	11.00 - 18.00	28/02/2019	13:35	Dry.		
OH405	17.00	11.00 - 18.00	19/03/2019	12:56	Dry.		
OH405	17.00	11.00 - 18.00	21/03/2019	09:45	Dry.		
OH405	17.00	11.00 - 18.00	02/05/2019	12:56	Dry.		
OH405	17.00	11.00 - 18.00	30/05/2019	13:20	Dry.		
OH407	15.00	6.00 - 15.50	14/02/2019	16:30	Dry.		Water level below 216.75mOD.
OH407	15.00	6.00 - 15.50	28/02/2019	13:45	Dry.		
OH407	15.00	6.00 - 15.50	19/03/2019	12:20	Dry.		Diver installed at 14.50m. Serial number BP219.
OH407	15.00	6.00 - 15.50	21/03/2019	10:00	Dry.		
OH407	15.00	6.00 - 15.50	02/05/2019	13:40	Dry.		
OH407	15.00	6.00 - 15.50	31/05/2019	10:00	Dry.		

general remarks:

CONTRACT 34888	CHECKED CT
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Geotechnical Engineering Limited
GROUNDWATER LEVELS



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	installation depth (m)	response zone (m)	date	time	water level (m - bgl)	reduced water level (m)	remarks
OH416	4.50	2.50 - 5.00	04/02/2019	14:25	2.44	284.41	
OH416	4.50	2.50 - 5.00	05/02/2019	09:35	2.24	284.61	
OH416	4.50	2.50 - 5.00	06/02/2019	09:54	2.24	284.61	
OH416	4.50	2.50 - 5.00	07/02/2019	09:02	2.23	284.62	
OH416	4.50	2.50 - 5.00	08/02/2019	14:22	2.20	284.65	
OH416	4.50	2.50 - 5.00	11/02/2019	09:38	2.04	284.81	
OH416	4.50	2.50 - 5.00	12/02/2019	09:05	2.04	284.81	
OH416	4.50	2.50 - 5.00	14/02/2019	09:12	2.07	284.78	
OH416	4.50	2.50 - 5.00	28/02/2019	14:00	2.39	284.46	
OH416	4.50	2.50 - 5.00	19/03/2019	13:40	2.18	284.67	Diver installed at 4.00m. Serial number BP305.
OH416	4.50	2.50 - 5.00	21/03/2019	09:30	2.20	284.65	
OH416	4.50	2.50 - 5.00	02/05/2019	12:15	2.66	284.19	
OH416	4.50	2.50 - 5.00	30/05/2019	14:00	2.77	284.08	

general remarks:

CONTRACT 34888	CHECKED CT
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GROUNDWATER TESTING DATA



CLIENT: OSBORNE

SITE: HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	date and time	sample depth (m)	water temperature (°C)	dissolved oxygen concentration (mg/l)	pH	resistivity (ohmcm)	conductivity (uS/cm)	total dissolved solids (ppm)	salinity (PSU)	redox (mV)	remarks	
DSRC406	14/02/19 08:38:00	31.98	3.76	12.26	8.70	43189.8	23.15367	25.32697	0.0	175.7	Slightly cloudy, light brown. No visual or olfactory contamination.	
DSRC406	14/02/19 08:39:00	31.98	4.26	5.69	7.99	4208.0	357.4659	384.588	0.3	246.6		
DSRC406	14/02/19 08:40:00	31.98	5.57	0.67	7.95	2642.2	378.4795	391.1866	0.3	252.0		
DSRC406	14/02/19 08:41:00	31.98	6.45	0.43	7.90	2598.7	384.8085	387.4156	0.3	259.4		
DSRC406	14/02/19 08:42:00	31.98	7.08	0.39	7.87	2571.3	388.9116	384.3262	0.3	263.1		
DSRC406	14/02/19 08:43:00	31.98	8.17	0.22	7.78	2491.4	401.3852	384.5051	0.3	264.7		
DSRC406	14/02/19 08:44:00	31.98	9.32	0.13	7.80	2466.0	405.5086	376.22	0.3	252.4		
DSRC406	14/02/19 08:45:00	31.98	10.21	0.13	7.79	2358.2	424.0535	384.1254	0.3	239.2		
DSRC406	14/02/19 08:46:00	31.98	12.02	0.13	7.73	2256.9	443.085	382.9671	0.3	227.3		
DSRC406	14/02/19 08:47:00	31.98	12.46	0.15	7.72	2285.8	437.4769	373.902	0.3	216.7		
DSRC406	14/02/19 08:48:00	31.98	12.20	0.20	7.72	2325.7	429.9734	369.8907	0.3	205.1		
DSRC419	14/02/19 09:48:00	38.00	6.35	11.45	7.99	42551.2	23.54411	23.77346	0.0	284.9		Translucent, clear. No visual or olfactory contamination.
DSRC419	14/02/19 09:49:00	38.00	6.87	1.15	7.85	2611.1	382.9784	380.8437	0.3	313.4		
DSRC419	14/02/19 09:50:00	38.00	7.65	0.65	7.83	2531.5	395.0268	384.0286	0.3	314.1		
DSRC419	14/02/19 09:51:00	38.00	8.27	0.48	7.83	2492.9	401.1436	383.1387	0.3	312.6		
DSRC419	14/02/19 09:52:00	38.00	8.66	0.39	7.83	2476.8	403.7505	381.4786	0.3	311.7		
DSRC419	14/02/19 09:53:00	38.00	8.96	0.36	7.82	2457.0	406.993	381.4285	0.3	310.4		
DSRC419	14/02/19 09:54:00	38.00	9.45	0.32	7.82	2421.8	412.9087	381.7338	0.3	308.3		

remarks
denotes result exceeding capacity of testing equipment

CONTRACT
34888

CHECKED
CT

GROUNDWATER TESTING DATA



CLIENT: OSBORNE

SITE: HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	date and time	sample depth (m)	water temperature (°C)	dissolved oxygen concentration (mg/l)	pH	resistivity (ohmcm)	conductivity (uS/cm)	total dissolved solids (ppm)	salinity (PSU)	redox (mV)	remarks
DSRC419	14/02/19 09:55:00	38.00	10.13	0.30	7.82	2377.9	420.5458	381.8338	0.3	306.6	
DSRC419	14/02/19 09:56:00	38.00	10.92	0.28	7.82	2328.8	429.4132	381.8425	0.3	305.4	
DSRC419	14/02/19 09:57:00	38.00	11.50	0.26	7.82	2302.6	434.289	380.3208	0.3	305.9	
DSRC419	14/02/19 09:58:00	38.00	11.80	0.25	7.81	2287.0	437.248	380.0408	0.3	306.7	
OH416	14/02/19 09:25:00	N/A	6.32	11.47	8.60	42916.0	23.30137	23.54828	0.0	265.9	
OH416	14/02/19 09:26:00	N/A	7.44	0.87	7.44	1919.9	520.8611	509.3914	0.4	292.8	Unable to obtain water sample. Purged dry after 1 minute. No recharge after 30 minutes.

remarks
denotes result exceeding capacity of testing equipment

CONTRACT
34888

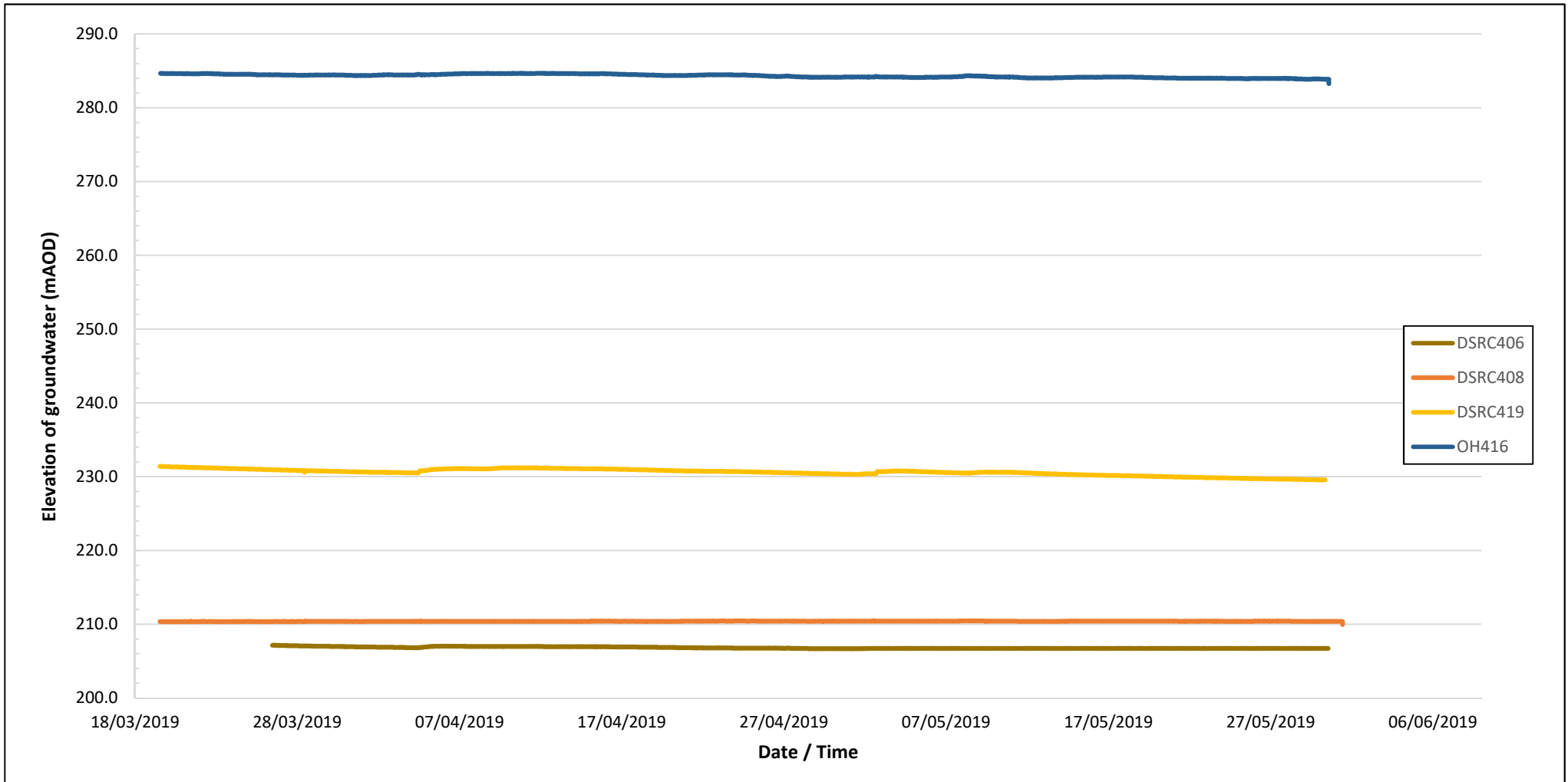
CHECKED
CT

DIVER DATA - COMBINED



CLIENT OSBORNE

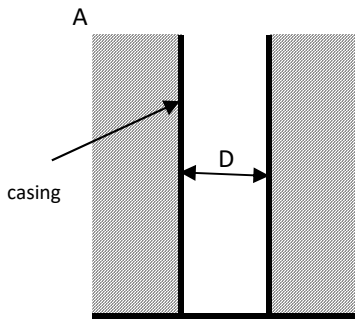
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



REMARKS

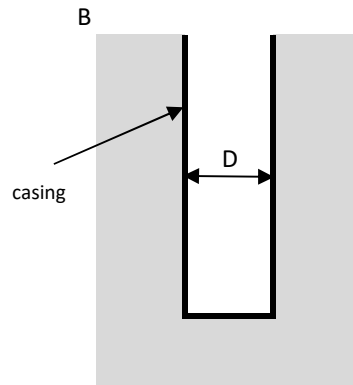
CONTRACT	CHECKED
34888	

PERMEABILITY TEST - INTAKE FACTORS



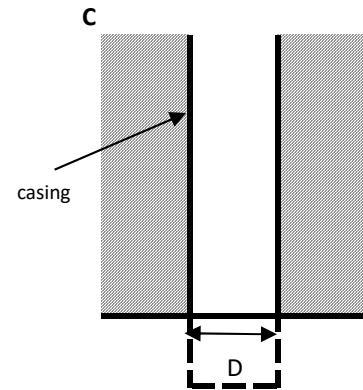
$$F=2D$$

Soil flush with bottom
at impervious
boundary



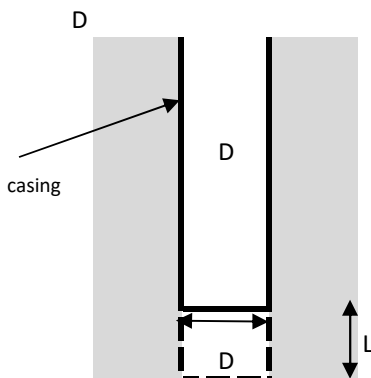
$$F=2.75D$$

Soil flush with bottom
in uniform soil



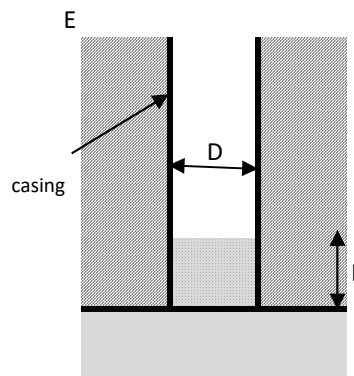
$$F = \frac{2\pi L}{\ln \left[\frac{2L}{D} + \sqrt{1 + \left(\frac{2L}{D} \right)^2} \right]}$$

Well point or hole
extended at impervious
boundary



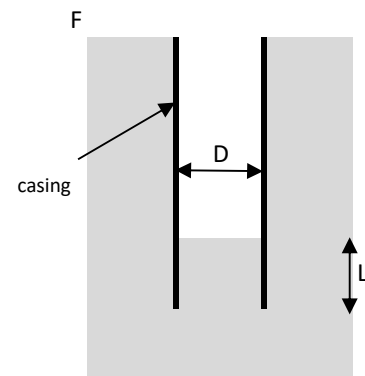
$$F = \frac{2\pi L}{\ln \left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D} \right)^2} \right]}$$

Well point or hole
extended in uniform
soil



$$F = \frac{2D}{1 + \left(\frac{8}{\pi} \right) \left(\frac{L}{D} \right)}$$

Soil in casing with
bottom at impervious
boundary



$$F = \frac{2.75D}{1 + \left(\frac{11}{\pi} \right) \left(\frac{L}{D} \right)}$$

Soil in casing with
bottom in uniform soil

REMARKS

Expressions come from Hvorslev.

BS EN ISO 22282-2:2012 recommends the use of intake factors given above for the Hvorslev method variable head test.

BS EN ISO 22282-2:2012 reports equation D as suitable for the Velocity method variable head test where $1.2 < L/D < 10$.

BS EN ISO 22282-2:2012 refers to a simpler version of Equation D for $L/D > 10$, however Equation D will still apply for $L/D > 10$.

Equation D may be used for tests using piezometer tips.

Cases A and B tend to measure the mean permeability of the soil; C and D the horizontal permeability; E and F the vertical permeability.

Where the horizontal permeability is much greater than the vertical, all tests tend to measure the former.

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



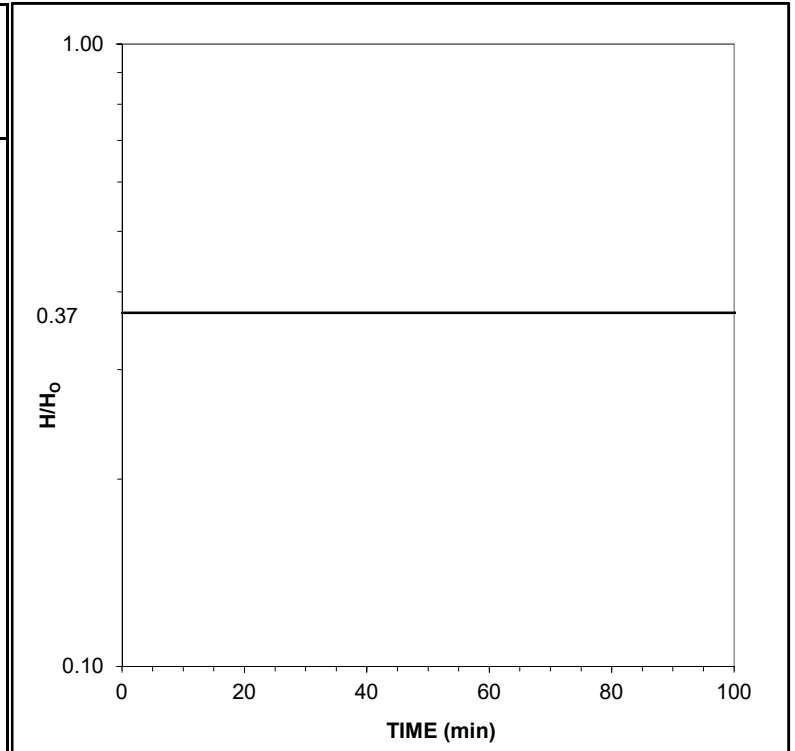
BOREHOLE **DSRC404**

DEPTH RECORD

BASE OF FILTER	34.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	23.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	11.00 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	Dry m	DATE	30/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	28.45		
0.50	28.65		
1.00	28.72		
1.50	28.77		
2.00	28.80		
2.50	28.81		
3.00	28.85		
3.50	28.90		
4.00	28.96		
4.50	29.02		
5.00	29.08		
5.50	29.13		
7.00	29.30		
10.00	29.65		
15.50	30.57		
19.00	30.82		
22.50	30.92		
26.50	31.02		
30.00	31.10		
35.00	31.15		
41.50	31.18		
47.00	31.19		
53.00	31.21		
60.00	31.23		
125.00	31.33		
195.00	31.40		



Hvorslev method
$$k = \frac{A}{FT}$$

Velocity graph method
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	13.781 m	Intake factor*, F	13.781 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



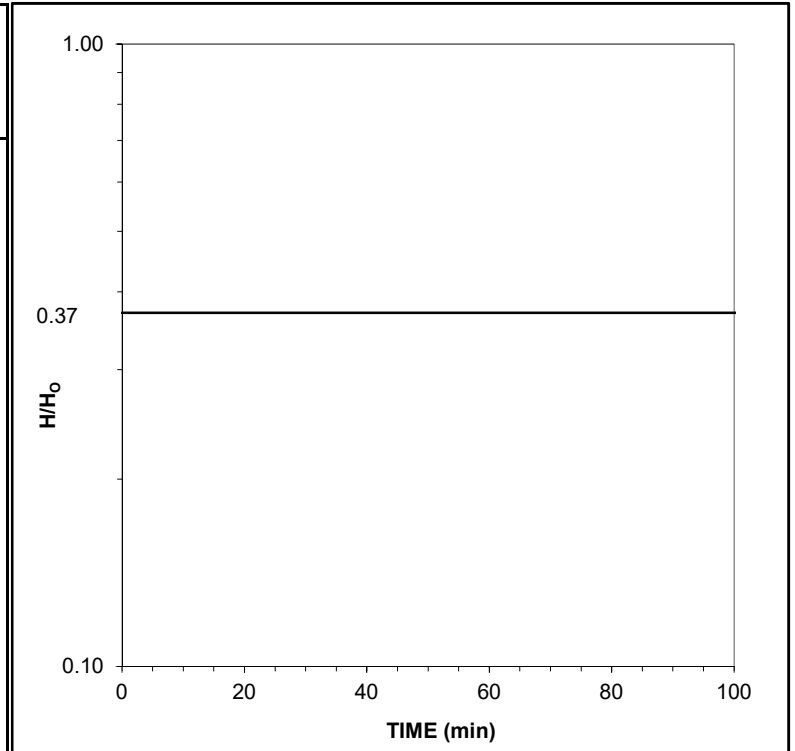
BOREHOLE **DSRC406**

DEPTH RECORD

BASE OF FILTER	35.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	20.50 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	14.50 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	31.90 m	DATE	30/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	33.90		
0.25	33.50		
0.50	33.08		
1.00	33.05		
1.50	32.97		
2.00	32.92		
2.50	32.87		
3.25	32.79		
4.00	32.72		
5.00	32.64		
6.25	32.54		
7.50	32.46		
9.00	32.36		
11.00	32.25		
12.50	32.18		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	17.218 m	Intake factor*, F	17.218 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



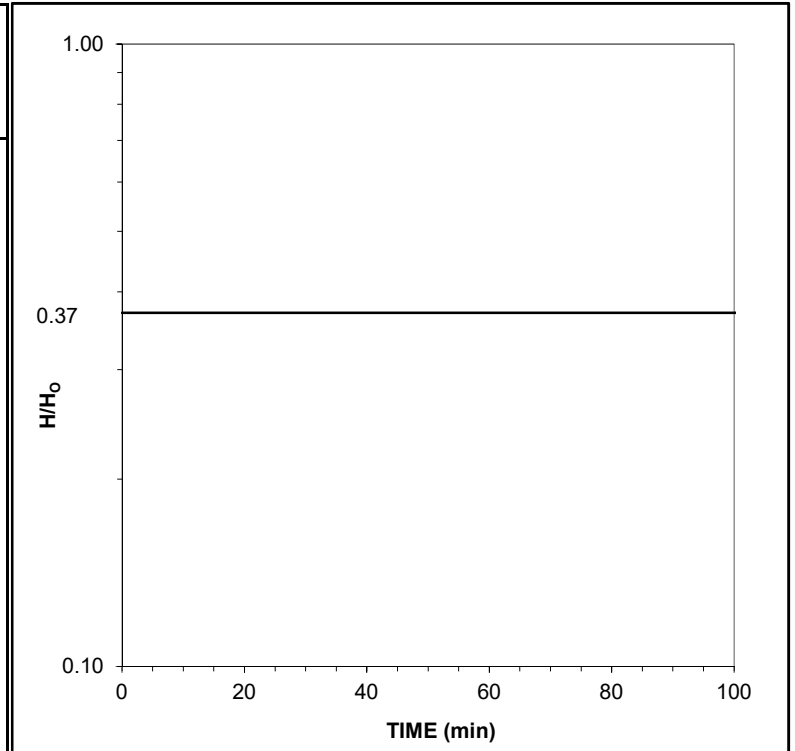
BOREHOLE **DSRC408**

DEPTH RECORD

BASE OF FILTER	24.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	20.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	4.00 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	22.10 m	DATE	31/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	18.01		
1.50	18.70		
2.00	18.93		
2.50	19.11		
3.00	19.27		
3.50	19.37		
4.00	19.49		
4.50	19.56		
5.00	19.63		
6.00	19.77		
7.00	19.89		
8.00	19.93		
10.00	20.06		
12.00	20.18		
14.00	20.30		
16.00	20.41		
18.00	20.51		
20.00	20.57		
22.00	20.60		
24.00	20.65		
26.00	20.71		
120.00	21.46		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	6.277 m	Intake factor*, F	6.277 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms⁻¹	Permeability, k	-- ms⁻¹

REMARKS

Water added at 0.1bar pressure for 10 minutes. Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



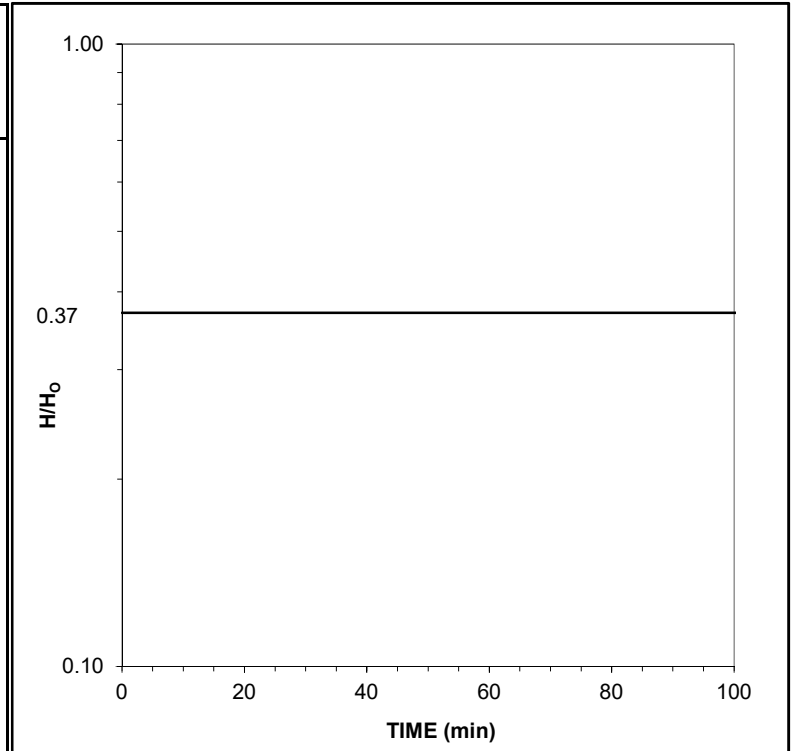
BOREHOLE DSRC419

DEPTH RECORD

BASE OF FILTER	42.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	36.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	6.00 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	39.32 m	DATE	30/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	40.00		
0.50	39.90		
0.75	39.86		
1.00	39.82		
1.25	39.79		
1.50	39.78		
2.00	39.76		
2.50	39.75		
3.00	39.73		
5.00	39.69		
7.00	39.65		
10.00	39.62		
15.00	39.56		
20.00	39.53		
25.00	39.51		
30.00	39.50		
35.00	39.48		
40.00	39.46		
45.00	39.44		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	8.550 m	Intake factor*, F	8.550 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



BOREHOLE

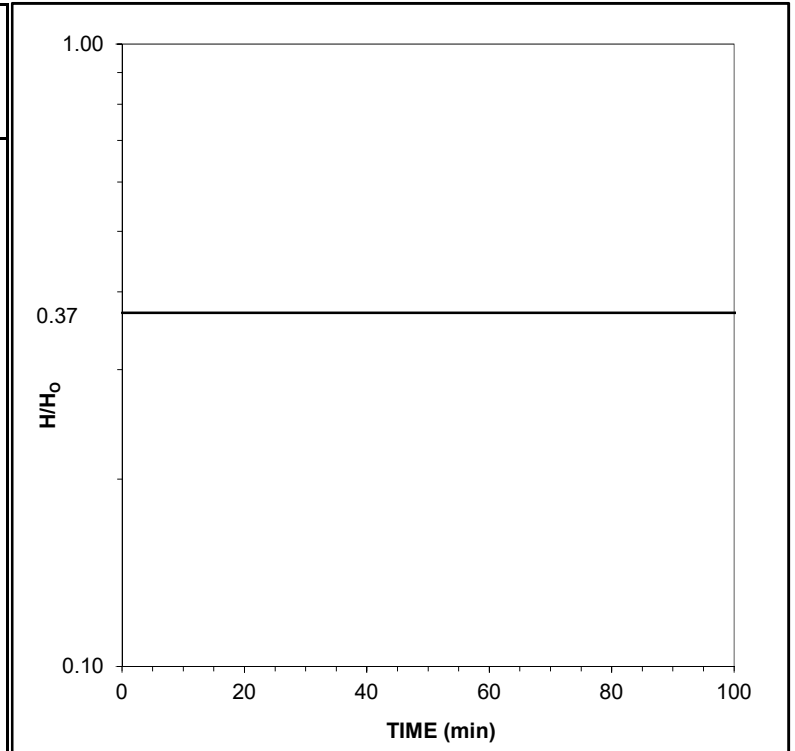
OH405

DEPTH RECORD

BASE OF FILTER	18.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	11.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	7.00 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	Dry m	DATE	30/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	16.00		
0.50	16.35		
1.00	16.45		
1.12	16.85		
1.30	17.00		
1.50	Dry		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	9.638 m	Intake factor*, F	9.638 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



BOREHOLE

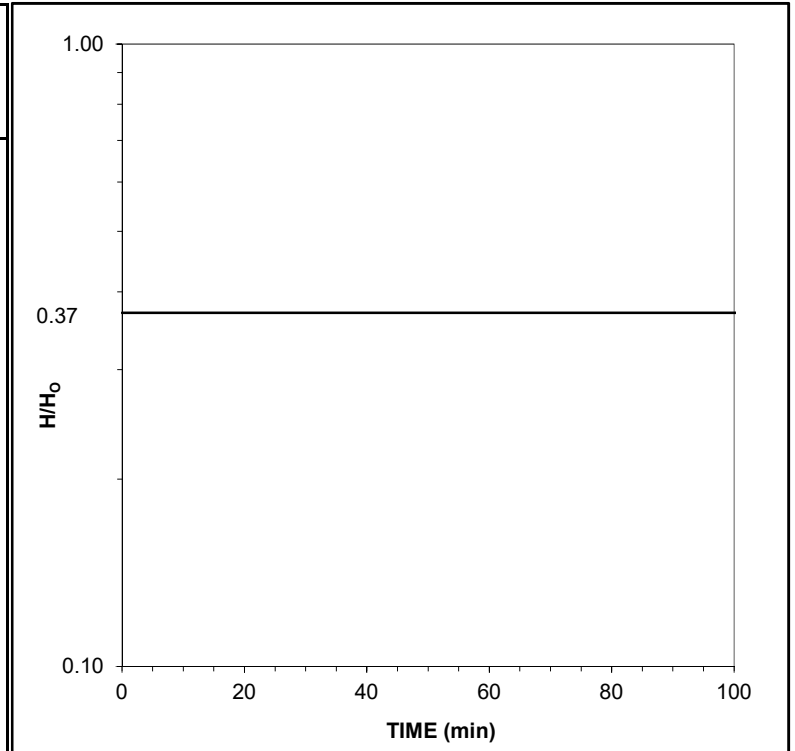
OH407

DEPTH RECORD

BASE OF FILTER	15.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	6.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	9.50 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	Dry m	DATE	31/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	9.20		
0.50	9.30		
1.00	9.86		
1.50	10.27		
2.00	10.52		
2.50	10.70		
3.00	10.82		
3.50	10.99		
4.00	11.12		
4.50	11.24		
5.00	11.35		
6.00	11.53		
7.00	11.67		
8.00	11.80		
9.00	11.92		
10.00	12.02		
11.00	12.11		
12.00	12.15		
13.00	12.19		
15.00	12.29		
17.00	12.38		
19.00	12.43		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	12.260 m	Intake factor*, F	12.260 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT OSBORNE

BOREHOLE OH416

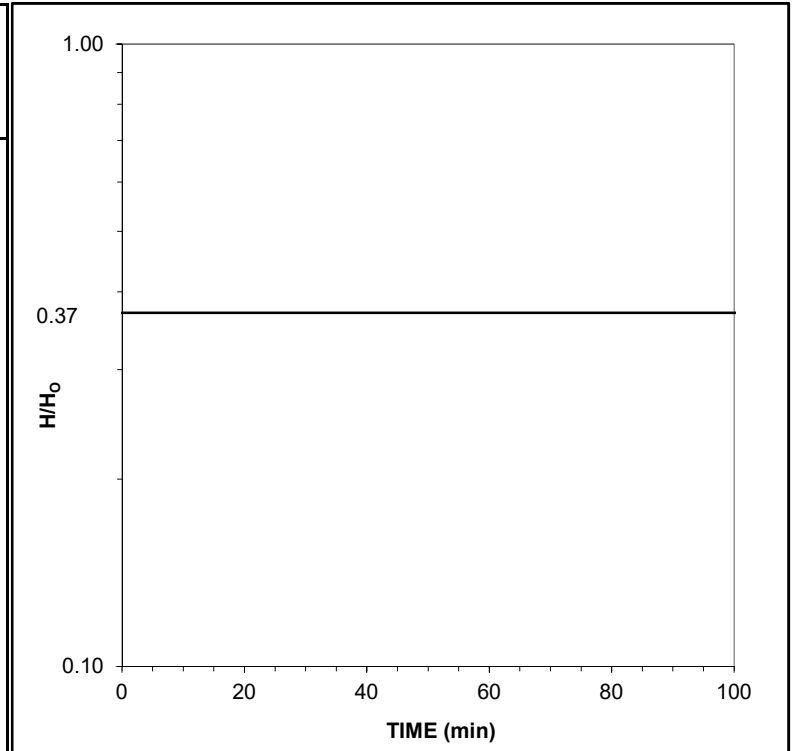
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	5.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.50 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	2.50 m	FILTER MEDIUM	GRANULAR
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	2.77 m	DATE	31/05/2019

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H ₀
0.00	3.91		
1.50	3.90		
2.00	3.87		
2.50	3.86		
3.00	3.85		
3.50	3.85		
4.00	3.85		
5.00	3.84		
6.00	3.83		
7.00	3.83		
8.00	3.82		
9.00	3.81		
10.00	3.80		
11.00	3.80		
13.00	3.79		
15.00	3.77		
20.00	3.73		
25.00	3.71		
29.00	3.69		
39.00	3.61		
50.00	3.46		
70.00	3.27		
80.00	3.20		
90.00	3.16		
94.50	3.14		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* D

RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m ²	Cross sectional area of access tube, A	0.0020 m ²
Intake factor*, F	4.444 m	Intake factor*, F	4.444 m
Time lag, T	s	Variable head, H ₁	m at time, t ₁ s
		Variable head, H ₂	m at time, t ₂ s
Permeability, k	-- ms ⁻¹	Permeability, k	-- ms ⁻¹

REMARKS

Test zone not fully saturated - unable to calculate permeability.

Test Operator: EL/JW

CONTRACT	CHECKED
34888	CT

* See intake factors key sheet



APPENDIX B

LABORATORY TESTING



2718



GEOTECHNICAL ENGINEERING LIMITED

For the attention of Dave Owen/Emma Leivers

Version No. 2

Page No. 1 of 58

Date of Issue 01/07/2019

TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	Samples received	03/04/2019
GEL REPORT NUMBER	34888	Schedule received	03/04/2019
Your ref/PO:		Testing commenced	12/04/2019
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	9	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	9	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	4	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	4	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear (Subcontracted)	2	YES
ISRM: Suggested Methods: 2007, Rock Water Content	7	NO
ISRM: Suggested Methods: 1974 - 2006: Porosity/Density Determination (Subcontracted)	2	YES
ISRM: Suggested Methods: 1974 - 2006: Indirect Tensile Strength by the Brazil Test (Subcontracted)	1	YES
ISRM: Suggested Methods: 1974 - 2006: Determination of the Slake Durability Index (Subcontracted)	1	NO
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	11	YES
ISRM: Suggested Methods: 1974 - 2006: UCS with Young's Modulus (Subcontracted)	1	YES
ISRM: 2007: Point Load Strength Test	72	YES
ISRM: 2007: Suggested Methods: Determination of Shear Strength by Direct Shear on Rock (Subcontracted)	1	NO
ISRM: Suggested Methods: 1981: Petrographic Examination of Rock (Subcontracted)	3	NO

Remarks This report may not be partially reproduced without written permission from this laboratory.	Approved Signatories: W Jones (Laboratory Manager) E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 20 Revision date 09/10/17 DC:JH

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LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

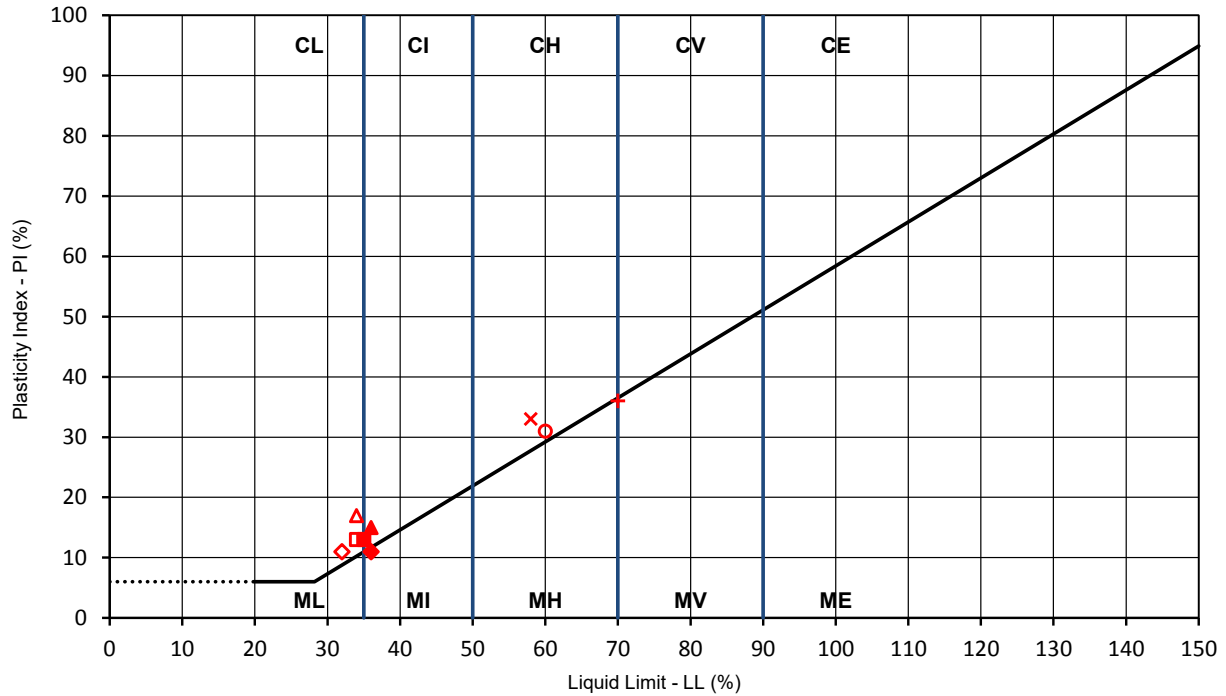
borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks	
	no./type	depth (m)									
DSRC406	57D	41.40	41.40	13.1	BXE	0	34	21	13	Grey slightly sandy silty CLAY	
DSRC406	73D	53.20	53.20	13.2	BXE	0	32	21	11	Grey slightly sandy silty CLAY	
DSRC406	84D	59.10	59.10	12.9	BXE	17	34	17	17	Grey slightly sandy slightly gravelly CLAY	
DSRC415	8D	3.20	3.20	18.4	BXE	1	58	25	33	Grey slightly sandy CLAY	
DSRC415	11D	5.50	5.50	31.2	BXE	13	70	34	36	Brown slightly sandy slightly gravelly clayey SILT	
DSRC415	19D	15.75	15.75	20.4	BXE	16	60	29	31	Grey slightly sandy slightly gravelly silty CLAY	
DSRC419	42C	42.10	42.10	14.7	BXE	4	35	22	13	Orangish brown slightly gravelly slightly sandy silty CLAY	
DSRC419	46C	48.10	48.40	21.1	BXE	0	36	25	11	Greyish brown slightly sandy clayey SILT	
DSRC419	50C	54.10	54.10	13.9	BXE	0	36	21	15	Grey slightly sandy silty CLAY	
general remarks natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified) NP denotes non plastic # denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892											
specimen preparation							test method			CONTRACT	CHECKED
A - as received				D - oven dried (60oC)		X - cone penetrometer (test 4.3)			34888	TB	
B - washed on 0.425mm sieve				E - oven dried (105oC)		Y - cone penetrometer (test 4.4)					
C - air dried				F - not known		Z - casagrande apparatus (test 4.5)					

Geotechnical Engineering Limited
ATTERBERG LINE PLOT



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION



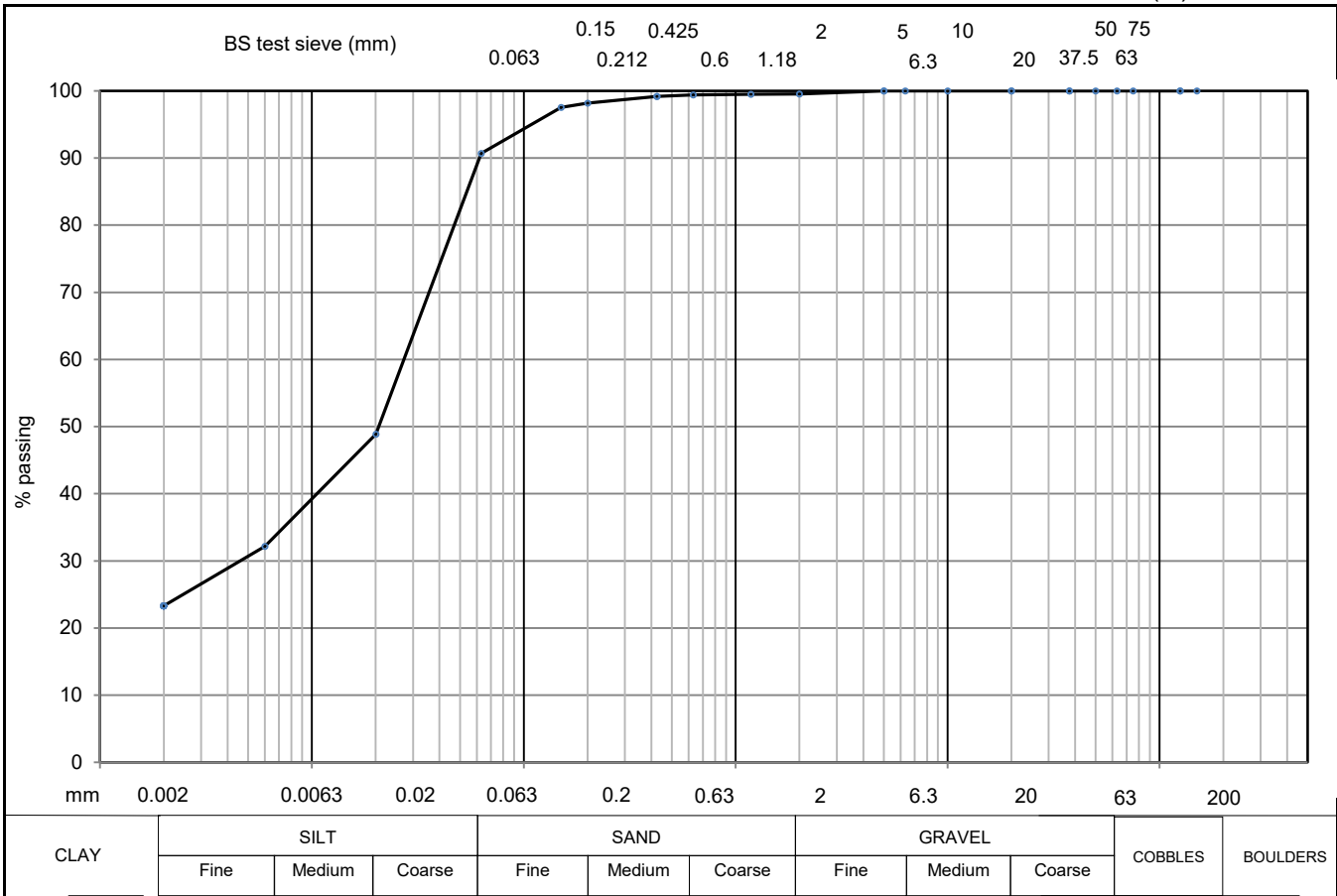
BH/TP No.	depth (m)	LL	PL	PI	remarks
□ DSRC406	41.40	34	21	13	
◇ DSRC406	53.20	32	21	11	
△ DSRC406	59.10	34	17	17	
× DSRC415	3.20	58	25	33	
+ DSRC415	5.50	70	34	36	
○ DSRC415	15.75	60	29	31	
■ DSRC419	42.10	35	22	13	
◆ DSRC419	48.40	36	25	11	
▲ DSRC419	54.10	36	21	15	

CONTRACT	CHECKED
34888	TB

Geotechnical Engineering Limited
PARTICLE SIZE DISTRIBUTION
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC404
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	42C
DESCRIPTION	Yellowish brown slightly sandy clayey SILT	SAMPLE DEPTH (m)	36.00
		SPECIMEN TOP (m)	36.55
		SPECIMEN BASE (m)	36.89



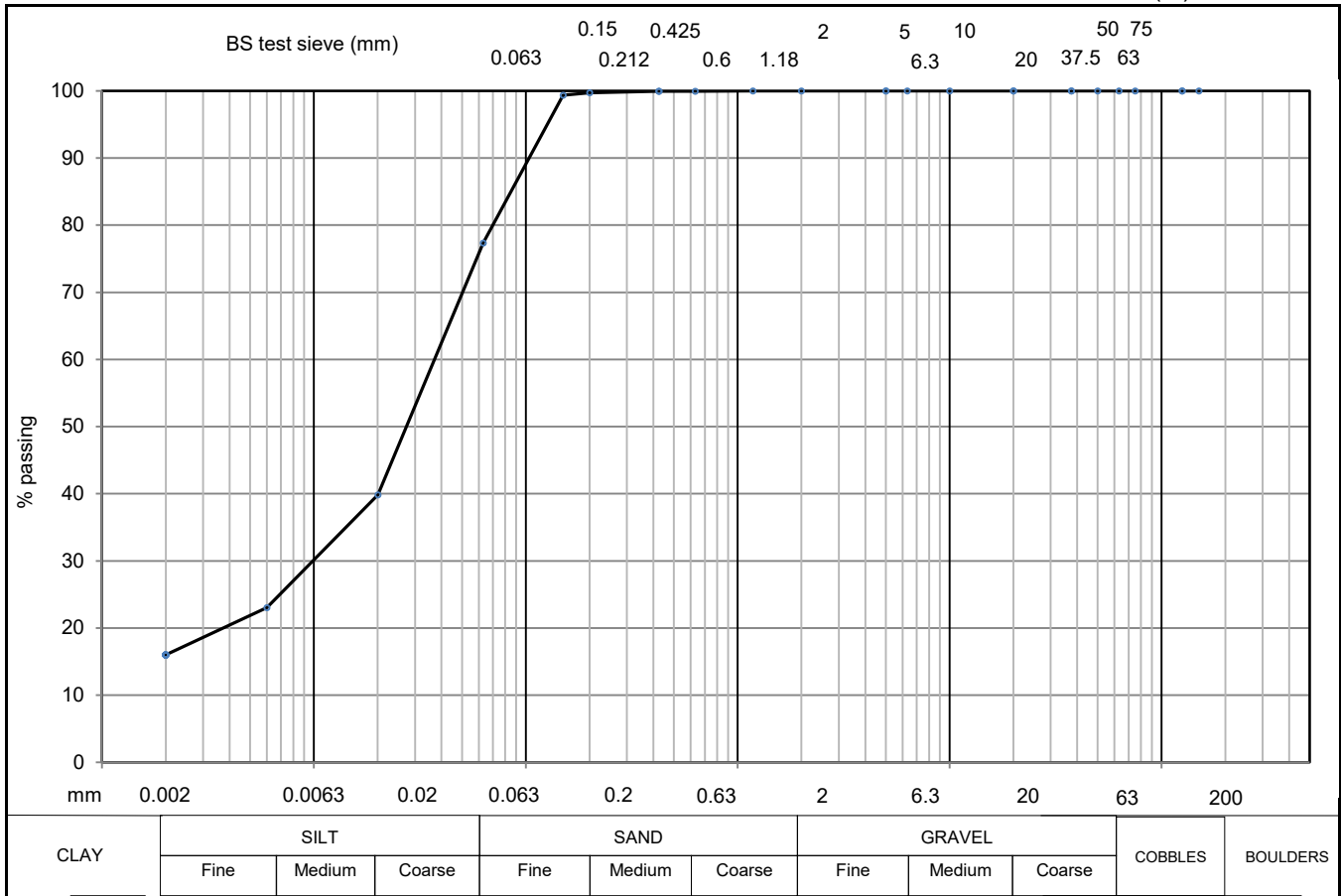
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	23			5	100	20	49
SILT	67	150		2	100	6	32
SILT & CLAY	91	75		1.18	99	2	23
SAND	9	63					
GRAVEL	0						
COBBLE & BOULDER	0						
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	98		
5.4 - sedimentation by pipette		6.3		0.063	91		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	34888	TB

Geotechnical Engineering Limited
PARTICLE SIZE DISTRIBUTION
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC406
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	54C
DESCRIPTION	Greyish brown slightly sandy clayey SILT	SAMPLE DEPTH (m)	39.00
		SPECIMEN TOP (m)	40.40
		SPECIMEN BASE (m)	40.50



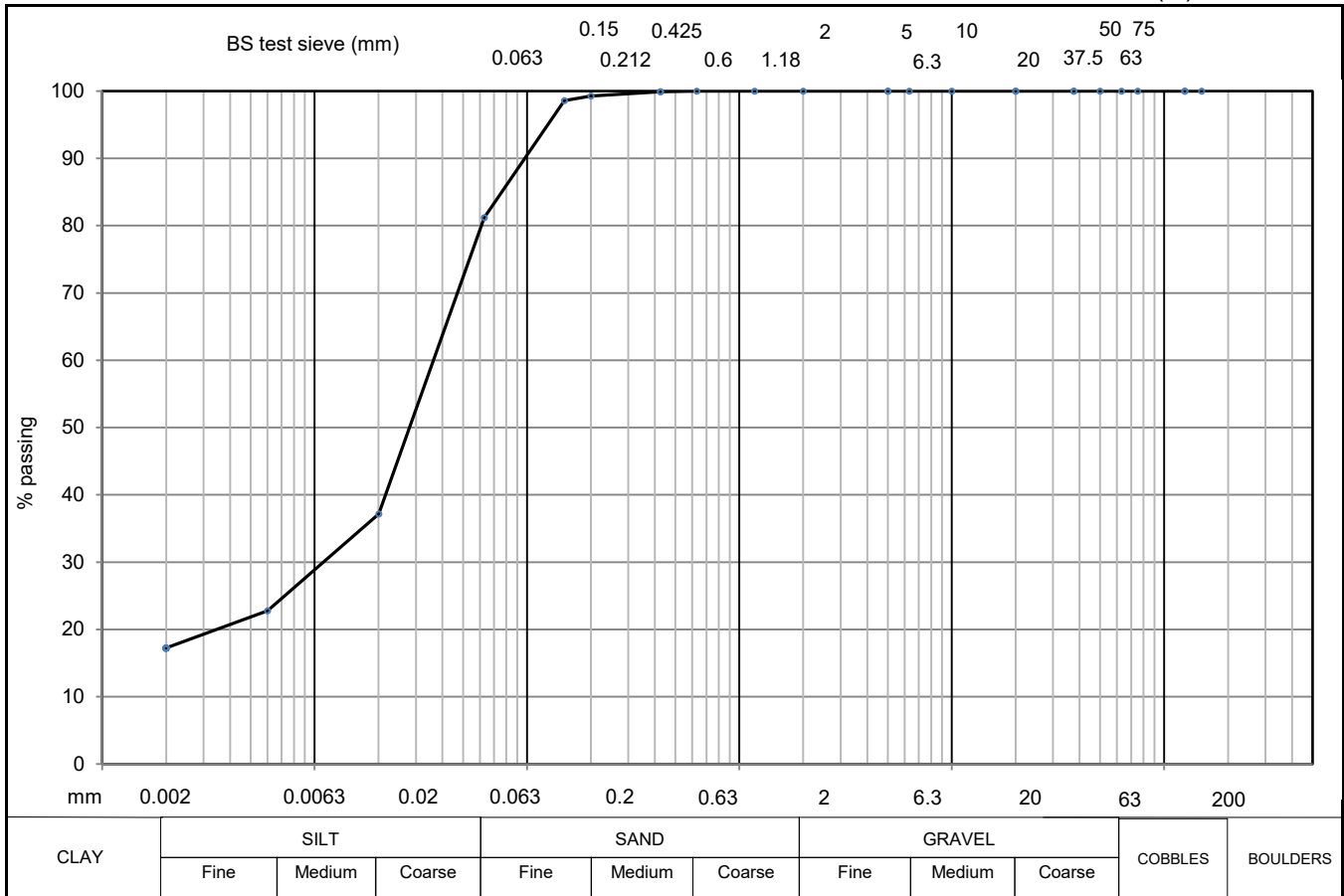
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	16			5		20	40
SILT	61	150		2		6	23
SILT & CLAY	77	75		1.18	100	2	16
SAND	23	63		0.63	100		
GRAVEL	0	50		0.425	100		
COBBLE & BOULDER	0	37.5		0.2	100		
test method(s)	5.2 & 5.4	20		0.15	99		
test method		10		0.063	77		
5.2 - sieving							
5.3 - sedimentation by hydrometer							
5.4 - sedimentation by pipette							

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	34888	TB

Geotechnical Engineering Limited
PARTICLE SIZE DISTRIBUTION
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC408
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	34C
DESCRIPTION	Grey slightly sandy clayey SILT	SAMPLE DEPTH (m)	27.20
		SPECIMEN TOP (m)	27.40
		SPECIMEN BASE (m)	27.65



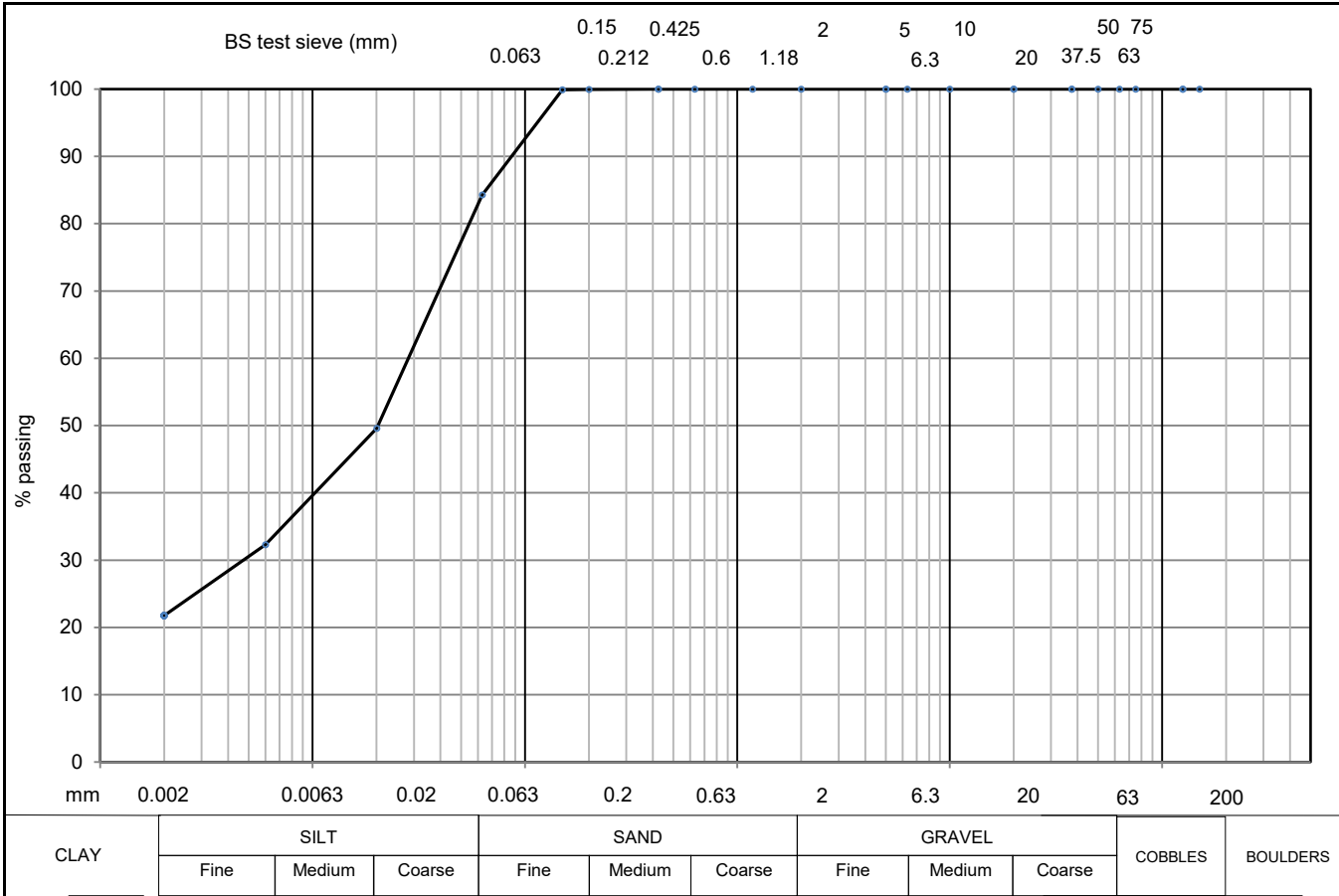
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	17			5		20	37
SILT	64	150		2		6	23
SILT & CLAY	81	75		1.18		2	17
SAND	19	63		0.63	100		
GRAVEL	0	50		0.425	100		
COBBLE & BOULDER	0	37.5		0.2	99		
test method(s)	5.2 & 5.4	20		0.15	99		
test method		10		0.063	81		
5.2 - sieving							
5.3 - sedimentation by hydrometer							
5.4 - sedimentation by pipette							

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	34888	TB

Geotechnical Engineering Limited
PARTICLE SIZE DISTRIBUTION
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC419
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	40C
DESCRIPTION	Light grey slightly sandy clayey SILT	SAMPLE DEPTH (m)	39.10
		SPECIMEN TOP (m)	39.84
		SPECIMEN BASE (m)	40.10



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22			5		20	50
SILT	63	150		2		6	32
SILT & CLAY	84	75		1.18		2	22
SAND	16						
GRAVEL	0						
COBBLE & BOULDER	0						
test method(s)	5.2 & 5.4	63		0.63			
test method		50		0.425	100		
5.2 - sieving		37.5		0.2	100		
5.3 - sedimentation by hydrometer		20		0.15	100		
5.4 - sedimentation by pipette		10		0.063	84		
		6.3					

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	34888	TB

Determination of Shear Strength by Direct Shear

(small shearbox apparatus)

Borehole No DSRC406
 Depth (m) 38.07-38.19
 Sample Type D

Description:

Grey sandy SILT. Sand is fine.

Specimen Details

Depth within original sample *mm* n/a
 Orientation within original sample n/a
 Test condition Submerged
 Preparation < 2 mm material remoulded at existing moisture content to the approximate in-situ density.

Particle density *Mg/m³* 2.67 (assumed)

Specimen Number		1	2	3
Length	<i>mm</i>	59.74	59.88	59.94
Width	<i>mm</i>	59.77	59.78	59.96
Height	<i>mm</i>	17.65	17.71	17.65
Initial water content	%	13.9	13.9	13.9
Initial wet density	<i>Mg/m³</i>	2.38	2.37	2.36
Initial dry density	<i>Mg/m³</i>	2.09	2.08	2.08
Initial voids ratio		0.277	0.285	0.286

Consolidation Stage

Normal stress	<i>kPa</i>	160	240	850
Duration	<i>day(s)</i>	1	1	1

Shearing Stage

Normal stress	<i>kPa</i>	160	240	850
Peak Conditions:				
Rate of horizontal displacement	<i>mm/min</i>	0.024	0.024	0.028
Maximum shear stress	<i>kPa</i>	136.0	209.2	543.4
Horizontal displacement at MSS	<i>mm</i>	5.9	1.1	3.4
Vertical Displacement at Peak	<i>mm</i>	0.29	0.18	0.16

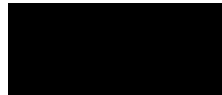
Final water content	%	15.8	14.2	14.7
Duration	<i>day(s)</i>	1	1	1

Shear Strength Parameters

		Peak Condition
Apparent Cohesion	<i>kPa</i>	57
Angle of Shearing Resistance	<i>degrees</i>	30.0

Notes:

Processed by TG
 Checked and Approved by



J Sturges - Operations Manager
 03/07/2019

Project Number:

29176

Project Name:

HE551505 A417 MISSING LINK GROUND INVESTIGATION**GEOLABS**®

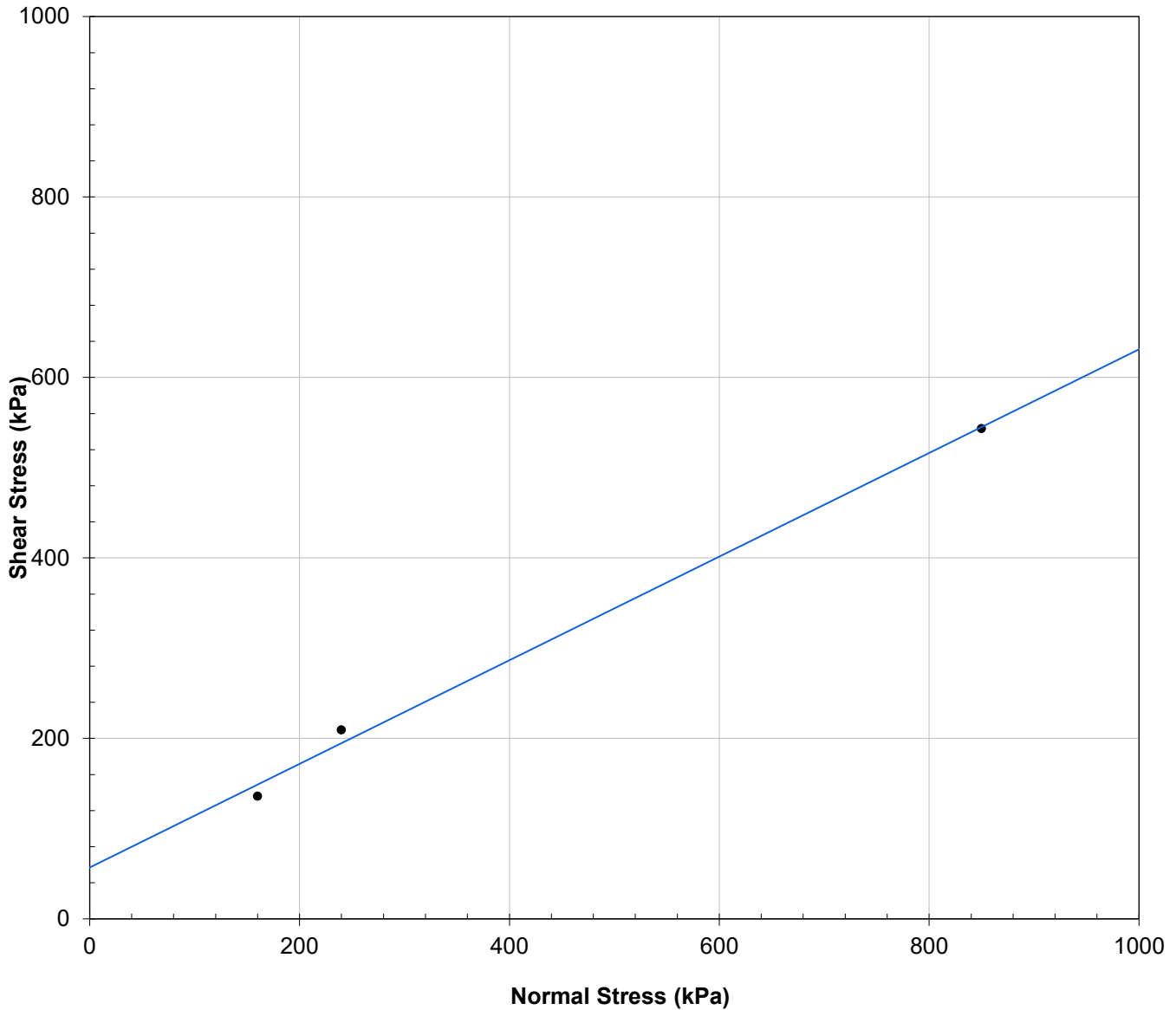
Determination of Shear Strength by Direct Shear

(small shearbox apparatus)

Borehole No	DSRC406
Depth (m)	38.07-38.19
Sample Type	D

Description:	Grey sandy SILT. Sand is fine.
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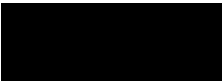
Shear Stress v Normal Stress



Peak: $c' = 57$

$\Phi' = 30^\circ$

Processed by TG
Checked and Approved by



J Sturges - Operations Manager
03/07/2019

Project Number: **29176**

Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**




Determination of Shear Strength by Direct Shear

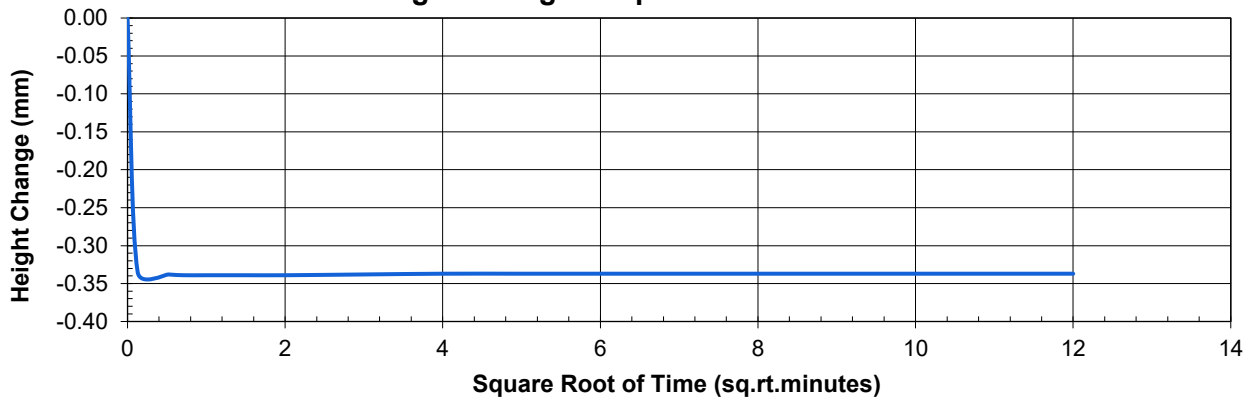
(small shearbox apparatus)

Borehole No	DSRC406
Depth (m)	38.07-38.19
Sample Type	D

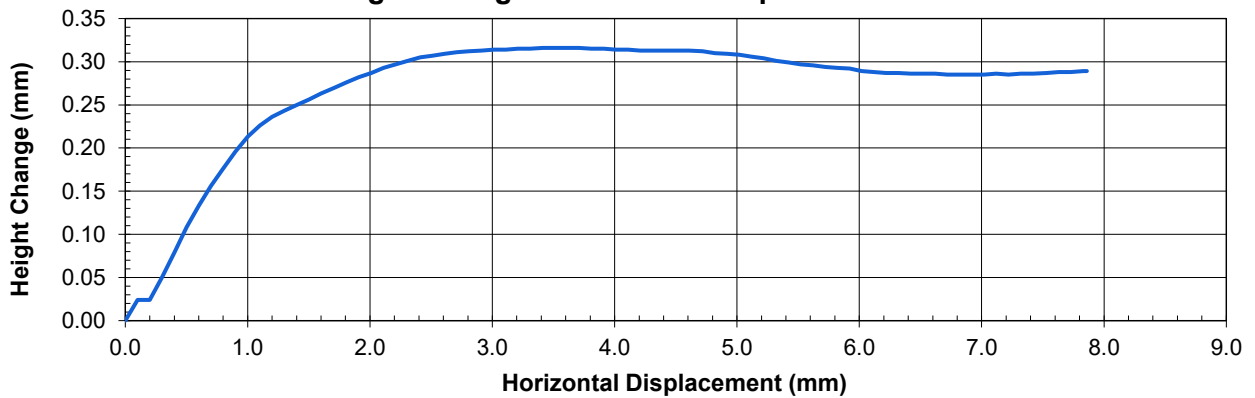
Description:	Grey sandy SILT. Sand is fine.
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Specimen: 1

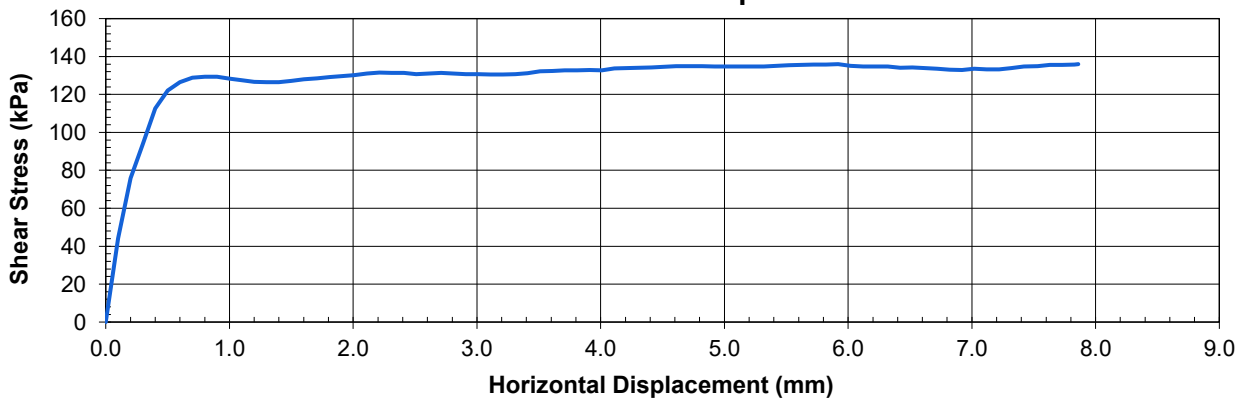
Height Change v Square Root Time



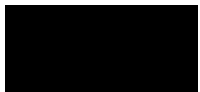
Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Processed by TG
Checked and Approved by



J Sturges - Operations Manager
03/07/2019

Project Number: **29176**

Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**




Determination of Shear Strength by Direct Shear

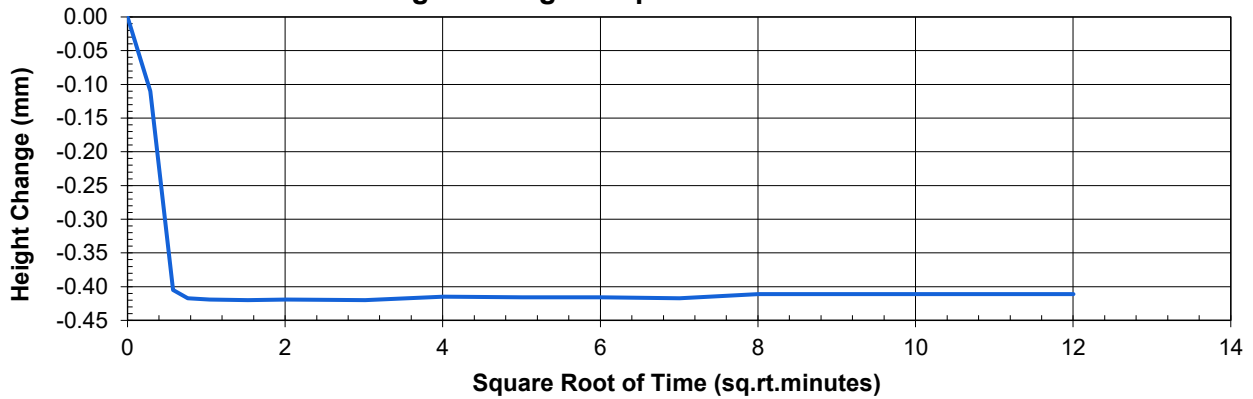
(small shearbox apparatus)

Borehole No	DSRC406
Depth (m)	38.07-38.19
Sample Type	D

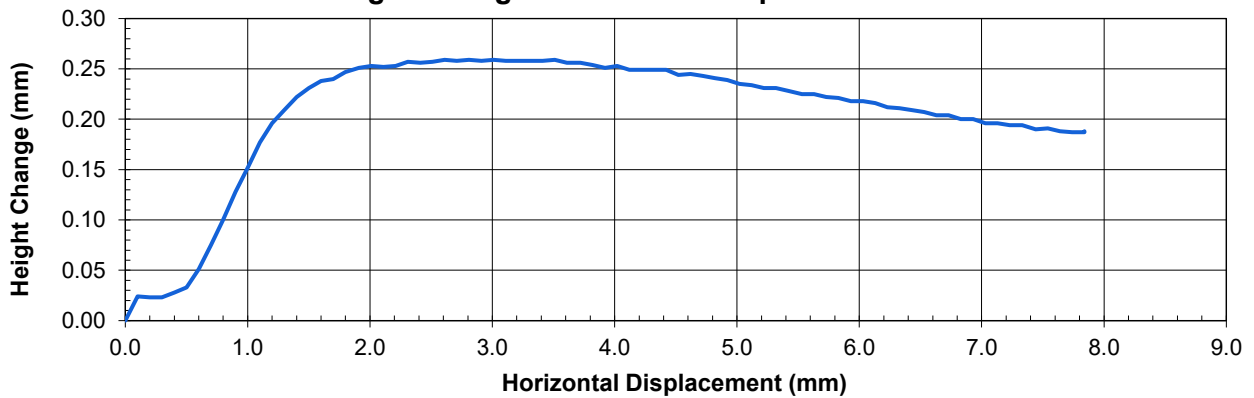
Description:	Grey sandy SILT. Sand is fine.
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Specimen: 2

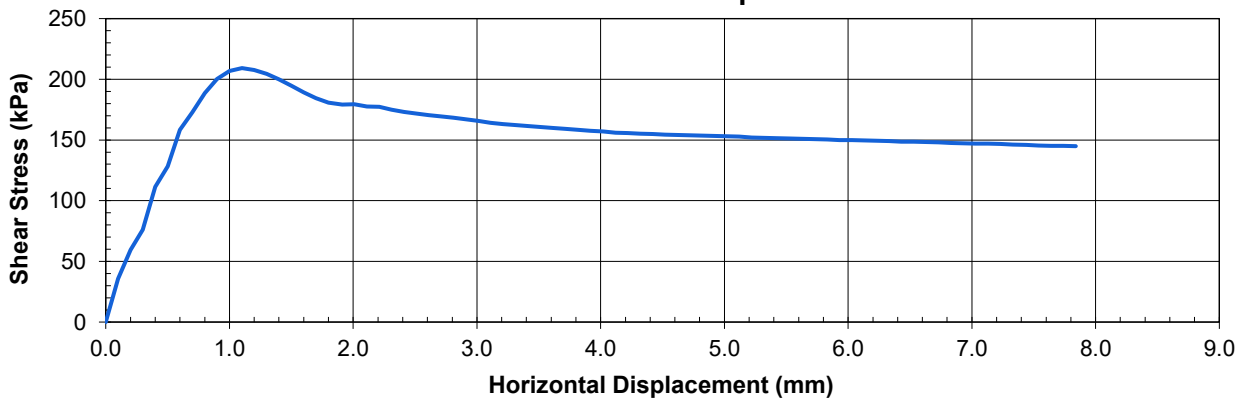
Height Change v Square Root Time



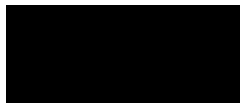
Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Processed by TG
Checked and Approved by



03/07/2019

Project Number: **29176**

Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**




Determination of Shear Strength by Direct Shear

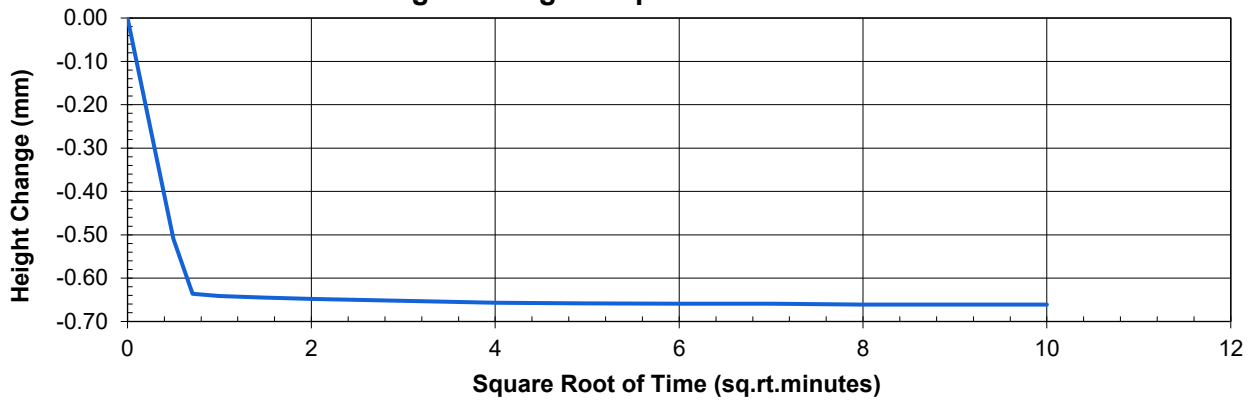
(small shearbox apparatus)

Borehole No DSRC406
 Depth (m) 38.07-38.19
 Sample Type D

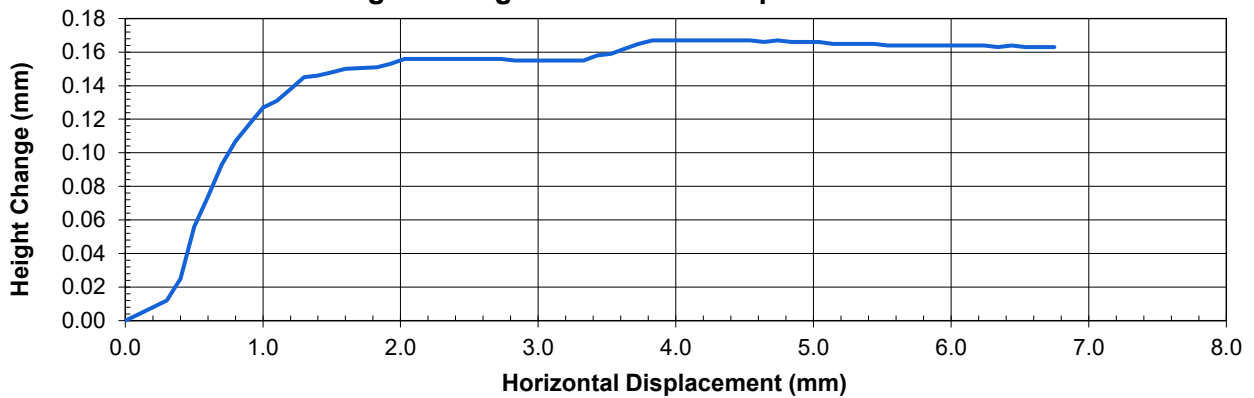
Description:
 Grey sandy SILT. Sand is fine.

Specimen: 3

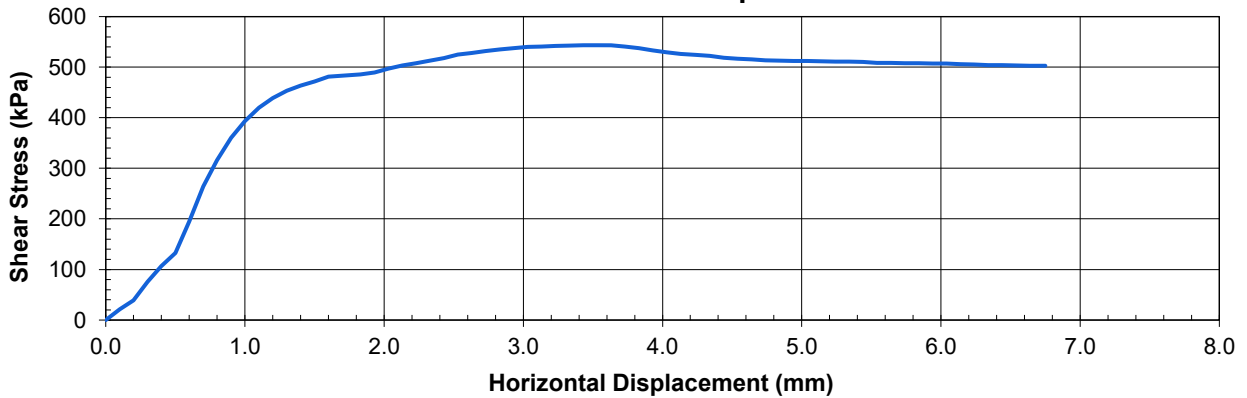
Height Change v Square Root Time

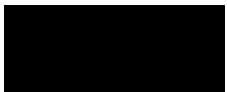


Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Processed by TG
 Checked and Approved by

 J Sturges - Operations Manager
 03/07/2019

Project Number: **29176**
 Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**



Determination of Shear Strength by Direct Shear

(small shearbox apparatus)

Borehole No DSRC408
 Depth (m) 31.40-31.60
 Sample Type C

Description:

Grey sandy SILT. Sand is fine.

Specimen Details

Depth within original sample *mm* n/a
 Orientation within original sample n/a
 Test condition Submerged
 Preparation < 2 mm material remoulded at existing moisture content to approximate in-situ density.

Particle density *Mg/m³* 2.67 (assumed)

Specimen Number		1	2	3
Length	<i>mm</i>	59.94	60.79	61.18
Width	<i>mm</i>	60.04	60.85	61.07
Height	<i>mm</i>	18.93	18.39	18.11
Initial water content	%	13.6	13.6	13.6
Initial wet density	<i>Mg/m³</i>	2.20	2.21	2.22
Initial dry density	<i>Mg/m³</i>	1.94	1.94	1.95
Initial voids ratio		0.377	0.375	0.368

Consolidation Stage

Normal stress	<i>kPa</i>	100	300	600
Duration	<i>day(s)</i>	1	1	1

Shearing Stage

Normal stress	<i>kPa</i>	100	300	600
Peak Conditions:				
Rate of horizontal displacement	<i>mm/min</i>	0.024	0.024	0.024
Maximum shear stress	<i>kPa</i>	91.6	213.8	371.3
Horizontal displacement at MSS	<i>mm</i>	1.2	2.6	2.7
Vertical Displacement at Peak	<i>mm</i>	0.13	0.35	0.15

Final water content	%	19.6	21.2	18.6
Duration	<i>day(s)</i>	1	1	1

Shear Strength Parameters

		Peak Condition
Apparent Cohesion	<i>kPa</i>	40
Angle of Shearing Resistance	<i>degrees</i>	29.0

Notes:

Checked and Approved by



S Allen - Senior Technician
07/06/2019

Project Number:

29176

Project Name:

HE551505 A417 MISSING LINK GROUND INVESTIGATION

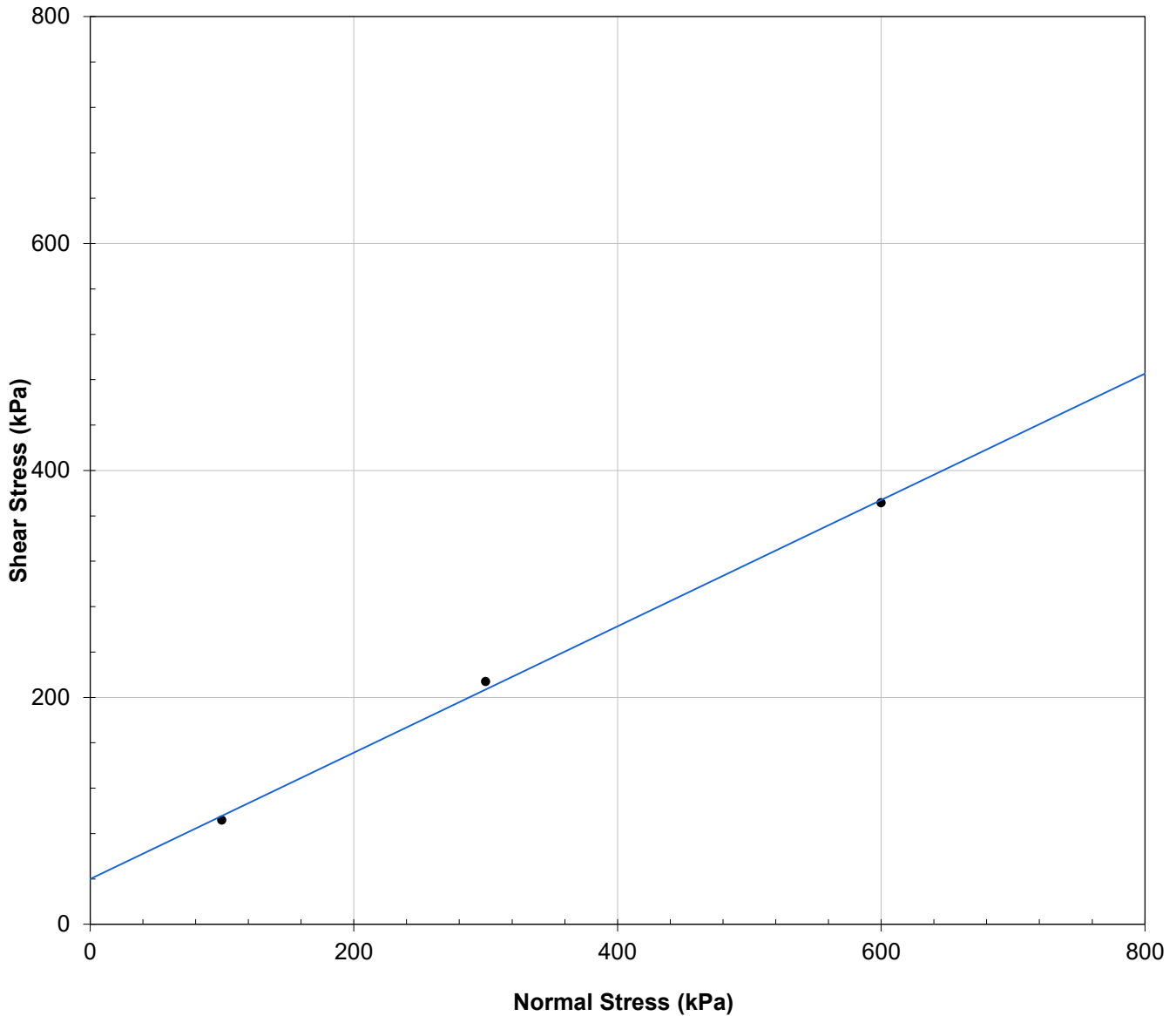

Determination of Shear Strength by Direct Shear

(small shearbox apparatus)

Borehole No	DSRC408
Depth (m)	31.40-31.60
Sample Type	C

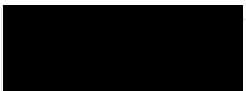
Description:	Grey sandy SILT. Sand is fine.
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Shear Stress v Normal Stress



Peak: $c' = 40$

$\phi' = 29^\circ$

Checked and Approved by

S Allen - Senior Technician 07/06/2019

Project Number:	29176
Project Name:	HE551505 A417 MISSING LINK GROUND INVESTIGATION



Determination of Shear Strength by Direct Shear

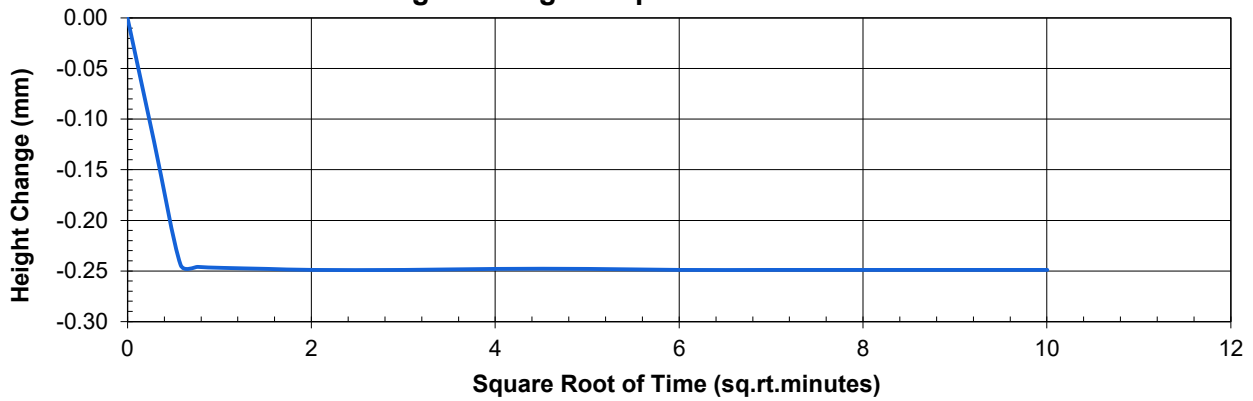
(small shearbox apparatus)

Borehole No DSRC408
 Depth (m) 31.40-31.60
 Sample Type C

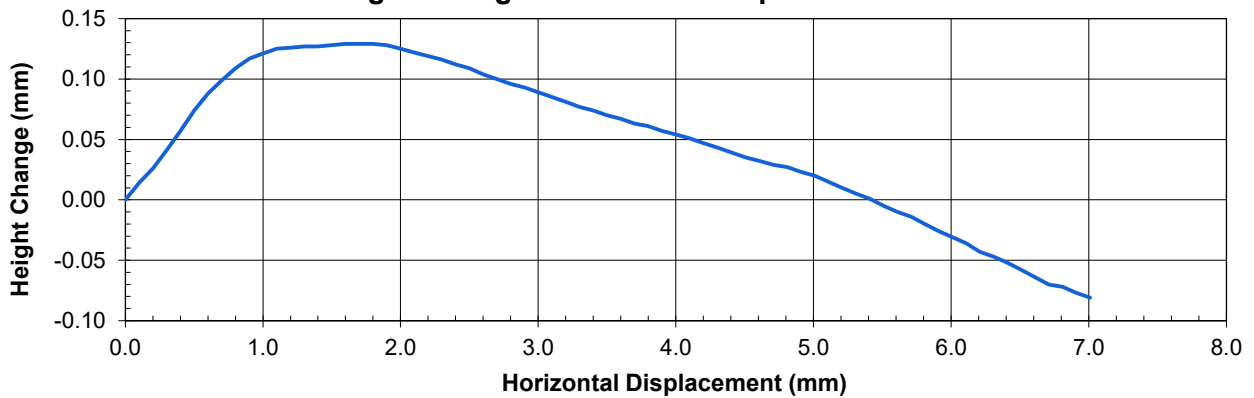
Description:
 Grey sandy SILT. Sand is fine.

Specimen: 1

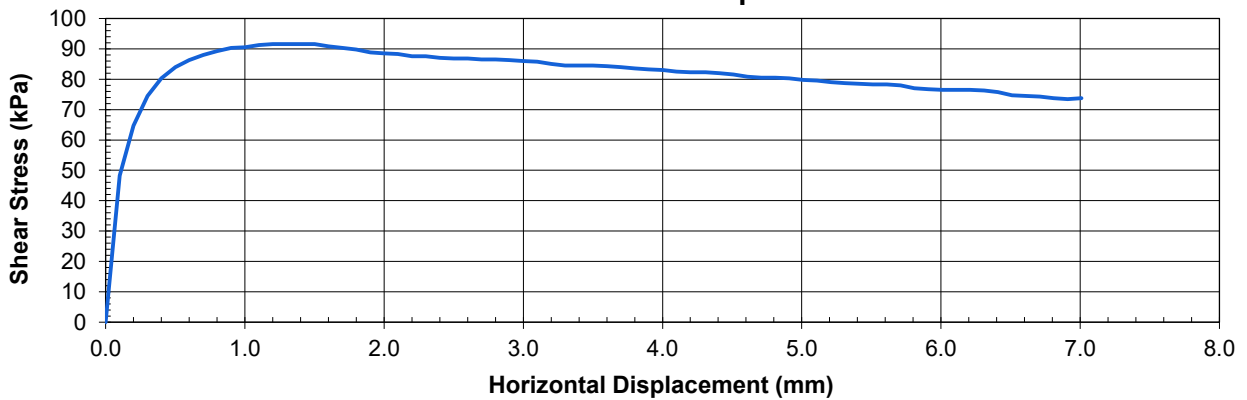
Height Change v Square Root Time

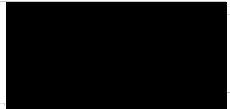


Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Checked and Approved by

 07/06/2019

Project Number: **29176**
 Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**



Determination of Shear Strength by Direct Shear

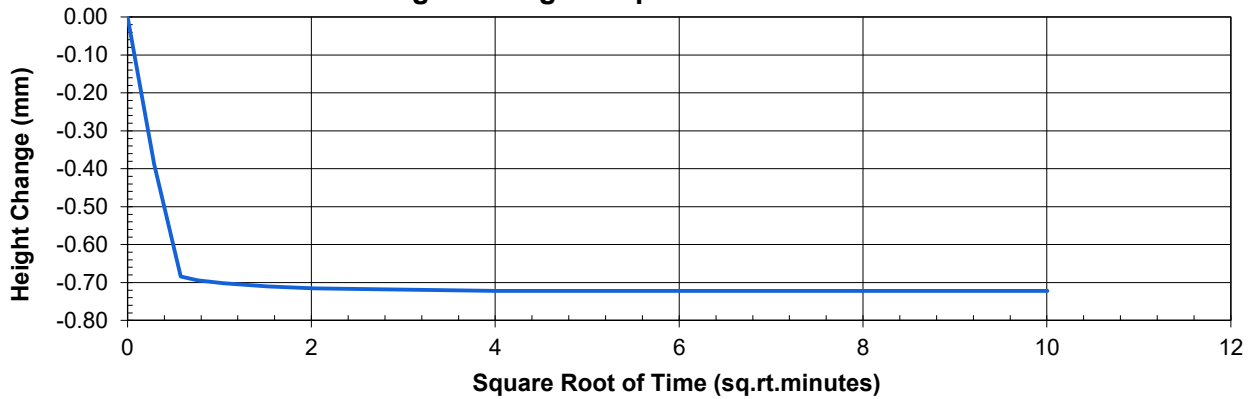
(small shearbox apparatus)

Borehole No	DSRC408
Depth (m)	31.40-31.60
Sample Type	C

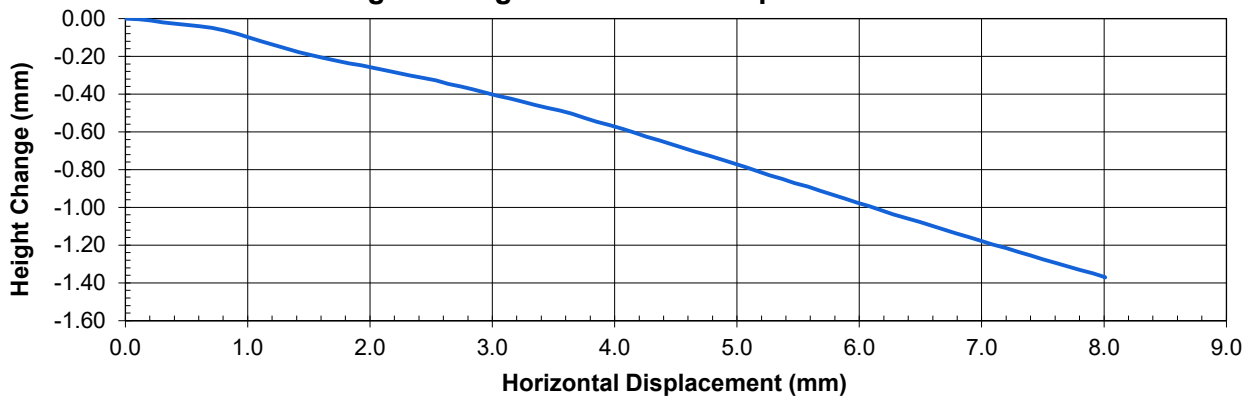
Description:
Grey sandy SILT. Sand is fine.

Specimen: 2

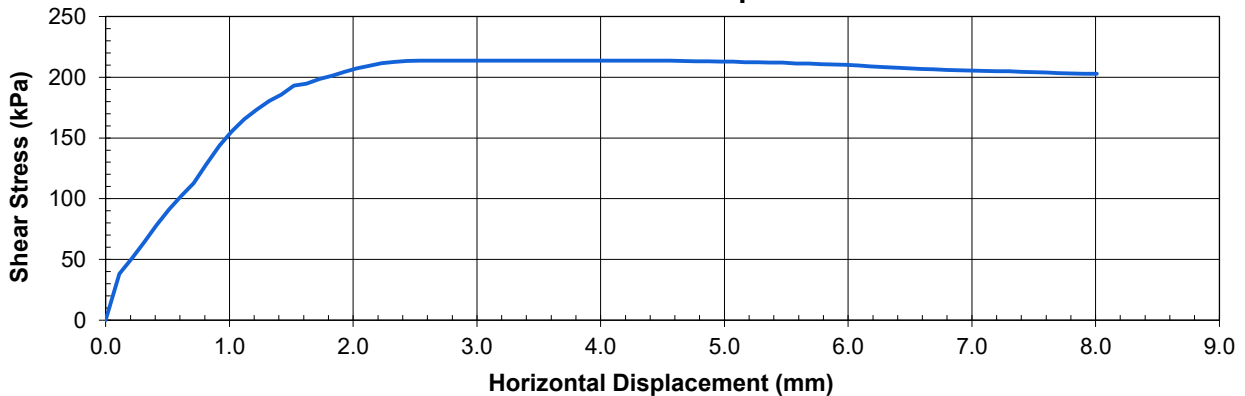
Height Change v Square Root Time




Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



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07/06/2019

Project Number: **29176**
Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**



Determination of Shear Strength by Direct Shear

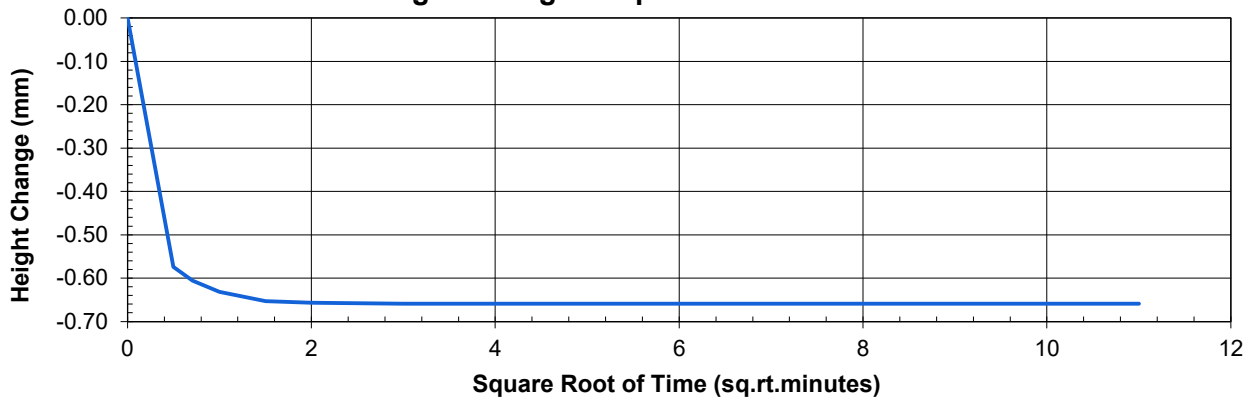
(small shearbox apparatus)

Borehole No	DSRC408
Depth (m)	31.40-31.60
Sample Type	C

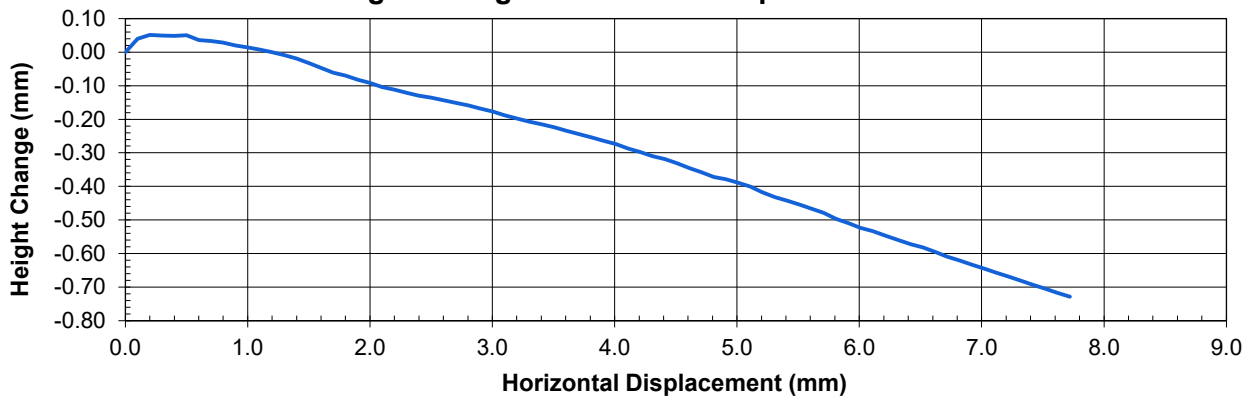
Description:
 Grey sandy SILT. Sand is fine.

Specimen: 3

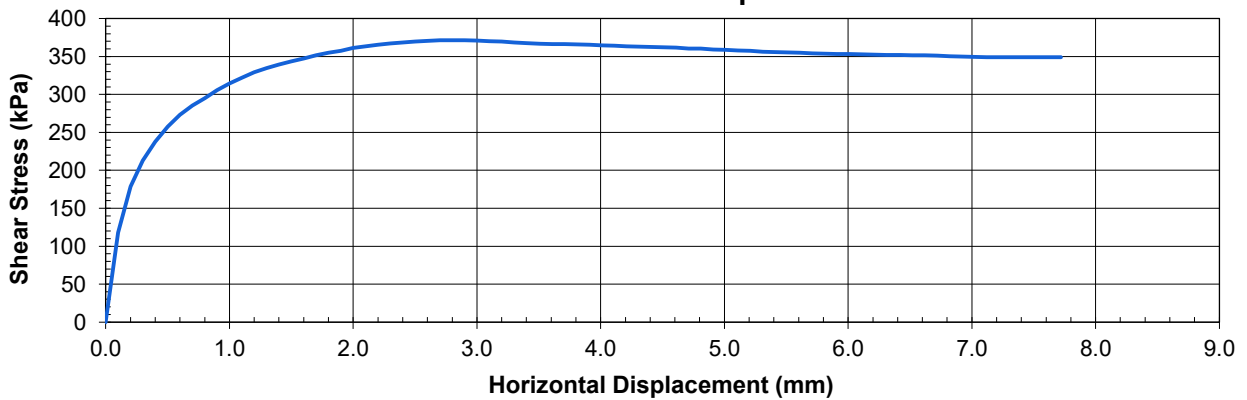
Height Change v Square Root Time




Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Checked and Approved by

 S Allen - Senior Technician
 07/06/2019

Project Number: **29176**
 Project Name: **HE551505 A417 MISSING LINK GROUND INVESTIGATION**



ROCK WATER CONTENT

I.S.R.M. Suggested Methods : 2007 Edition



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC404	16Cs	8.40	8.40	7.0	Yellowish brown LIMESTONE
DSRC404	36Cs	30.95	30.95	7.3	Orangish brown LIMESTONE
DSRC406	19Cs	6.95	6.95	9.6	Yellowish brown LIMESTONE
DSRC408	17Cs	10.30	10.30	7.3	Light brown LIMESTONE
DSRC408	33Cs	25.90	25.90	19	Grey SILTSTONE
DSRC408	52Cs	45.75	45.75	12	Grey SILTSTONE
DSRC419	36Cs	33.20	33.20	12	Orangish brown LIMESTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT 34888	CHECKED TB


POROSITY/DENSITY DETERMINATION USING SATURATION AND CALIPER/BUOYANCY TECHNIQUES

Sample details				Test results							
Borehole Ref.	Sample Ref.	Depth (m)	Description	Wet Density (Mg/m ³)	Dry Density (Mg/m ³)	Water Content (%)	Volume (cm ³)	Method of volume calculation	D. Tested	(*) Pore Volume (cm ³)	Porosity (%)
DSRC404	39	33.65-34.10	Weak yellowish brown and grey LIMESTONE. Fresh	2.33	2.10	11	288.42	Buoyancy technique	30/04/19	67.46	23.39
DSRC406	44	31.50-31.90	Weak grey LIMESTONE. Fresh	2.45	2.27	7.9	197.15	Buoyancy technique	30/04/19	35.28	17.90


(*) Pore volume obtained by water saturation at 20°.

Checked and Approved by <div style="background-color: black; width: 50px; height: 20px; margin: 5px 0;"></div> C Clergeaud (Snr. Geologist) Date: 07/05/2019	Project Number: <h3 style="margin: 5px 0;">GEO / 29176</h3> Project Name: <h3 style="margin: 5px 0;">HE551505 A417 MISSING LINK GROUND INVESTIGATION</h3> <h3 style="margin: 5px 0;">34888</h3>	 
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INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Sample details				Indirect Tensile Strength test (LF0879C (1000kN) compression frame used)											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Sample Diameter (mm)	Sample Width (mm)	Degree of Saturation (%)	Water Content (%)	Specific Gravity* (Mg/m ³)	Stress Rate (N/s)	Test Duration (min:sec)	Failure Sketch	Failure Load (kN)	Tensile Strength (MPa)	Remarks
DSRC406	23	9.35-9.65	Weak yellowish brown and grey LIMESTONE. Fresh	29/04/19	101.00	52.20	74.4	7.0	2.70 (a)	200	01:48		21.60	2.61	

* Specific Gravity: (a) assumed or (m) measured/supplied by client.

Checked and Approved by

 C Clergeaud (Snr. Geologist)
 Date: 07/05/2019

Project Number:
GEO / 29176

Project Name:
**HE551505 A417 MISSING LINK GROUND INVESTIGATION
 34888**



ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006
INDIRECT TENSILE STRENGTH BY THE BRAZIL TEST

Borehole Ref.: DSRC406	Description: Weak yellowish brown and grey LIMESTONE. Fresh
Sample Ref.: 23	
Depth (m): 9.35-9.65	

Sample Details

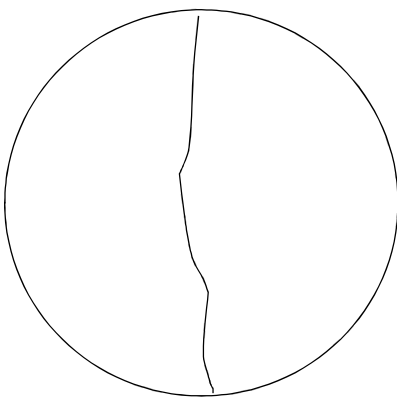
Diameter	101.00 mm
Thickness	52.20 mm
Thickness / Diameter Ratio	0.52
Bulk Density	2.31 Mg/m ³
Dry Density	2.16 Mg/m ³
Water Content	7.0 %
Specific Gravity (Assumed)	2.70 Mg/m ³
Degree of Saturation	74.4 %

Test Results

Stress Rate	0.20 kN/s
Test Duration	01:48 min:sec
Angle of loading with respect to anisotropy	90 °

Failure Sketch

Mode of failure: Axial Split



Solid lines for material failures. Dashed lines for apparent weakness failure.

LF0879C (1000kN) compression frame and steel loading jaws used

Date tested: 29/04/2019




Failure Load
21.60 kN

Tensile Strength
2.61 MPa

Sample type: C

Remarks:



Note: The dimensional requirements of Flatness (<0.25 mm), Perpendicularity (to within 0.25°) and irregularities across thickness (< 0.025 mm) are all met.

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ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006
DETERMINATION OF THE SLAKE-DURABILITY INDEX

Sample details				Water Temp. (°C)	Appearance of fragments after 2 nd cycle	Natural Water Content (%)	1 st Cycle	2 nd Cycle
Borehole Ref.	Sample Ref.	Depth (m)	Description				Slake Durability Index I _{d(1)}	Slake Durability Index I _{d(2)}
DSRC415	13	8.00-8.20	Weak yellowish brown and grey SILTSTONE. Fresh	19.3 ± 2	Retained: Retained specimen remain virtually unchanged. Passing: SILT	8.4	94.2	89.9

Note: Tap water used as slaking fluid.

Checked and Approved by  C Clergeaud (Snr. Geologist) Date: 03/07/2019	Project Number: <p style="text-align: center;">GEO / 29176</p> Project Name: <p style="text-align: center;">HE551505 A417 MISSING LINK GROUND INVESTIGATION 34888</p>	
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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition



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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
DSRC406	21Cs	8.45	8.50	100.6	232.5	2.31	10.4	2.29	10	01:17	3.57	Yellowish brown LIMESTONE, N, AxCa. H/D ratio falls outside ISRM specification
DSRC406	27Cs	14.35	14.40	101.5	227.6	2.24	6.7	2.41	20	04:08	10.31	Yellowish brown LIMESTONE, N, AxCa. H/D ratio falls outside ISRM specification
DSRC406	34Cs	22.10	22.20	101.0	246.2	2.44	10.6	2.25	10	03:48	4.84	Yellowish brown mottled orangish brown LIMESTONE, N, AxCa. H/D ratio falls outside ISRM specification
DSRC408	28Cs	20.88	20.90	98.9	245.3	2.48	11.3	2.29	10	02:07	3.48	Grey and orange LIMESTONE, N, Ax
DSRC408	77Cs	68.75	68.80	98.1	216.3	2.21	11.2	2.29	10	03:37	4.29	Grey SILTSTONE, N, Ax. H/D ratio falls outside ISRM specification
DSRC415	21C	18.00	18.60	101.5	275.5	2.71	6.5	2.42	10	05:36	6.94	Grey SILTSTONE, P, AxCa
DSRC415	23Cs	20.60	20.65	101.5	188.0	1.85	9.8	2.36	10	02:43	4.01	Orangish brown LIMESTONE, N, Ax. H/D ratio falls outside ISRM specification
DSRC415	31Cs	31.20	31.25	100.8	243.4	2.41	9.7	2.35	10	04:00	4.86	Yellowish brown LIMESTONE, N, Ax. H/D ratio falls outside ISRM specification
DSRC415	35Cs	34.90	34.95	101.5	234.5	2.31	5.4	2.48	10	04:15	23.37	Light brown LIMESTONE, N, Ax. H/D ratio falls outside ISRM specification
DSRC419	22Cs	17.17	17.20	102.0	229.9	2.25	4.4	2.49	20	09:27	22.08	Yellowish brown LIMESTONE, N, Ax. H/D ratio falls outside ISRM specification
DSRC419	31Cs	29.20	29.25	101.6	253.7	2.50	8.9	2.37	10	02:51	3.95	Orangish brown LIMESTONE, N, Ax

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other


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UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details				Density				Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
Borehole Ref.	Sample Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m ³)	Dry (Mg/m ³)	Mean after prep.		H/D Ratio	Load at Failure (kN)	UCS (MPa) <small>3 sig. fig.</small>	Failure Sketch	D. Tested	Remarks
								Diameter (mm)	Height (mm)						
DSRC406	40	28.15-28.50	Weak grey LIMESTONE. Fresh	6.9	100	2.45	2.29	101.20	265.90	2.6	139.6	17.4		03/05/19	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by  C Clergeaud (Snr. Geologist) Date: 07/05/2019	Project Number: GEO / 29176 Project Name: HE551505 A417 MISSING LINK GROUND INVESTIGATION 34888	 
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Unconfined Compressive Strength with Young's Modulus

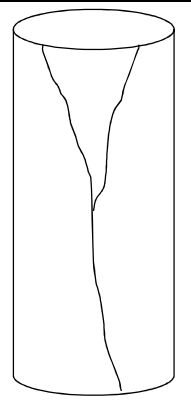
Borehole Ref.: DSRC406 Sample Ref.: 40 Depth (m): 28.15-28.50	Description: Weak grey LIMESTONE. Fresh
---	--

Diameter	101.20 mm
Height	265.90 mm
Bulk Density	2.45 Mg/m ³
Dry Density	2.29 Mg/m ³
Water Content	6.9 %
Degree of Saturation: 100 %	Specific Gravity: 2.7 Mg/m ³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Y-Shaped



Solid lines for material failures.
Dashed lines for apparent weakness failure.

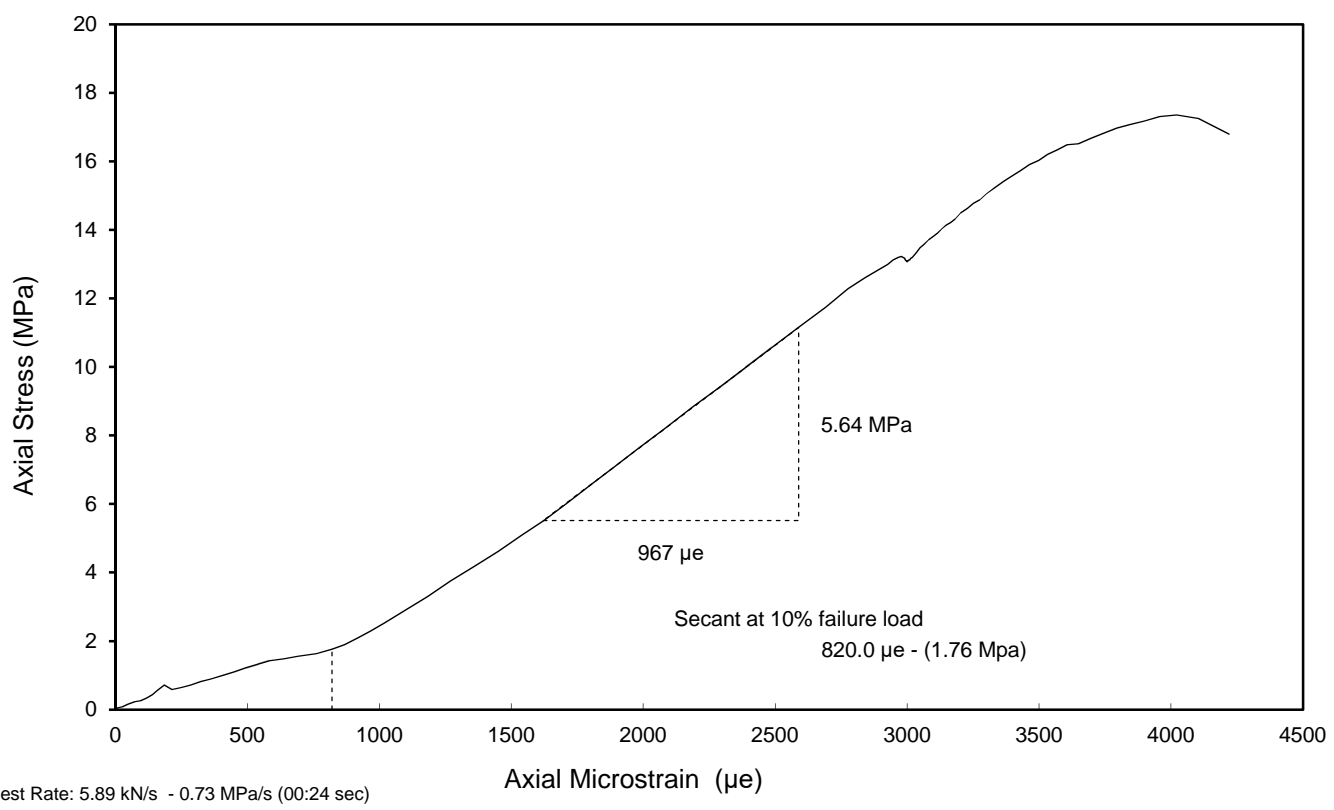
Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 65°

Date tested: 03/05/2019



Sample type	C
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Test results

Unconfined Compressive Strength	17.4 MPa
Young's Modulus <small>(tangential at 50% failure load)</small>	5.83 GPa
Poisson's Ratio <small>(tangential at 50% failure load)</small>	n/a
Young's Modulus <small>(secant at 10% failure load)</small>	2.15 GPa
Poisson's Ratio <small>(secant at 10% failure load)</small>	n/a



Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by  C Clergeaud (Snr. Geologist) Date: 07/05/2019	Project Number: GEO / 29176 Project Name: HE551505 A417 MISSING LINK GROUND INVESTIGATION 34888	
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POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC404	5.60	D	Y	N		60	100	6.46	100.00	0.65	1.37	0.88	Yellowish brown LIMESTONE	
DSRC404	5.60	A	X	N	100		55	3.33	83.68	0.48	1.26	0.60	Yellowish brown LIMESTONE	
DSRC404	13.60	D	Y	N		50	100	4.48	100.00	0.45	1.37	0.61	Yellowish brown LIMESTONE	
DSRC404	13.60	A	X	N	100		40	1.75	71.36	0.34	1.17	0.40	Yellowish brown LIMESTONE	
DSRC404	13.65	D	Y	N		60	100	5.85	100.00	0.59	1.37	0.80	Yellowish brown LIMESTONE	
DSRC404	13.65	A	X	N	100		50	5.60	79.79	0.88	1.23	1.09	Yellowish brown LIMESTONE	
DSRC404	13.70	D	Y	N		50	100	8.21	100.00	0.82	1.37	1.12	Yellowish brown LIMESTONE	
DSRC404	13.70	A	X	N	100		45	9.91	75.69	1.73	1.21	2.08	Yellowish brown LIMESTONE	
DSRC404	13.80	D	Y	N		60	100	1.11	100.00	0.11	1.37	0.15	Orangish brown mottled yellowish brown LIMESTONE	
DSRC404	13.80	A	X	N	100		60	0.15	87.40	0.02	1.29	0.03	Orangish brown mottled yellowish brown LIMESTONE	
DSRC404	13.90	D	Y	N		50	100	8.06	100.00	0.81	1.37	1.10	Yellowish brown LIMESTONE	
DSRC404	13.90	A	X	N	100		45	7.20	75.69	1.26	1.21	1.51	Yellowish brown LIMESTONE	
DSRC404	23.65	D	Y	N		30	100	3.45	100.00	0.35	1.37	0.47	Orangish brown LIMESTONE	
DSRC404	23.65	A	X	N	100		50	3.53	79.79	0.55	1.23	0.68	Orangish brown LIMESTONE	
DSRC404	34.50	D	Y	N		50	100	14.34	100.00	1.43	1.37	1.96	Orangish brown LIMESTONE	
DSRC404	34.50	A	X	N	100		60	5.08	87.40	0.66	1.29	0.85	Orangish brown LIMESTONE	
DSRC404	34.55	D	Y	N		50	100	8.23	100.00	0.82	1.37	1.12	Orangish brown LIMESTONE	
DSRC404	34.55	A	X	N	100		50	8.46	79.79	1.33	1.23	1.64	Orangish brown LIMESTONE	
DSRC404	34.60	D	Y	N		60	100	16.17	100.00	1.62	1.37	2.21	Orangish brown LIMESTONE	

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	34888	TB
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC404	34.60	A	X	N	100		40		7.10	71.36	1.39	1.17	1.64	Orangish brown LIMESTONE
DSRC404	34.65	D	Y	N		50	100		5.79	100.00	0.58	1.37	0.79	Orangish brown LIMESTONE
DSRC404	34.65	A	X	N	100		40		1.10	71.36	0.22	1.17	0.25	Orangish brown LIMESTONE
DSRC404	34.70	D	Y	N		40	100		8.14	100.00	0.81	1.37	1.11	Orangish brown LIMESTONE
DSRC404	34.70	A	X	N	100		45		5.56	75.69	0.97	1.21	1.17	Orangish brown LIMESTONE
DSRC406	8.50	I	X	N	100	90	45		3.15	75.69	0.55	1.21	0.66	Yellowish brown LIMESTONE
DSRC406	8.55	I	X	N	95	40	40		3.25	69.56	0.67	1.16	0.78	Yellowish brown LIMESTONE
DSRC406	8.60	I	X	N	100	60	50		3.65	79.79	0.57	1.23	0.71	Yellowish brown LIMESTONE
DSRC406	8.70	I	X	N	95	100	40		1.93	69.56	0.40	1.16	0.46	Yellowish brown LIMESTONE
DSRC406	14.35	I	X	N	90	100	30		4.85	58.63	1.41	1.07	1.52	Yellowish brown LIMESTONE
DSRC406	14.40	I	X	N	90	60	40		1.49	67.70	0.33	1.15	0.37	Yellowish brown LIMESTONE
DSRC406	14.45	I	X	N	80	50	50		7.36	71.36	1.45	1.17	1.70	Yellowish brown LIMESTONE
DSRC406	14.50	I	X	N	90	100	55		2.94	79.39	0.47	1.23	0.57	Yellowish brown LIMESTONE
DSRC406	22.10	D	Y	N		50	100		4.68	100.00	0.47	1.37	0.64	Yellowish brown LIMESTONE
DSRC406	22.10	A	X	N	100		60		1.73	87.40	0.23	1.29	0.29	Yellowish brown LIMESTONE
DSRC408	5.47	D	Y	N		60	100		6.41	100.00	0.64	1.37	0.88	Orangish brown LIMESTONE
DSRC408	5.47	A	X	N	100		50		5.17	79.79	0.81	1.23	1.00	Orangish brown LIMESTONE
DSRC408	10.30	D	Y	N		80	100		3.54	100.00	0.35	1.37	0.48	Light brown LIMESTONE
DSRC408	10.30	A	X	N	100		65		9.47	90.97	1.14	1.31	1.50	Light brown LIMESTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	34888	TB
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC408	12.50	D	Y	N		60	100	2.13	100.00	0.21	1.37	0.29	Orangish brown LIMESTONE	
DSRC408	12.50	A	X	N	100		50	1.87	79.79	0.29	1.23	0.36	Orangish brown LIMESTONE	
DSRC408	19.45	D	Y	N		40	100	0.25	100.00	0.03	1.37	0.03	Grey SILTSTONE	
DSRC408	19.45	A	X	N	100		30	0.20	61.80	0.05	1.10	0.06	Grey SILTSTONE	
DSRC408	19.50	D	Y	N		50	100	0.10	100.00	0.01	1.37	0.01	Grey SILTSTONE	
DSRC408	19.50	A	X	N	100		50	0.10	79.79	0.02	1.23	0.02	Grey SILTSTONE	
DSRC408	19.60	D	Y	N		30	100	0.12	100.00	0.01	1.37	0.02	Grey SILTSTONE	
DSRC408	19.60	A	X	N	100		25	0.13	56.42	0.04	1.06	0.04	Grey SILTSTONE	
DSRC408	20.88	I	X	N	95	100	50	1.50	77.77	0.25	1.22	0.30	Grey LIMESTONE	
DSRC408	25.90	D	Y	N		50	100	0.09	100.00	0.01	1.37	0.01	Grey SILTSTONE	
DSRC408	25.90	A	X	N	100		60	0.08	87.40	0.01	1.29	0.01	Grey SILTSTONE	
DSRC408	26.00	D	Y	N		30	100	0.08	100.00	0.01	1.37	0.01	Grey SILTSTONE	
DSRC408	26.00	A	X	N	100		25	0.09	56.42	0.03	1.06	0.03	Grey SILTSTONE	
DSRC408	30.40	D	Y	N		75	100	0.03	100.00	0.00	1.37	0.00	Grey SILTSTONE	
DSRC408	30.40	A	X	N	100		60	0.11	87.40	0.01	1.29	0.02	Grey SILTSTONE	
DSRC408	34.20	D	Y	N		45	95	0.11	95.00	0.01	1.33	0.02	Grey SILTSTONE	
DSRC408	34.20	A	X	N	95		60	0.41	85.19	0.06	1.27	0.07	Grey SILTSTONE	
DSRC408	45.75	D	Y	N		60	100	0.56	100.00	0.06	1.37	0.08	Grey SILTSTONE	
DSRC408	45.75	A	X	N	100		55	0.58	83.68	0.08	1.26	0.10	Grey SILTSTONE	

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	34888	TB
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC408	45.80	D	Y	N		50	100	0.13	100.00	0.01	1.37	0.02	Grey SILTSTONE	
DSRC408	45.80	A	X	N	100		60	0.82	87.40	0.11	1.29	0.14	Grey SILTSTONE	
DSRC408	45.85	D	Y	N		30	100	0.30	100.00	0.03	1.37	0.04	Grey LIMESTONE	
DSRC408	45.85	A	X	N	100		40	0.47	71.36	0.09	1.17	0.11	Grey LIMESTONE	
DSRC408	68.75	D	Y	N		25	100	0.85	100.00	0.09	1.37	0.12	Grey SILTSTONE	
DSRC408	68.75	A	X	N	100		40	1.02	71.36	0.20	1.17	0.24	Grey SILTSTONE	
DSRC408	68.80	I	X	N	90	50	60	0.83	82.92	0.12	1.26	0.15	Grey SILTSTONE	
DSRC408	68.85	I	X	N	90	60	50	0.67	75.69	0.12	1.21	0.14	Grey SILTSTONE	
DSRC408	69.05	D	Y	N		50	100	0.85	100.00	0.09	1.37	0.12	Grey SILTSTONE	
DSRC408	69.05	A	X	N	100		40	1.37	71.36	0.27	1.17	0.32	Grey SILTSTONE	
DSRC415	9.85	D	Y	N		50	100	1.88	100.00	0.19	1.37	0.26	Grey SILTSTONE	
DSRC415	9.85	A	X	N	100		60	2.09	87.40	0.27	1.29	0.35	Grey SILTSTONE	
DSRC415	13.50	D	Y	N		60	105	1.72	105.00	0.16	1.40	0.22	Grey SILTSTONE	
DSRC415	13.50	A	X	N	105		60	2.32	89.56	0.29	1.30	0.38	Grey SILTSTONE	
DSRC415	13.60	D	Y	N		80	100	0.04	100.00	0.00	1.37	0.01	Grey SILTSTONE	
DSRC415	13.60	A	X	N	100		40	1.01	71.36	0.20	1.17	0.23	Grey SILTSTONE	
DSRC415	14.40	D	Y	N		40	100	0.49	100.00	0.05	1.37	0.07	Grey SILTSTONE	
DSRC415	14.40	A	X	N	100		40	0.58	71.36	0.11	1.17	0.13	Grey SILTSTONE	
DSRC415	14.55	D	Y	N		50	100	0.21	100.00	0.02	1.37	0.03	Grey SILTSTONE	

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	34888	TB
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC415	14.55	A	X	N	100		40		0.03	71.36	0.01	1.17	0.01	Grey SILTSTONE
DSRC415	14.80	D	Y	N		50	100		0.95	100.00	0.10	1.37	0.13	Grey SILTSTONE
DSRC415	14.80	A	X	N	100		45		1.68	75.69	0.29	1.21	0.35	Grey SILTSTONE
DSRC415	20.60	D	Y	N		25	100		0.16	100.00	0.02	1.37	0.02	Orangish brown LIMESTONE
DSRC415	20.60	A	X	N	100		40		0.06	71.36	0.01	1.17	0.01	Orangish brown LIMESTONE
DSRC415	31.20	D	Y	N		25	100		3.45	100.00	0.35	1.37	0.47	Yellowish brown LIMESTONE
DSRC415	31.20	A	X	N	100		40		0.70	71.36	0.14	1.17	0.16	Yellowish brown LIMESTONE
DSRC415	34.90	D	Y	N		25	100		4.79	100.00	0.48	1.37	0.65	Light brown LIMESTONE
DSRC415	34.90	A	X	N	100		30		1.42	61.80	0.37	1.10	0.41	Light brown LIMESTONE
DSRC415	42.00	D	Y	N		60	100		8.34	100.00	0.83	1.37	1.14	Yellowish brown LIMESTONE
DSRC415	42.00	A	X	N	100		55		6.02	83.68	0.86	1.26	1.08	Yellowish brown LIMESTONE
DSRC415	42.32	D	Y	N		55	100		4.85	100.00	0.49	1.37	0.66	Yellowish brown LIMESTONE
DSRC415	42.32	A	X	N	100		55		6.96	83.68	0.99	1.26	1.25	Yellowish brown LIMESTONE
DSRC415	42.53	D	Y	N		60	100		8.10	100.00	0.81	1.37	1.11	Yellowish brown LIMESTONE
DSRC415	42.53	A	X	N	100		55		2.19	83.68	0.31	1.26	0.39	Yellowish brown LIMESTONE
DSRC415	42.71	D	Y	N		45	100		7.46	100.00	0.75	1.37	1.02	Yellowish brown LIMESTONE
DSRC415	42.71	A	X	N	100		45		0.94	75.69	0.16	1.21	0.20	Yellowish brown LIMESTONE
DSRC415	42.80	D	Y	N		70	100		3.60	100.00	0.36	1.37	0.49	Yellowish brown LIMESTONE
DSRC415	42.80	A	X	N	100		60		6.42	87.40	0.84	1.29	1.08	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				34888	TB			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC415	46.70	D	Y	N		50	100	6.36	100.00	0.64	1.37	0.87	Yellowish brown LIMESTONE	
DSRC415	46.70	A	X	N	100		45	3.64	75.69	0.64	1.21	0.77	Yellowish brown LIMESTONE	
DSRC415	46.75	D	Y	N		50	100	4.77	100.00	0.48	1.37	0.65	Yellowish brown LIMESTONE	
DSRC415	46.75	A	X	N	100		55	3.26	83.68	0.47	1.26	0.59	Yellowish brown LIMESTONE	
DSRC415	46.80	D	Y	N		60	100	5.23	100.00	0.52	1.37	0.71	Yellowish brown LIMESTONE	
DSRC415	46.80	A	X	N	100		50	6.45	79.79	1.01	1.23	1.25	Yellowish brown LIMESTONE	
DSRC415	46.85	D	Y	N		55	100	7.21	100.00	0.72	1.37	0.98	Yellowish brown LIMESTONE	
DSRC415	46.85	A	X	N	100		45	1.37	75.69	0.24	1.21	0.29	Yellowish brown LIMESTONE	
DSRC415	46.90	D	Y	N		40	100	2.00	100.00	0.20	1.37	0.27	Yellowish brown LIMESTONE	
DSRC415	46.90	A	X	N	100		60	3.67	87.40	0.48	1.29	0.62	Yellowish brown LIMESTONE	
DSRC419	3.98	D	Y	N		40	100	11.40	100.00	1.14	1.37	1.56	Yellowish brown LIMESTONE	
DSRC419	3.98	A	X	N	100		60	2.10	87.40	0.27	1.29	0.35	Yellowish brown LIMESTONE	
DSRC419	8.05	D	Y	N		60	100	9.29	100.00	0.93	1.37	1.27	Light brown LIMESTONE	
DSRC419	8.05	A	X	N	100		65	9.32	90.97	1.13	1.31	1.47	Light brown LIMESTONE	
DSRC419	8.10	D	Y	N		60	100	10.82	100.00	1.08	1.37	1.48	Light brown LIMESTONE	
DSRC419	8.10	A	X	N	100		60	12.97	87.40	1.70	1.29	2.18	Light brown LIMESTONE	
DSRC419	8.15	D	Y	N		60	100	6.25	100.00	0.63	1.37	0.85	Light brown LIMESTONE	
DSRC419	8.15	A	X	N	100		60	6.46	87.40	0.85	1.29	1.09	Light brown LIMESTONE	
DSRC419	8.20	D	Y	N		70	100	6.70	100.00	0.67	1.37	0.92	Yellowish brown LIMESTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				34888	TB			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC419	8.20	A	X	N	100		70		6.64	94.41	0.75	1.33	0.99	Yellowish brown LIMESTONE
DSRC419	8.25	D	Y	N		50	100		7.50	100.00	0.75	1.37	1.02	Yellowish brown LIMESTONE
DSRC419	8.25	A	X	N	100		50		3.27	79.79	0.51	1.23	0.63	Yellowish brown LIMESTONE
DSRC419	17.17	D	Y	N		30	100		8.72	100.00	0.87	1.37	1.19	Yellowish brown LIMESTONE
DSRC419	17.17	A	X	N	100		50		13.89	79.79	2.18	1.23	2.69	Yellowish brown LIMESTONE
DSRC419	29.20	D	Y	N		30	100		2.88	100.00	0.29	1.37	0.39	Orangish brown LIMESTONE
DSRC419	29.20	A	X	N	100		30		11.15	61.80	2.92	1.10	3.21	Orangish brown LIMESTONE
DSRC419	37.50	I	X	N	95	90	40		0.62	69.56	0.13	1.16	0.15	Yellowish brown LIMESTONE
DSRC419	38.40	D	Y	N		40	100		3.97	100.00	0.40	1.37	0.54	Orangish brown LIMESTONE
DSRC419	38.40	A	X	N	100		60		2.98	87.40	0.39	1.29	0.50	Orangish brown LIMESTONE
DSRC419	38.50	D	Y	N		50	100		3.71	100.00	0.37	1.37	0.51	Orangish brown LIMESTONE
DSRC419	38.50	A	X	N	100		45		2.01	75.69	0.35	1.21	0.42	Orangish brown LIMESTONE
DSRC419	38.68	D	Y	N		40	100		0.08	100.00	0.01	1.37	0.01	Orangish brown LIMESTONE
DSRC419	38.68	A	X	N	100		50		1.02	79.79	0.16	1.23	0.20	Orangish brown LIMESTONE
DSRC419	45.90	D	Y	N		50	100		0.11	100.00	0.01	1.37	0.02	Grey SILTSTONE
DSRC419	45.90	A	X	N	100		60		0.10	87.40	0.01	1.29	0.02	Grey SILTSTONE
DSRC419	55.40	D	Y	N		45	100		0.15	100.00	0.02	1.37	0.02	Grey SILTSTONE
DSRC419	55.40	A	X	N	100		60		0.52	87.40	0.07	1.29	0.09	Grey SILTSTONE

general remarks



tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	34888	TB
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

ISRM Suggested Method
Determination of Shear Strength by Direct Shear on Rock Sample
 (large shearbox apparatus)

Borehole No: DSRC404 Sample No: 33CS Depth (m): 27.00 - 27.50	Description: Medium strong yellowish brown and light brown LIMESTONE. Moderately to slightly weathered. Natural shear plane with no infill material. Joint roughness coefficient = 10-12. Debris is fine to coarse gravel and sand.
---	--

Specimen Details				
Type of shear plane	Pre existing plane of weakness: Joint			
Preparation	Rock core encapsulated in concrete avoiding shear plane then positioned in shearbox with shear plane parallel to interface of top and bottom halves of shearbox.			
Specimen Number	1			
Maximum Length	<i>mm</i>	111.1		
Maximum Width	<i>mm</i>	104.3		
Area	<i>mm²</i>	8788.3		
Shearing Stage				
Normal stress	<i>kPa</i>	100	300	600
Peak Conditions:				
Rate of horizontal displacement	<i>mm/min</i>	0.1	0.1	0.1
Maximum shear stress	<i>kPa</i>	450.6	290.0	428.3
Horizontal displacement at MSS	<i>mm</i>	4.1	14.8	34.1
Residual Conditions:				
Rate of horizontal displacement	<i>mm/min</i>	0.1	0.1	0.1
Residual shear stress	<i>kPa</i>	316.7	209.7	325.7
Final cumulative displacement	<i>mm</i>	39.7		
Duration	<i>day(s)</i>	1	1	1
Shear Strength Parameters				
Maximum Condition:				
Apparent Cohesion	<i>kPa</i>	25.3¹		
Angle of Shearing Resistance	<i>degrees</i>	35.5¹		
Residual Condition:				
Apparent Cohesion	<i>kPa</i>	15.6¹		
Angle of Shearing Resistance	<i>degrees</i>	28.5¹		
Notes:	¹ Peak and residual angles of shear resistance based upon the 2nd and 3rd shear stages only.			

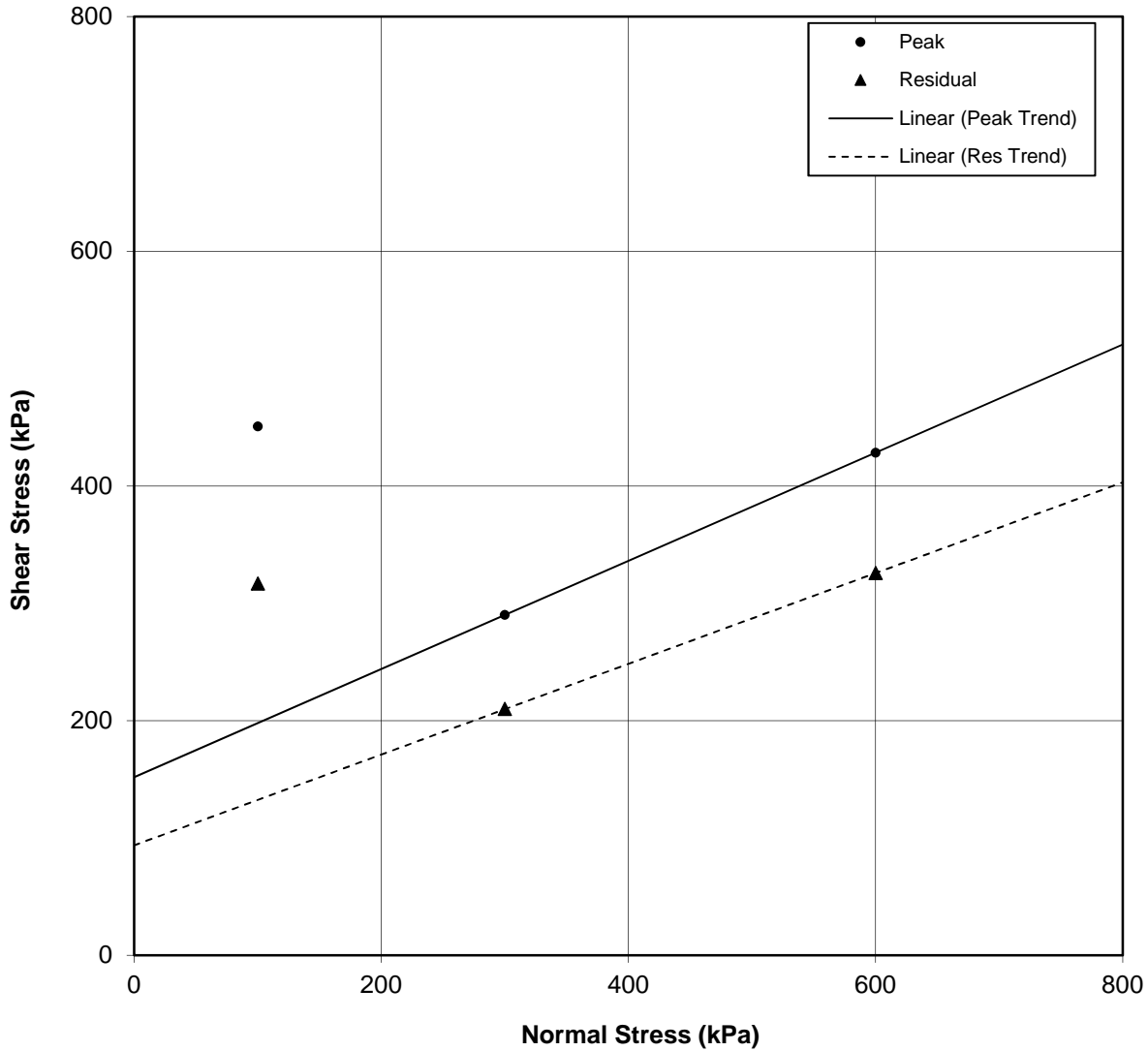
Checked and Approved by  S R Allen (Senior Tech) Date: 13/06/2019	Project Number: GEO / 29176 Project Name: HE551505 A417 MISSING LINK GROUND INVESTIGATION	
---	--	---

ISRM Suggested Method
Determination of Shear Strength by Direct Shear on Rock Sample
 (large shearbox apparatus)

Borehole No: DSRC404
 Sample No: 33CS
 Depth (m): 27.00 - 27.50

Description:
 Medium strong yellowish brown and light brown LIMESTONE. Moderately to slightly weathered. Natural shear plane with no infill material. Joint roughness coefficient = 10-12. Debris is fine to coarse gravel and sand.

Shear Stress v Normal Stress



Peak: $c' = 25.3$ **Residual:** $c'r = 15.6$
 $\Phi' = 35.5$ $\Phi' r = 28.5$

Checked and Approved by



S R Allen (Senior Tech)

Date: 13/06/2019

Project Number:

GEO / 29176

Project Name:

HE551505 A417 MISSING LINK GROUND INVESTIGATION

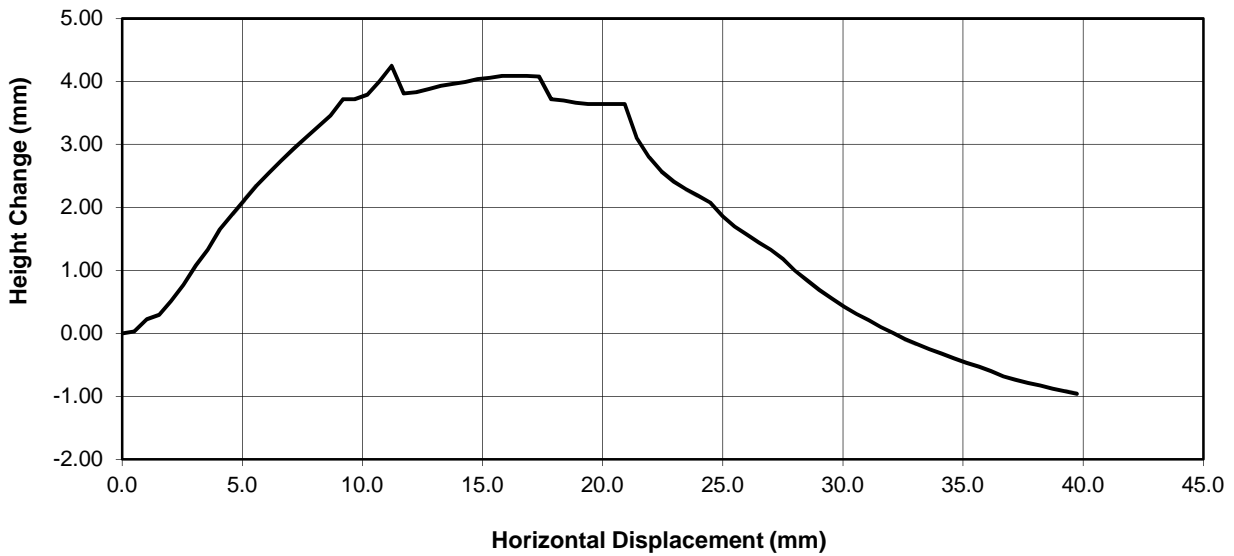


ISRM Suggested Method
Determination of Shear Strength by Direct Shear on Rock Sample
 (large shearbox apparatus)

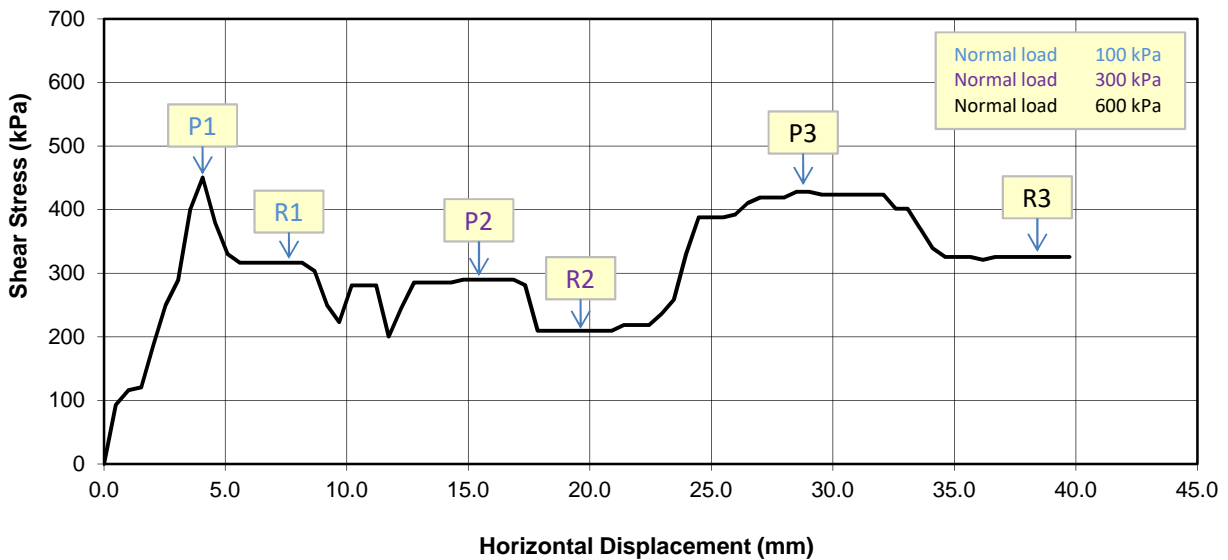
Borehole No: DSRC404
 Sample No: 33CS
 Depth (m): 27.00 - 27.50

Description:
 Medium strong yellowish brown and light brown
 LIMESTONE. Moderately to slightly weathered. Natural
 shear plane with no infill material. Joint roughness
 coefficient = 10-12. Debris is fine to coarse gravel and sand.

Height Change v Horizontal Displacement



Shear Stress v Horizontal Displacement



Checked and Approved by



S R Allen (Senior Tech)

Date: 13/06/2019

Project Number:

GEO / 29176

Project Name:

HE551505 A417 MISSING LINK GROUND INVESTIGATION





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Report - 65047/K

REPORT ON THE PETROGRAPHIC EXAMINATION OF THREE SEDIMENT SAMPLES –
CLIENT: GEOTECHNICAL ENGINEERING LIMITED
PROJECT: HE551505 A417 MISSING LINK GROUND INVESTIGATION



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This report comprises
9 pages of text
Appendix A – 3 pages / photographs
Appendix B – 9 pages / photomicrographs

27 June 2019

For the attention of Wendy Jones

Partners: NCD Sandberg SC Clarke DJ Ellis AA Willmott RA Rogerson MA Eden JD French CMorgan GSMayers GCS Moor JFagan JHDell
Senior Associates: RDEasthope IMHudson SRPMorris MI Ingle M Faliva RALucas ALPitman DAKinnersley ATHollyman JGlen DrWRNewby
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Report - 65047/K

REPORT ON THE PETROGRAPHIC EXAMINATION OF THREE SEDIMENT SAMPLES –
CLIENT: GEOTECHNICAL ENGINEERING LIMITED
PROJECT: HE551505 A417 MISSING LINK GROUND INVESTIGATION

1 INTRODUCTION

Three sediment cores were submitted to the laboratory for analysis on 26 April 2019. It was requested that petrographic analysis be carried out on the samples. Instructions to proceed with the analysis of the samples were submitted under Purchase Order Reference: 34888/WJ.

2 SAMPLES

<i>Laboratory reference</i>	<i>Client reference no.</i>	<i>Depth</i>	<i>Core diameter/length</i>
K15171/1	DSRC404, No. 24	16.70m	100/127-180mm
K15171/2	DSRC408, No. 14	8.80m	100/130-172mm
K15171/3	DSRC408, No. 30	22.95m	100/85-123mm



3 TEST METHODS

3.1 Petrographic examination

The petrographic testing was carried out in accordance with the ISRM Suggested Method for Petrographic Examination of Rocks¹ using descriptive terminology where possible as defined in BS 5930 and BS EN ISO 14689 2018. In brief the following work was carried out.

- (i) The sample was examined as received, photographed and described visually.
- (ii) The sample was tested qualitatively for stability in water.
- (iii) A fluorescent resin impregnated thin section was prepared from the sample. The thin section was orientated parallel with the core axis and was taken from a selected representative portion of the sample. The thin section measured about 50x75mm. The thin section preparation was carried out without the use of water using an oil-based cutting fluid to ensure the preservation of water-soluble materials.
- (iv) The thin section was examined with a Zeiss petrological photomicroscope and the distribution of porosity and microcracking was assessed from an examination of the thin section in fluorescent light using the petrological microscope.

¹ from Rock Characterisation Testing and Monitoring, ISRM Suggested Methods, Published by Pergamon Press 1981.

4 PETROGRAPHIC DESCRIPTION OF THE SAMPLES

4.1 Sample 24, Borehole DSRC404 (K15171/1)

(i) Visual description

A photograph illustrating the sample as received is given in Figure A1 in Appendix A. The macroscopic features of the sample are described as follows:

Geomaterials sample ref.	K15171/1
Client sample ref.	DSRC404, No. 24 (Depth: 16.7m)
Rock type	Limestone (Bio-peloidal sparite)
Strength classification <small>Note 1 / characteristics</small>	The sample has an estimated strength of strong (50-100MPa) and typically broke along stylolites perpendicular to the core axis.
Macroscopic structure	The sample exhibits a peloidal texture. The peloids are typically composed of shell fragments and sand particles which are supported by a highly calcareous matrix. These clasts appear to vary in size from 1-5mm. No bedding is visible within the sample. The sample is slightly weathered and is discolored to medium brownish yellow. This discoloration typically occurs along a plane parallel to the core axis, and can also be seen along stylolites within the sample.
Colour	Light yellowish grey.
Grain size	Very fine grained.
Stylolites	Minor amounts of tight undulating stylolites which are infilled with very fine grained orangish brown material. They typically occur perpendicular to the core axis.
Water stability <small>Note 2</small> (description after 24hrs in water)	Fairly Stable / Grade 2

Note 1: Strength terms as defined in BS EN ISO 14689:2018.

Note 2: Water stability terms defined as in BS EN ISO 14689:2018.



(ii) Petrographic description

A photograph of the thin section showing the large-scale structure of the sample is given in Figure B1 in Appendix B and Figures B2 and B3 illustrates and describes the texture and mineralogy of the sample. The petrographic description of the sample is as follows:

Geomaterials sample ref.	K15171/1	
Client sample ref.	DSRC404, No. 24 (Depth: 16.7m)	
Mineral / Estimated Vol. %	Typical grain size, mm:	Mode of occurrence
Carbonate minerals / 53%	0.04-0.2	Occurs as subhedral sparry calcite crystals which can be seen replacing relict bioclasts as well as occurring in the matrix.
Microcrystalline carbonate minerals ^{Note1/} 45%	<0.005	Occurs as concentrations of micrite forming peloids and occurring as concentric rings surrounding relict bioclasts. Sometimes this material also occurs in localised patches.
Iron oxide minerals / 2%	0.01-0.07	Occurs as subhedral spherical crystals which are typically substantially altered. These crystals resemble geologically altered pyrite that is completely replaced by iron oxides.
Quartz / <1%	0.04-0.16	Occurs as subrounded to subangular fine silt grade particles.
Summary description of texture	The sample is matrix supported and composed of abundant elongate to spherical, well rounded peloids. They are typically between 0.7-3mm in size and are evenly distributed throughout the sample. Moderate to major amounts of these peloids contain relict bioclastic nuclei which have been replaced by sparry calcite. The matrix is typically composed of sparry calcite and is typically evenly distributed with rare patches of coarse calcite crystals. Moderate patches of micritic matrix occur sporadically within the sample and rarely occur as elongated patches perpendicular to the core axis. Minor amounts of bioclasts occur within the sample as aragonitic shell fragments and are typically sparse. The iron oxide minerals typically occur within the micritic layers of peloids and rarely as patches within the matrix. They are typically evenly dispersed throughout the sample and appear to stain the surrounding material in planes of alteration. Minor amounts of stylolites occur perpendicular to the core axis. They are typically infilled with iron oxide minerals.	
Porosity and microcracking	The sample is highly porous, typically concentrated within the peloids. Microcracks are present through many peloids and appear to be associated with the iron oxide minerals.	
Weathering and alteration	The sample exhibits moderate weathering which is typically localised in patches and along cracking. In these areas the iron oxide minerals appear to be more substantially altered.	

Note 1: X-ray diffraction analysis is required to identify the carbonate minerals.

4.1 Sample 14, Borehole DSRC408 (K15171/2)

(i) Visual description

A photograph illustrating the sample as received is given in Figure A2 in Appendix A. The macroscopic features of the sample are described as follows:

Geomaterials sample ref.	K15171/2
Client sample ref.	DSRC408, No.14 (depth: 8.8m)
Rock type	Limestone (Bio-peloidal sparite)
Strength classification ^{Note 1} / characteristics	The sample has an estimated strength of Medium Strong (25-50MPa) and typically broke along patches of discoloration.
Macroscopic structure	The sample exhibits a peloidal texture. The peloids are typically composed of shell fragments which are supported by a highly calcareous matrix. They vary in size from 1-2mm. There is no visible bedding in this sample. The sample is lightly weathered and exhibits localized discoloration. This discoloration typically occurs in patches and is medium brownish yellow.
Colour	Light yellow grey.
Grain size	Very fine grained.
Cracking	None seen.
Water stability ^{Note 2} (description after 24hrs in water)	Stable / Grade 1

Note 1: Strength terms as defined in BS EN ISO 14689:2018.

Note 2: Water stability terms defined as in BS EN ISO 14689:2018.



(ii) Petrographic description

A photograph of the thin section showing the large-scale structure of the sample is given in Figure B4 in Appendix B and Figures B5 and B6 illustrate and describe the texture and mineralogy of the sample. The petrographic description of the sample is as follows:

Geomaterials sample ref.	K15171/2	
Client sample ref.	DSRC408, No.14 (depth: 8.8m)	
Mineral / Estimated Vol. %	Typical grain size, mm:	Mode of occurrence
Carbonate minerals / 50%	0.04-0.3	Occurs as subhedral sparry calcite crystals which can be seen replacing relict bioclasts as well as occurring in the matrix.
Microcrystalline carbonate minerals ^{Note1} / 47%	<0.005	Occurs as concentrations of micrite forming peloids and occurring as concentric rings surrounding relict bioclasts. Sometimes this material also occurs in localised patches.
Iron oxide minerals / 3%	0.01-0.05	Occurs as subhedral spherical crystals which are typically substantially altered. These crystals resemble geologically altered pyrite that has been completely replaced by iron oxides.
Feldspars / <1%	0.04-0.08	Occurs as subhedral crystals which are sparsely distributed throughout the sample.
Quartz / <1%	0.02-0.05	Occurs as subrounded to subangular fine silt grade particles that are sparsely distributed throughout the sample.
Summary description of texture	The sample is matrix supported and composed of abundant elongate to spherical, well rounded peloids. They are typically between 0.4-1.2mm in size and are evenly distributed throughout the sample. Many of the peloids contain relict bioclastic nuclei which have been replaced with sparry calcite. The matrix is typically composed of sparry matrix which is evenly distributed throughout the sample and rarely occurs in patches of coarse calcite crystals. Moderate amounts of micritic matrix occur as sporadic localised patches. Minor amounts of bioclasts occur within the sample as aragonitic shell fragments that are typically sparse and are concentrated within micritic areas. Trace foraminifera microfossils occur sparsely throughout the sample. The iron oxide minerals typically occur within the micritic layers of peloids and rarely as patches within the matrix. They are typically evenly dispersed throughout the sample and appear to stain the surrounding material in planes of alteration. The silt grade quartz is typically sparse and evenly distributed.	
Porosity and microcracking	The sample has major porosity associated with the micritic layers in the peloids. The sparry matrix typically has very low microporosity and in patches of micritic matrix has moderate porosity. The sample exhibits trace amounts of microcracking which is associated with areas of alteration.	
Weathering and alteration	The sample exhibits moderate weathering which is typically localised in patches. In these areas the iron oxide minerals appear to be more substantially altered.	

Note 1: X-ray diffraction analysis is required to identify the carbonate minerals.

4.2 Sample 30, Borehole DSRC408 (K15171/3)

(i) Visual description

A photograph illustrating the sample as received is given in Figure A3 in Appendix A. The macroscopic features of the sample are described as follows:

Geomaterials sample ref.	K15171/3
Client sample ref.	DSRC408, No. 30 (depth: 22.95m)
Rock type	Siltstone
Strength classification <small>Note 1 / characteristics</small>	The sample has an estimated strength of Extremely Weak (0.6-1MPa).
Macroscopic structure	The sample is thinly laminated and is slightly to non-calcareous. The laminations typically range from dark green clay like material to light yellow layers of silt grade material. The laminations are typically considered to be undulating. The sample is moderately weathered and exhibits planes of orangish brown discoloration as well as the top of the sample being partially disintegrated.
Colour	Dark brownish green.
Grain size	Very fine grained.
Cracking	Minor amounts of partly open cracks occur along laminations which are perpendicular to the core axis.
Water stability <small>Note 2</small> (description after 24hrs in water)	Unstable / Grade 4

Note 1: Strength terms as defined in BS EN ISO 14689:2018.

Note 2: Water stability terms defined as in BS EN ISO 14689:2018.



(ii) Petrographic description

A photograph of the thin section showing the large-scale structure of the sample is given in Figure B7 in Appendix B and Figures B8 and B9 illustrate and describe the texture and mineralogy of the sample. The petrographic description of the sample is as follows:

Geomaterials sample ref.	K15171/3	
Client sample ref.	DSRC408, No. 30 (depth: 22.95m)	
Mineral / Estimated Vol. %	Typical grain size, mm:	Mode of occurrence
Quartz / 77%	0.025-0.08	Occurs as subrounded to subangular fine silt grade particles and sometimes occurs within lenses.
Calcite / 7%	0.002-0.05	Occurs as subhedral crystals and appear to form patches where they are more abundant.
Muscovite mica / 5%	0.005-0.025	Occurs as subhedral platy crystals which are typically moderately aligned.
Feldspars / 5%	0.03-0.06	Occurs as subhedral to anhedral crystals which typically occur as plagioclase feldspar. Trace amounts of these particles occur as microcline.
Pyrite / 3%	0.05-0.25	Occurs as framboidal crystals.
Sheet silicates / 3%	<0.002	Occurs as amorphous crystals that are too fine to be fully identified in thin section. They are present as patches within the matrix.
Chlorite / <1%	<0.005	Occurs as fibrous crystals.
Summary description of texture	The sample is grain supported and dominated by silt grade quartz particles that are 0.025-0.08mm in size and are evenly distributed throughout the sample. Minor amounts of calcite occur within sporadic localised patches in the sample. Moderately aligned mica crystals occur throughout the sample and are typically evenly distributed. Feldspar, pyrite and sheet silicates occur sparsely throughout the sample and are evenly distributed. Trace amounts of chlorite occur sparsely throughout the sample and are evenly distributed. Moderate amounts of lenses composed of almost entirely silt grade quartz and trace amounts of mica occur throughout the sample. They are typically up to 5mm thick and occur perpendicular to the core axis.	
Porosity and microcracking	The sample has major porosity which typically occurs between the quartz particles. No microcracking has been seen within the sample.	
Weathering and alteration	The sample exhibits moderate weathering where the pyrite crystals are moderately to substantially altered throughout the sample.	

Note 1: X-ray diffraction analysis is required to identify the carbonate minerals.



5 REMARKS

The above concludes the requested programme of testing. Please do not hesitate to contact us if we can be of any further assistance in this matter.

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GL2 4NF

for GEOMATERIALS RESEARCH SERVICES
(part of Sandberg LLP)

C. Walden, BSc., FGS
Geologist

For the attention of Wendy Jones

M. A. Eden, BSc., MSc., FGS., C.Geol. FIMMM
Partner

27 June 2019

Samples can only be retained for a period of one month from the date of issue of the report unless we are instructed otherwise.
Samples can be returned or retained for a further charge.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

APPENDIX A – PHOTOGRAPHS ILLUSTRATING THE SAMPLES AS RECEIVED

Figure A1

Sample 24, Borehole DSRC404 (K15171/1)

The sample as received, longitudinal split surface:



Figure A2

Sample 14, Borehole DSRC408 (K15171/2)

The sample as received, longitudinal split surface:



Figure A3

Sample 30, Borehole DSRC408 (K15171/3)

The sample as received, longitudinal split surface:



APPENDIX B – PHOTOMICROGRAPHS ILLUSTRATING THE THIN SECTION

Figure B1

Sample 24, Borehole DSRC404 (K15171/1)

Photograph illustrating the entire area of the thin section prepared from the sample:

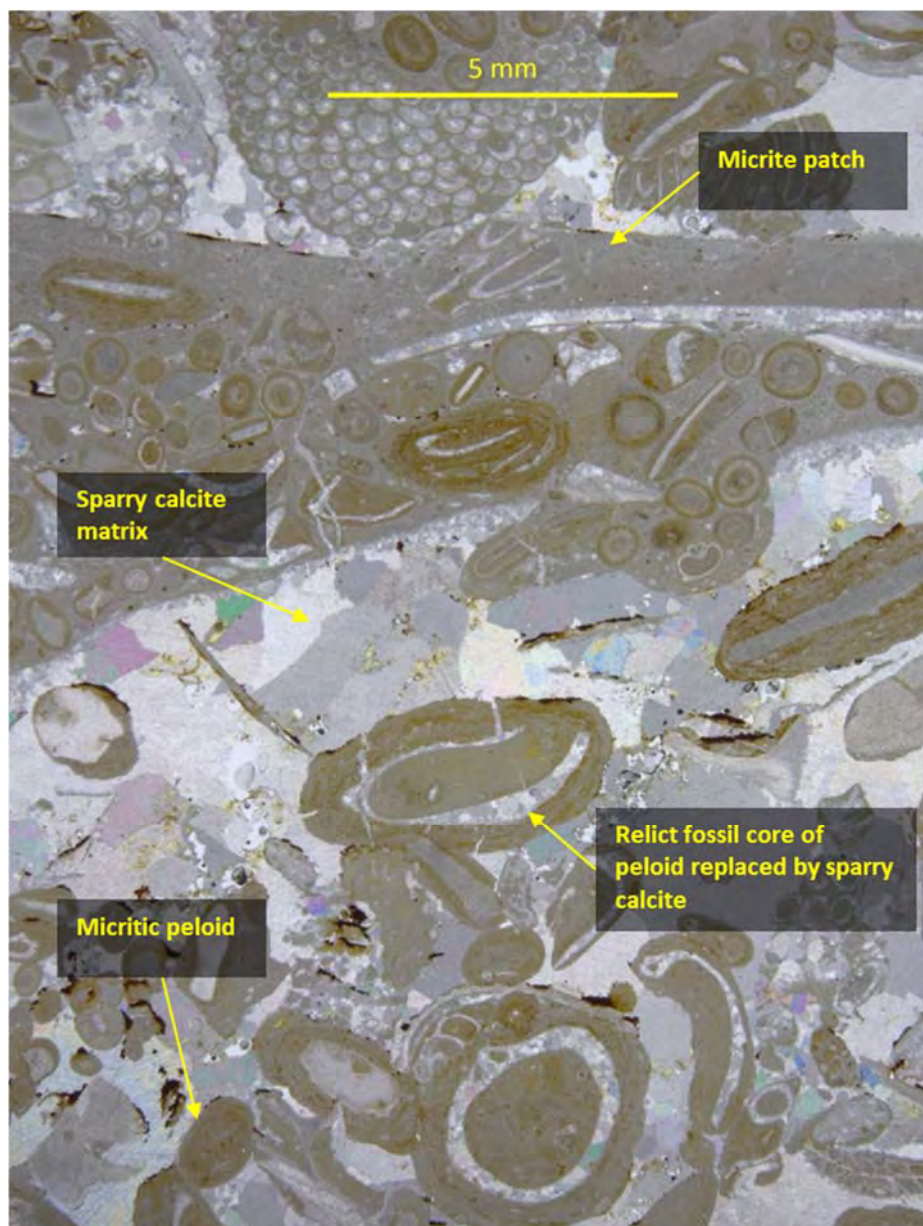


Figure B2

Sample 24, Borehole DSRC404 (K15171/1)

Thin section, crossed polars: View showing the general appearance of the sample. The view is dominated by sparry calcite matrix, for example in D1 to F2. A micritic peloid can be seen in D3 to E4.

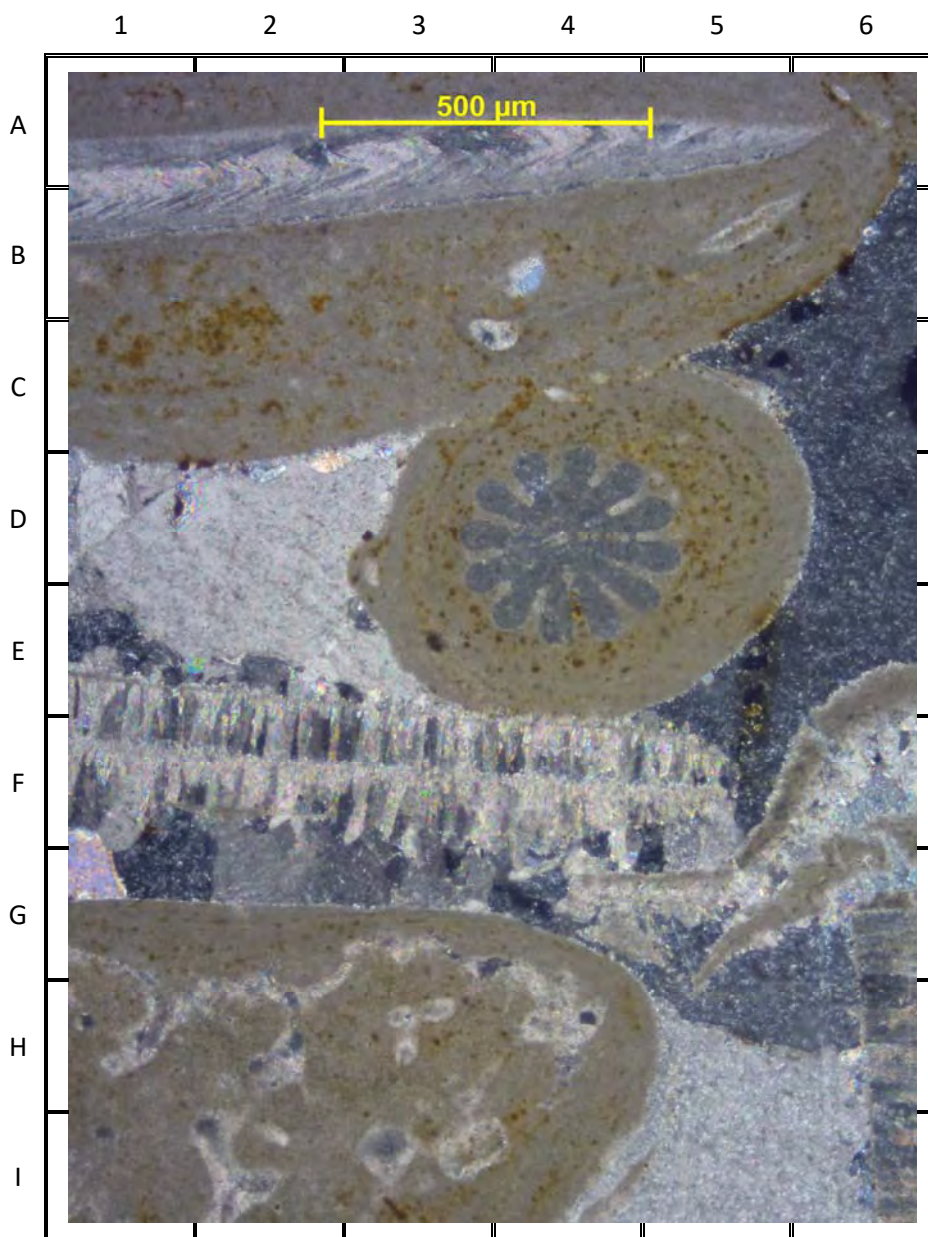


Figure B3

Sample 24, Borehole DSRC404 (K15171/1)

Thin section, crossed polars: View showing peloids with bioclastic nuclei. Relict aragonite crystals and can be seen in A1-C2/3. Sparry calcite can be seen in D4/5. A bioclastic nucleus can be seen in I2/3 to F5. This nucleus is surrounded by micritic material, for example in F3.

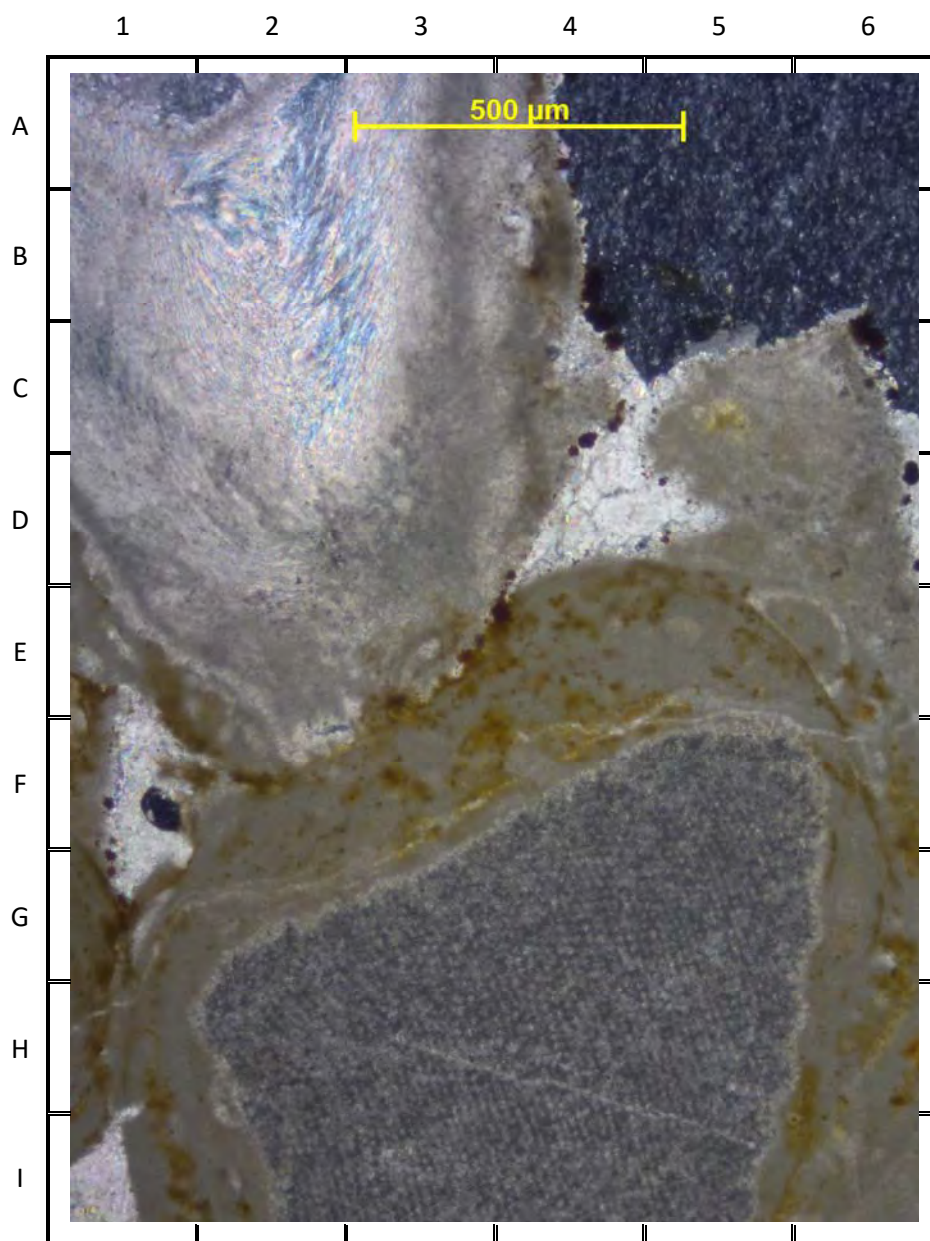


Figure B4

Sample 14, Borehole DSRC408 (K15171/2)

Photograph illustrating the entire area of the thin section prepared from the sample:

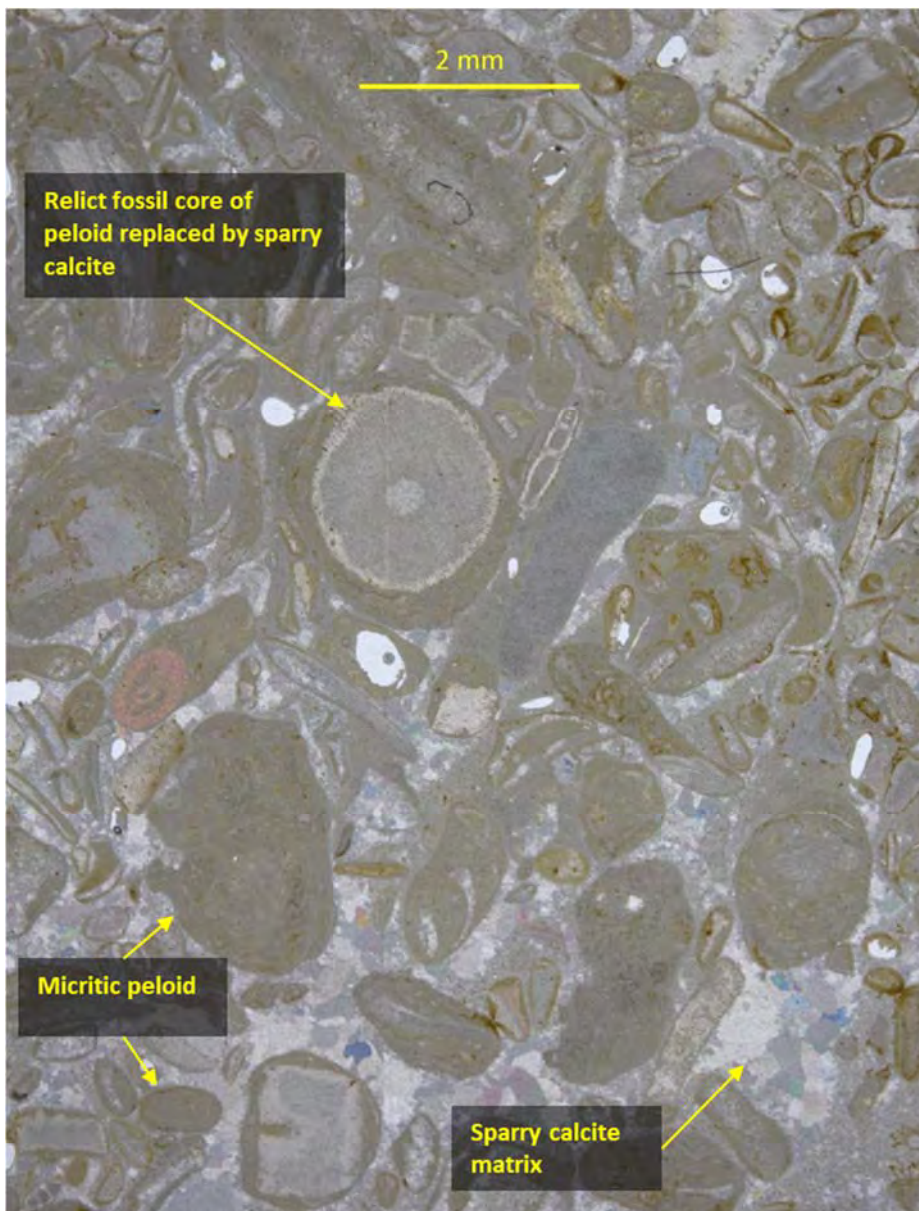


Figure B5

Sample 14, Borehole DSRC408 (K15171/2)

Thin section, crossed polars: View showing the general appearance of the limestone (bio-peloidal sparite). The image is dominated by sparry calcite crystals seen for example in C5/6 and G3 to H4. A micritic peloid can also be seen in this view in I1 to I5.

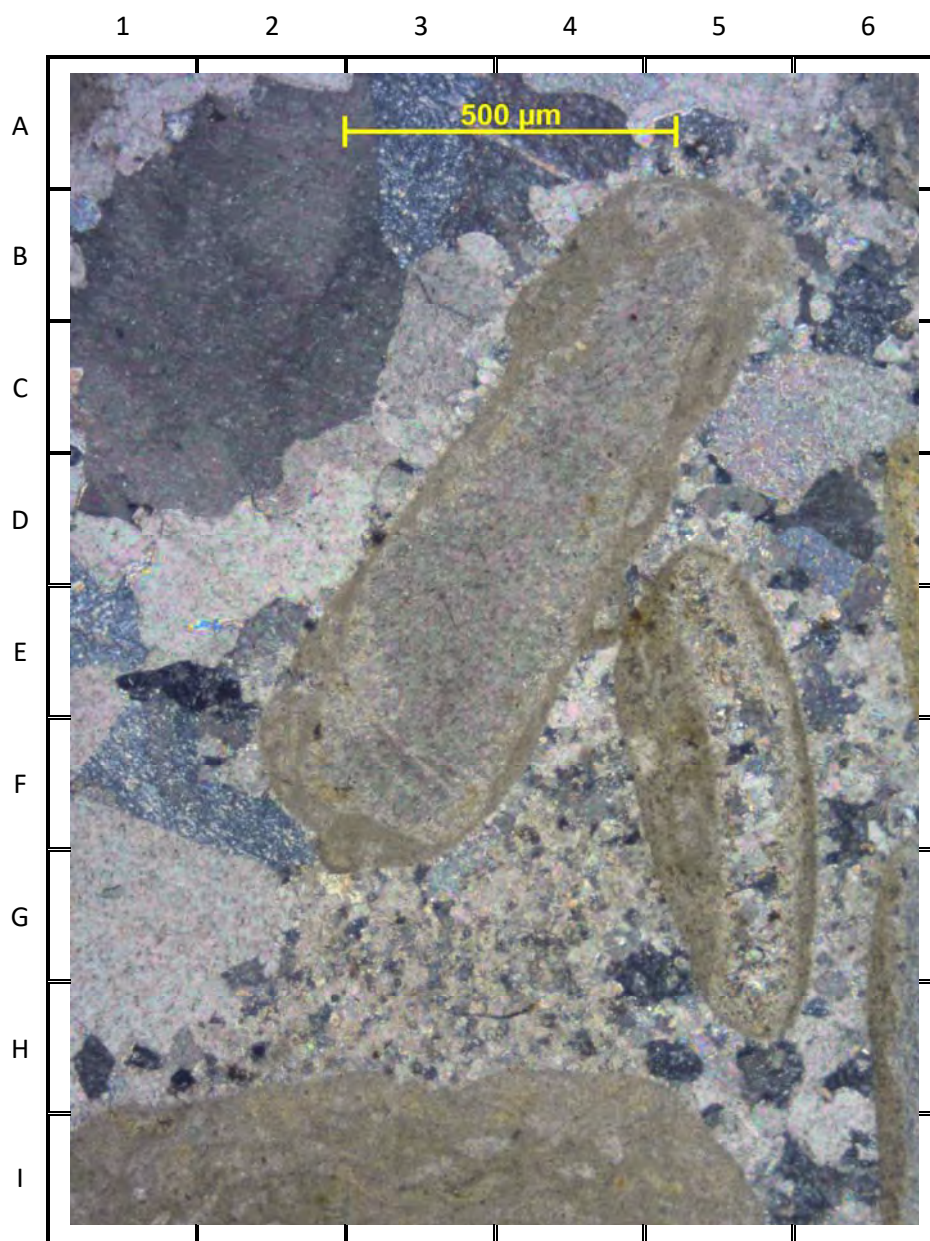


Figure B6

Sample 14, Borehole DSRC408 (K15171/2)

Thin section, crossed polars: View showing a slightly weathered area within the sample where the iron oxide minerals are staining the surrounding peloids, for example in I3/4 to H/I5. The image is dominated by interlocking sparry calcite crystals seen for example in A5 to A6. A micritic peloid can be seen in F3 to G5.

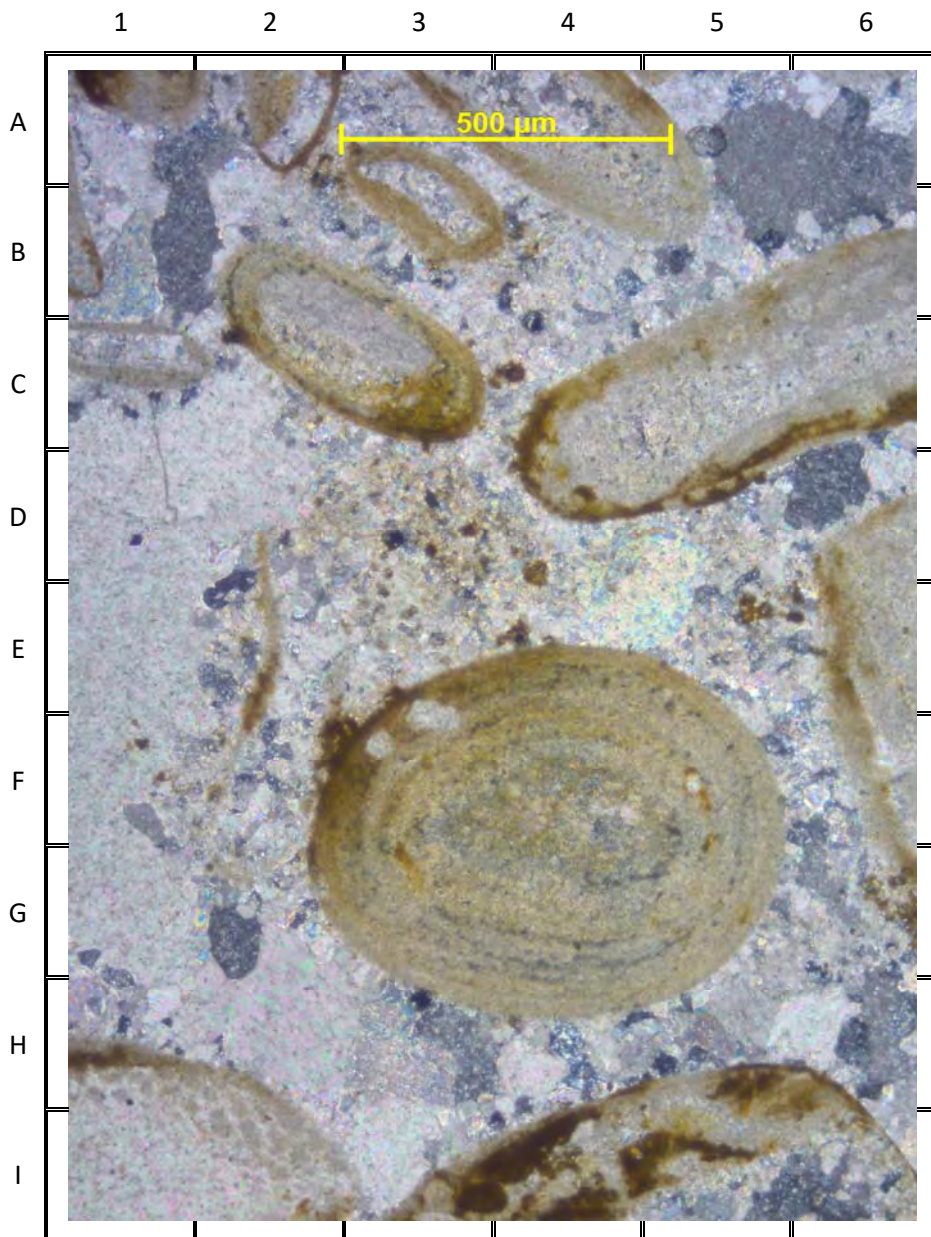


Figure B7

Sample 30, Borehole DSRC408 (K15171/3)

Photograph illustrating the entire area of the thin section prepared from the sample:

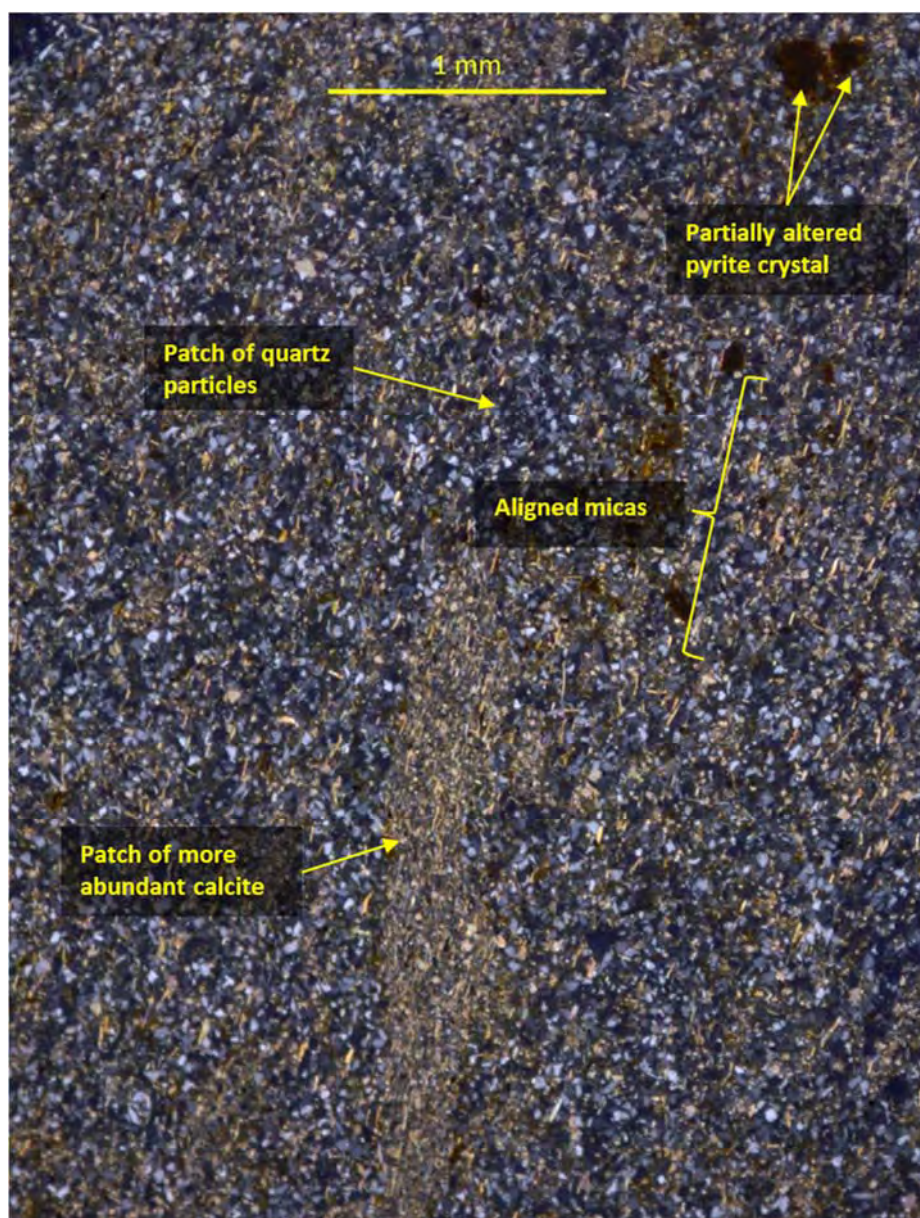


Figure B8

Sample 30, Borehole DSRC408 (K15171/3)

Thin section, crossed polars: View showing the typical appearance of the siltstone. The image is dominated by abundant quartz crystals, for example in C3 and F4. Mica crystals can be seen in this view, such as in D/E2/3. An example of a chlorite patch can also be seen in E/F4.

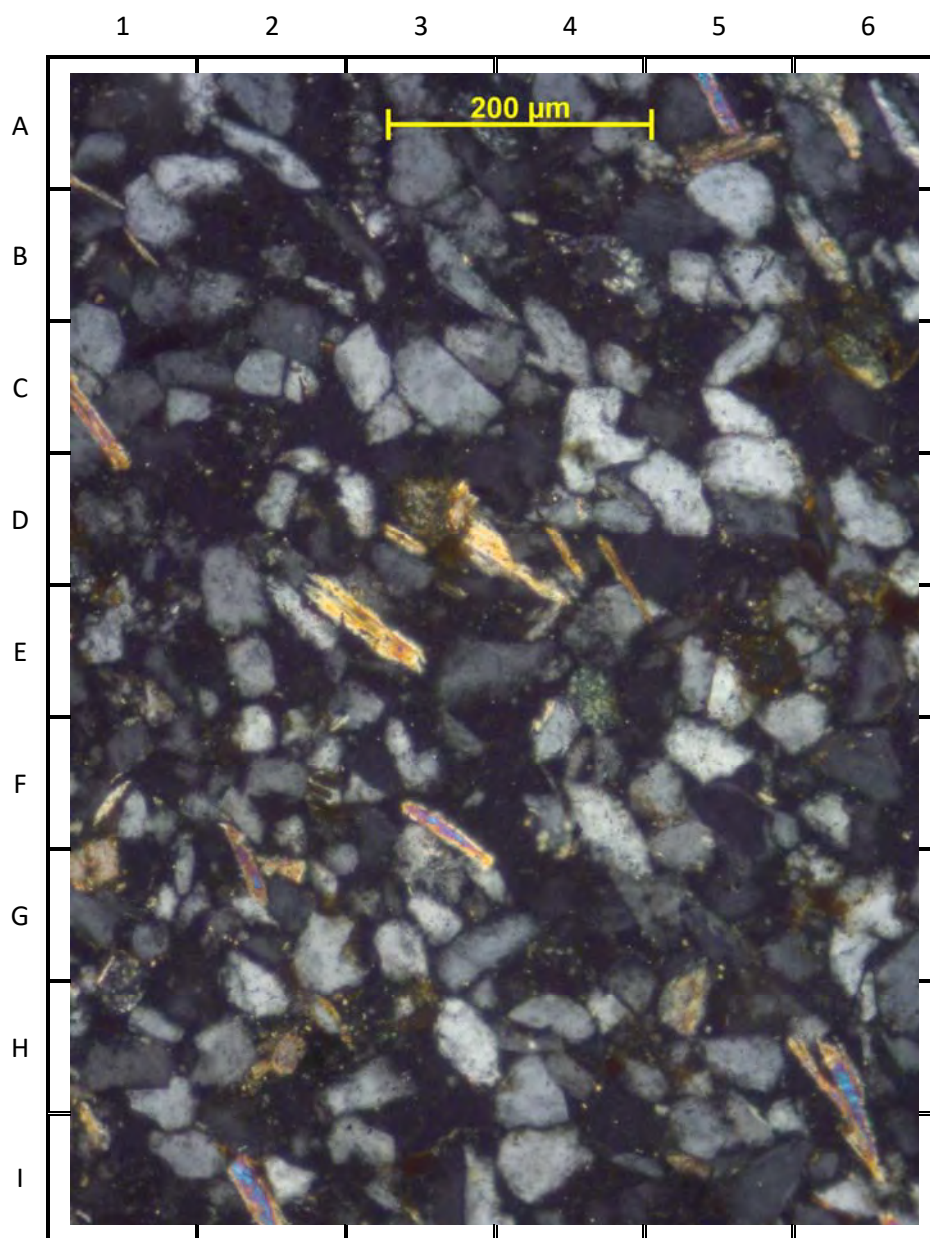
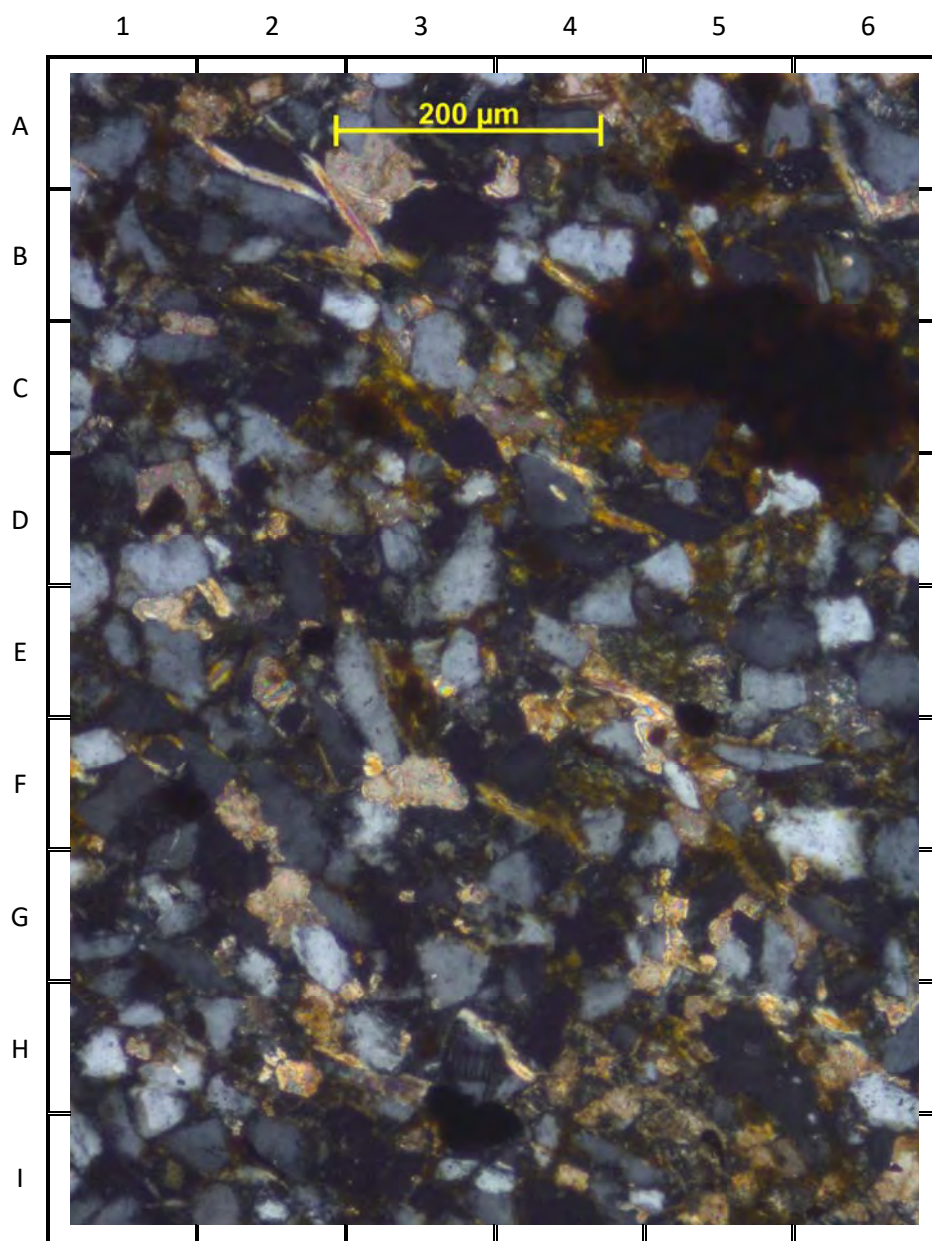


Figure B9

Sample 30, Borehole DSRC408 (K15171/3)

Thin section, crossed polars: View of calcite crystals within the sample. Quartz crystals can be seen in E6 and D1/2. An example of calcite can be seen in E3 and G2. Partially altered pyrite can be seen in B/C4 to C6. An example of a feldspar crystal can be seen in H3/4.



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Where our involvement consists exclusively of testing samples, the results and our conclusions relate only to the samples tested.





APPENDIX C

CHEMICAL ANALYSES



Emma Leivers

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WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-24098

Project / Site name:	HE551505 A417 Missing link Ground Investigation	Samples received on:	08/01/2019
Your job number:	34888-DO	Samples instructed on:	08/01/2019
Your order number:		Analysis completed by:	15/01/2019
Report Issue Number:	1	Report issued on:	15/01/2019
Samples Analysed:	1 leachate sample - 1 soil sample		

Signe

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.



Analytical Report Number: 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Lab Sample Number				1126641				
Sample Reference				DSRC419				
Sample Number				2				
Depth (m)				0.30-0.50				
Date Sampled				07/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	4.6				
Total mass of sample received	kg	0.001	NONE	2.0				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
------------------	------	-----	-----------	--------------	--	--	--	--

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.8				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.019				
Total Sulphur	mg/kg	50	MCERTS	410				
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0075				

Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				

Total Phenols

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	0.26				
Acenaphthene	mg/kg	0.05	MCERTS	0.64				
Fluorene	mg/kg	0.05	MCERTS	0.62				
Phenanthrene	mg/kg	0.05	MCERTS	4.9				
Anthracene	mg/kg	0.05	MCERTS	1.4				
Fluoranthene	mg/kg	0.05	MCERTS	11				
Pyrene	mg/kg	0.05	MCERTS	9.1				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.8				
Chrysene	mg/kg	0.05	MCERTS	3.2				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	4.2				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	3.0				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.7				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	2.5				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.73				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.3				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	53.0				
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Analytical Report Number: 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Lab Sample Number				1126641				
Sample Reference				DSRC419				
Sample Number				2				
Depth (m)				0.30-0.50				
Date Sampled				07/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	42				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.30				
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	11				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	25000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	450				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	37				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	170				

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0				
Toluene	ug/kg	1	MCERTS	< 1.0				
Ethylbenzene	ug/kg	1	MCERTS	< 1.0				
p & m-xylene	ug/kg	1	MCERTS	< 1.0				
o-xylene	ug/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2.6				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	8.5				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	82				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	93				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	17				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	130				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	430				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	580				



Analytical Report Number: 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Lab Sample Number				1126641			
Sample Reference				DSRC419			
Sample Number				2			
Depth (m)				0.30-0.50			
Date Sampled				07/01/2019			
Time Taken				None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				

VOCs

Chloromethane	µg/kg	1	ISO 17025	< 1.0			
Chloroethane	µg/kg	1	NONE	< 1.0			
Bromomethane	µg/kg	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/kg	1	NONE	< 1.0			
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0			
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0			
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0			
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0			
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0			
Trichloromethane	µg/kg	1	MCERTS	< 1.0			
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0			
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0			
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0			
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0			
Benzene	µg/kg	1	MCERTS	< 1.0			
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0			
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0			
Trichloroethene	µg/kg	1	MCERTS	< 1.0			
Dibromomethane	µg/kg	1	MCERTS	< 1.0			
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0			
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0			
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0			
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/kg	1	NONE	< 1.0			
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0			
Chlorobenzene	µg/kg	1	MCERTS	< 1.0			
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0			
p & m-Xylene	µg/kg	1	MCERTS	< 1.0			
Styrene	µg/kg	1	MCERTS	< 1.0			
Tribromomethane	µg/kg	1	NONE	< 1.0			
o-Xylene	µg/kg	1	MCERTS	< 1.0			
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0			
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0			
Bromobenzene	µg/kg	1	MCERTS	< 1.0			
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0			
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0			
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0			
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0			
Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0			
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0			
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0			



Analytical Report Number: 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Lab Sample Number				1126642				
Sample Reference				DSRC419				
Sample Number				2				
Depth (m)				0.30-0.50				
Date Sampled				07/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	8.5				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO ₄	mg/l	0.1	ISO 17025	1.9				
Chloride	mg/l	0.15	ISO 17025	1.5				
Fluoride	µg/l	50	ISO 17025	400				
Ammoniacal Nitrogen as N	µg/l	15	NONE	33				

Phenols by HPLC

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

Total Phenols

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	8.9				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	5.9				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.32				
Lead (dissolved)	µg/l	1	ISO 17025	1.1				
Manganese (dissolved)	µg/l	0.06	ISO 17025	7.3				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	3.1				
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.5				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Zinc (dissolved)	µg/l	0.4	ISO 17025	2.7				

Calcium (dissolved)	mg/l	0.012	ISO 17025	13				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.52				



Analytical Report Number : 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1126641	DSRC419	2	0.30-0.50	Light brown loam and sand with gravel and vegetation.



Analytical Report Number : 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	NONE
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 19-24098

Project / Site name: HE551505 A417 Missing link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



Emma Leivers

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Analytical Report Number : 19-26062

Project / Site name:	HE551505 A417 MISSING LINK GROUND INVESTIGATION	Samples received on:	23/01/2019
Your job number:	34888-DO	Samples instructed on:	23/01/2019
Your order number:		Analysis completed by:	30/01/2019
Report Issue Number:	1	Report issued on:	30/01/2019
Samples Analysed:	1 leachate sample - 1 soil sample		

Signed: 

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1138925				
Sample Reference				OH405				
Sample Number				2				
Depth (m)				0.30-0.40				
Date Sampled				22/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	26				
Total mass of sample received	kg	0.001	NONE	1.8				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.027				
Total Sulphur	mg/kg	50	MCERTS	630				
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.037				

Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				

Total Phenols

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	0.37				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	2.0				
Pyrene	mg/kg	0.05	MCERTS	2.0				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.81				
Chrysene	mg/kg	0.05	MCERTS	1.2				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.8				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.1				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.9				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.5				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.34				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.2				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	15.2				
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Analytical Report Number: 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1138925				
Sample Reference				OH405				
Sample Number				2				
Depth (m)				0.30-0.40				
Date Sampled				22/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	33				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	56				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.82				
Boron (water soluble)	mg/kg	0.2	MCERTS	3.8				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	38				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	39				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	38000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	40				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	720				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	50				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	98				

Monoaromatics

Benzene	ug/kg	1	MCERTS	< 1.0				
Toluene	ug/kg	1	MCERTS	< 1.0				
Ethylbenzene	ug/kg	1	MCERTS	< 1.0				
p & m-xylene	ug/kg	1	MCERTS	< 1.0				
o-xylene	ug/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	21				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	21				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	17				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	95				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	110				



Analytical Report Number: 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number	1138925						
Sample Reference	OH405						
Sample Number	2						
Depth (m)	0.30-0.40						
Date Sampled	22/01/2019						
Time Taken	None Supplied						
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				

VOCs

Chloromethane	µg/kg	1	ISO 17025	< 1.0			
Chloroethane	µg/kg	1	NONE	< 1.0			
Bromomethane	µg/kg	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/kg	1	NONE	< 1.0			
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0			
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0			
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0			
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0			
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0			
Trichloromethane	µg/kg	1	MCERTS	< 1.0			
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0			
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0			
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0			
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0			
Benzene	µg/kg	1	MCERTS	< 1.0			
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0			
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0			
Trichloroethene	µg/kg	1	MCERTS	< 1.0			
Dibromomethane	µg/kg	1	MCERTS	< 1.0			
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0			
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0			
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0			
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/kg	1	NONE	< 1.0			
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0			
Chlorobenzene	µg/kg	1	MCERTS	< 1.0			
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0			
p & m-Xylene	µg/kg	1	MCERTS	< 1.0			
Styrene	µg/kg	1	MCERTS	< 1.0			
Tribromomethane	µg/kg	1	NONE	< 1.0			
o-Xylene	µg/kg	1	MCERTS	< 1.0			
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0			
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0			
Bromobenzene	µg/kg	1	MCERTS	< 1.0			
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0			
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0			
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0			
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0			
Butylbenzene	µg/kg	1	MCERTS	< 1.0			
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0			
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0			
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0			



Analytical Report Number: 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1138926				
Sample Reference				OH405				
Sample Number				2				
Depth (m)				0.30-0.40				
Date Sampled				22/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	8.1				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO ₄	µg/l	100	ISO 17025	8830				
Chloride	mg/l	0.15	ISO 17025	4.0				
Fluoride	µg/l	50	ISO 17025	250				
Ammoniacal Nitrogen as N	µg/l	15	NONE	17				

Phenols by HPLC

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

Total Phenols

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	3.5				
Barium (dissolved)	µg/l	0.05	ISO 17025	9.5				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	47				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (III)	µg/l	1	NONE	1.6				
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.6				
Copper (dissolved)	µg/l	0.7	ISO 17025	20				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.33				
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0				
Manganese (dissolved)	µg/l	0.06	ISO 17025	7.1				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.8				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	4.3				
Zinc (dissolved)	µg/l	0.4	ISO 17025	4.3				

Calcium (dissolved)	mg/l	0.012	ISO 17025	45				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.5				



Analytical Report Number : 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1138925	OH405	2	0.30-0.40	Brown clay and sand with gravel and brick.



Analytical Report Number : 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	NONE
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS

Analytical Report Number : 19-26062

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Iss No 19-26062-1 HE551505 A417 MISSING LINK GROUND INVESTIGATION 34888-DO

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The results included within the report are representative of the samples submitted for analysis.



Emma Leivers

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Analytical Report Number : 19-26145

Project / Site name:	HE551505 A417 MISSING LINK GROUND INVESTIGATION	Samples received on:	24/01/2019
Your job number:	34888	Samples instructed on:	24/01/2019
Your order number:		Analysis completed by:	31/01/2019
Report Issue Number:	1	Report issued on:	31/01/2019
Samples Analysed:	1 leachate sample - 1 soil sample		

Signed: 

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1139455				
Sample Reference				DSRC415				
Sample Number				2				
Depth (m)				0.60-0.70				
Date Sampled				16/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	7.6				
Total mass of sample received	kg	0.001	NONE	2.0				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.1				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.024				
Total Sulphur	mg/kg	50	MCERTS	360				
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0074				

Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				

Total Phenols

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	21				
Acenaphthylene	mg/kg	0.05	MCERTS	2.5				
Acenaphthene	mg/kg	0.05	MCERTS	21				
Fluorene	mg/kg	0.05	MCERTS	29				
Phenanthrene	mg/kg	0.05	MCERTS	120				
Anthracene	mg/kg	0.05	MCERTS	37				
Fluoranthene	mg/kg	0.05	MCERTS	100				
Pyrene	mg/kg	0.05	MCERTS	84				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	39				
Chrysene	mg/kg	0.05	MCERTS	35				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	41				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	15				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	34				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	15				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.8				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	16				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	617				
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Analytical Report Number: 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1139455				
Sample Reference				DSRC415				
Sample Number				2				
Depth (m)				0.60-0.70				
Date Sampled				16/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1.8				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	35				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.20				
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	7.4				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.4				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	9900				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	4.5				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	500				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	4.2				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	19				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	17				

Monoaromatics & Oxygenates

Benzene	ug/kg	1	MCERTS	< 1.0				
Toluene	ug/kg	1	MCERTS	< 1.0				
Ethylbenzene	ug/kg	1	MCERTS	< 1.0				
p & m-xylene	ug/kg	1	MCERTS	< 1.0				
o-xylene	ug/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0				

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	2.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	39				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	80				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	240				
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	360				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	35				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	300				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	980				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	1200				
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	2500				



Analytical Report Number: 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1139455				
Sample Reference				DSRC415				
Sample Number				2				
Depth (m)				0.60-0.70				
Date Sampled				16/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

VOCs

Chloromethane	µg/kg	1	ISO 17025	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloromethane	µg/kg	1	MCERTS	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	MCERTS	< 1.0				
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloroethene	µg/kg	1	MCERTS	< 1.0				
Dibromomethane	µg/kg	1	MCERTS	< 1.0				
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0				
Chlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-Xylene	µg/kg	1	MCERTS	< 1.0				
Styrene	µg/kg	1	MCERTS	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	MCERTS	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0				
Bromobenzene	µg/kg	1	MCERTS	< 1.0				
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0				



Analytical Report Number: 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Lab Sample Number				1139456				
Sample Reference				DSRC415				
Sample Number				2				
Depth (m)				0.60-0.70				
Date Sampled				16/01/2019				
Time Taken				None Supplied				
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	8.5				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO ₄	µg/l	100	ISO 17025	5770				
Chloride	mg/l	0.15	ISO 17025	7.8				
Fluoride	µg/l	50	ISO 17025	350				
Ammoniacal Nitrogen as N	µg/l	15	NONE	310				
Hardness - Total	mgCaCO ₃ /l	1	NONE	30.8				

Phenols by HPLC

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

Total Phenols

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	18				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	13				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	NONE	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	2.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.29				
Lead (dissolved)	µg/l	1	ISO 17025	2.6				
Manganese (dissolved)	µg/l	0.06	ISO 17025	150				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	1.9				
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.7				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Zinc (dissolved)	µg/l	0.4	ISO 17025	1.3				
Calcium (dissolved)	mg/l	0.012	ISO 17025	11				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	1.1				



Analytical Report Number : 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1139455	DSRC415	2	0.60-0.70	Brown loam and sand with gravel.



Analytical Report Number : 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	NONE
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025

Iss No 19-26145-1 HE551505 A417 MISSING LINK GROUND INVESTIGATION 34888

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The results included within the report are representative of the samples submitted for analysis.



Analytical Report Number : 19-26145

Project / Site name: HE551505 A417 MISSING LINK GROUND INVESTIGATION

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC415	2	S	19-26145	1139455	c	Free cyanide in soil	L080-PL	c



Emma Leivers

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Analytical Report Number : 19-29777

Project / Site name:	HE551502 A417 Missing Link Ground Investigation	Samples received on:	15/02/2019
Your job number:	34888-DO	Samples instructed on:	20/02/2019
Your order number:		Analysis completed by:	26/02/2019
Report Issue Number:	1	Report issued on:	26/02/2019
Samples Analysed:	2 water samples		

Signed: 

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 19-29777

Project / Site name: HE551502 A417 Missing Link Ground Investigation

Lab Sample Number				1160464	1160465			
Sample Reference				DSRC406	DSRC419			
Sample Number				1	1			
Depth (m)				31.98	38.00			
Date Sampled				14/02/2019	14/02/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	7.7	7.5			
Temperature on Receipt	oC	0.1	NONE	5.60	5.60			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	470	470			
Sulphate as SO ₄	µg/l	45	ISO 17025	112000	33800			
Sulphate as SO ₄	mg/l	0.045	ISO 17025	112	33.8			
Chloride	mg/l	0.15	ISO 17025	10	56			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	< 15			
Ammonium as NH ₄	µg/l	15	ISO 17025	< 15	< 15			
Nitrate as N	mg/l	0.01	ISO 17025	0.58	0.22			
Nitrate as NO ₃	mg/l	0.05	ISO 17025	2.55	0.98			
Nitrite as N	µg/l	1	ISO 17025	12	2.3			
Nitrite as NO ₂	µg/l	5	ISO 17025	41	7.5			
Alkalinity	mgCaCO ₃ /l	3	ISO 17025	150	160			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.6	< 0.3			
Total Suspended Solids	mg/l	2	ISO 17025	2600	55			
Hardness - Total	mgCaCO ₃ /l	1	ISO 17025	269	218			
Bicarbonate	mgHCO ₃ /l	10	NONE	< 10	< 10			
Dissolved Oxygen	mg/l	1	NONE	8.0	6.6			

Heavy Metals / Metalloids

Aluminium (dissolved)	mg/l	0.012	ISO 17025	< 0.012	0.013			
Arsenic (dissolved)	µg/l	1	ISO 17025	3.8	2.0			
Boron (dissolved)	µg/l	10	ISO 17025	95	160			
Calcium (dissolved)	mg/l	0.012	ISO 17025	76	80			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.59	0.051			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	20	4.6			
Manganese (dissolved)	µg/l	0.06	ISO 17025	210	83			
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.8	2.4			
Sodium (dissolved)	mg/l	0.01	ISO 17025	21	50			

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 19-29777

Project / Site name: HE551502 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Alkalinity in Water (by titration)	Determination of Alkalinity by titration (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L025-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Ammonium as NH ₄ in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Dissolved Oxygen in water	Determination of dissolved oxygen.	In-house method	L086-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025



Analytical Report Number : 19-29777

Project / Site name: HE551502 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Temperature on Receipt (water)	Temperature of water upon receipt.	In-house method	L019-UK	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC406	1	W	19-29777	1160464	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC406	1	W	19-29777	1160464	c	Ammonium as NH4 in water	L082-PL	c
DSRC406	1	W	19-29777	1160464	c	Dissolved Oxygen in water	L086-PL	c
DSRC406	1	W	19-29777	1160464	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC406	1	W	19-29777	1160464	c	Nitrate as N in water	L078-PL	c
DSRC406	1	W	19-29777	1160464	c	Nitrate in water	L078-PL	c
DSRC406	1	W	19-29777	1160464	c	Nitrite as N in water	L082-PL	c
DSRC406	1	W	19-29777	1160464	c	Nitrite in water	L082-PL	c
DSRC406	1	W	19-29777	1160464	c	Settleable Solids in water	L004-PL	c
DSRC406	1	W	19-29777	1160464	c	Suspended solids in water	L004-PL	c
DSRC406	1	W	19-29777	1160464	c	Total oxidised nitrogen in water	L078-PL	c
DSRC406	1	W	19-29777	1160464	c	pH at 20oC in water (automated)	L099-PL	c
DSRC419	1	W	19-29777	1160465	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC419	1	W	19-29777	1160465	c	Ammonium as NH4 in water	L082-PL	c
DSRC419	1	W	19-29777	1160465	c	Dissolved Oxygen in water	L086-PL	c
DSRC419	1	W	19-29777	1160465	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC419	1	W	19-29777	1160465	c	Nitrate as N in water	L078-PL	c
DSRC419	1	W	19-29777	1160465	c	Nitrate in water	L078-PL	c
DSRC419	1	W	19-29777	1160465	c	Nitrite as N in water	L082-PL	c
DSRC419	1	W	19-29777	1160465	c	Nitrite in water	L082-PL	c
DSRC419	1	W	19-29777	1160465	c	Settleable Solids in water	L004-PL	c
DSRC419	1	W	19-29777	1160465	c	Suspended solids in water	L004-PL	c
DSRC419	1	W	19-29777	1160465	c	Total oxidised nitrogen in water	L078-PL	c
DSRC419	1	W	19-29777	1160465	c	pH at 20oC in water (automated)	L099-PL	c



APPENDIX D

GEOPHYSICAL REPORT

**REPORT ON THE
GEOPHYSICAL LOGGING
OF
SIX BOREHOLES
AT
THE A417
BIRDLIP**

Prepared For:



GEOTECHNICAL ENGINEERING LTD
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MAR 2019/GENG1901_ rpt/SO91

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Report by:	D. Hingley	28.02.19
Checked by:	James Whitford	11.03.19
Revision 1:	D. Hingley	14.03.19

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2. THE GEOPHYSICAL LOGGING METHODS	4
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4. PROCESSING AND PRESENTATION OF IMAGER RESULTS	4
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LIST OF FIGURES

Figure 3.1	Location map showing site location highlighted by red circle. © Bing Maps 2019.
Figure 3.2	Aerial image showing approximate borehole positions. © Bing Maps 2019.

Appendix 1	Defect Classification
Appendix 2	Geophysical Logs

1.0 INTRODUCTION

At the request of Geotechnical Engineering Ltd., borehole imaging and geophysical logging was carried out in six boreholes around the A417 near Birdlip, Gloucestershire.

The work was carried out by European Geophysical Services between the 16th January and the 12th February 2019.

The following logs were run:-

DSRC404 Logs	From (m)	To (m)
Optical Imager	39.9	42.3
Acoustic Imager	42.5	67.0
Natural Gamma	0.1	69.0
3 Arm Caliper	0.0	68.4
Temperature & Conductivity	42.4	68.0
Focused Resistivity	42.4	67.0
Density (gamma-gamma)	0.3	69.5

DSRC406 Logs	From (m)	To (m)
Optical Imager	31.6	54.6
Acoustic Imager	32.4	54.5
Natural Gamma	0.0	59.0
3 Arm Caliper	0.0	59.0
Temperature & Conductivity	32.7	59.0
Focused Resistivity	34.8	59.0
Density (gamma-gamma)	0.0	55.0
Impellor Flowmeter	34.8	58.8

1.0 INTRODUCTION

DSRC408 Logs	From (m)	To (m)
Optical Imager	19.4	21.7
Acoustic Imager	21.7	74.7
Natural Gamma	0.0	74.6
3 Arm Caliper	1.6	74.6
Temperature & Conductivity	22.5	73.4
Focused Resistivity	22.0	74.0
Density (gamma-gamma)	2.0	75.0
Impellor Flowmeter	20.2	73.8

DSRC415 Logs	From (m)	To (m)
Optical Imager	2.3	51.5
Acoustic Imager	48.6	51.3
Natural Gamma	0.0	51.3
3 Arm Caliper	0.8	51.3
Density (gamma-gamma)	0.8	50.8

DSRC419 Logs	From (m)	To (m)
Optical Imager	3.2	40.0
Natural Gamma	0.7	40.7
3 Arm Caliper	0.7	39.6
Density (gamma-gamma)	1.0	40.0

1.0 INTRODUCTION

OH407 Logs	From (m)	To (m)
Natural Gamma	1.1	51.4
3 Arm Caliper	0.5	51.0
Temperature & Conductivity	21.0	50.8
Focused Resistivity	22.5	50.5

2.0 THE GEOPHYSICAL LOGGING METHODS

The Equipment and Field Procedure

A fully digital logging system with a 600m capacity motorised winch mounted in a 4x4 van was used.

All logging data was recorded digitally for reprocessing and archiving purposes.

The optical imager survey was carried out first to avoid the disturbance of the fluid by the geophysical logs which may affect water clarity.

Natural Gamma (Gam)

The tool measures the naturally occurring gamma radiation found in rocks and sediments. It is mainly used to detect the clays that contain potassium K^{40} , though the U^{238} series of elements and the Th^{232} series of elements also emit gamma radiation.

The higher the concentration of these clay minerals the greater the responses on the natural gamma log.

Acoustic Borehole Imager (ABI)

This tool scans the borehole wall through 360 degrees and records the acoustic reflection of the resulting signal in terms of amplitude and transit time (the travel time from the tool to the borehole wall). This technique requires a fluid filled borehole with a minimum of suspended solids, polymers or mud within the fluid column.

This sensitive technique responds to small diameter changes, rugosity and the acoustic nature of the borehole wall. It is primarily used for detecting fractures and other discontinuities. The resultant images are orientated (to magnetic North) 0° through 90° , 180° and 270° back to 0° .

The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is viewed on the way down the borehole to allow fine tuning of the acquisition parameters. The settings are then adjusted and the image recorded on the way up the borehole which ensures a constant line speed during acquisition.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore data within approximately one metre of magnetic steel casing is un-orientated.

2.0 THE GEOPHYSICAL LOGGING METHODS

Optical Borehole Imager (Optical)

A precision-machined prism and CCD camera assembly permits a high definition video image of the borehole wall to be captured in a variety of horizontal and vertical resolutions. The resulting image is digitised in the sonde for transmission to the surface acquisition system.

The image is then orientated to Magnetic North and displayed as an unwrapped image log. This enables a detailed structural interpretation to be made if required.

For the best results the optical imager should be run above the water level or in clean, clear fluid. The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is recorded on the way down the borehole to limit disturbance to the clarity of the water in the borehole by the logging tool.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore the recorded data within approximately one metre of magnetic steel casing is un-orientated. This is corrected manually during the post-processing stage.

Focused Resistivity Log (Deep and Shallow)

The Focused Resistivity tool uses Guard Electrodes to focus the current into the formation. This gives excellent vertical resolution and good penetration, especially in highly conductive borehole fluids where a Normal Resistivity Sonde would not be as effective.

The tool has two electrode spacing's to allow a deep and shallow depth of investigation.

The response of this log is a function of porosity, type of formation / mineralogy and its pore water quality. These logs aid in the identification of strata and quality of the pore water

Caliper (Cal)

This tool measures the mean diameter of the borehole. It is used to check the integrity of the borehole lining, and where the borehole is unlined to identify zones of washout, breakout or fissures.

2.0 THE GEOPHYSICAL LOGGING METHODS

Fluid Temperature (T)

There is a natural geothermal gradient of increasing temperature with depth. This gradient varies with the thermal conductivity of the geological formation and is modified by water flowing in, out or vertically through the borehole.

This log is used to determine flow patterns within the borehole and to identify flow zones.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Fluid Conductivity (EC or EC25)

The electrical conductivity (EC) of the water is related to its salinity and dissolved solids and is therefore a measure of the quality of the borehole water. The shape of the log trace can indicate zones of inflow.

Using data from the temperature log the electrical conductivity is corrected to 25°C (EC25).

This log is used to identify different zones of water quality.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Impeller Flowmeter (FV)

This log is used to determine any flow pattern within the borehole and identify flow zones. The tool uses an impeller and is normally run at a constant logging speed against the anticipated flow for the best response. The data is corrected for logging speed and a fluid velocity (FV) log is produced.

3.0 SITE DETAILS

Site
A417 Birdlip

OS Grid Ref: SO 9320 1556

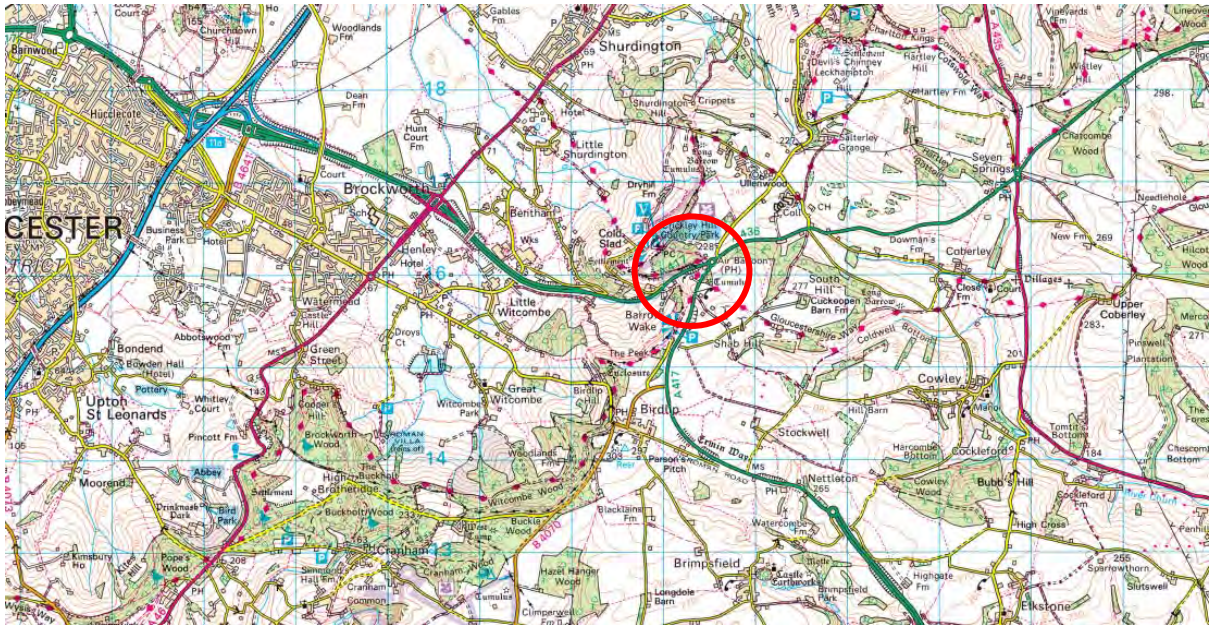


Figure 3.1 Location map showing site location highlighted by red circle. © Bing Maps 2019.



Figure 3.2 Aerial image showing approximate borehole positions. © Bing Maps 2019.

4.0 PROCESSING AND PRESENTATION OF IMAGER RESULTS

Detailed logs of the imager data have been produced at a vertical scale of 1:10.

Constructional details and information on each borehole are given in the headers of each log.

All images have been referenced to Magnetic North.

The borehole's azimuth and tilt are plotted alongside the images.

The image of the borehole wall is presented in an unwrapped form with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structural features and discontinuities have been picked from the images in the form of colour coded sinusoidal projections - see Appendix 1 for details. This 'Discontinuities' log is also presented with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structure picking is not a definitive analysis of all the features within a borehole. Only the discontinuities that have a linear dip and direction are 'picked' and used in the analysis of the discontinuities. Features that do not have a regular sinusoidal shape do not have a linear dip and direction, 'best fit' picking of these features is done if approximately 80% coverage of the sinusoid can be achieved. Below this percentage the inaccuracy of the picking is too great and if included in any structural analysis may adversely skew the results. Vughs, solution holes, and angular break outs are examples of features not picked.

The apparent azimuth and apparent dip (i.e. relative to the borehole's azimuth and tilt) of the discontinuities are calculated using the diameter of the borehole and the geometric parameters of the sinusoids overlaid on the discontinuities. The final processing stage is to correct these apparent values to true azimuth (in relation to Magnetic North) and true dip (from horizontal) by correcting for the borehole's azimuth and tilt.

The final results are presented as a 'tadpole' plot (Discontinuities - True°). The horizontal position of the tadpole's head gives the defect's true dip angle and its tail points in the direction of the defect's azimuth. These logs are presented with a horizontal scale in degrees. By convention the top of the page is North (Magnetic) and the right hand edge of the paper is East.

The true structural data has been presented in digital format as an excel file (xls).

5.0 BOREHOLE LOGGING CONSTRAINTS

- **Vehicle access restrictions**
None
 - **Tool access restrictions**
None
 - **Borehole conditions / risk to equipment**
 - **DSRC404** – Logged in two stages - borehole blocked at 69.0m during first attempt; casing pulled to 40.9m for 2nd attempt. Fluid logging completed directly after casing pull. Logging above 40.9m completed through casing.
 - **DSRC406** – Suspended sediments affecting flow logging results. Logging above 31.9m completed through casing.
 - **DSRC408** – Borehole logged immediately after completion of drilling. Logging above 19.3m completed through casing.
 - **DSRC415** – Borehole silting up during logging.
 - **DSRC419** – Borehole blocked at 42.0m.
 - **OH407** – Density and flow logging not run due to hole squeezing in and stability concerns. Imager logging unobtainable due to borehole conditions. Logging above 21.5m completed through casing.
 - **Lack of fluid filled column / cloudy fluid**
See above.
 - **Time constraint**
Onsite working hours prohibited working past 1700.
 - **Borehole construction / casing**
All boreholes cased to stable ground..
-

Appendix 1

Discontinuity Classification.

Discontinuity	Colour	Classification Parameters
Major Fracture or Fissure	Blue	An open break in the formation, that is <u>continuous</u> across the entire image.
Minor Fracture or Fissure	Turquoise	A thin or closed break in the formation, that is <u>continuous or discontinuous</u> across the image.
Vein	Green	That may be <u>continuous or discontinuous</u> across the entire image.
Fabric	Red	Defines a feature generally metamorphic, igneous or sedimentary in origin that may be <u>continuous or discontinuous</u> across the image, such as bedding and cross-bedding, schistosity or gneissosity.
Intrusions	Purple	Intrusive features such as dykes and sills, generally <u>continuous</u> across the image
Unknown	Black	Faint features which can not be classified.

Appendix 2

Geophysical Logs



EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC404**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393207, 215566**

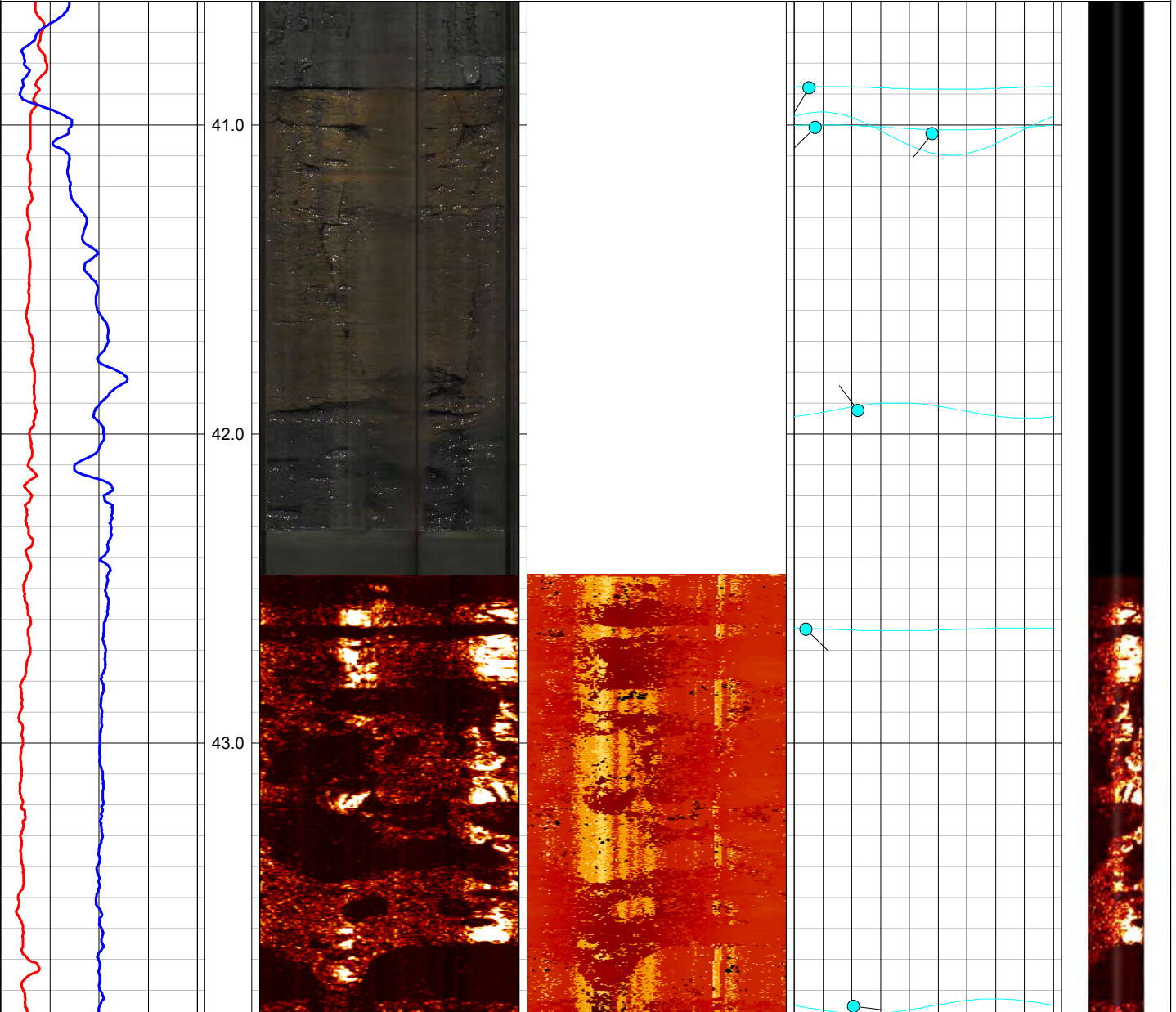
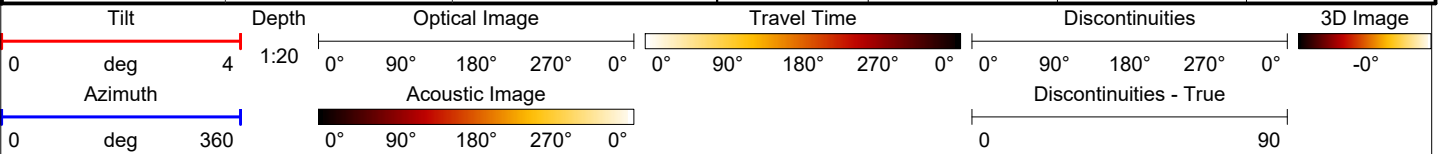
Elevation: **269.00**

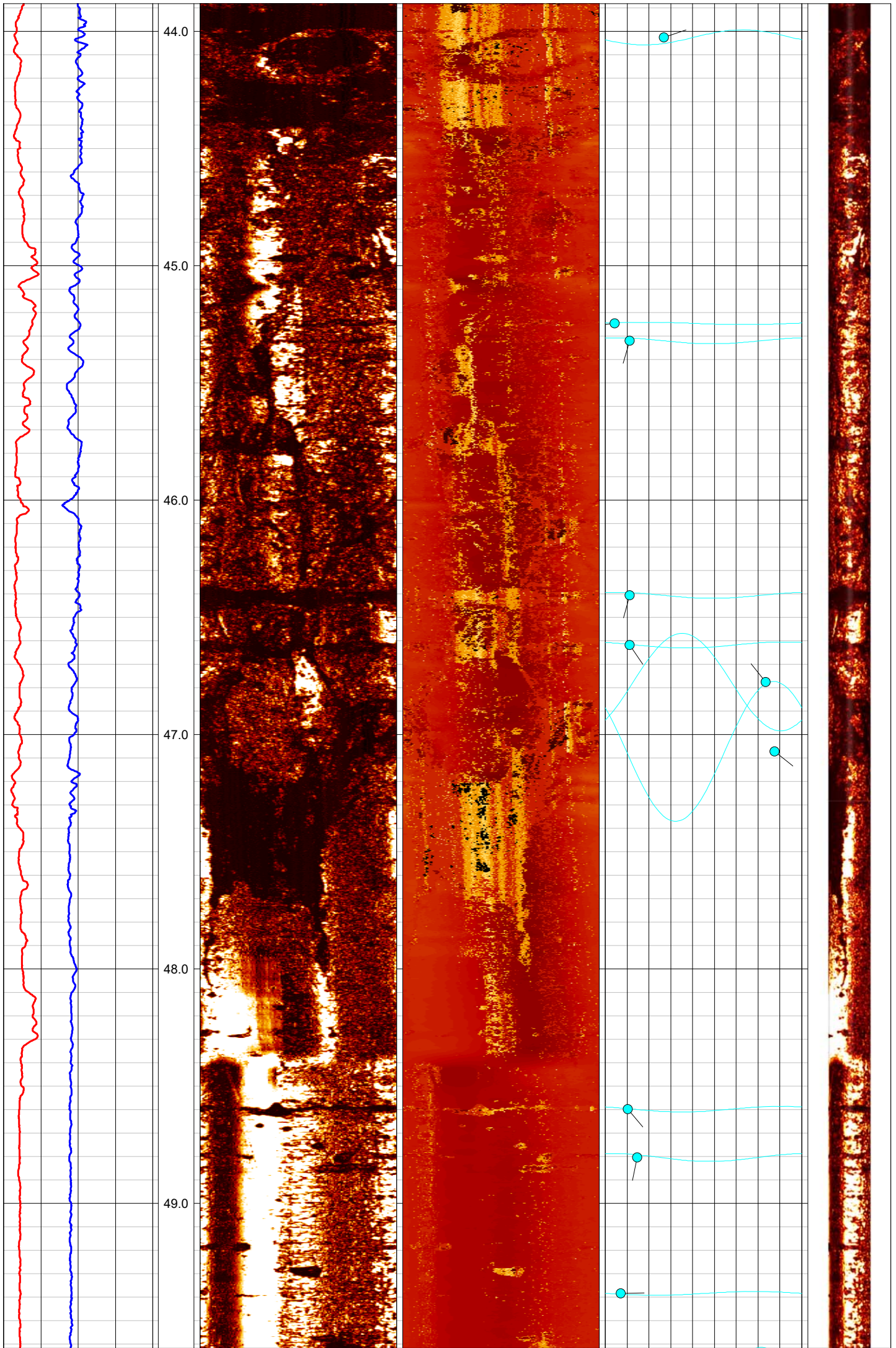
Drilled Depth: (m)	100.0	Date:	18th January 2019
Logged Depth: (m)	69.0	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Borehole blocked @ 69.0m; casing at 67.0m on 1st logging attempt. Casing pulled to 40.9m for logging 2nd attempt.	
Logged Interval: (m)	(1.0) 40.0 - 69.0		
Fluid Level: (m)	45.6/42.4		

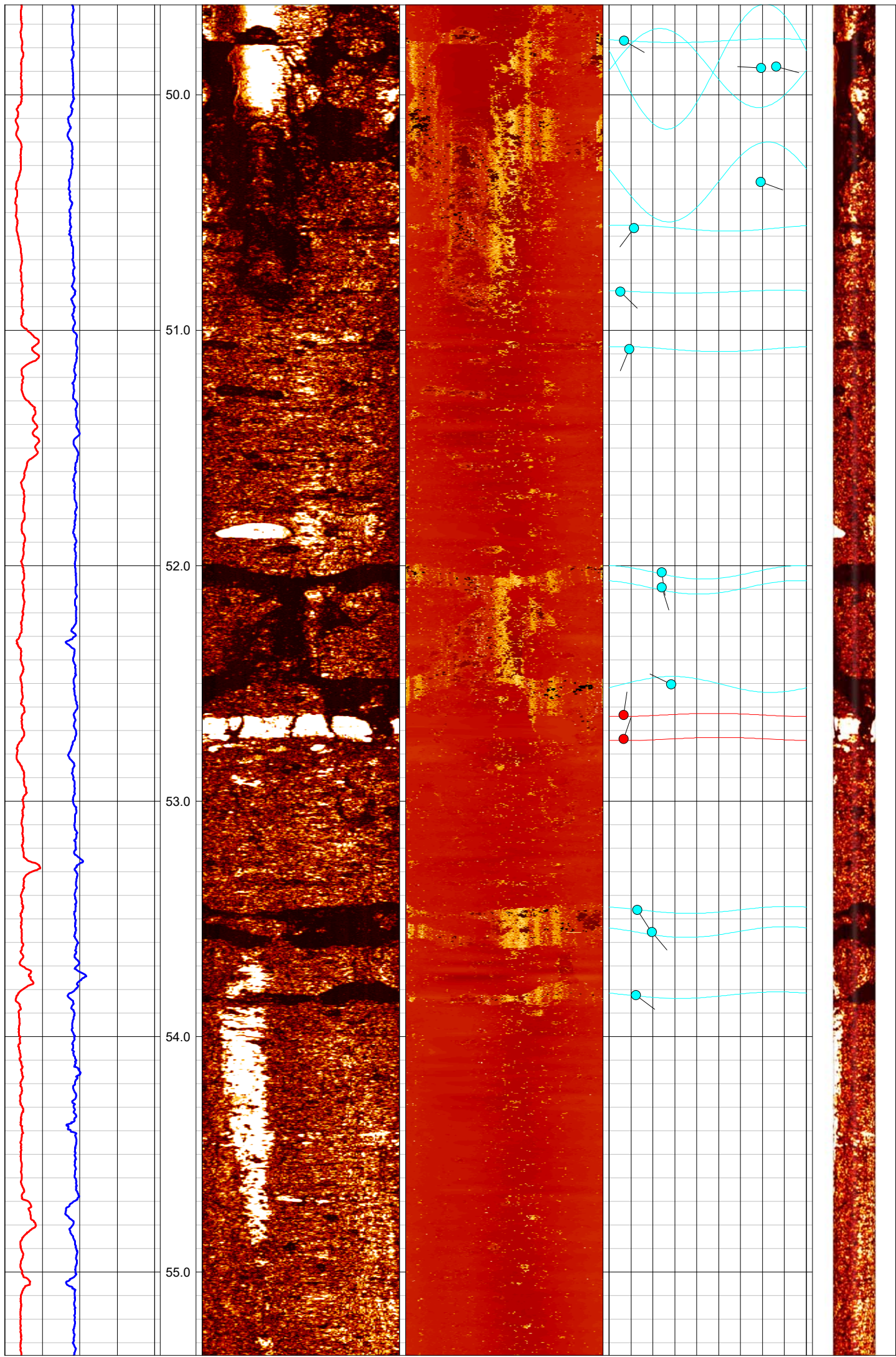
BOREHOLE RECORD

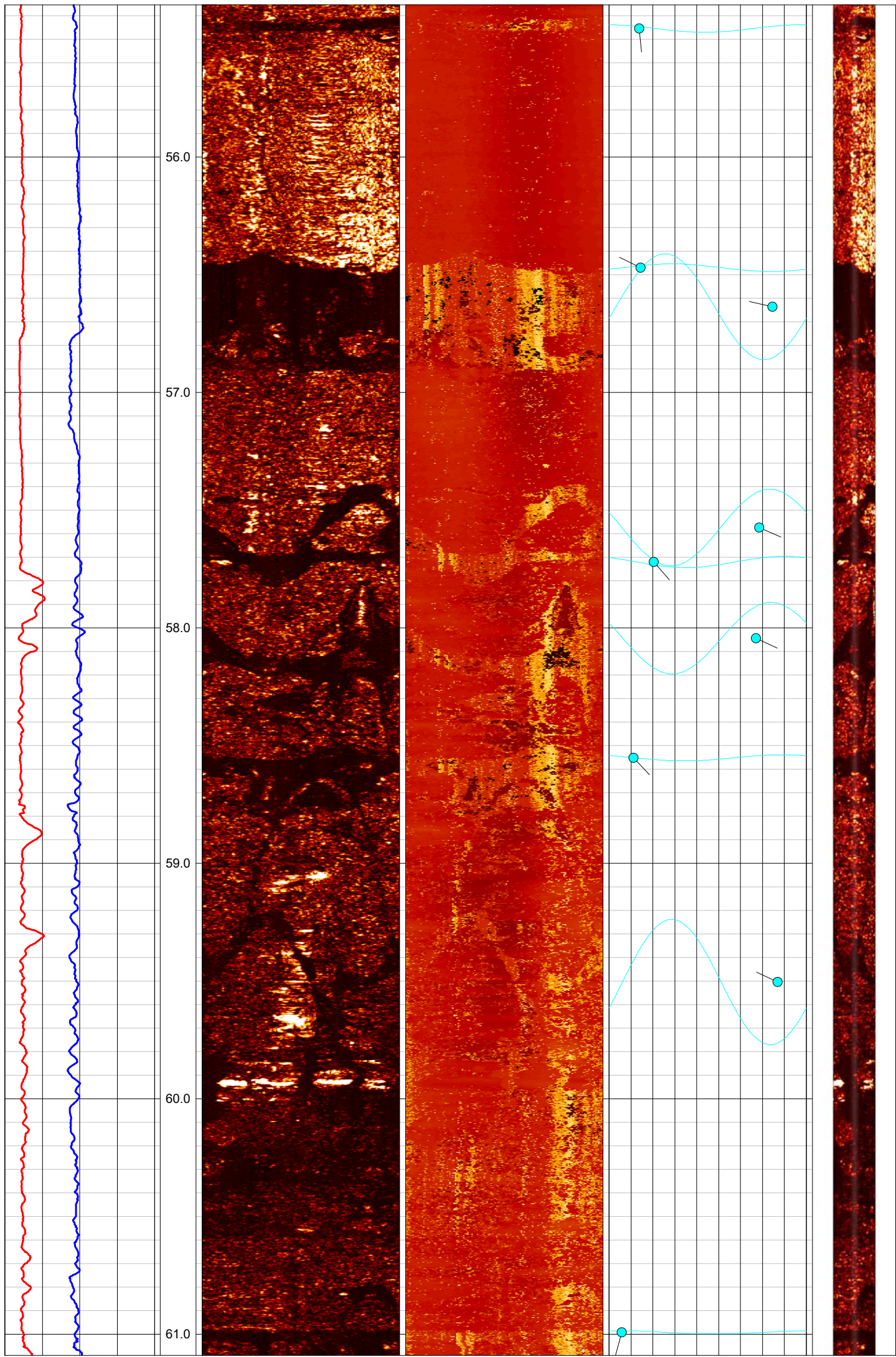
CASING RECORD

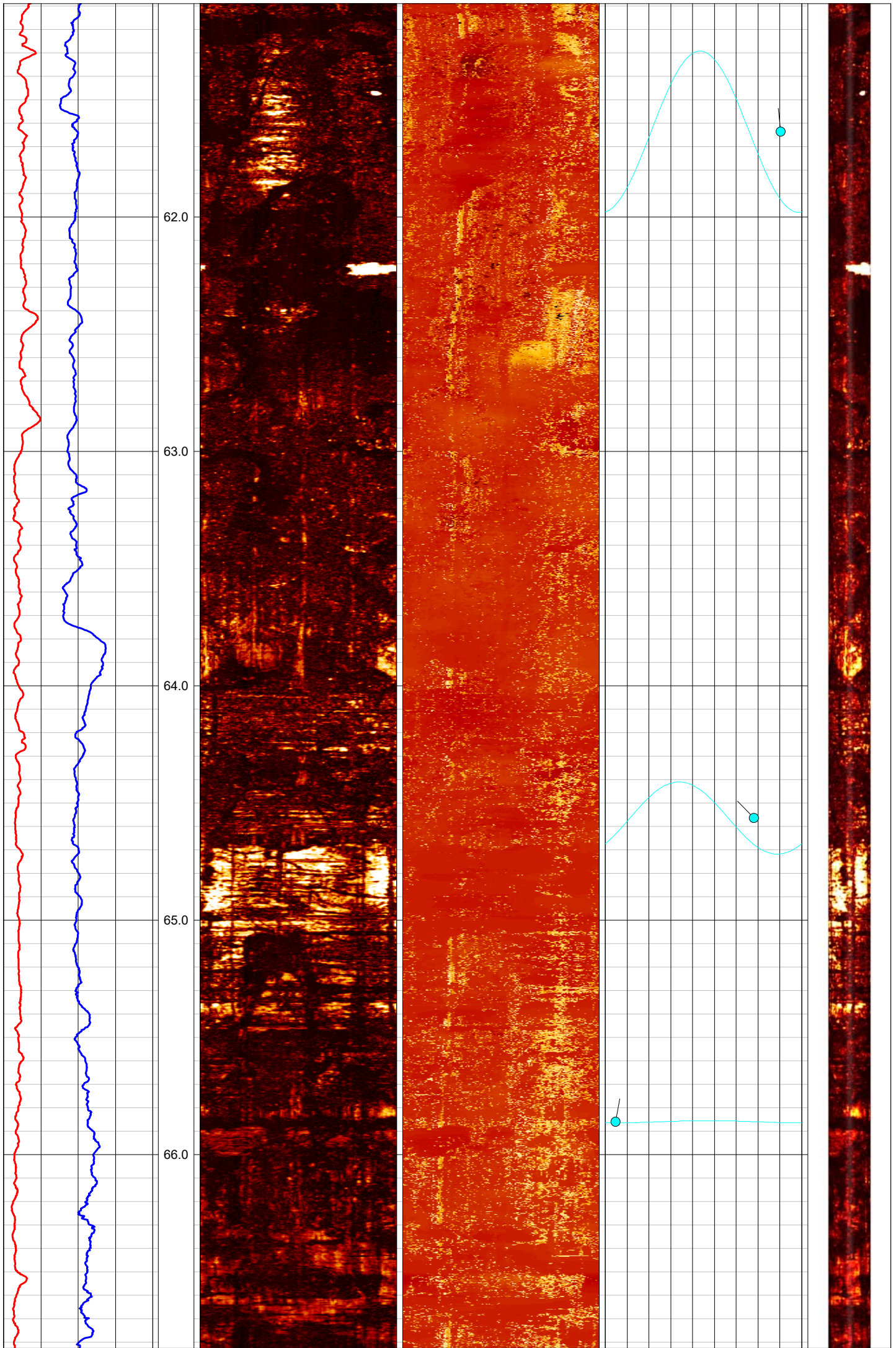
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	-0.6	69.0/40.0

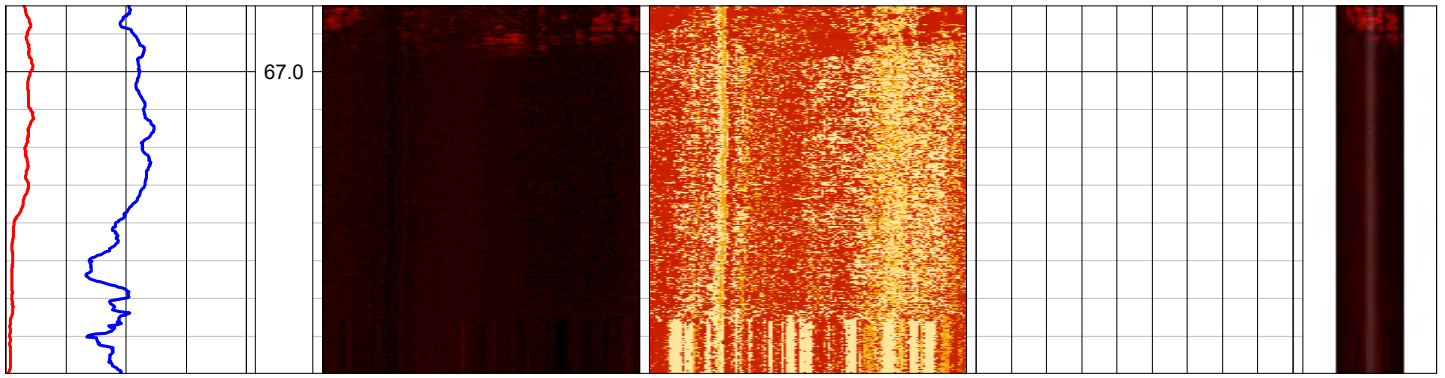














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC404**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393207, 215566**

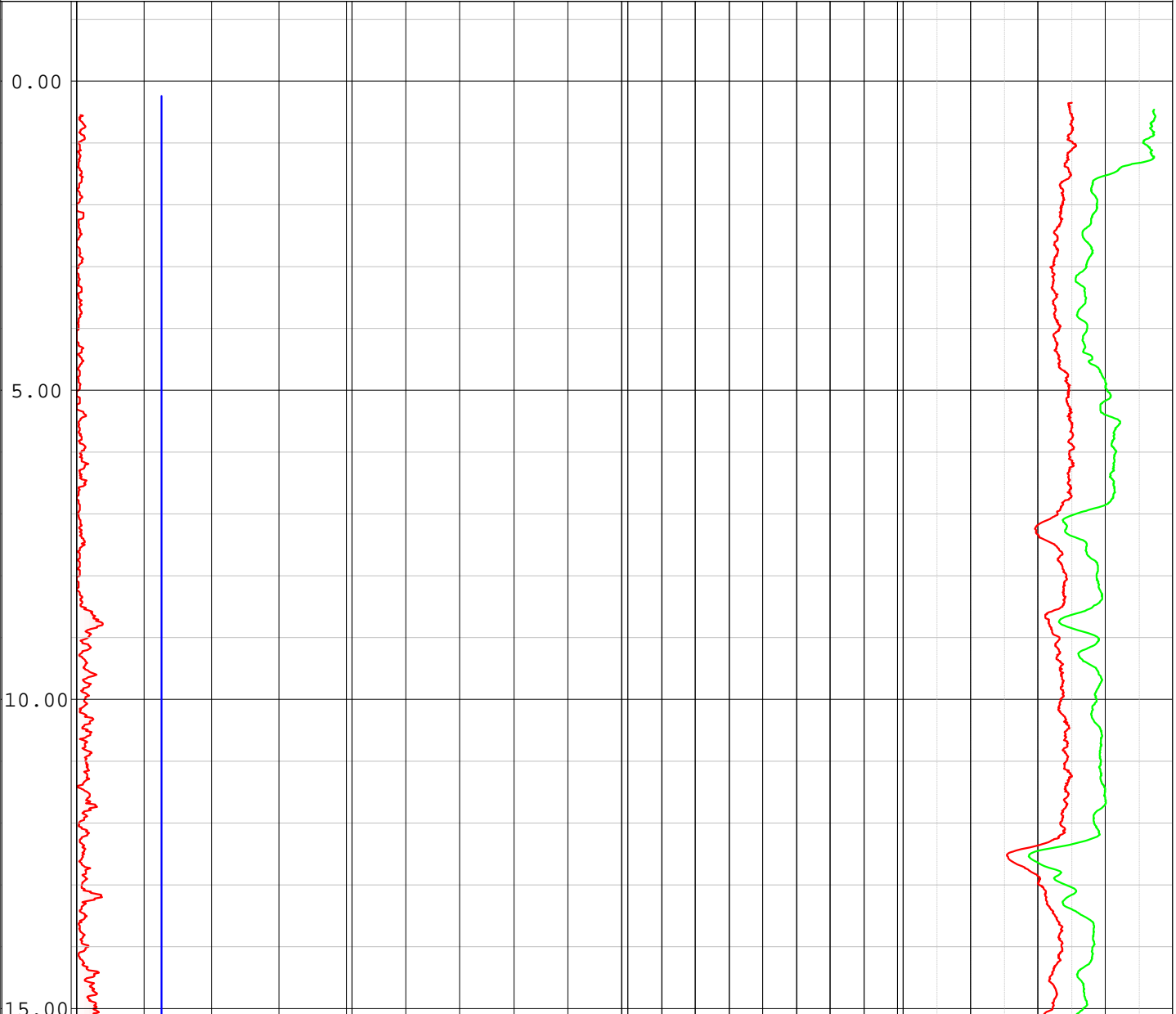
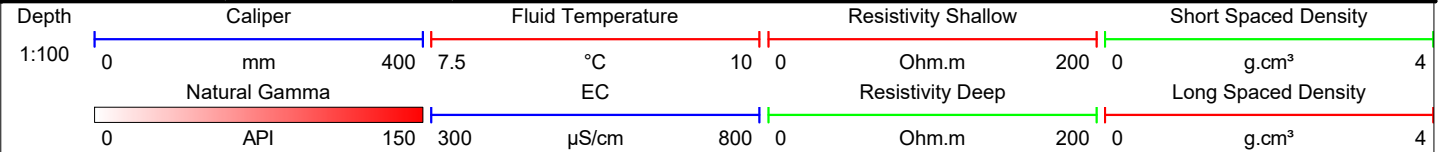
Elevation: **269.00**

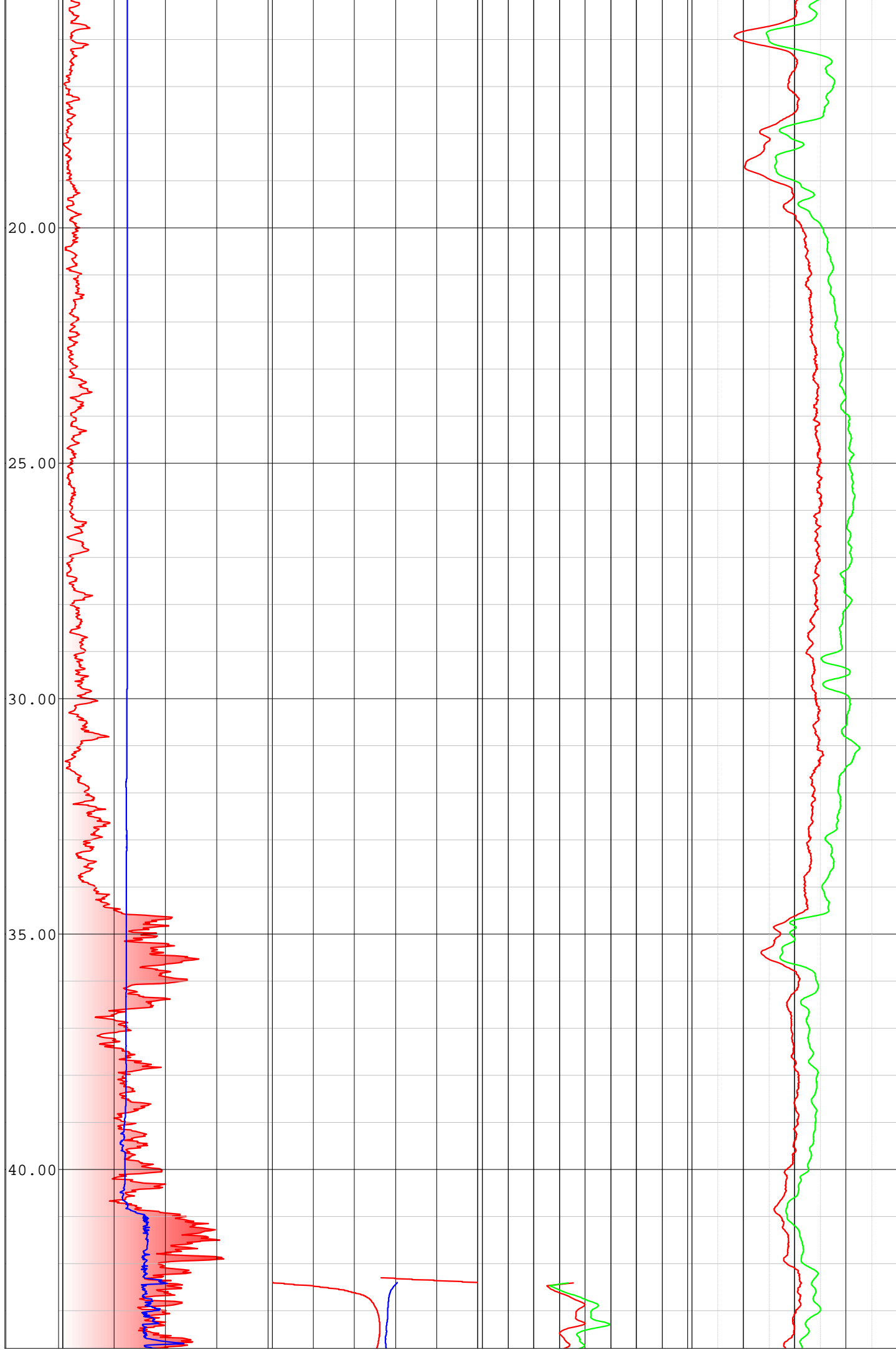
Drilled Depth: (m)	100.0	Date:	18th January 2019
Logged Depth: (m)	69.0	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Borehole blocked @ 69.0m; casing at 67.0m. Density and gamma logging completed through casing. Casing pulled back to 40.9m for Acoustic Imager; Resistivity, caliper and temperature conductivity logging.G6	
Logged Interval: (m)	(1.0) 40.0 - 69.0		
Fluid Level: (m)	45.6/42.4		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	125	-0.6	69.0/40.0









EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC406**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393384, 216009**

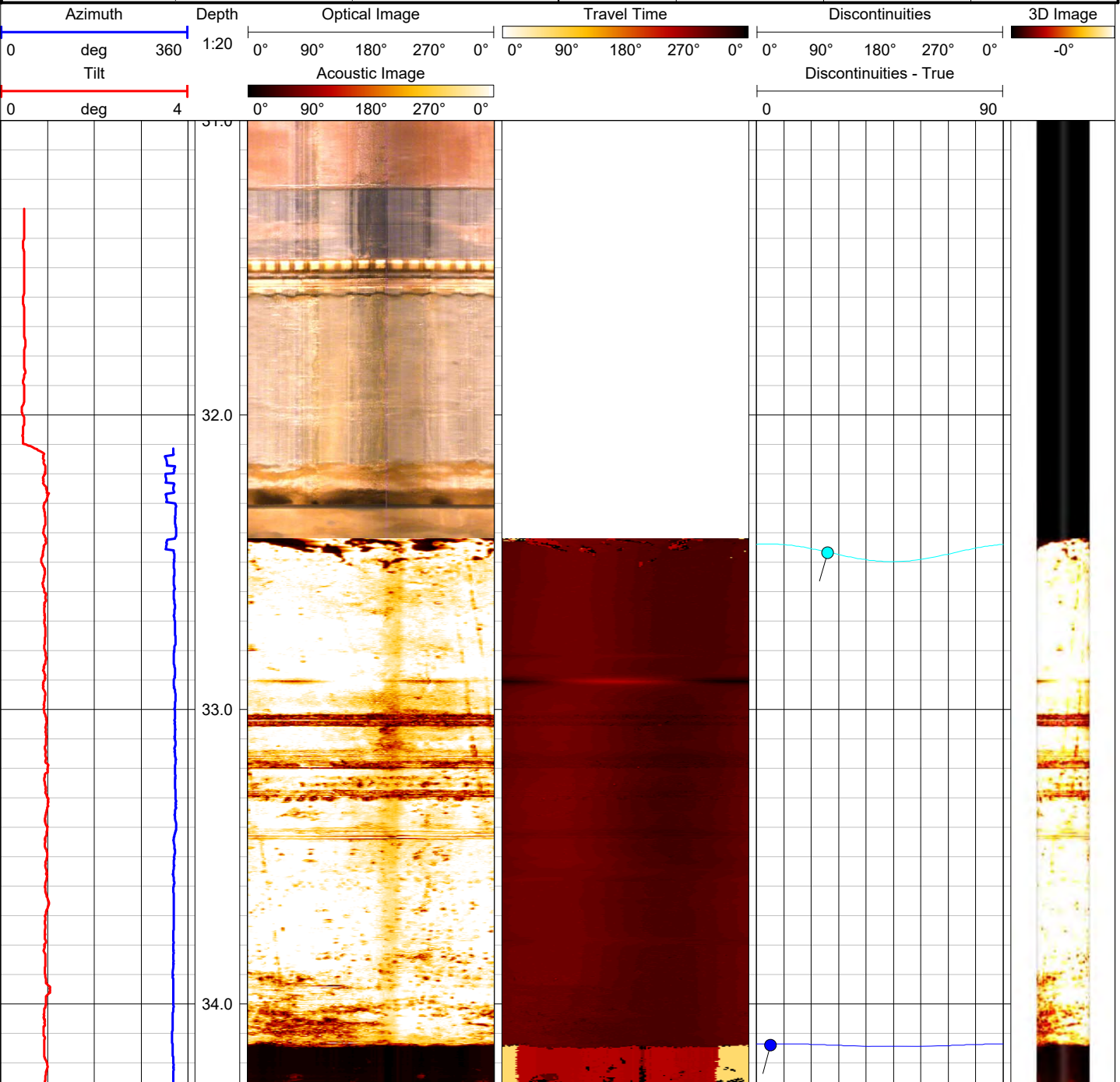
Elevation: **238.65**

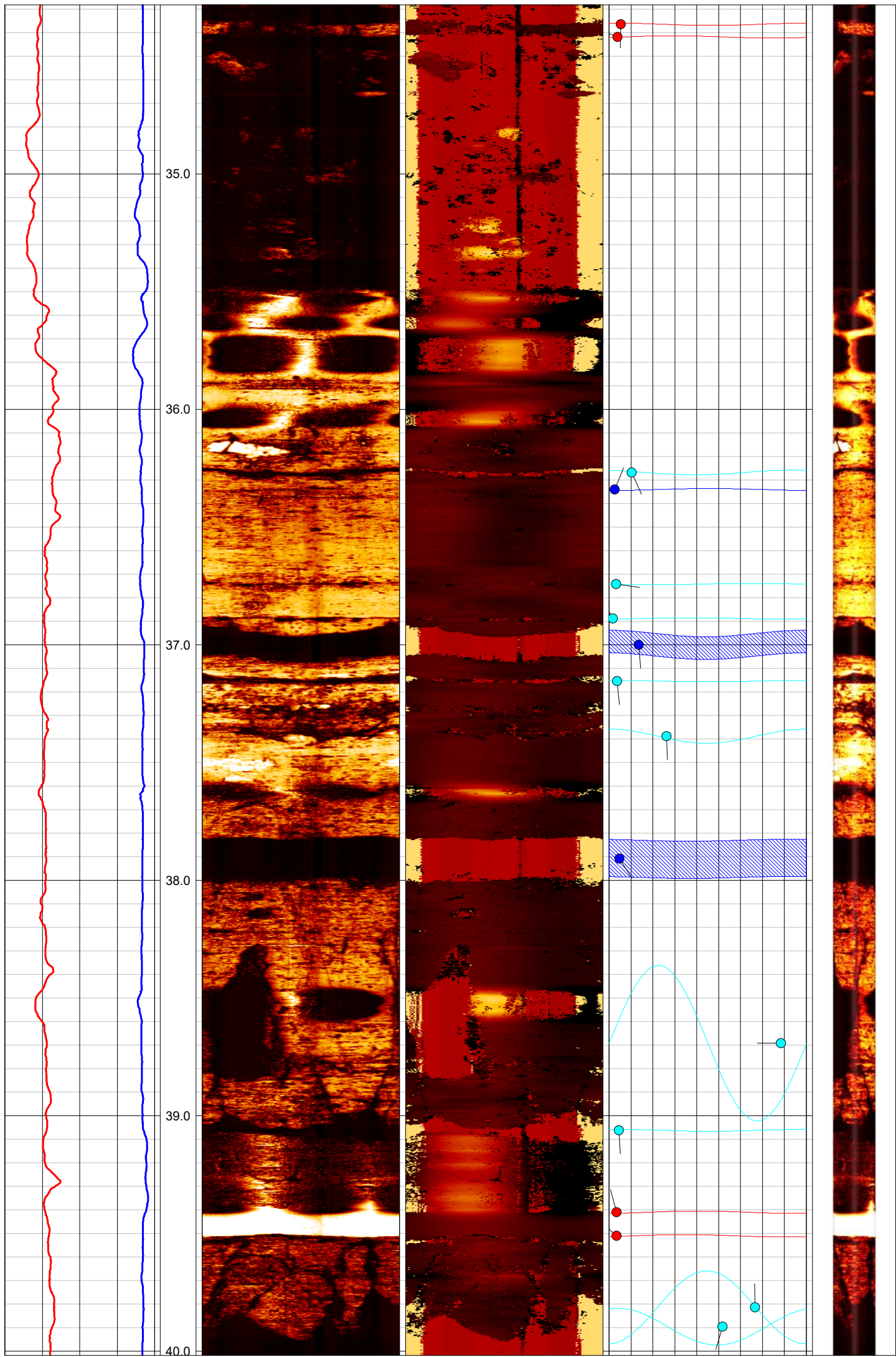
Drilled Depth: (m)	60.0*	Date:	28th & 29th January 2019
Logged Depth: (m)	54.6	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks:	
Logged Interval: (m)	31.6 - 54.6		
Fluid Level: (m)	32.3		

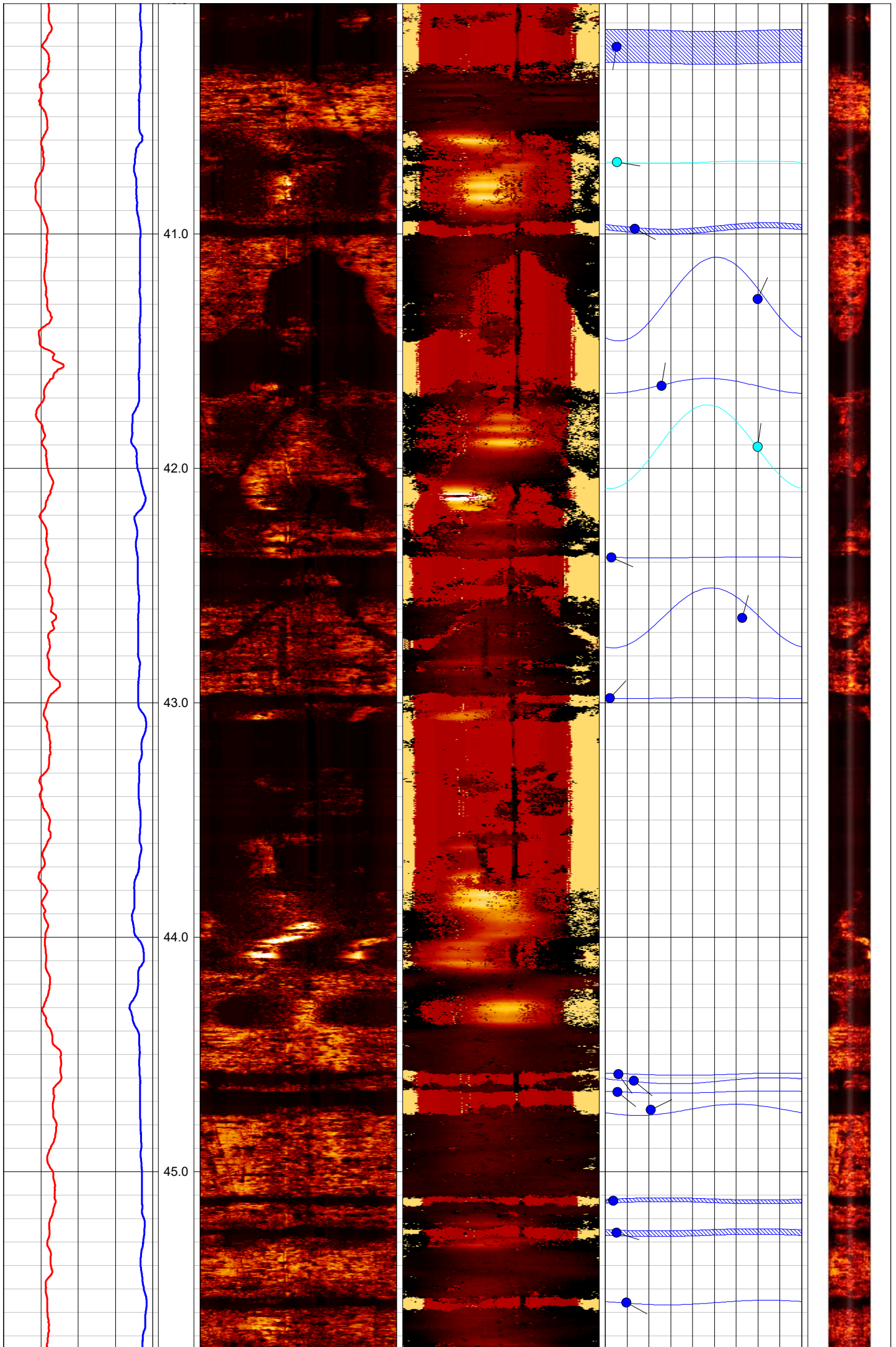
BOREHOLE RECORD

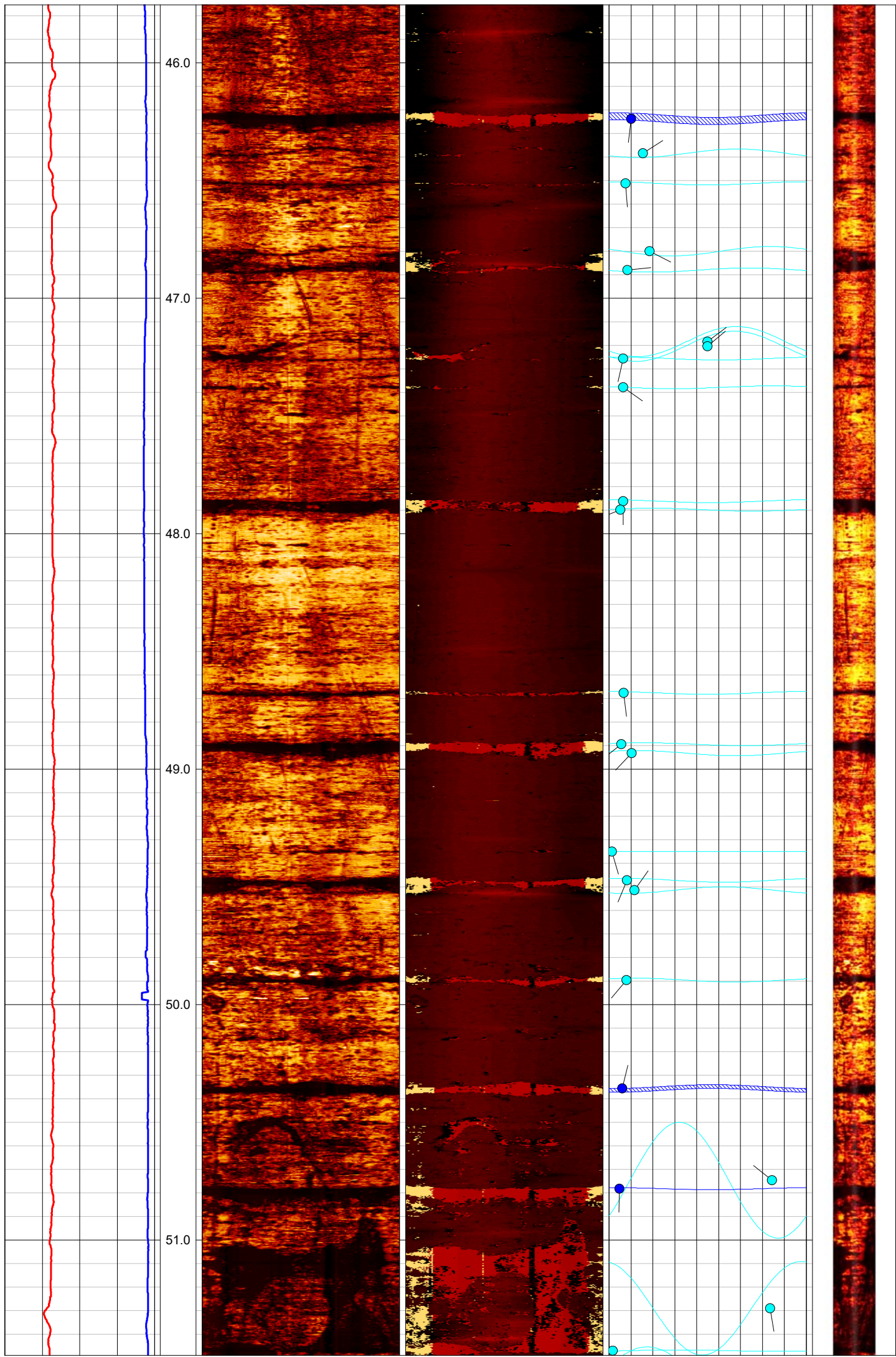
CASING RECORD

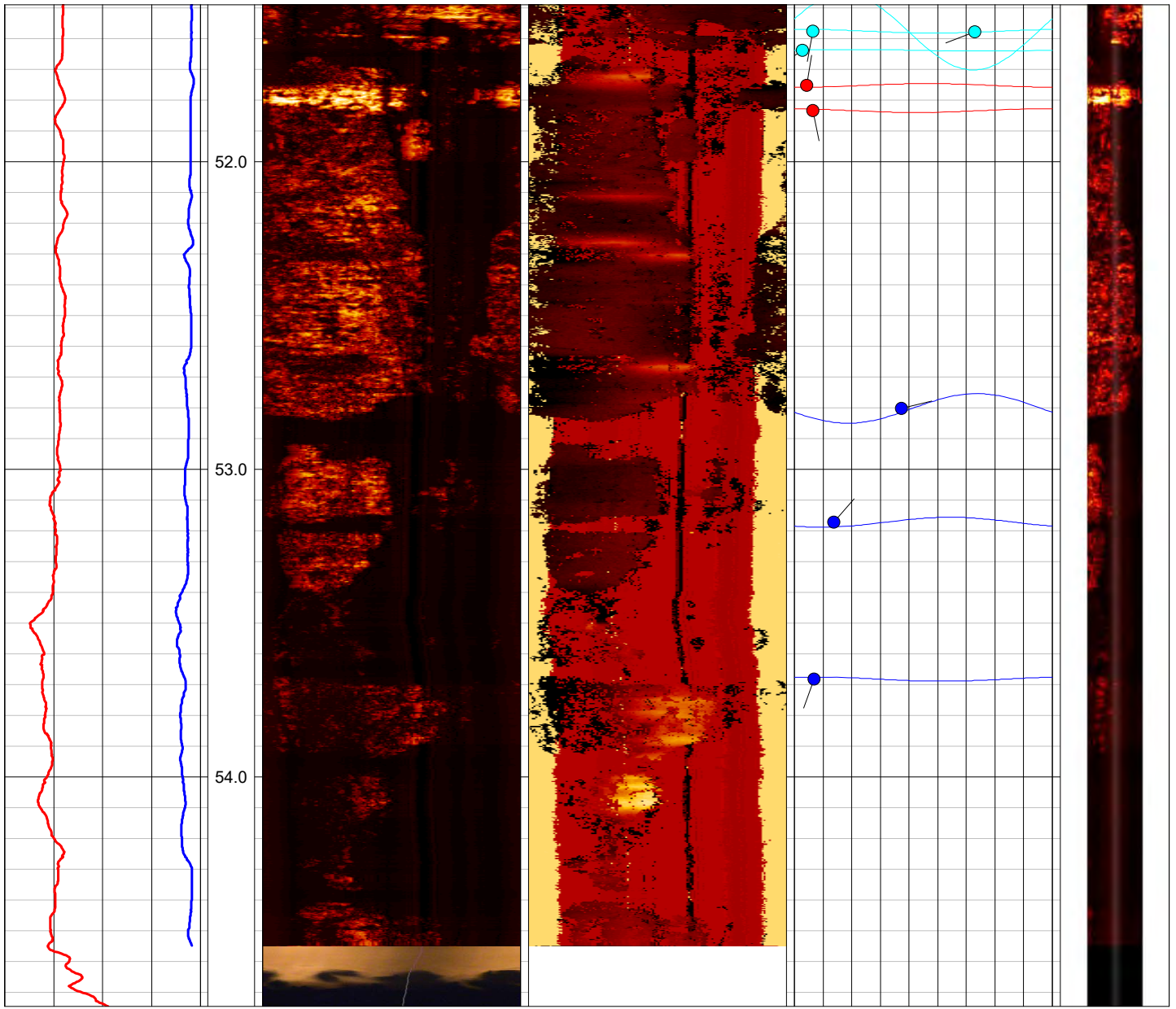
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	31.6	54.6	Geobor	127	-1.2	31.6













EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC406**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393384, 216009**

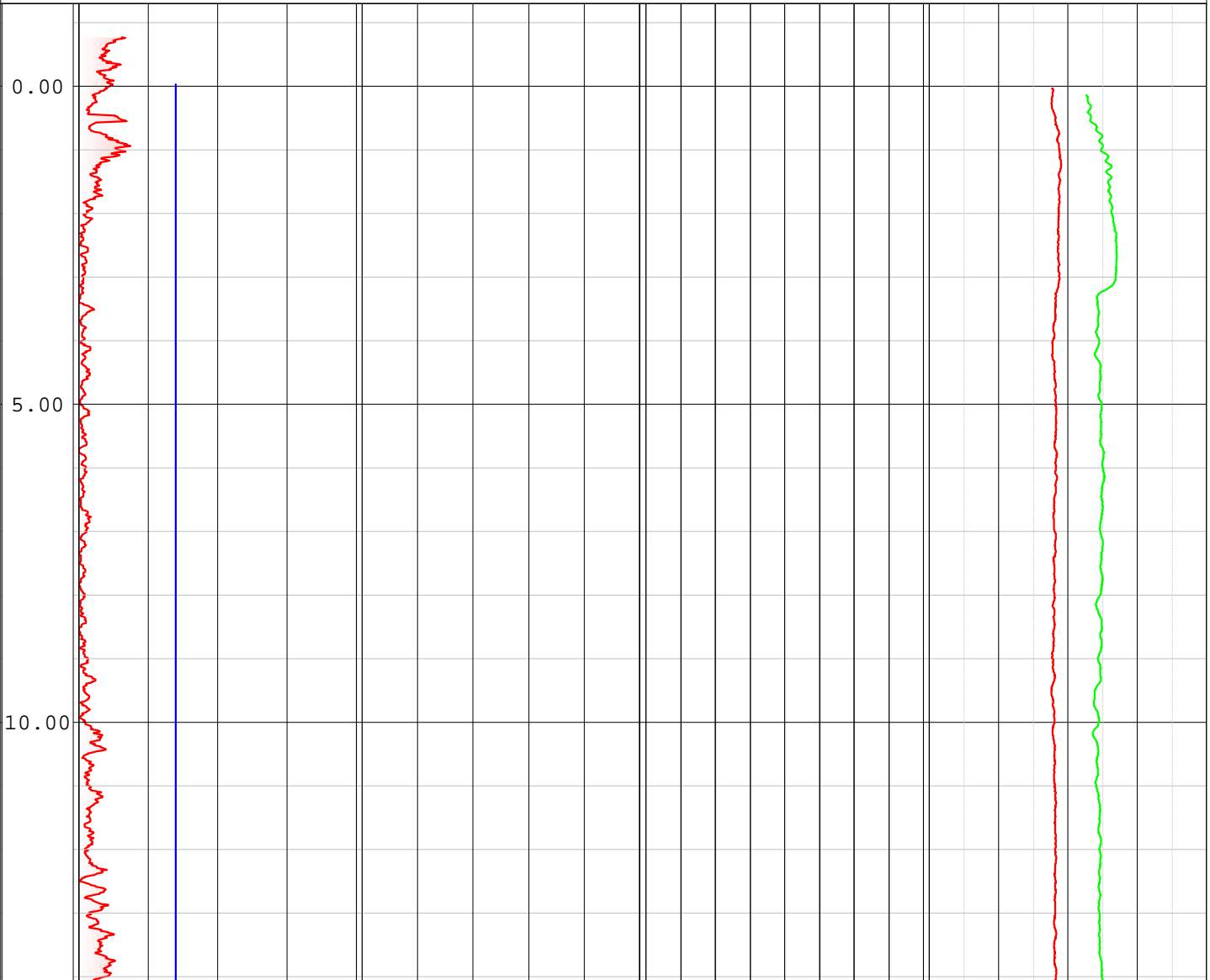
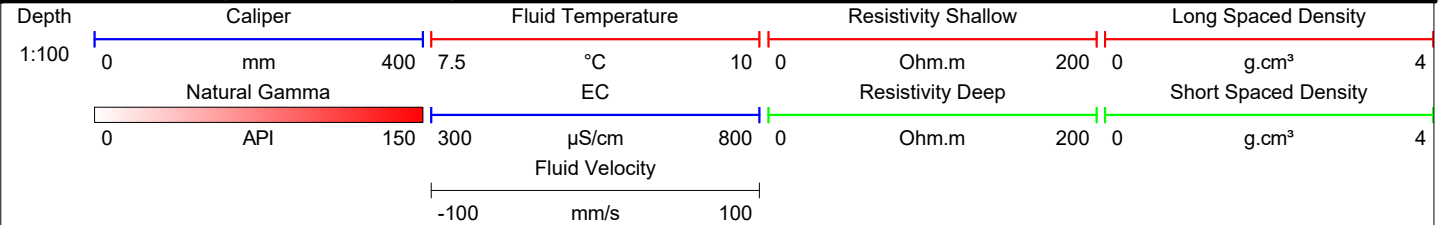
Elevation: **238.65**

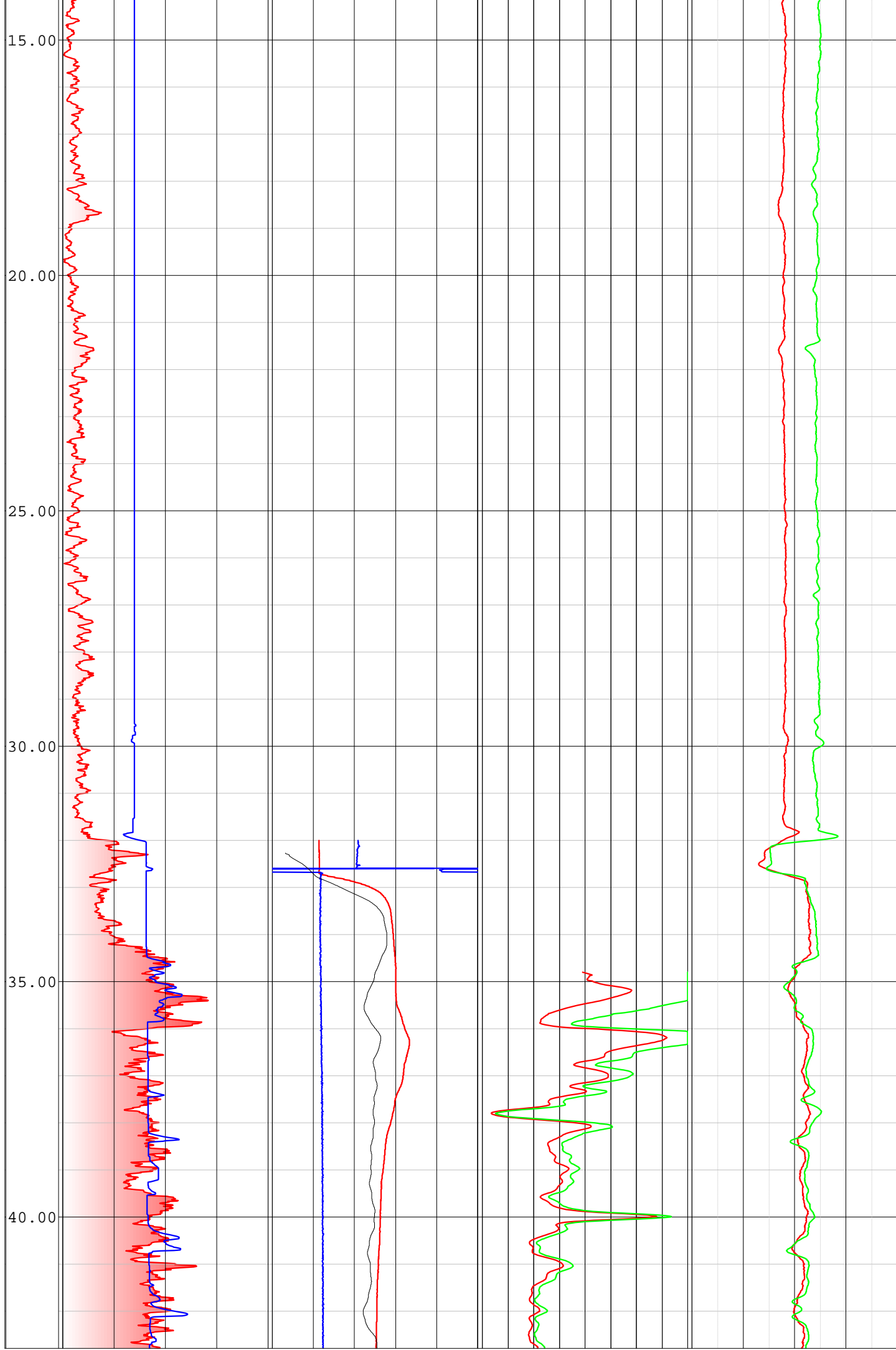
Drilled Depth: (m)	60.0*	Date:	28th & 29th January 2019
Logged Depth: (m)	54.6	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks: TRIS	
Logged Interval: (m)	31.6 - 54.6		
Fluid Level: (m)	32.3		

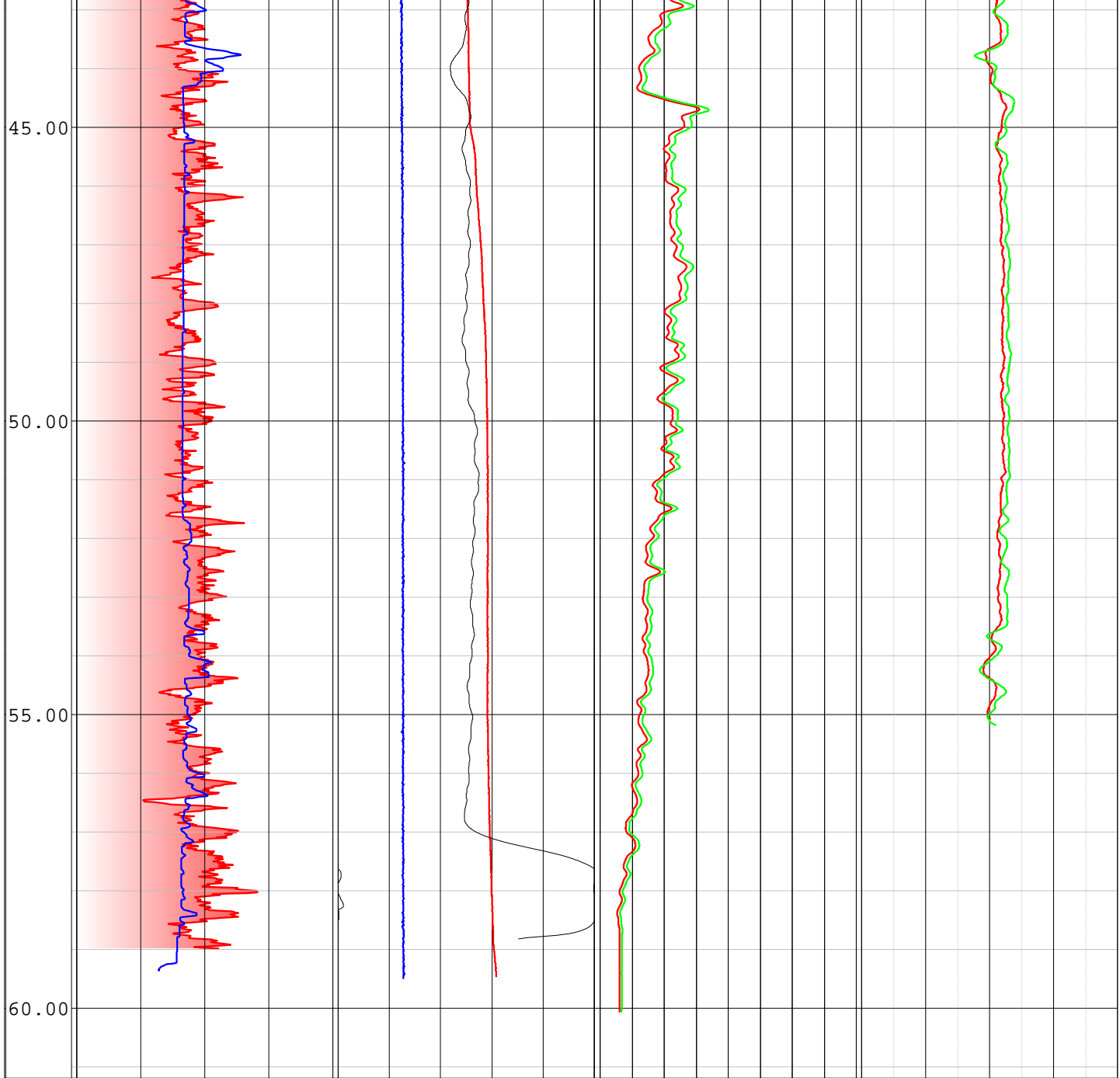
BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	31.6	54.6	Geobor	127	-1.2	31.6









EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC408**

Image

Location: **A417**

Area: **Gloucestershire**

Grid Ref: **393605, 216240**

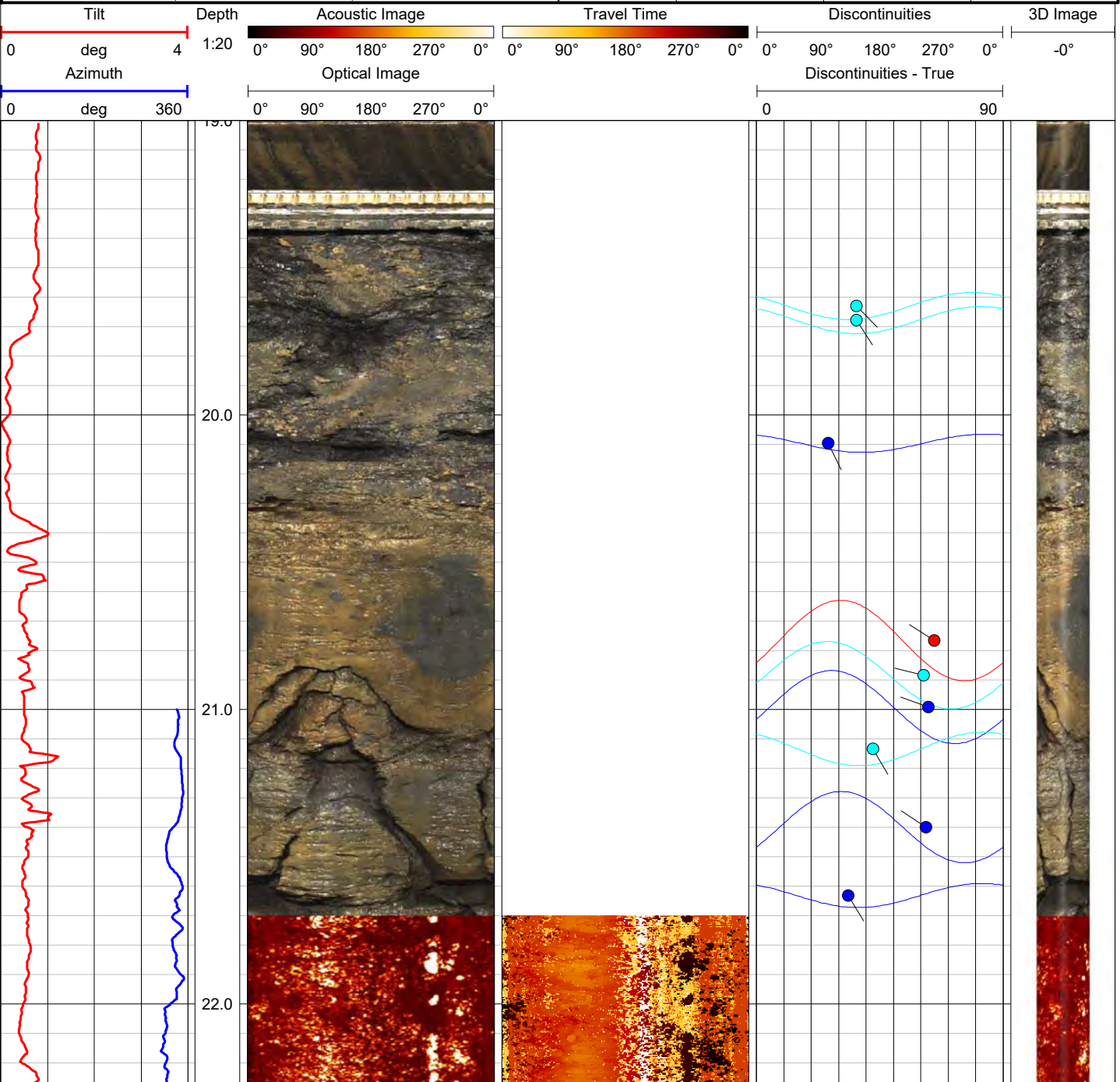
Elevation: **232.50**

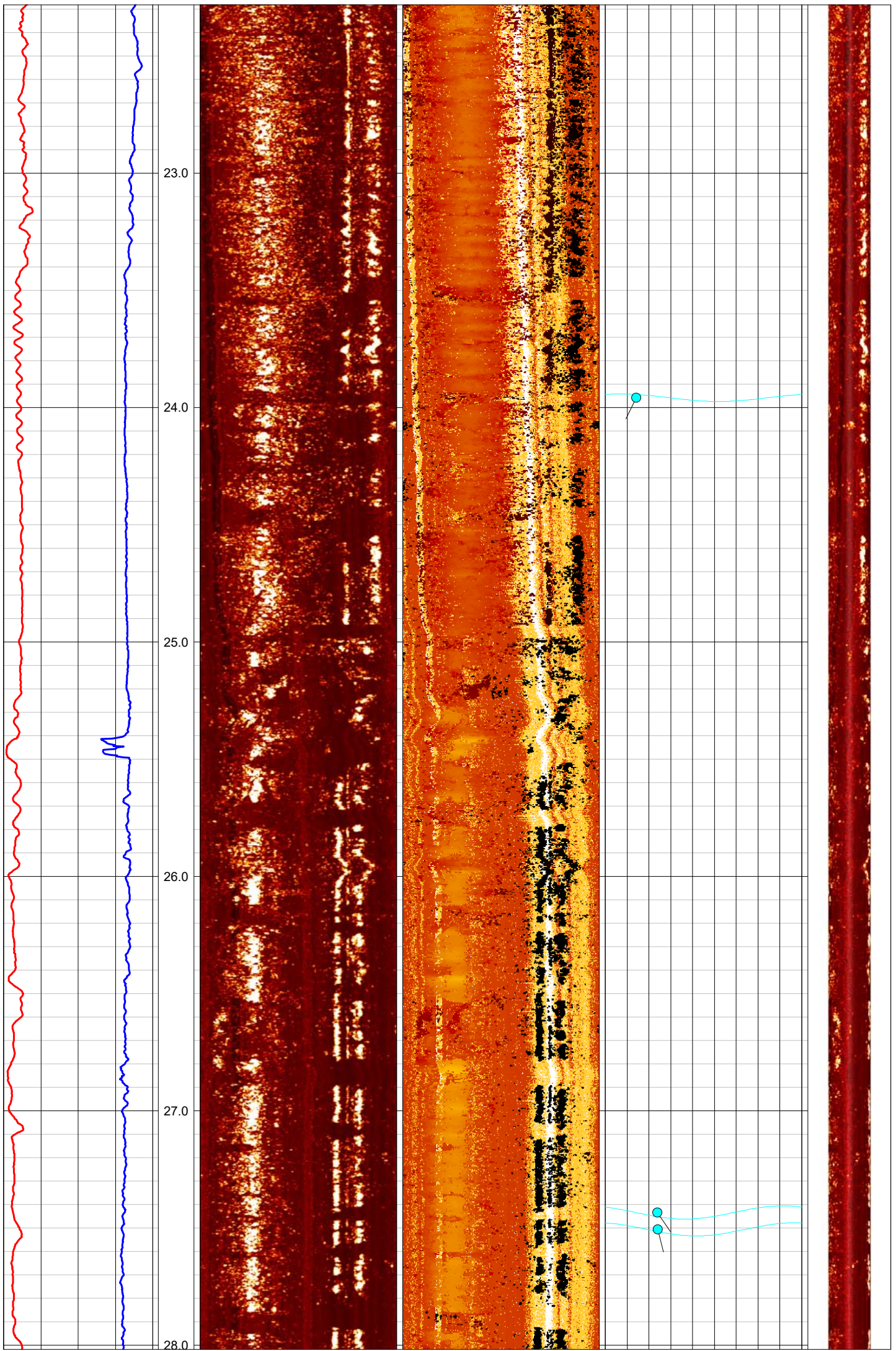
Drilled Depth: (m)	75.0	Date:	12.02.2019
Logged Depth: (m)	74.9	Recorded By:	M. Kynaston
Logging Datum:	Ground Level	Remarks: Logged immediately after completion of drilling. Fluid cloudy, Acoustic imager used in fluid filled section.	
Logged Interval: (m)	19 - 74.9		
Fluid Level: (m)	21.72		

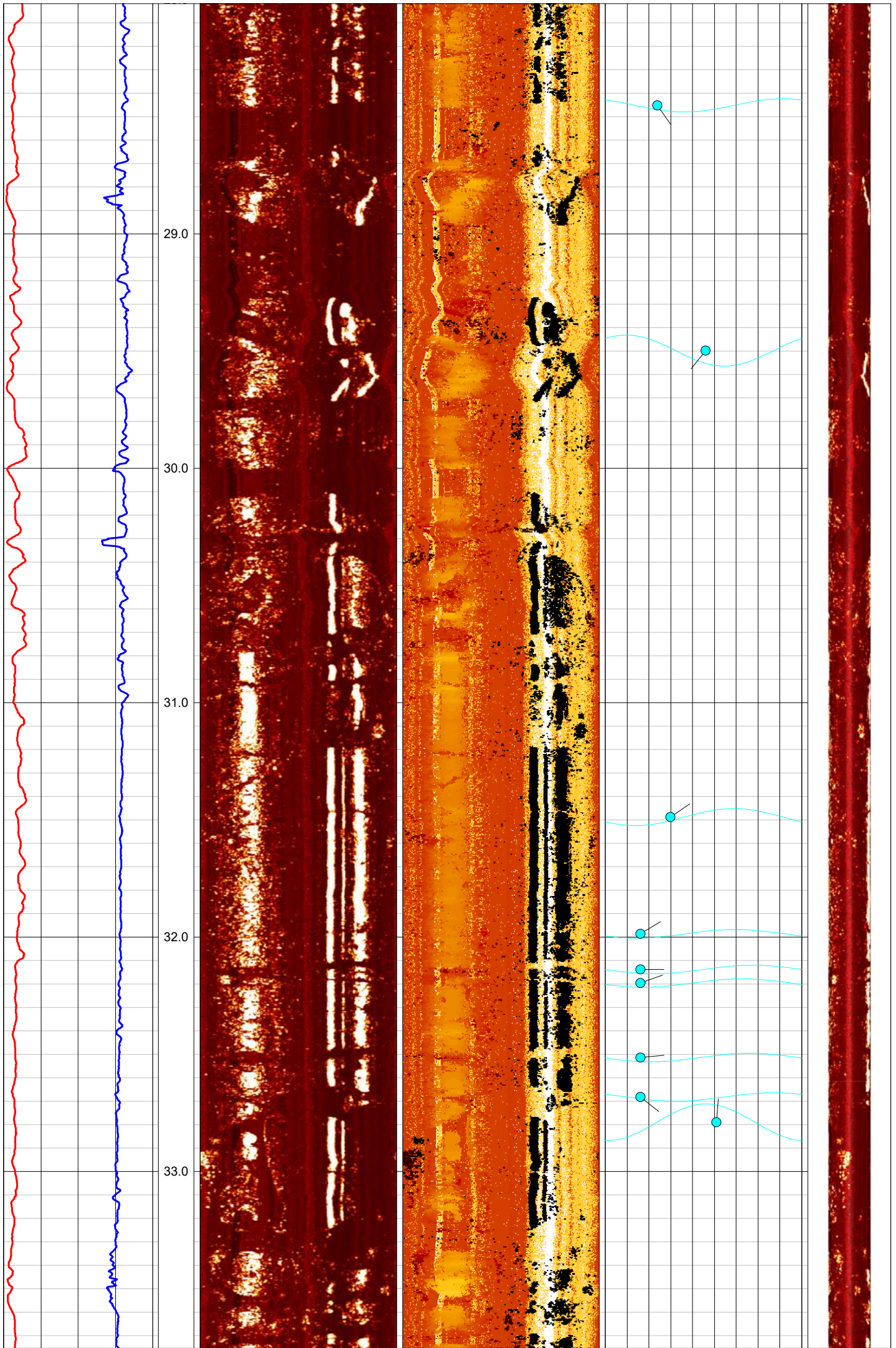
BOREHOLE RECORD

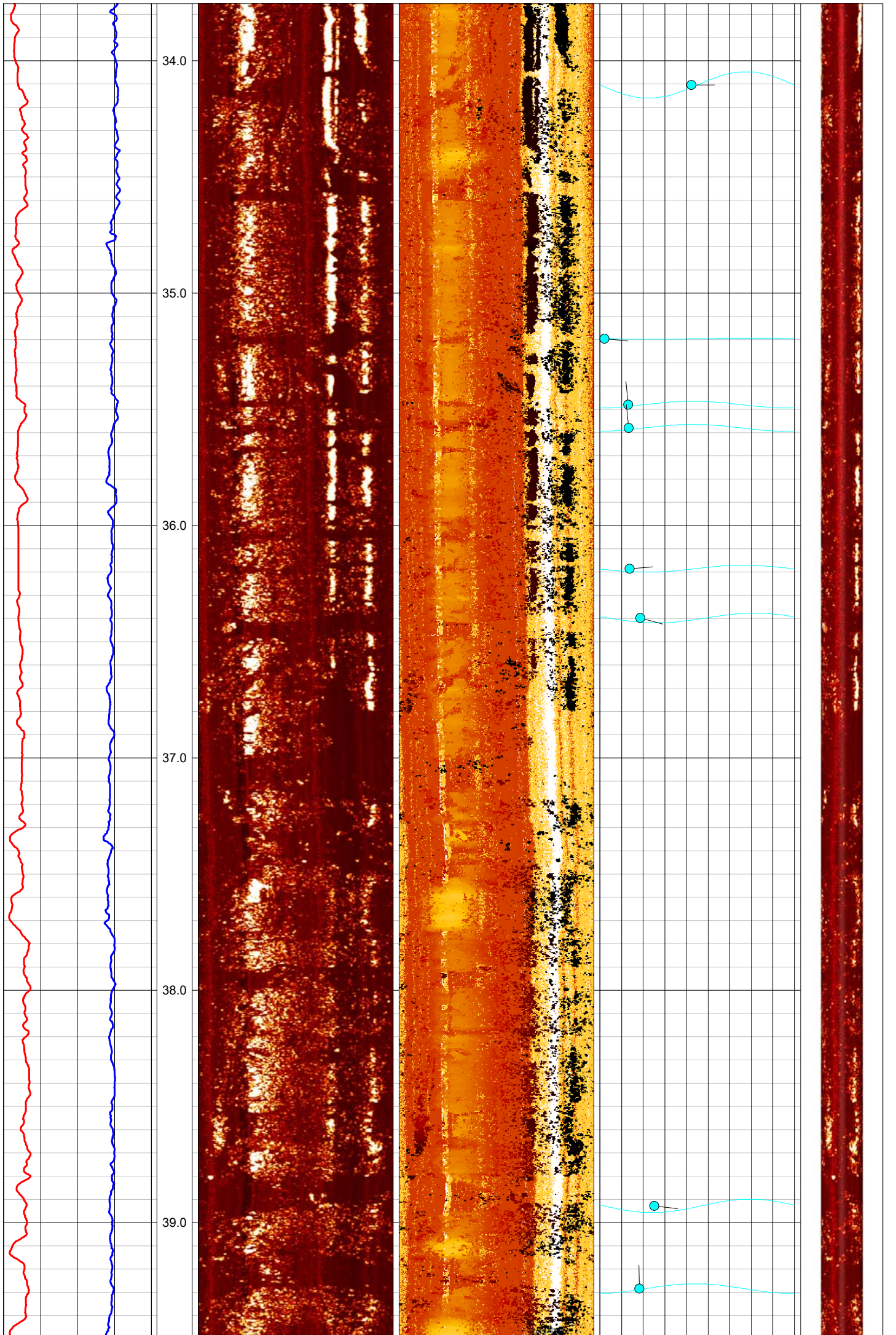
CASING RECORD

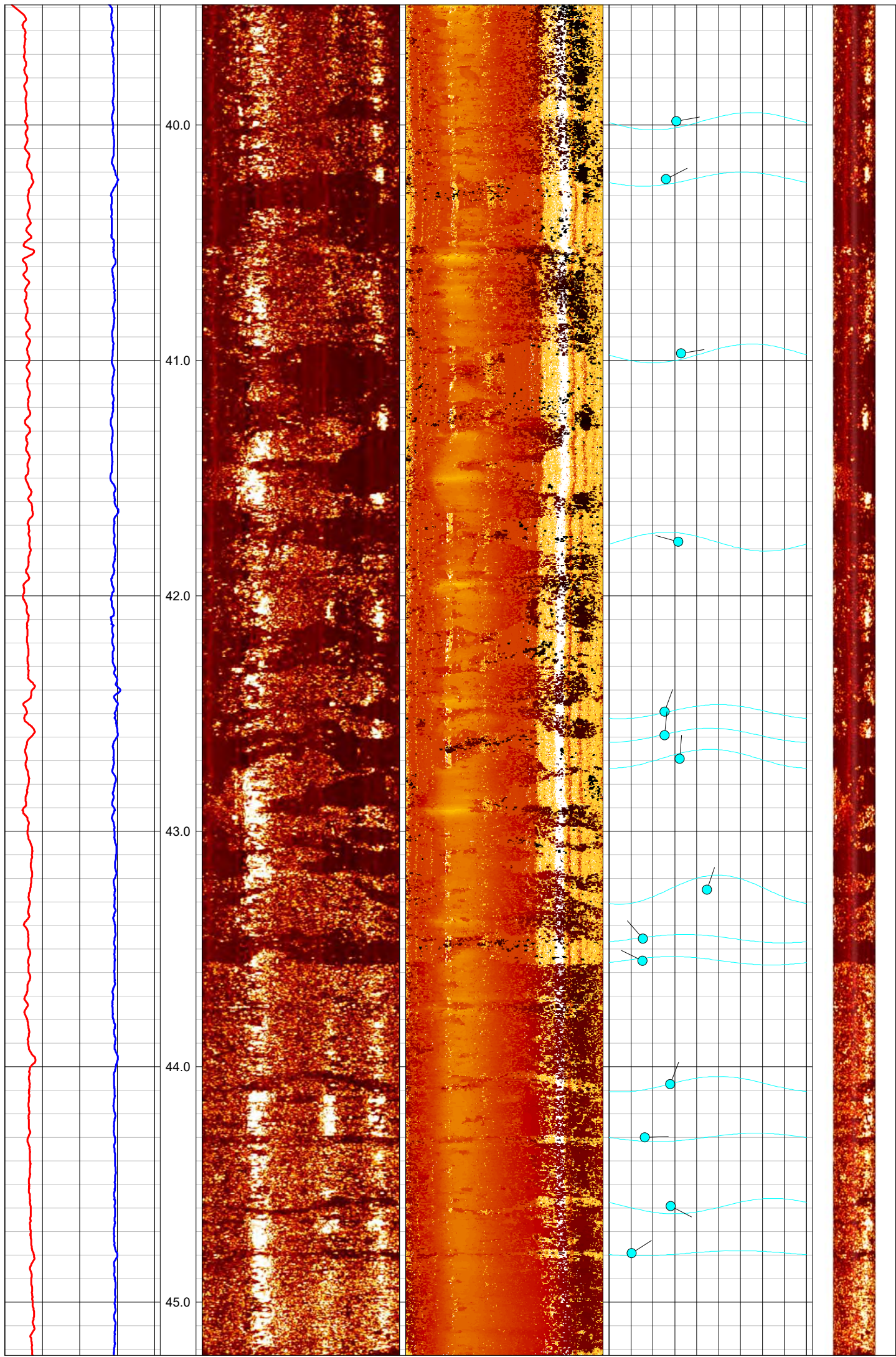
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	-1.1	19.32

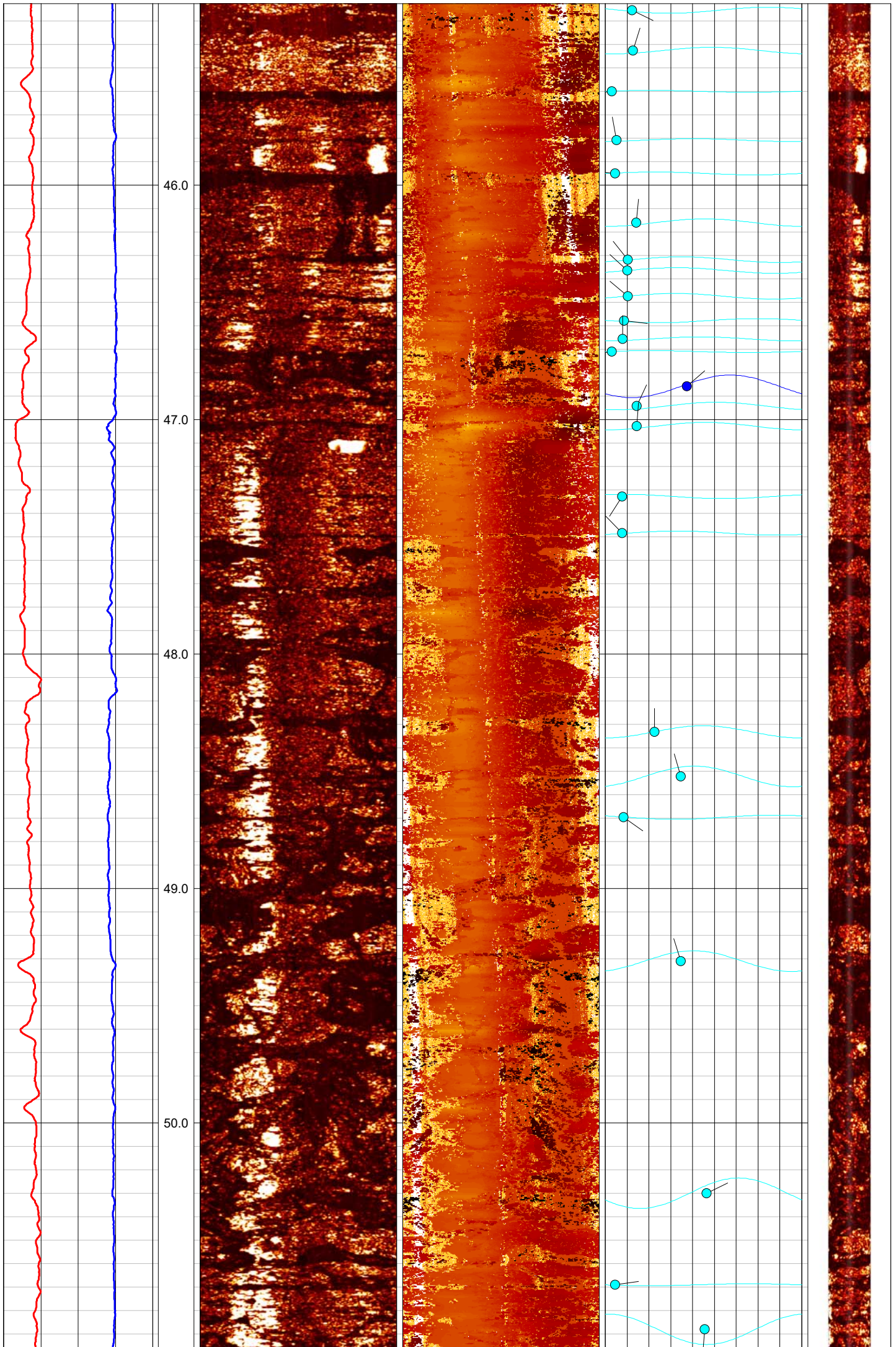


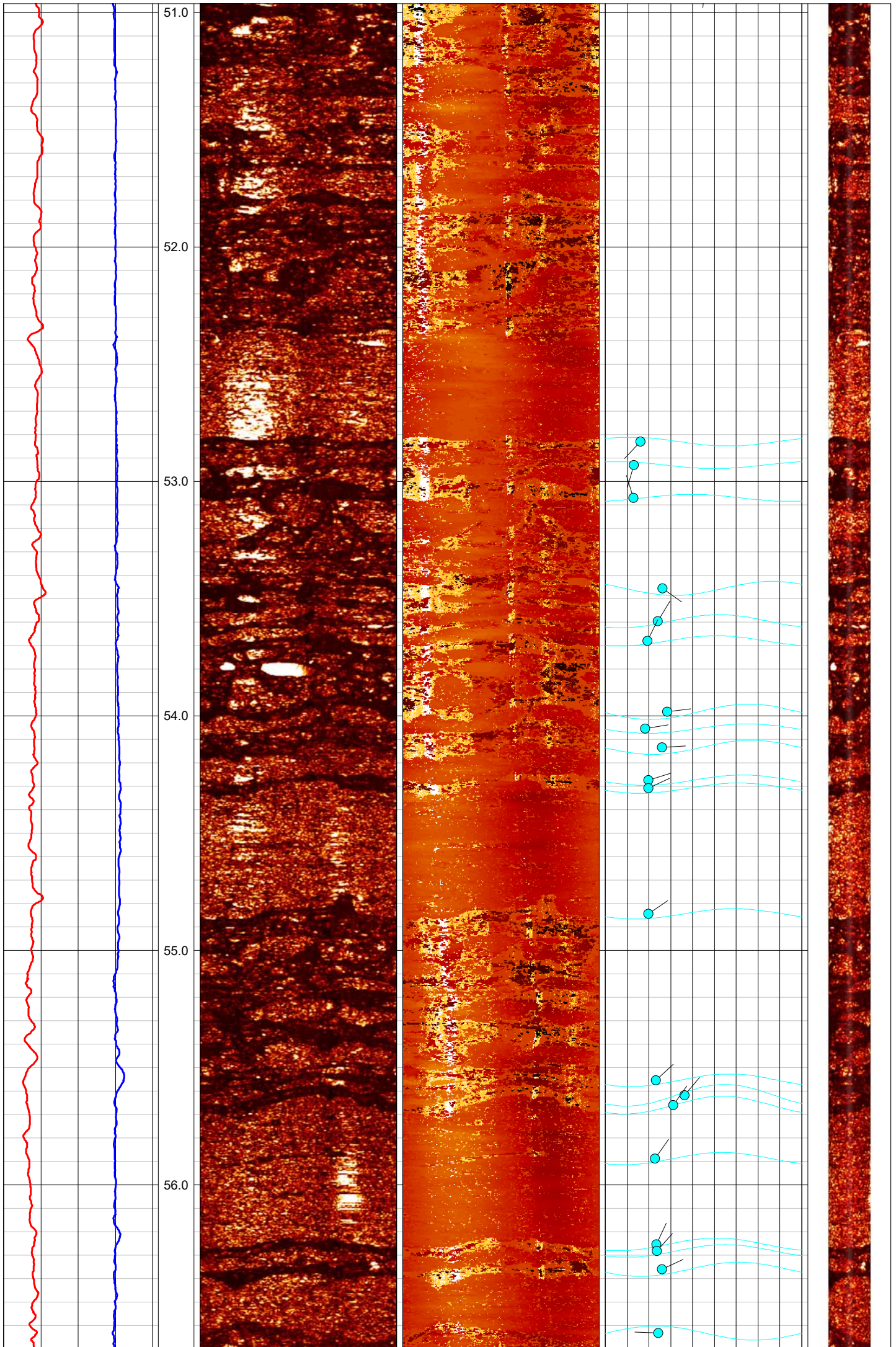


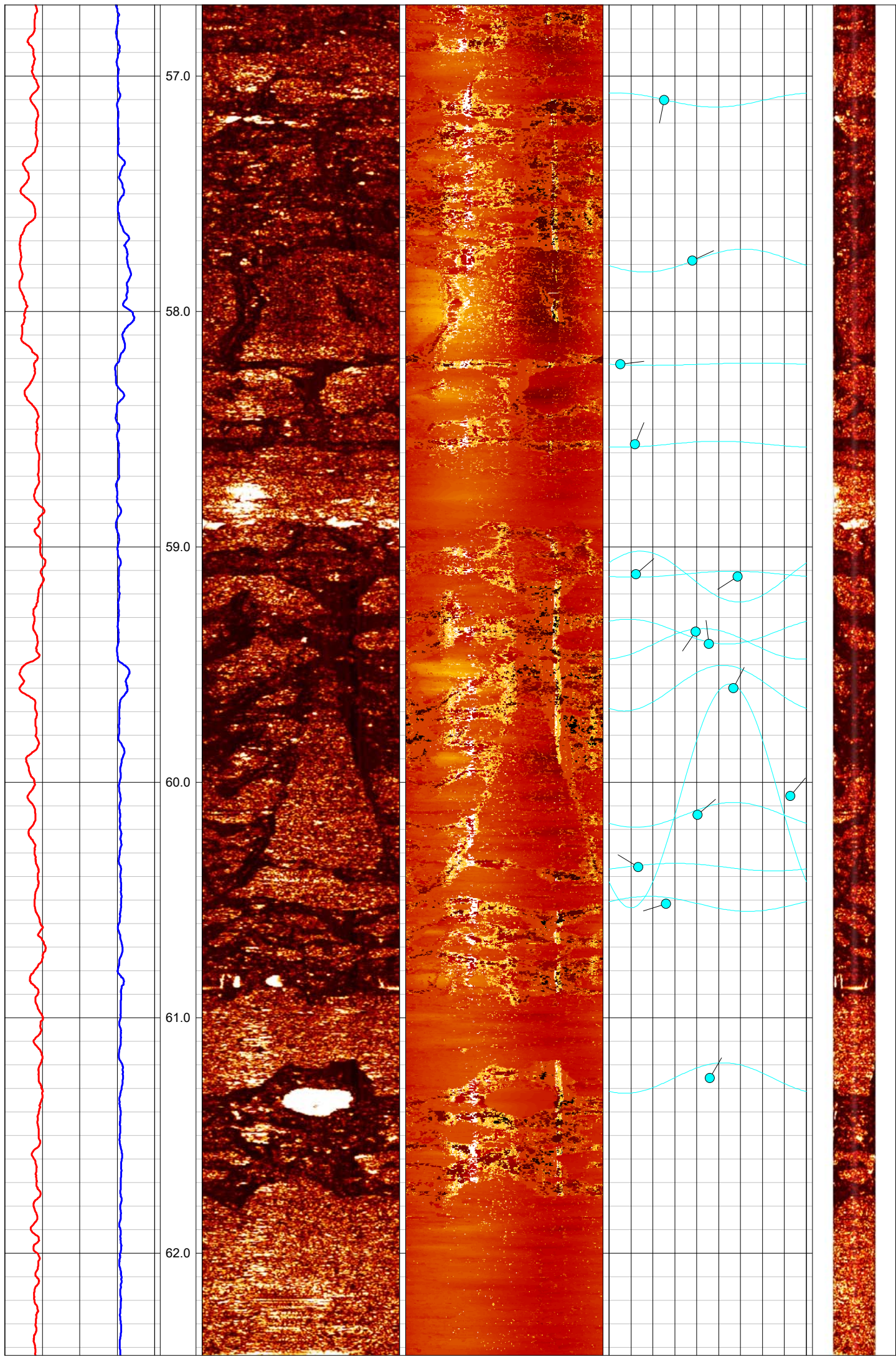


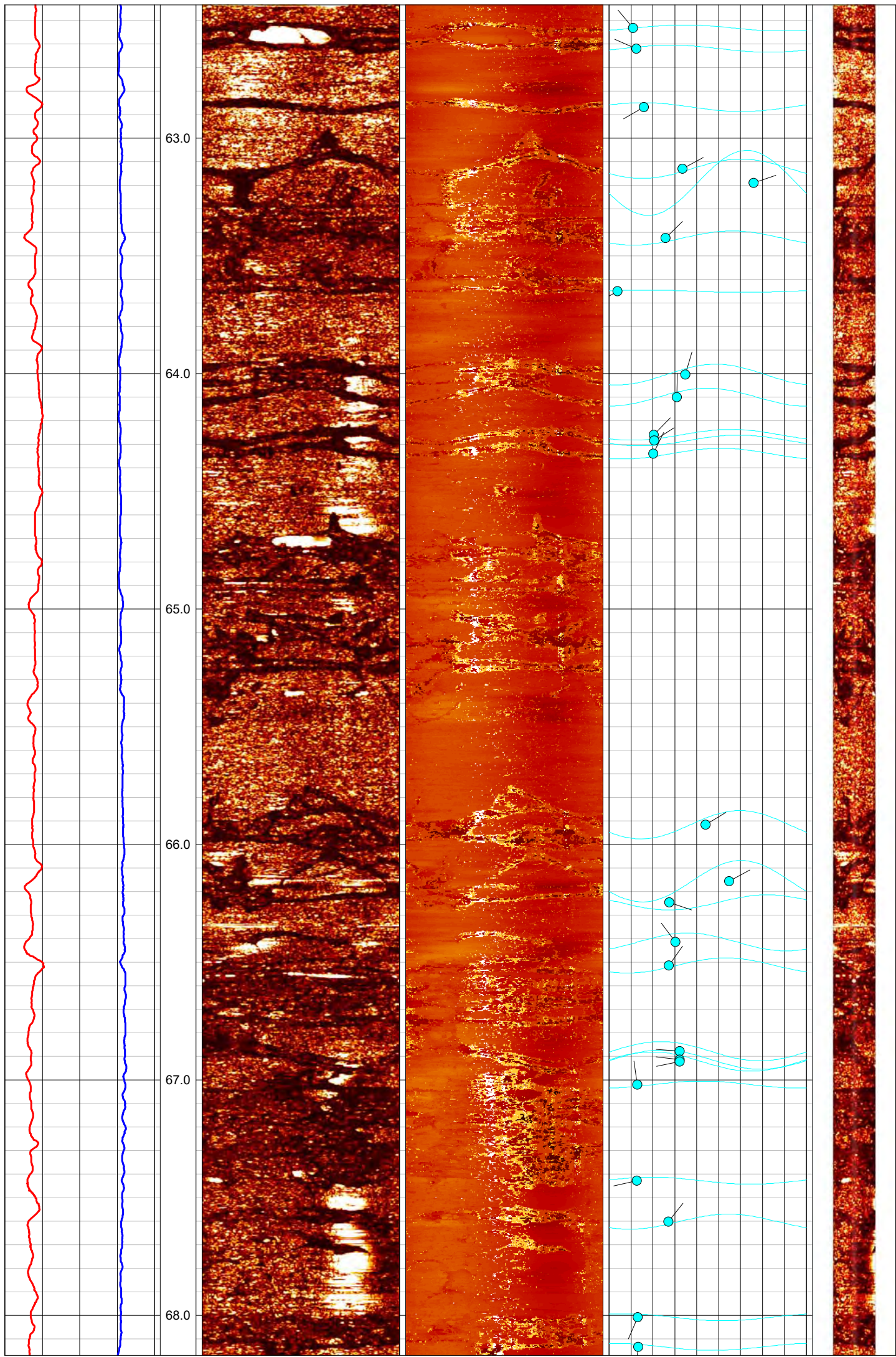


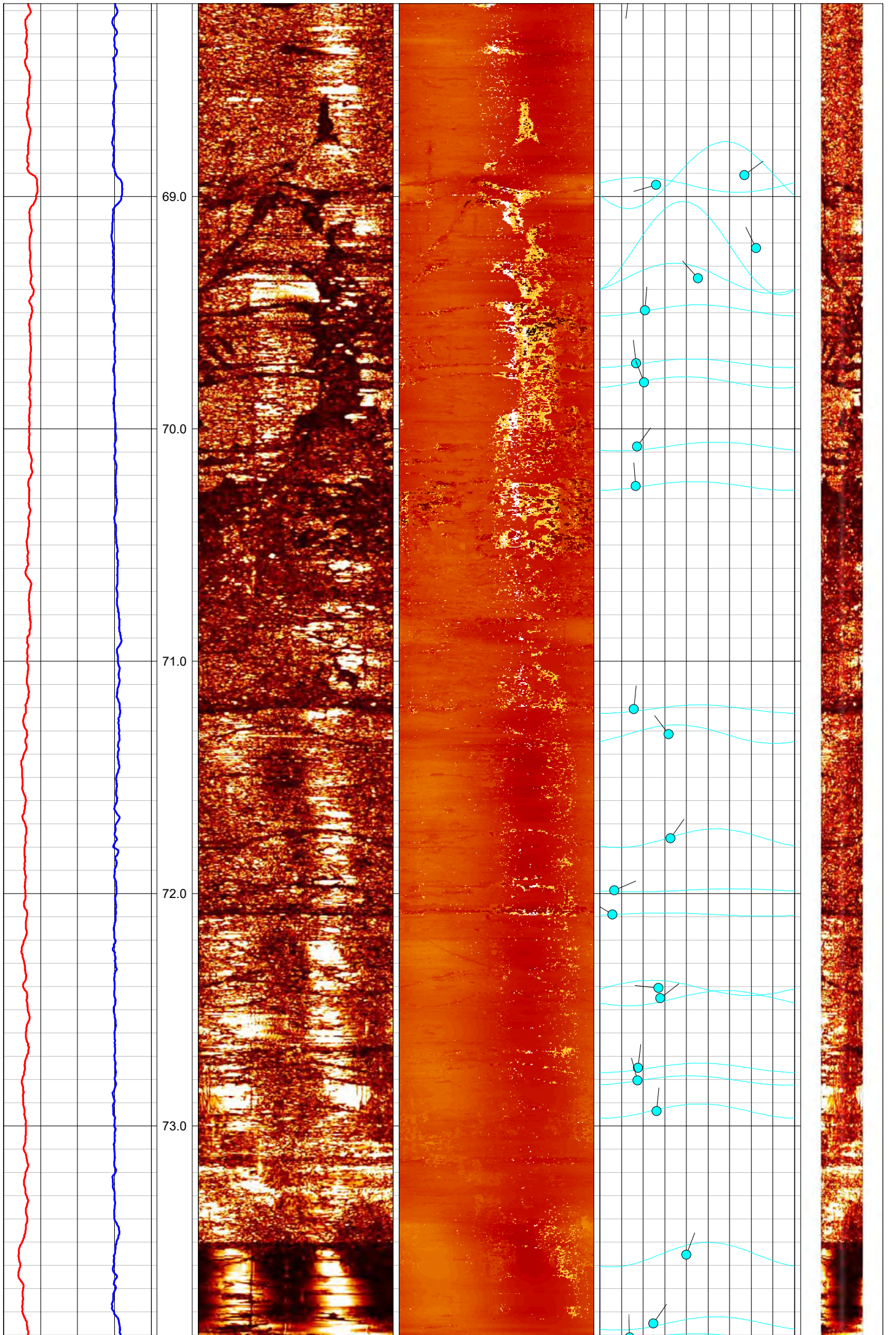


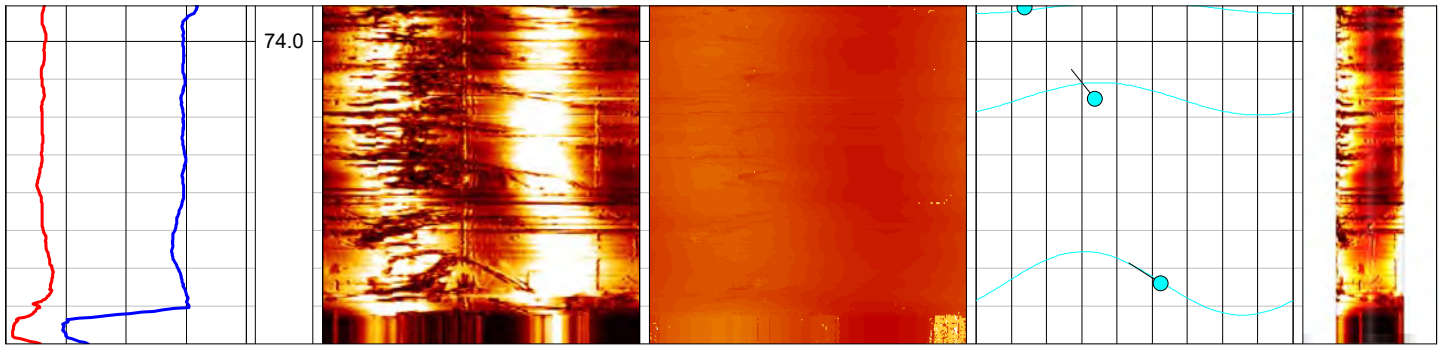














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC408**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393605, 216240**

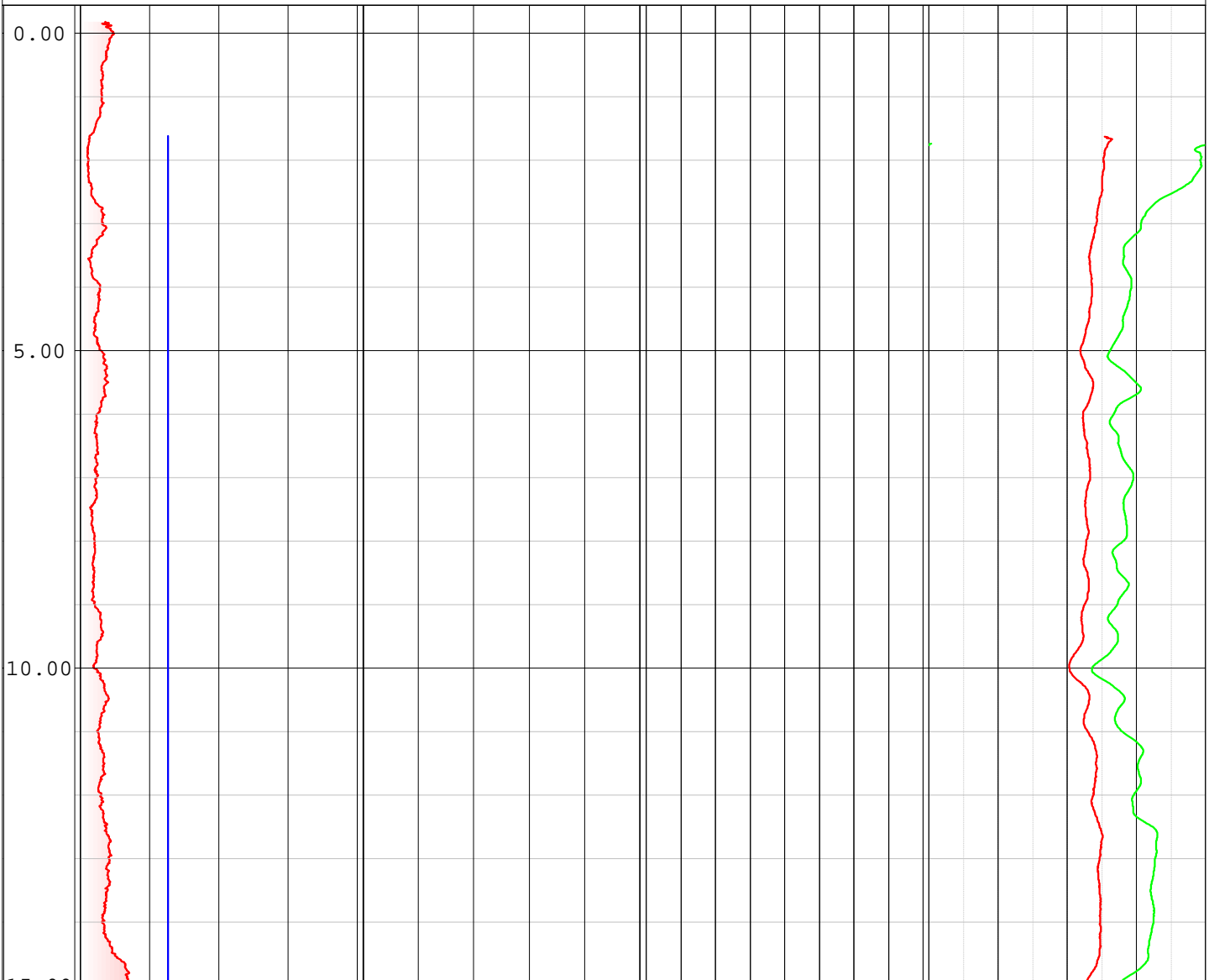
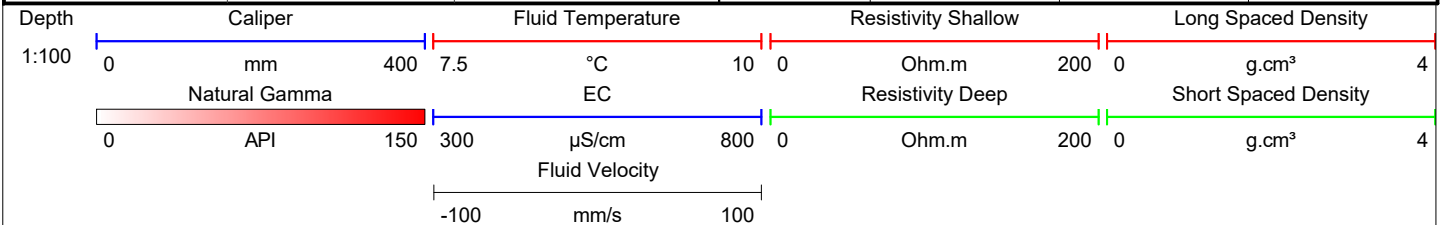
Elevation: **232.50**

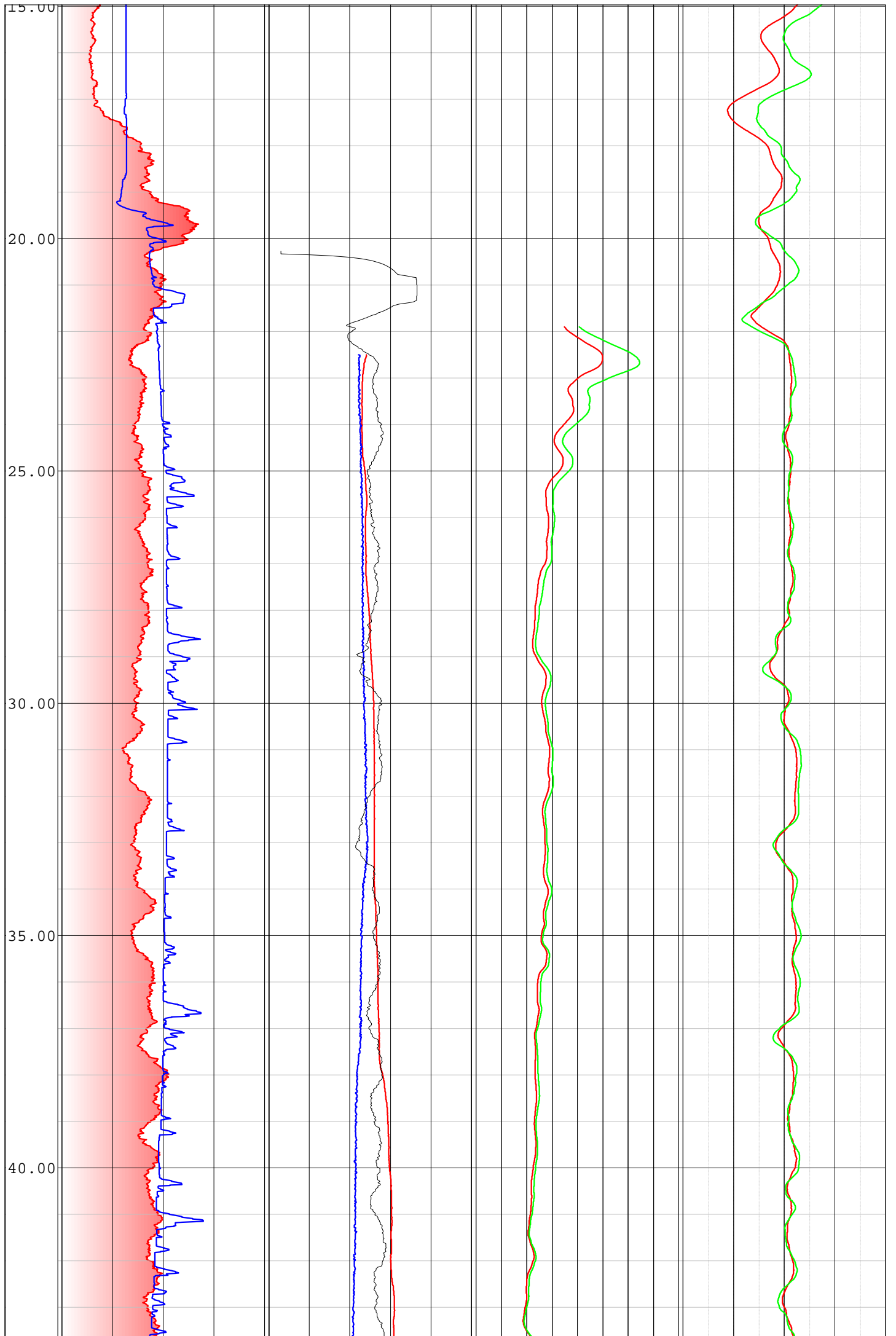
Drilled Depth: (m)	75.0	Date:	12th February 2019
Logged Depth: (m)	74.9	Recorded By:	M. Kynaston
Logging Datum:	Ground Level	Remarks: Logged immediately after completion of drilling.	
Logged Interval: (m)	19 - 74.9		
Fluid Level: (m)	21.72		

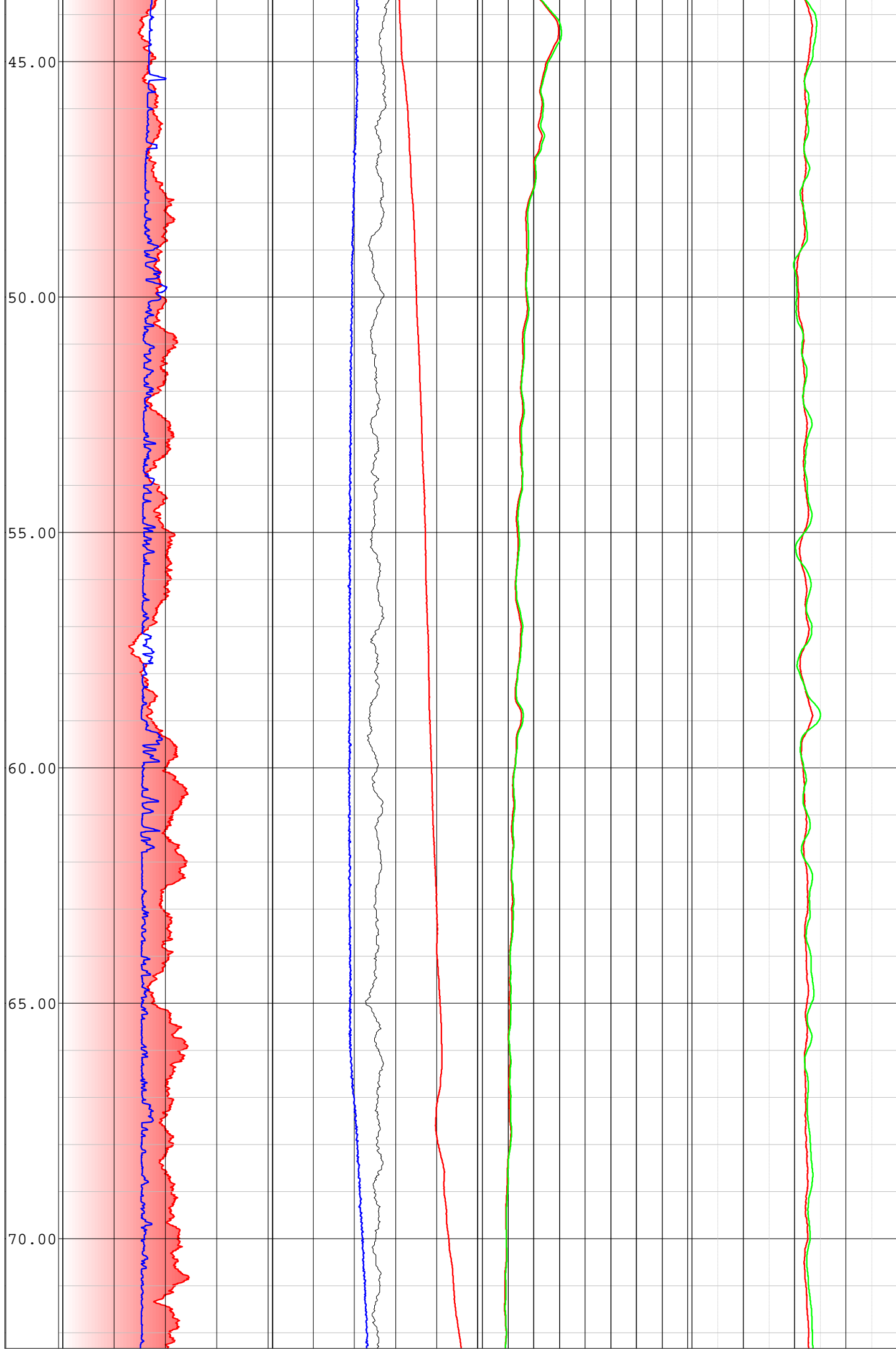
BOREHOLE RECORD

CASING RECORD

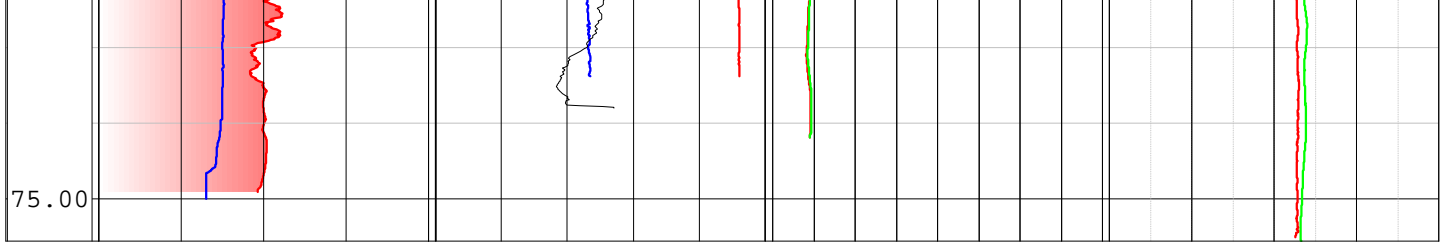
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	-1.1	19.32







75.00





EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC415**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393527, 213994**

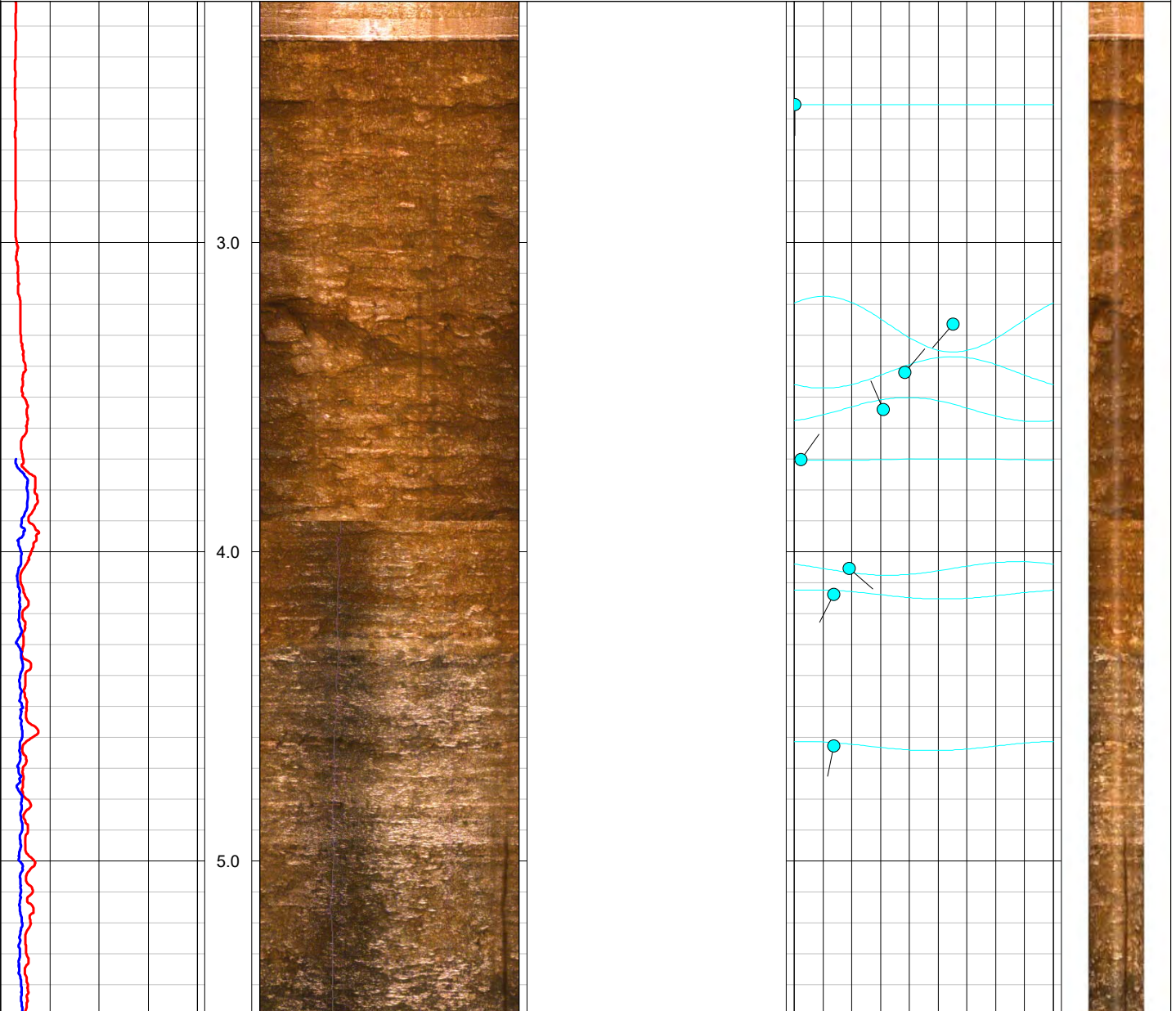
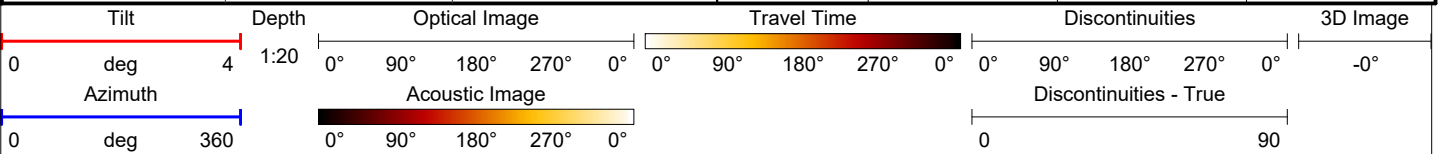
Elevation: **287.20**

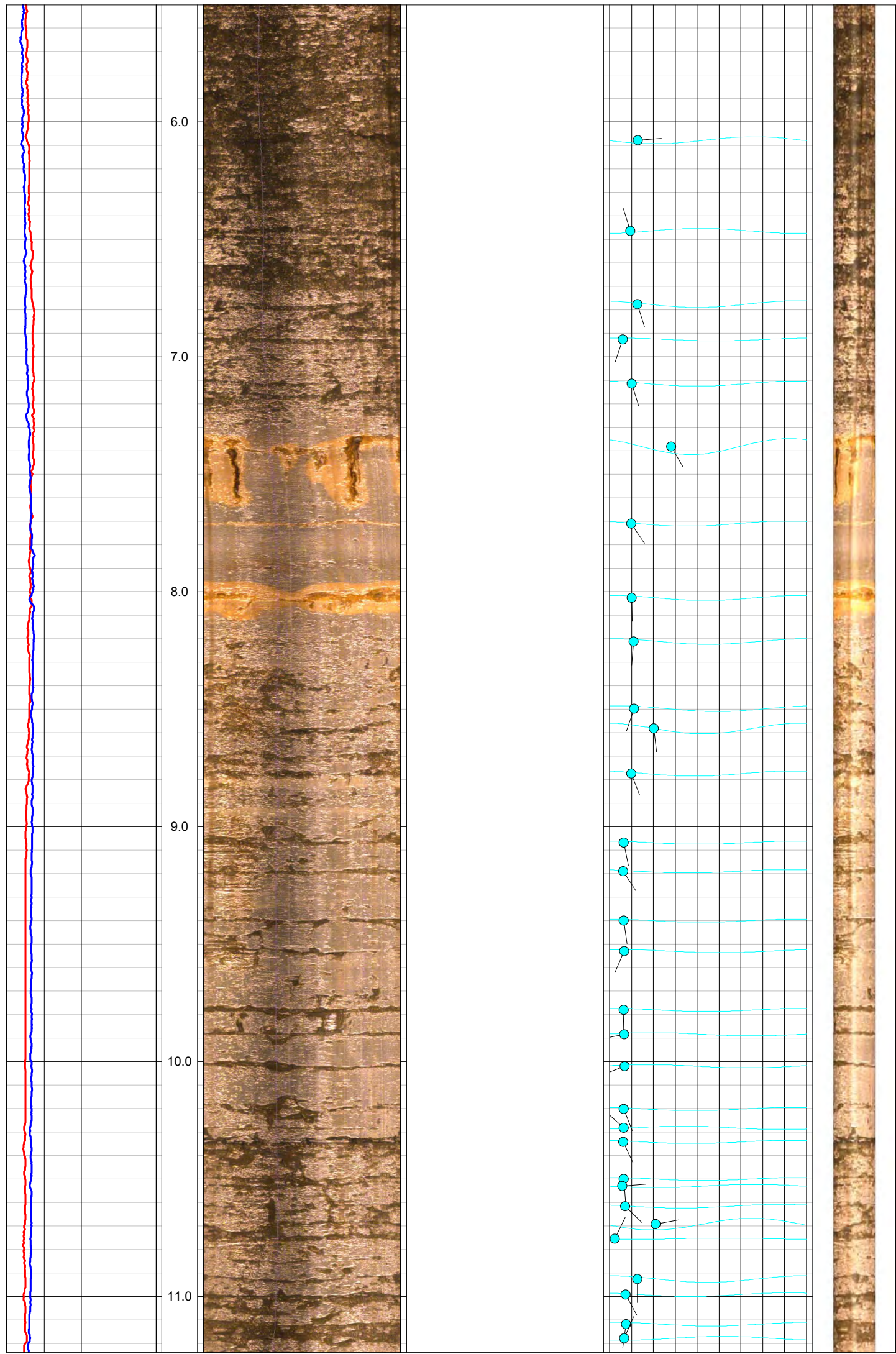
Drilled Depth: (m)	51.0*	Date:	29th January 2019
Logged Depth: (m)	51.4	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks: Borehole backfilling during logging.	
Logged Interval: (m)	2.5 - 51.4		
Fluid Level: (m)	48.5		

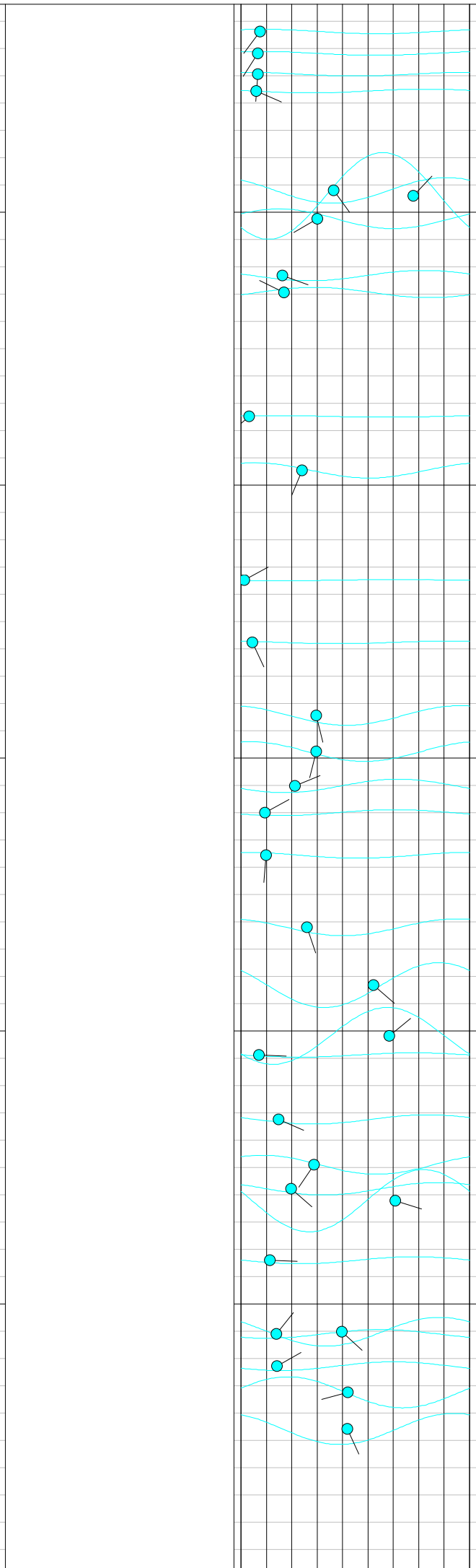
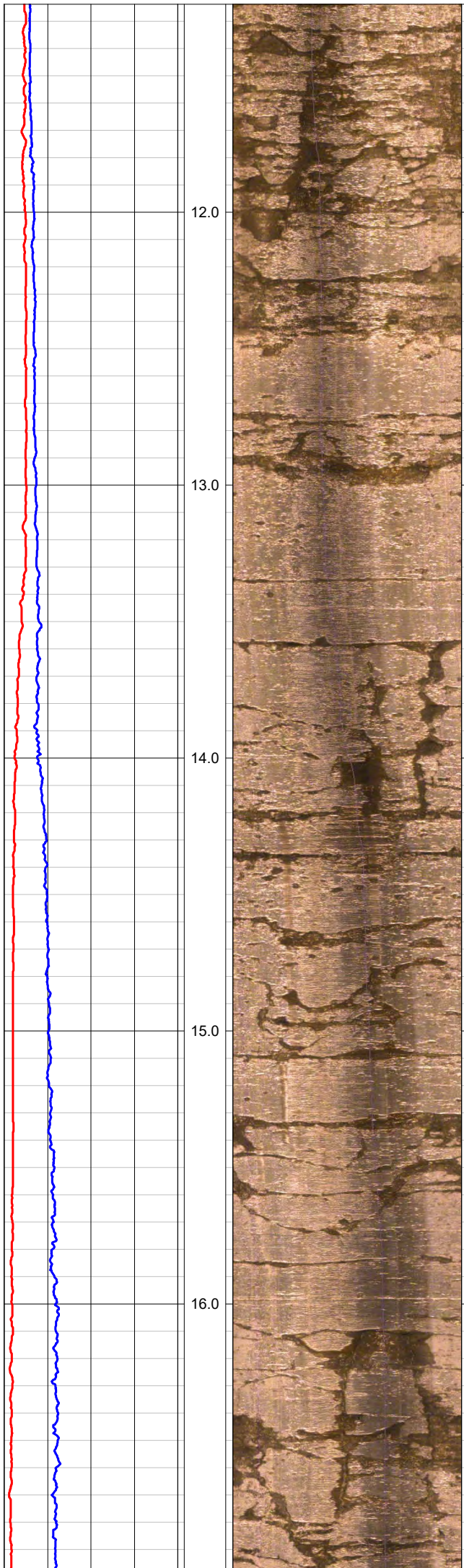
BOREHOLE RECORD

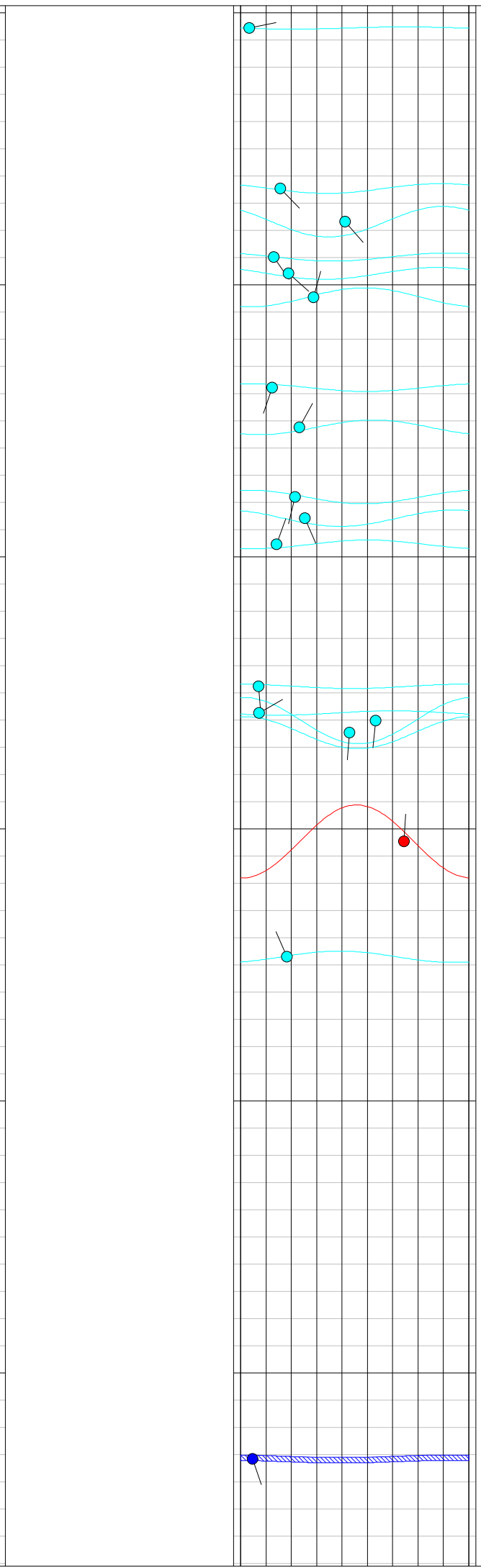
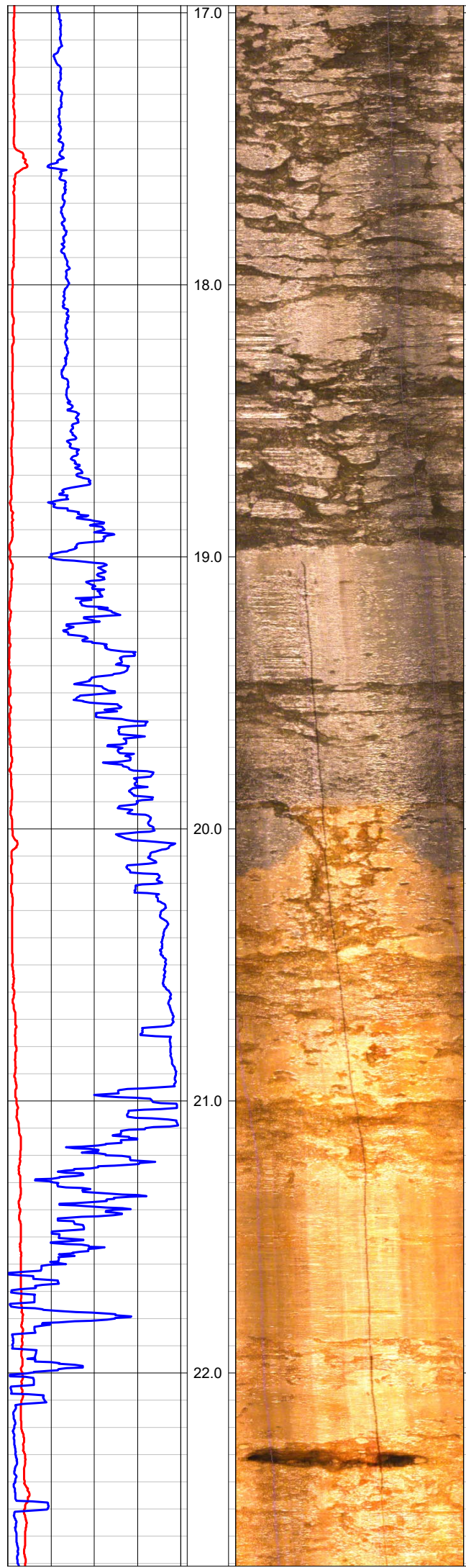
CASING RECORD

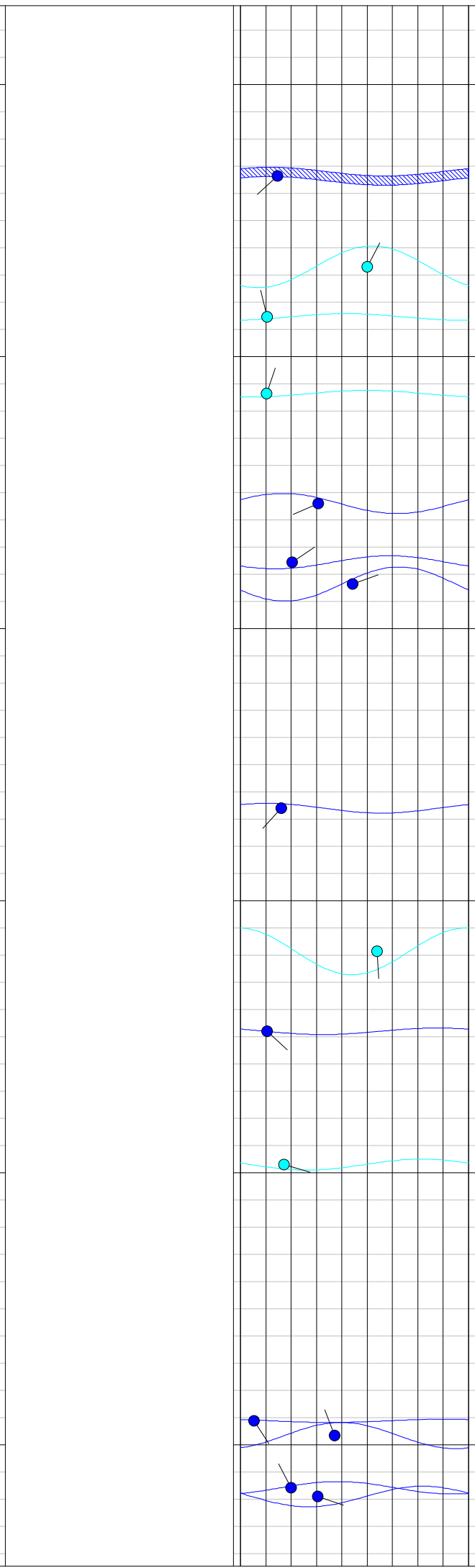
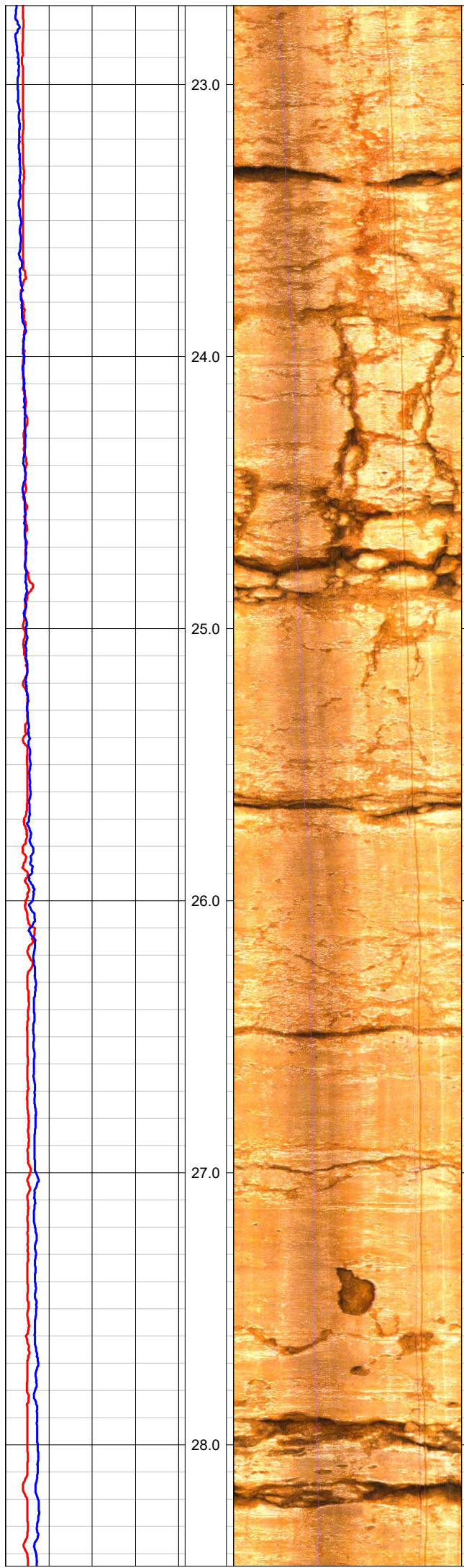
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	2.5	51.4	Geobor	127	-0.4	2.4

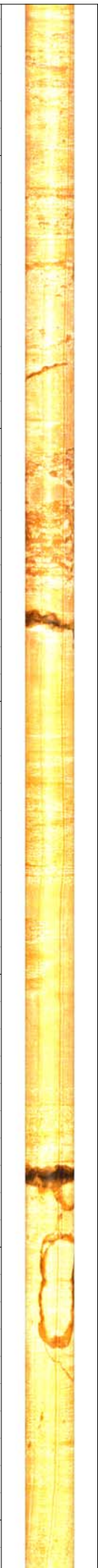
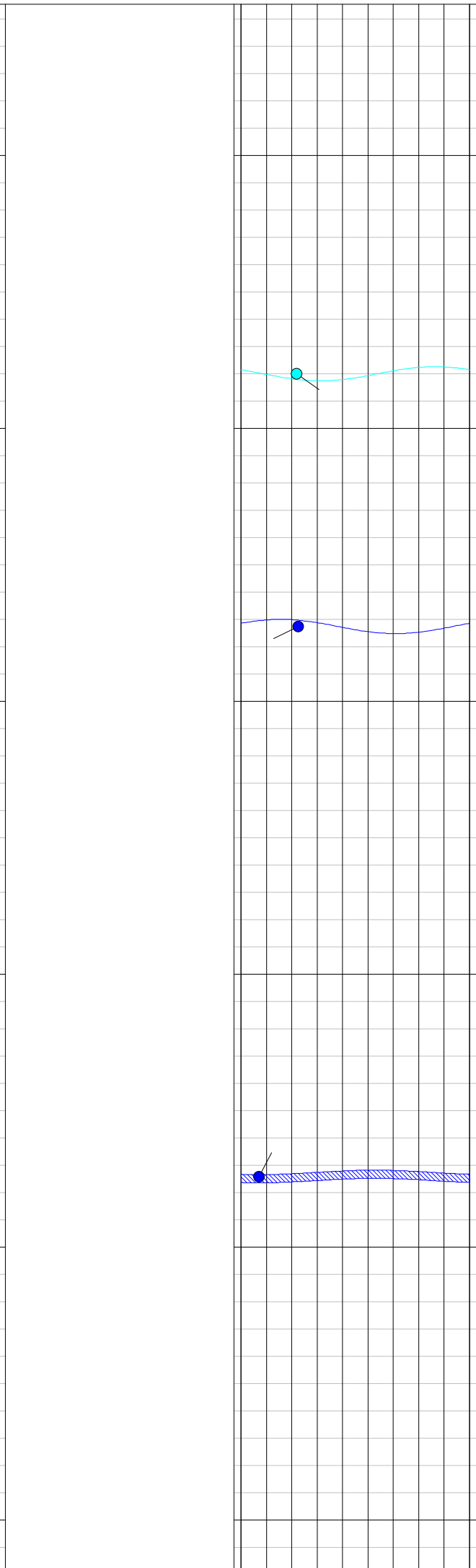
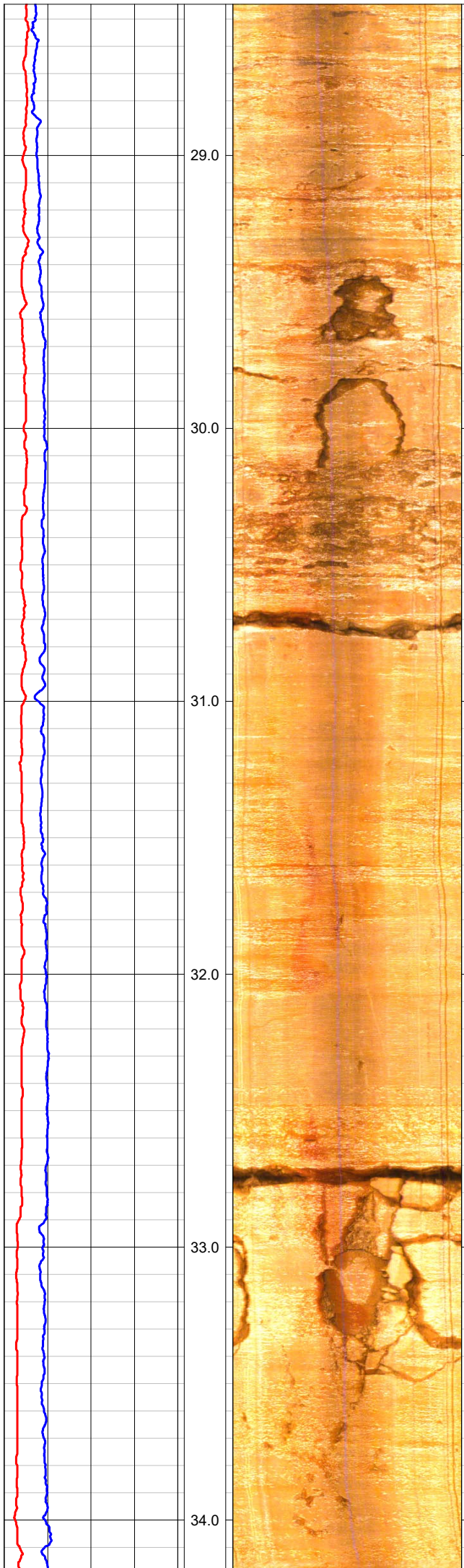


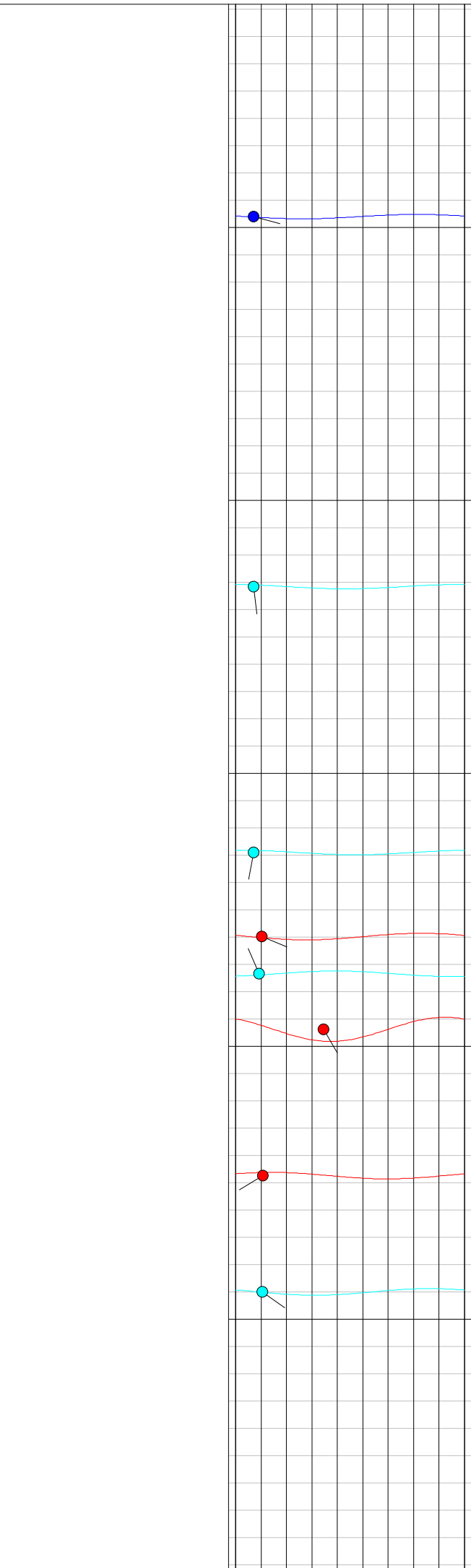
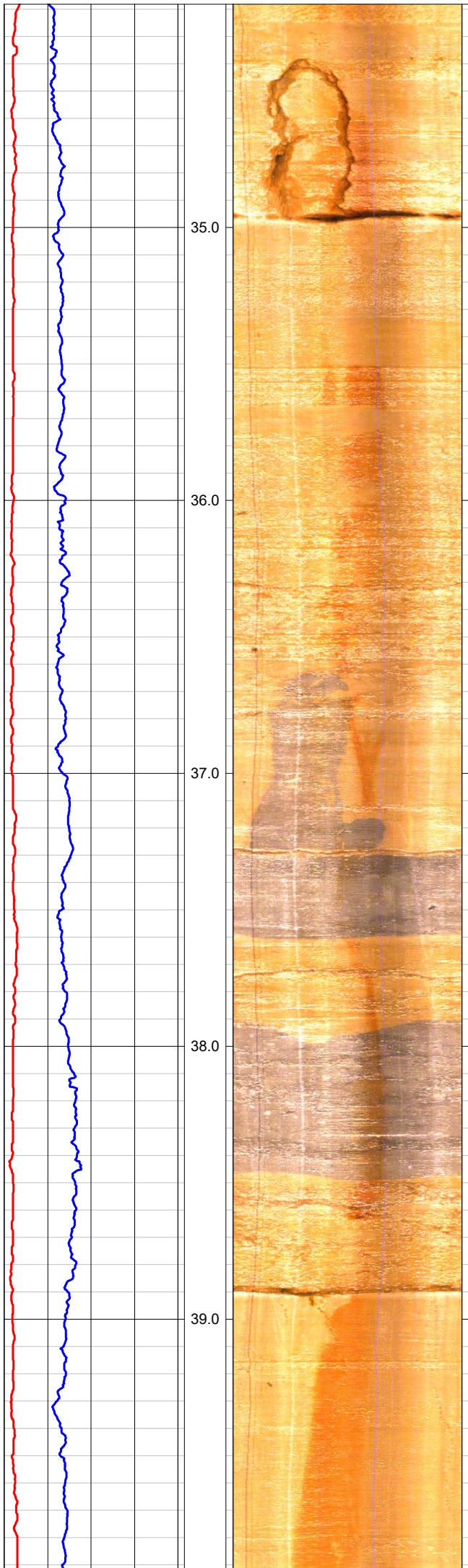


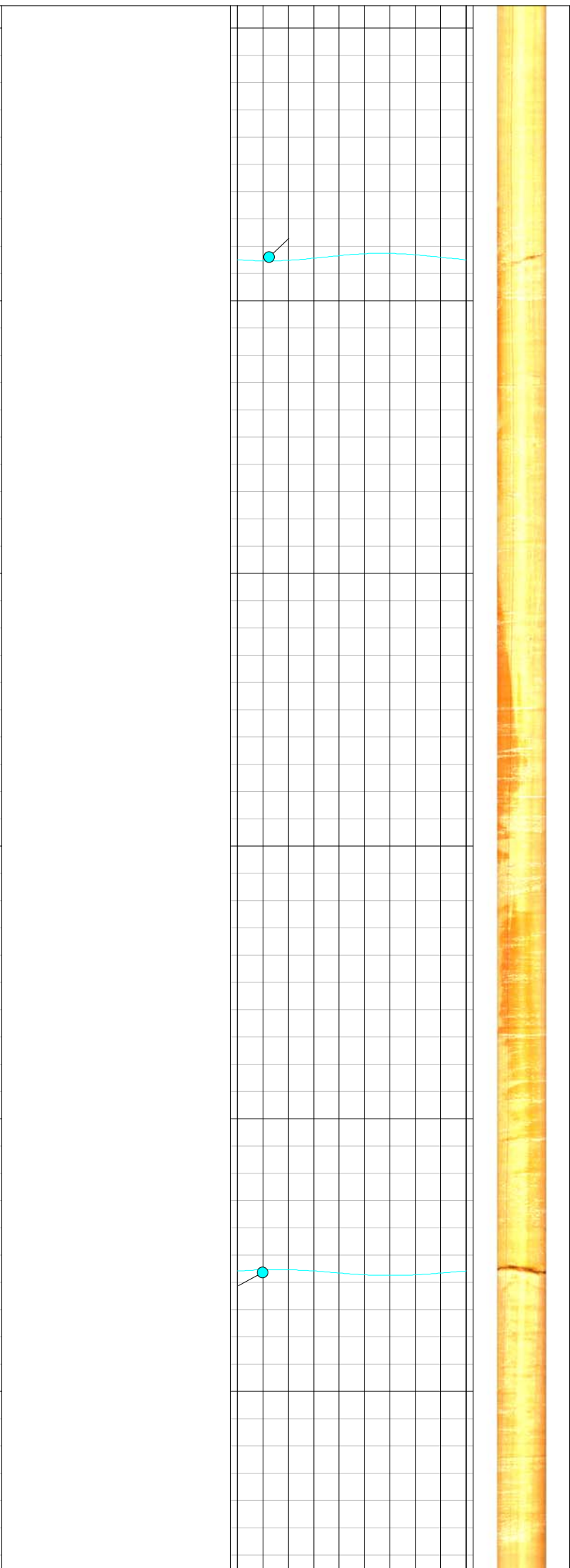
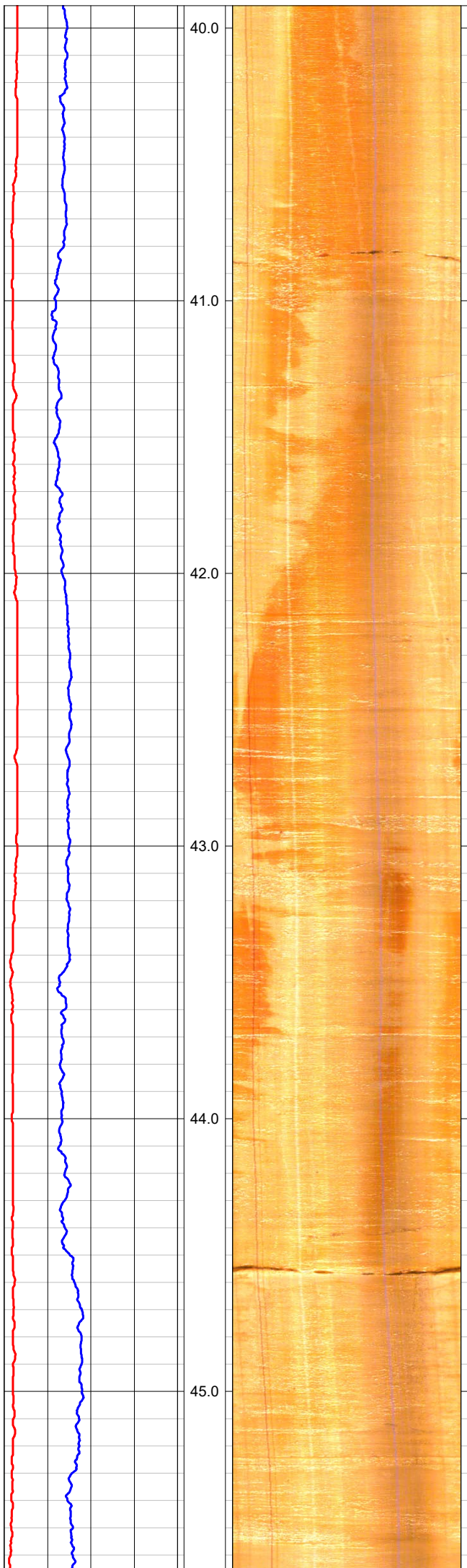


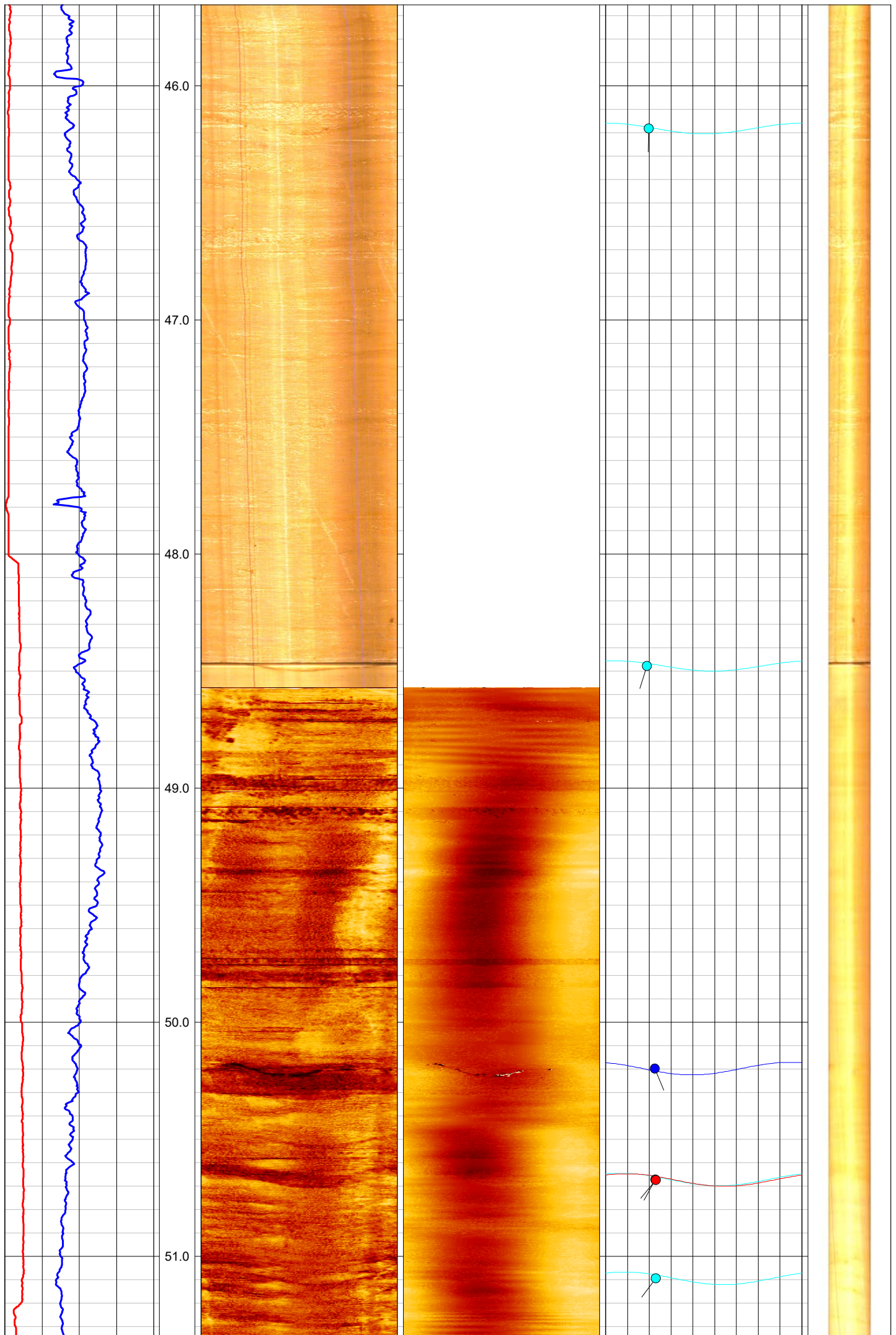














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC415**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393527, 213994**

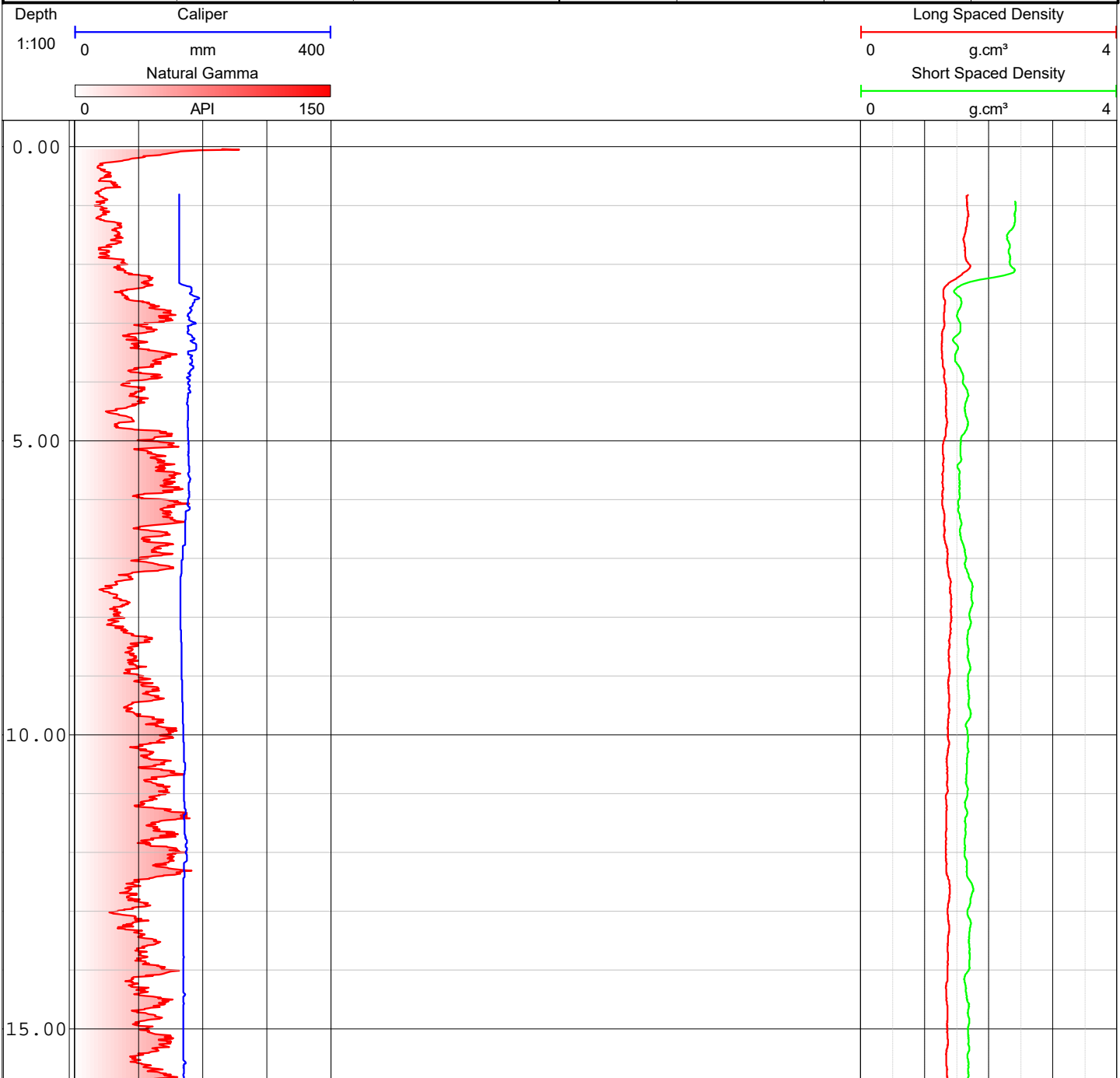
Elevation: **287.20**

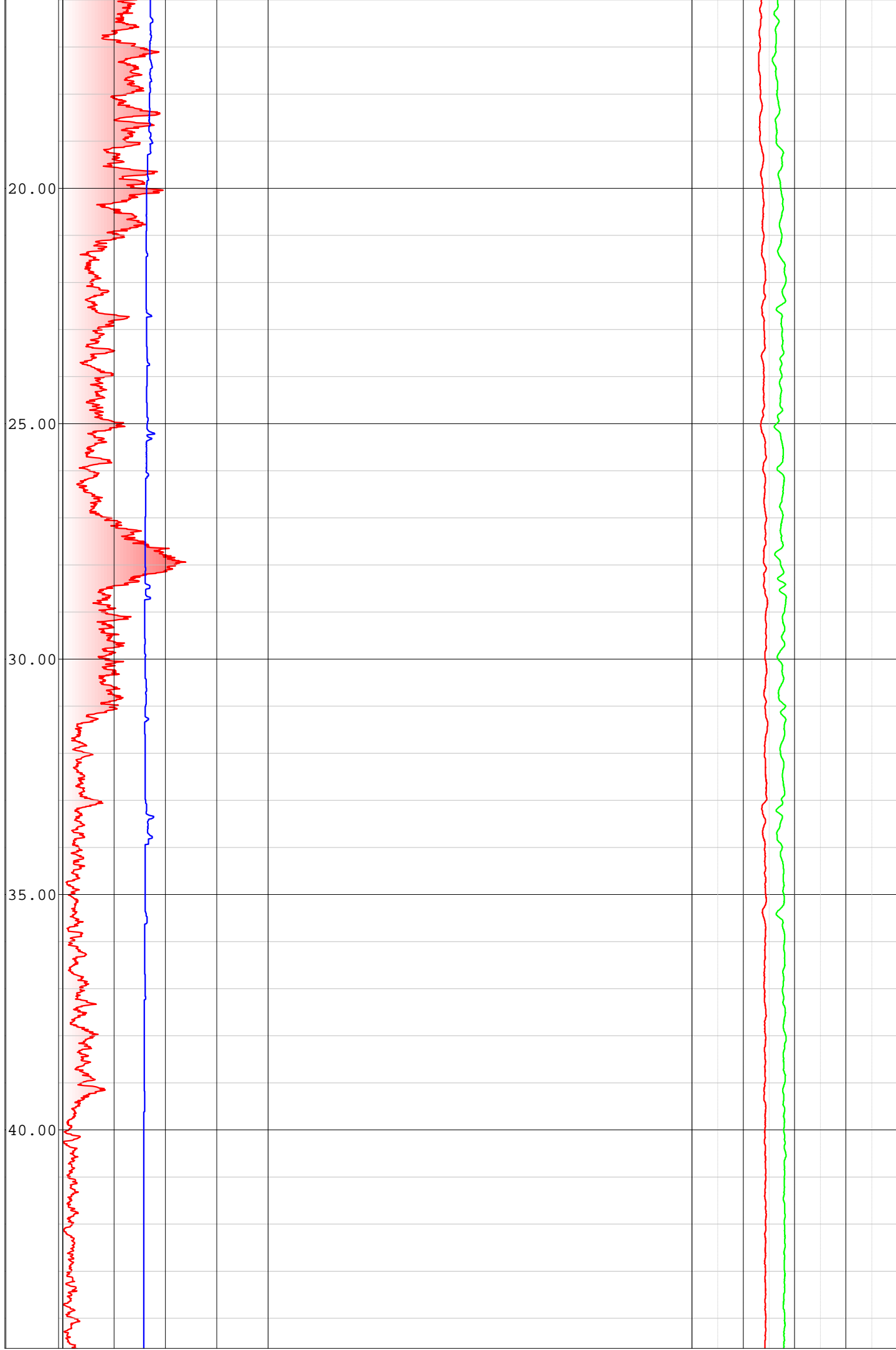
Drilled Depth: (m)	51.0*	Date:	29th January 2019
Logged Depth: (m)	50.1	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks: Hole silting up during logging. No fluid logs possible as water level 48.5m	
Logged Interval: (m)	0.0 - 50.1		
Fluid Level: (m)	48.5		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	-0.4	2.4









EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

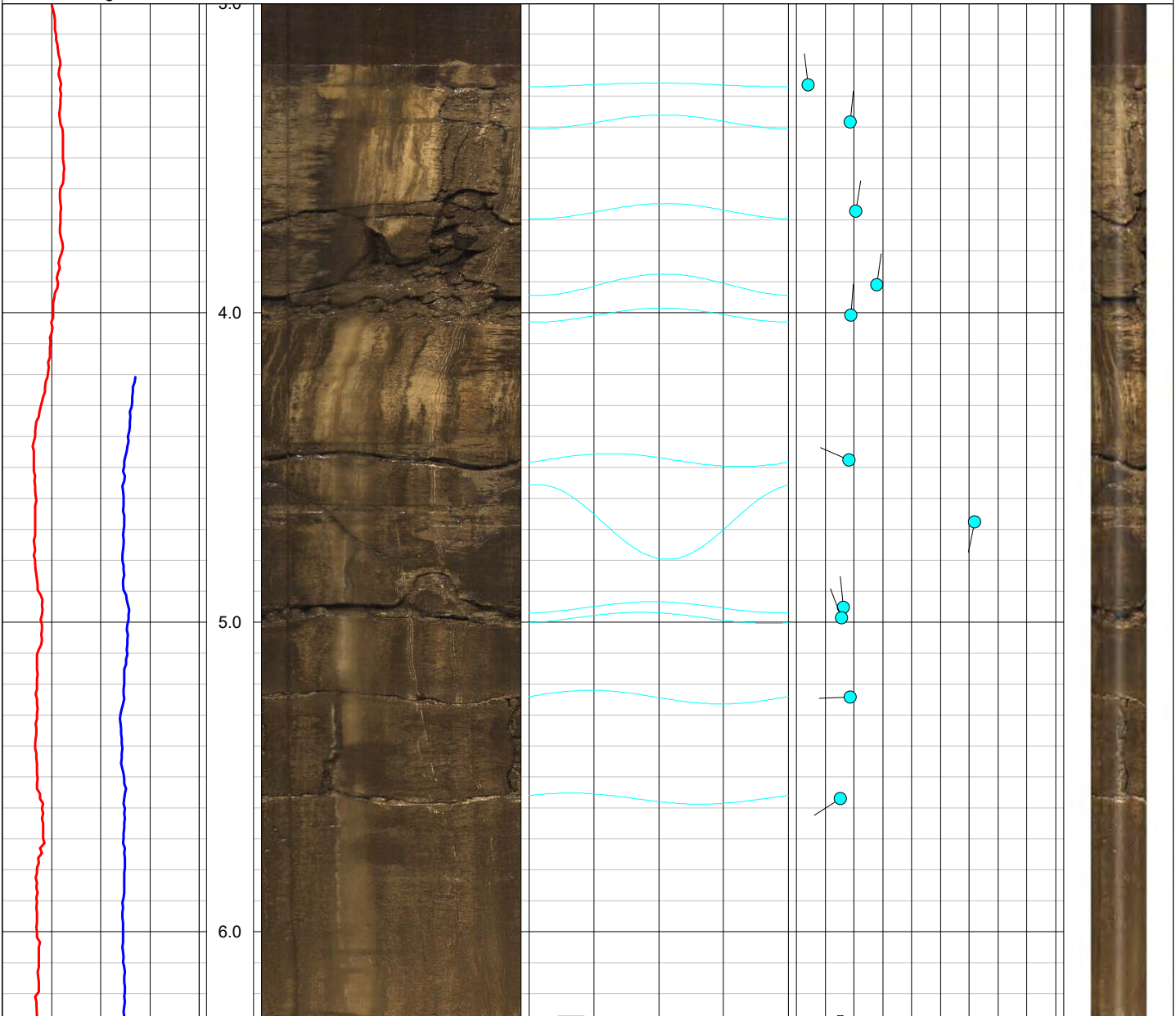
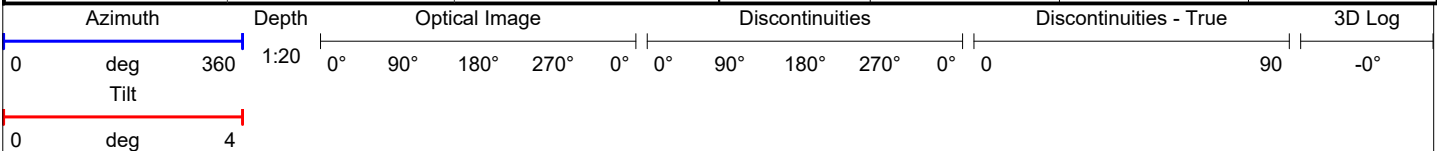
Borehole: **DSRC419**

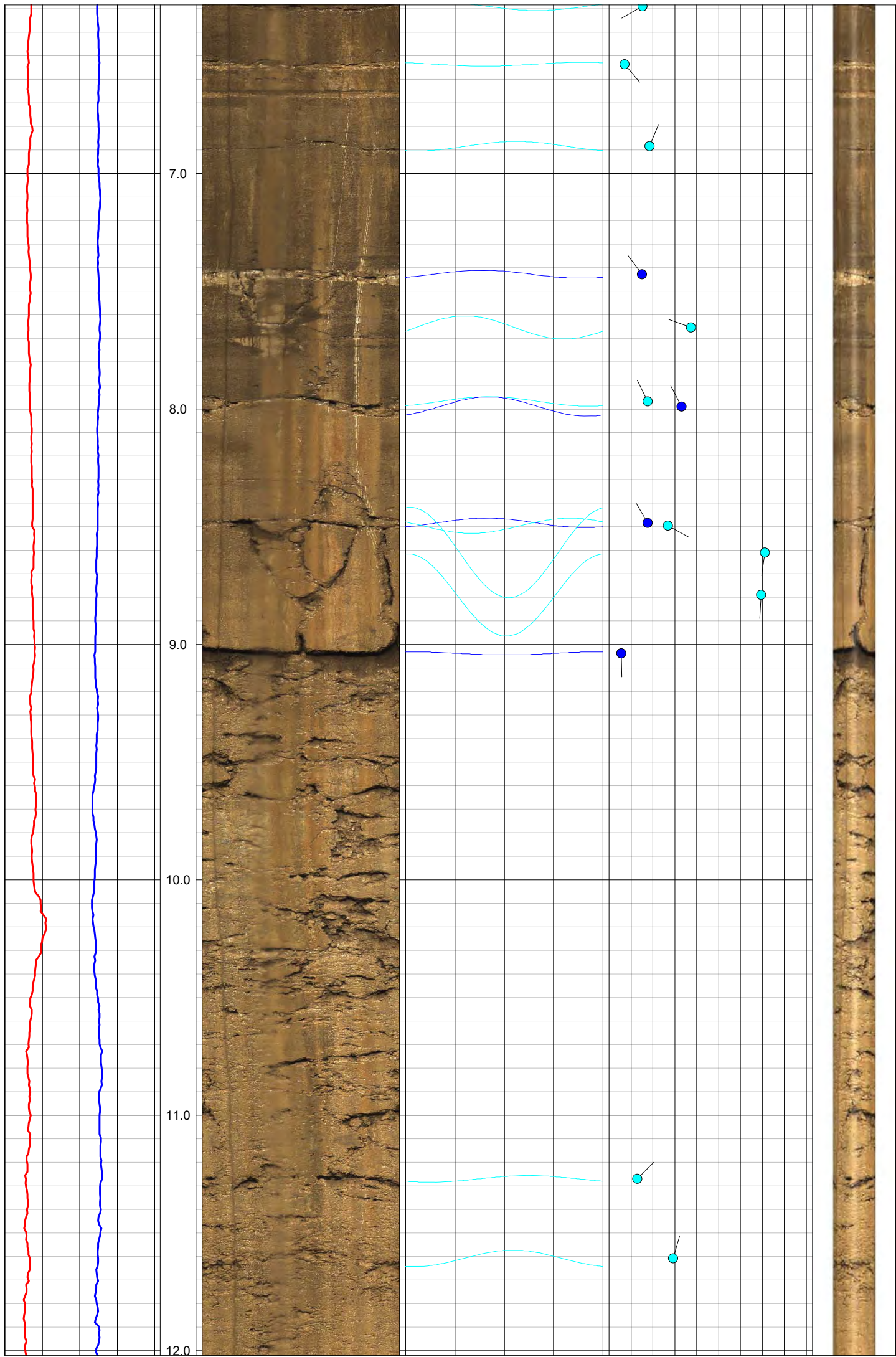
Image

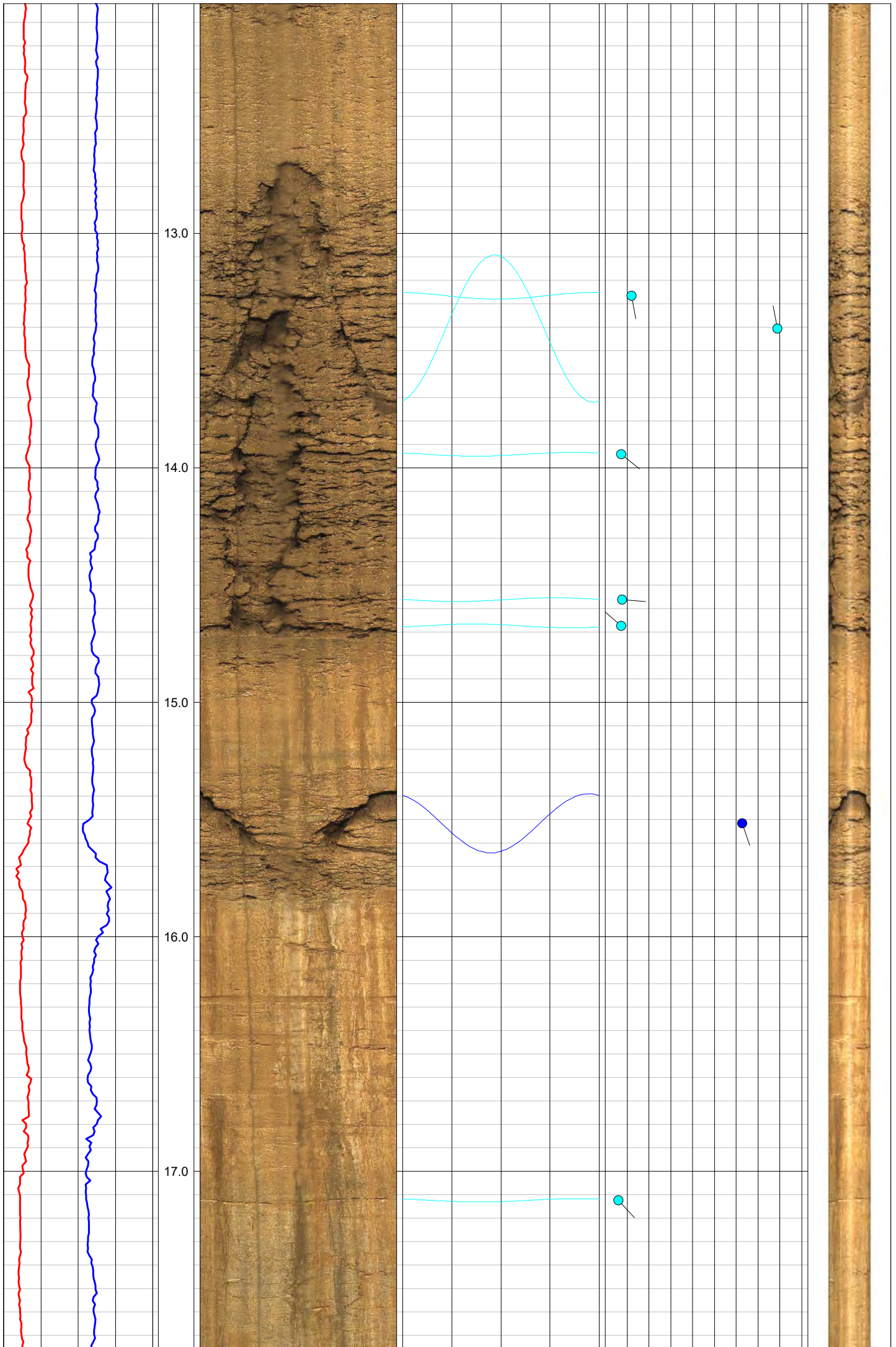
Location: **A417** Area: **Birdlip, Gloucestershire** Grid Ref: **393213, 215564** Elevation: **268.90**

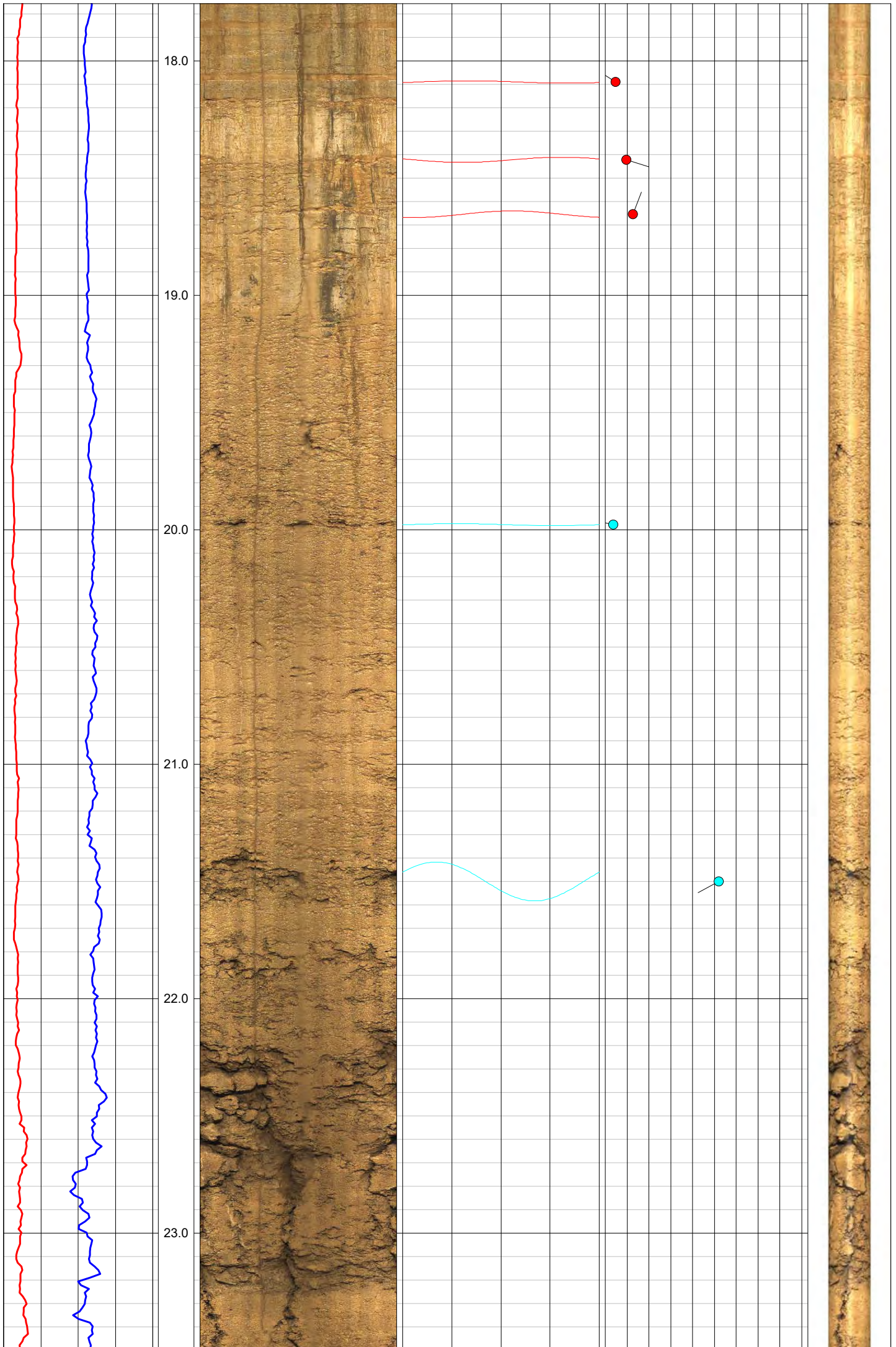
Drilled Depth: (m)	60.0*	Date:	16th January 2019
Logged Depth: (m)	40.2	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Hole blocked @ 40.2m - Unable to run fluid logs	
Logged Interval: (m)	3.2 - 40.2		
Fluid Level: (m)	38.3		

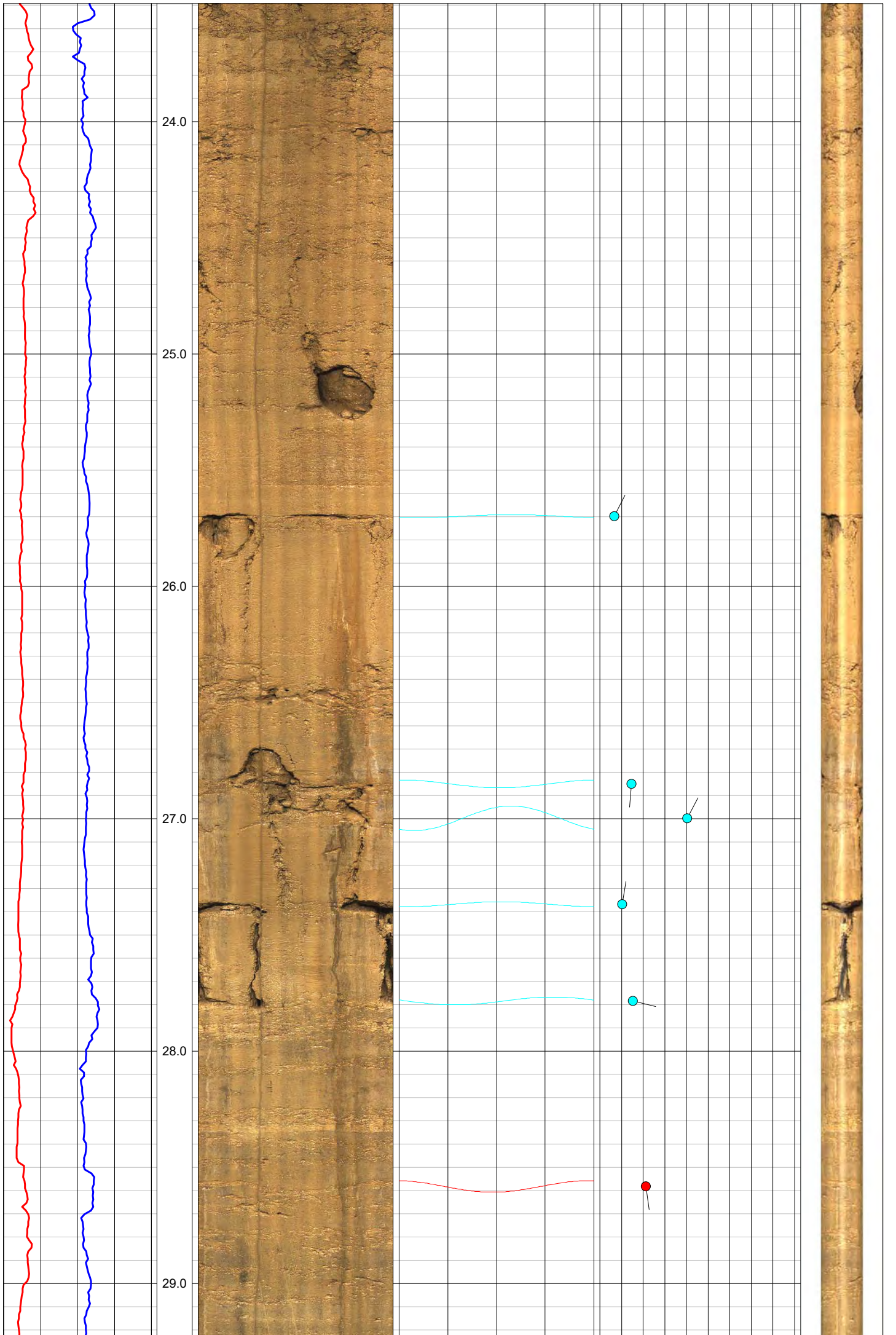
BOREHOLE RECORD			CASING RECORD			
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	3.2	60.0	Geobor	127	-0.4	3.2

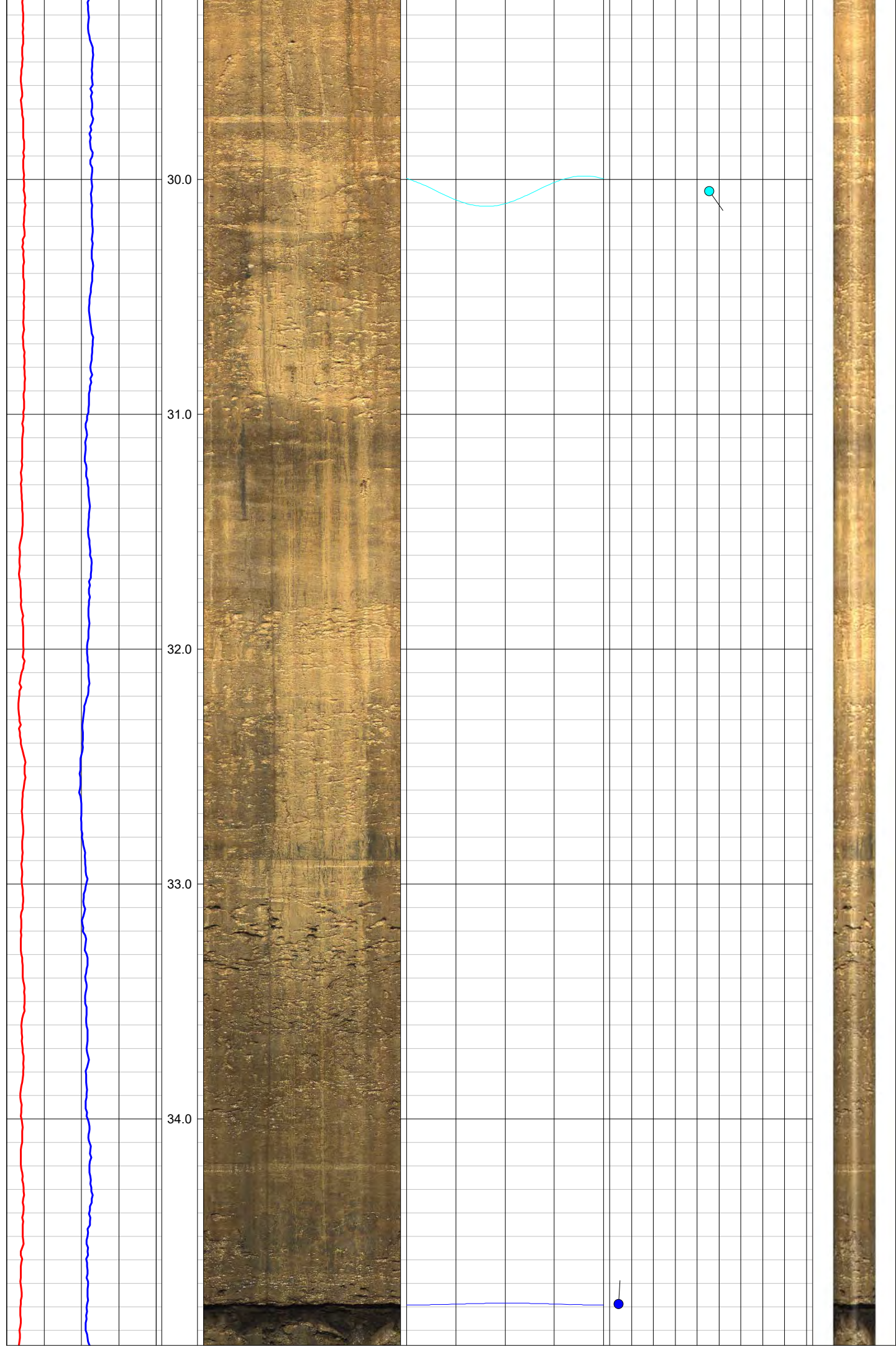


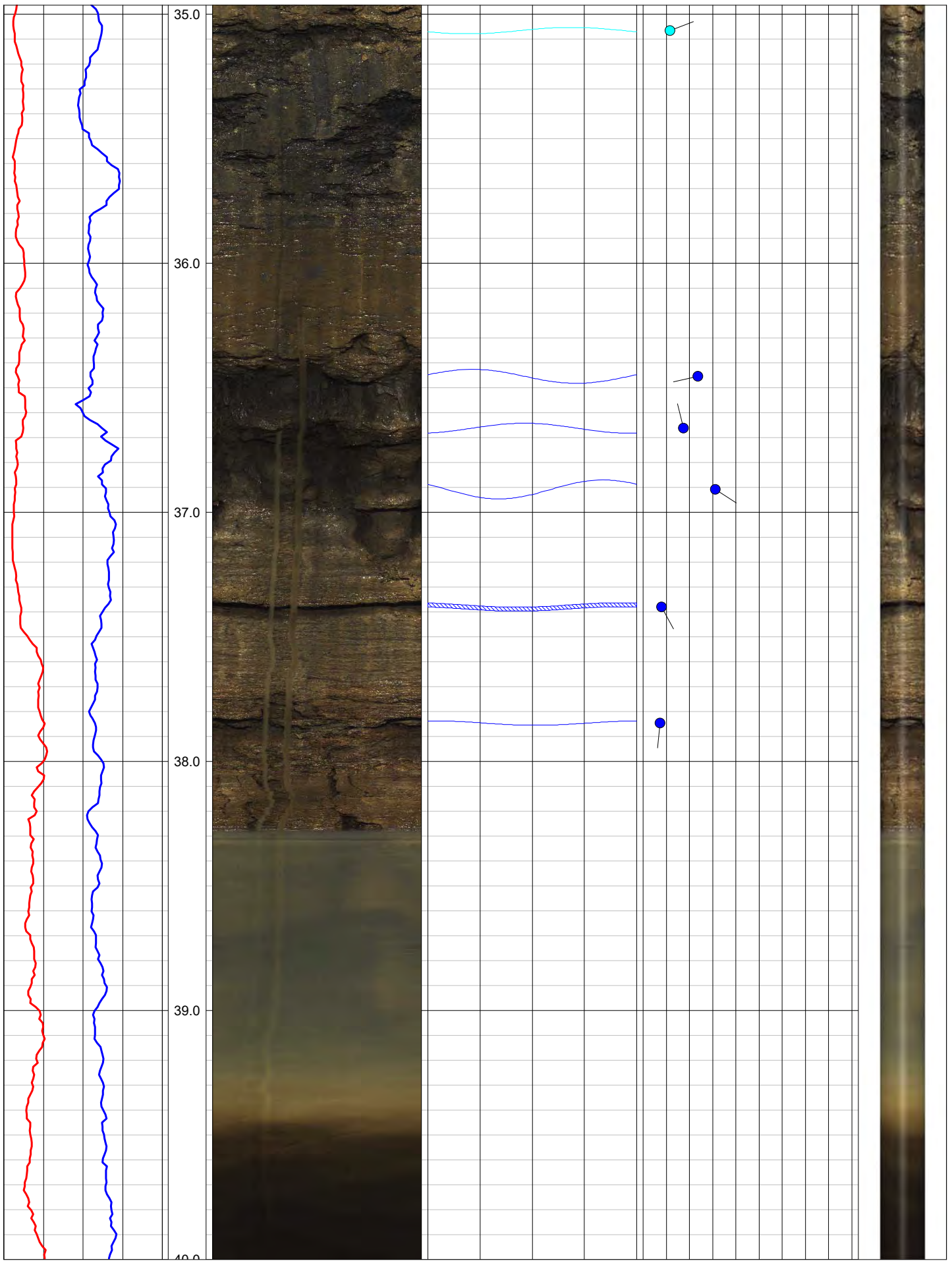














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC419**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393213, 215564**

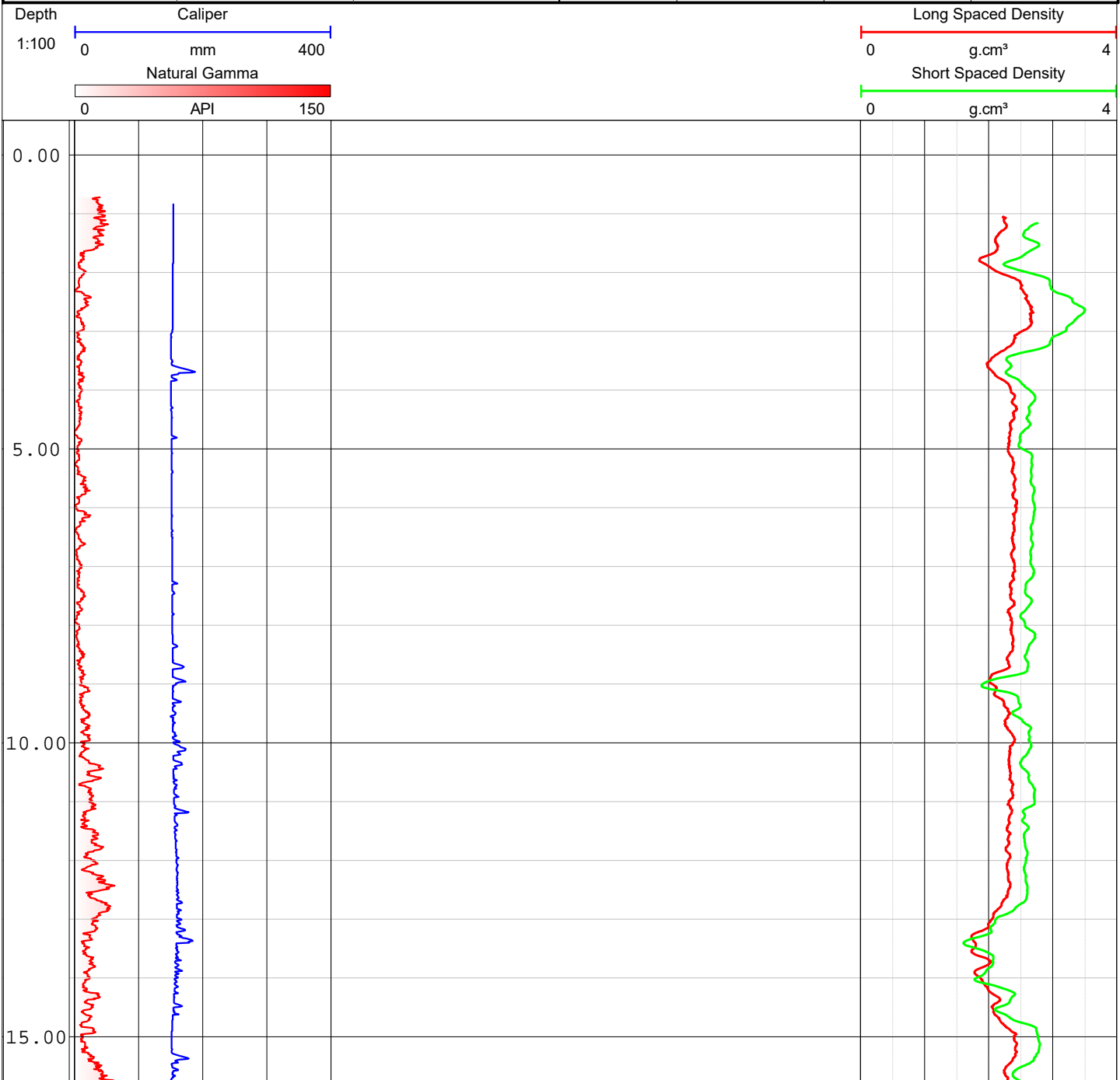
Elevation: **268.90**

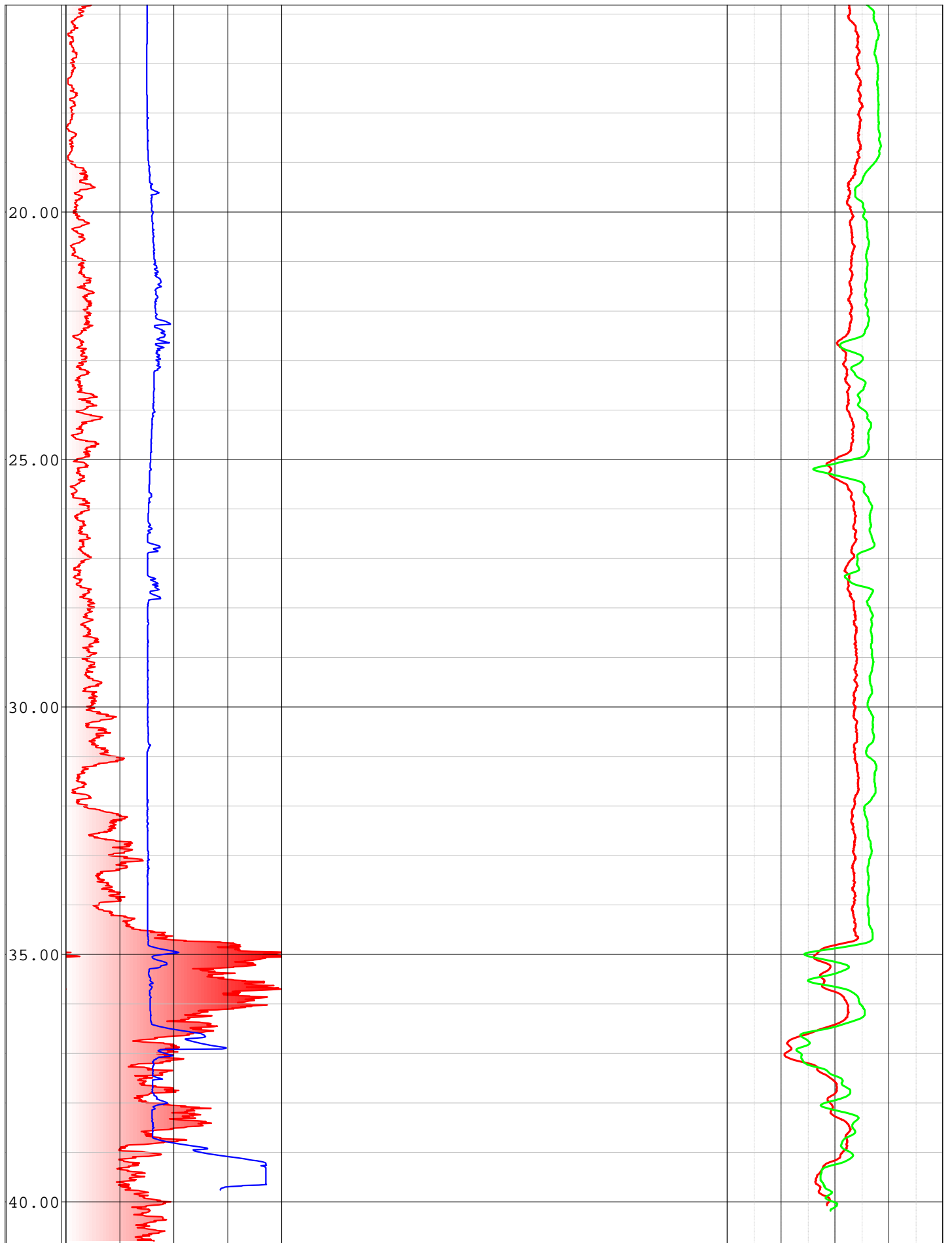
Drilled Depth: (m)	60.0*	Date:	16th January 2019
Logged Depth: (m)	40.2	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Hole blocked @ 40.2m - Unable to run fluid logs	
Logged Interval: (m)	3.2 - 40.2		
Fluid Level: (m)	38.3		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	-0.4	3.2







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **OH407**

Composite

Location: **A417**

Area: **Birdlip**

Grid Ref: **393596, 216246**

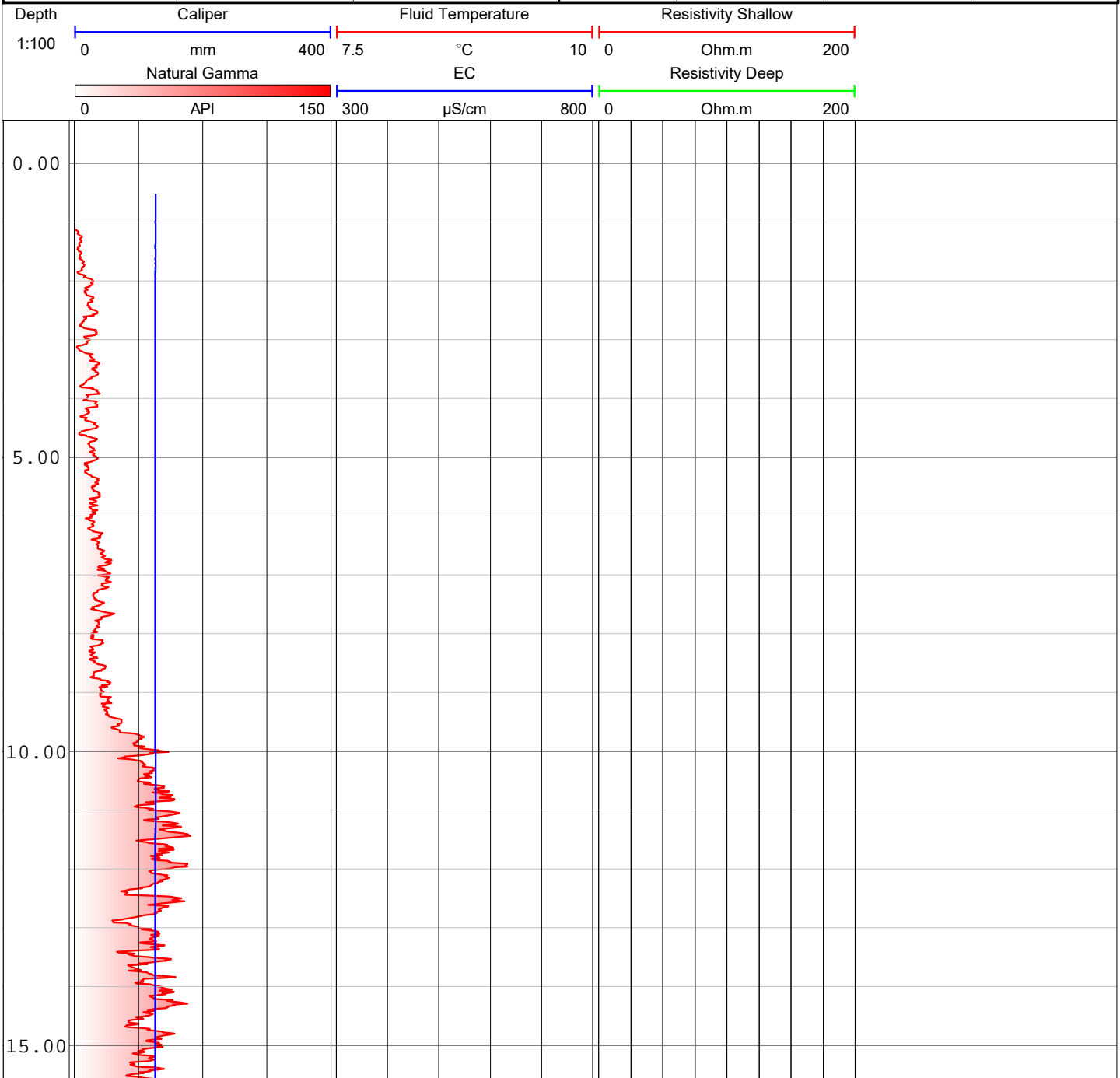
Elevation: **231.75**

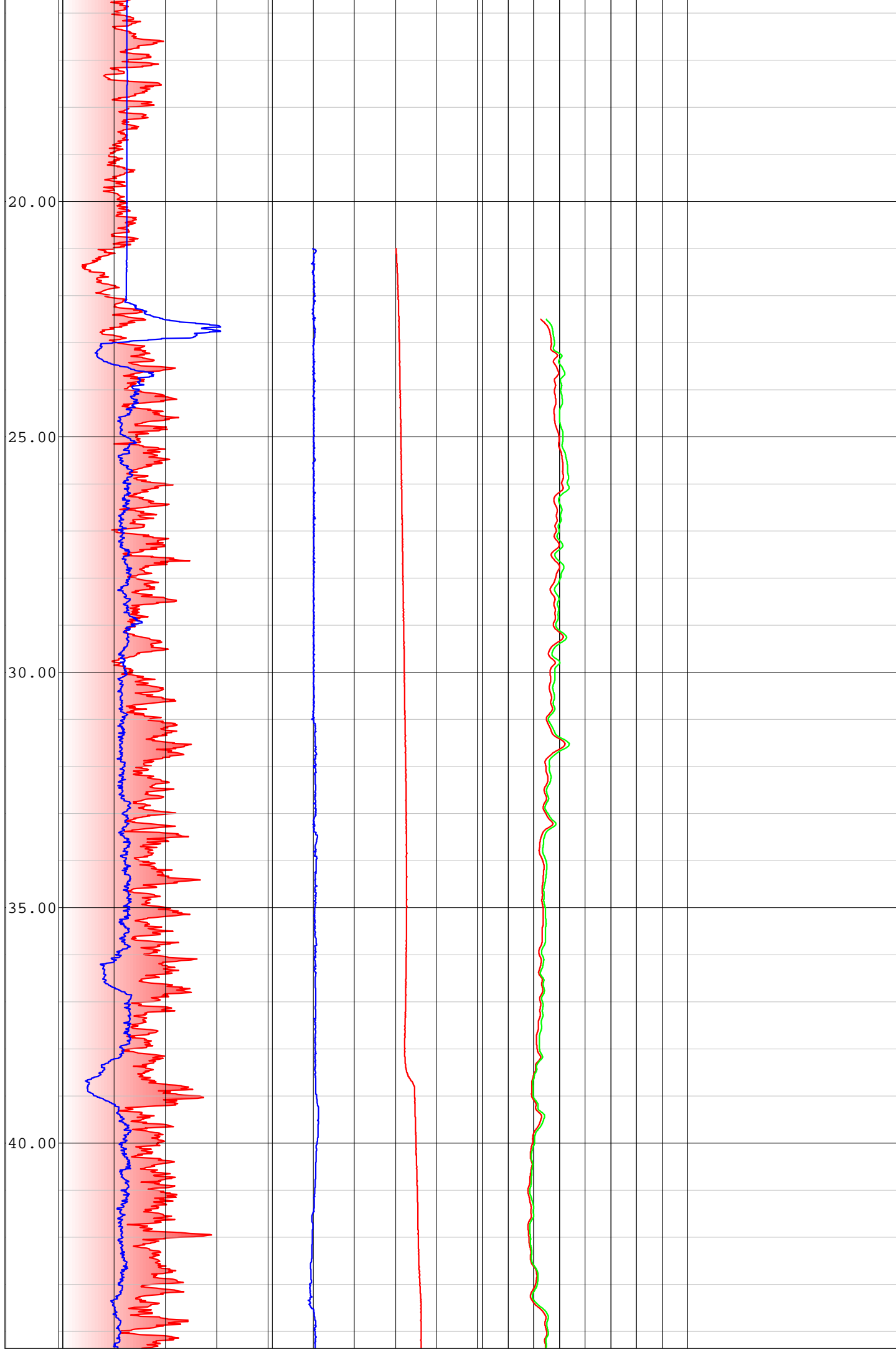
Drilled Depth: (m)	55.0	Date:	11th February 2019
Logged Depth: (m)	52.0	Recorded By:	
Logging Datum:	Ground Level	Remarks: Density and flow logs not run due to hole stability and hole squeeze. See caliper log.	
Logged Interval: (m)	0 - 55.2		
Fluid Level: (m)	21		

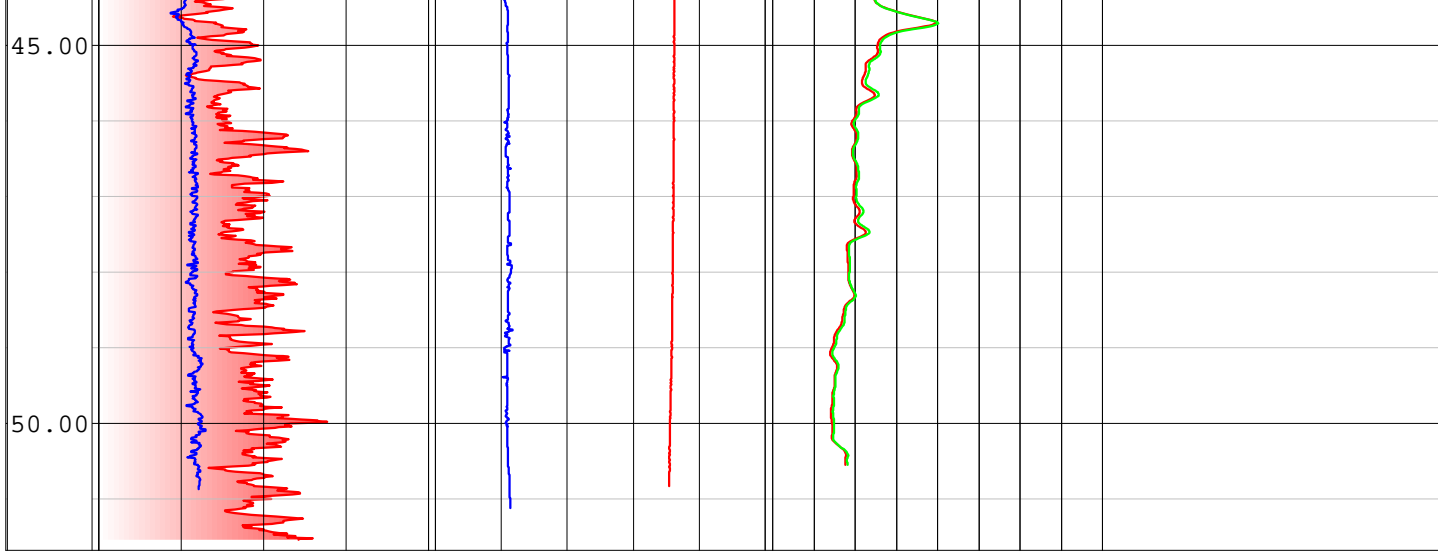
BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
			Geobor	127	0	21.5









HE551505 A417 MISSING LINK GROUND
INVESTIGATION - PHASE 2A

FACTUAL REPORT ON
GROUND INVESTIGATION

Prepared for HIGHWAYS ENGLAND

Report Ref: 35560

Geotechnical Engineering Ltd

Centurion House, Olympus Park
Quedgeley, Gloucester. GL2 4NF

01452 527743

www.geoeng.co.uk





HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

FACTUAL REPORT ON GROUND INVESTIGATION

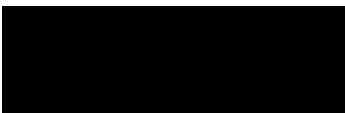
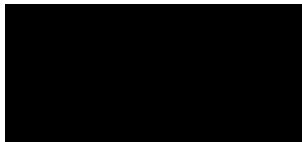
Prepared for HIGHWAYS ENGLAND

Report Ref: 35560

PROJECT: Road realignment

CONSULTANT: Arup

EMPLOYER: Osborne

VOLUME - VERSION	STATUS	ORIGINATOR	CHECKER	APPROVED	DATE
1 of 1 - A	Draft	EC	EL	-	20/11/2020
1 of 1 - B	Final	EC	EL	JH	08/12/2020
1 of 1 - C	Final	EC	EL	JH	15/01/2021
ORIGINATOR			APPROVER		
					
E CRIMP Senior Geotechnical Engineer			J HANSON Director		

The report is not to be used for contractual or engineering purposes unless this sheet is signed and the report designated "Final".

The report has been prepared for the sole use and reliance by Highways England Company Limited. GEL accepts no liability as a result of the use or reliance of this report by any other parties.



FIGURES (CONTINUED)

35560/07 (1098)
35560/08 (1)
35560/09 (1084)
35560/10 (1143)
35560/11 (1219)

APPENDICES

APPENDIX A FIELDWORK DATA

APPENDIX B SUBCONTRACTOR REPORTS
B1: DOWNHOLE GEOPHYSICS
B2: SURFACE GEOPHYSICS
B3: CONE PENETRATION TESTING

APPENDIX C PHOTOGRAPHS

APPENDIX D POST-FIELDWORK MONITORING
D1: GROUNDWATER MONITORING
D2: INCLINOMETER MONITORING
D3: PERMEABILITY TESTING

APPENDIX E LABORATORY TESTING

APPENDIX F CHEMICAL ANALYSES



1. INTRODUCTION

It is proposed to realign the A417 carriageway at Birdlip, Gloucestershire. Geotechnical Engineering Limited (GEL) was instructed by Osborne (the direct Employer) to carry out an investigation to determine the ground conditions. The project was undertaken on behalf of Highways England (the end Client).

The scope of works and terms and conditions of appointment were specified by Osborne and GEL correspondence reference T29042 dated 24th October 2018. The investigation was carried out under the direction and supervision of Osborne. Mott MacDonald Sweco Joint Venture provided the specification (referenced HE551505-MMSJV-HGT-000-SP-CE-00001) and ARUP (the Consultant) provided an addendum to the specification (referenced HE551505-ARP-VGT-X_XX_XXXX_X-SP-C-000003) and technical support to the Client.

This report describes the investigation and presents the findings.

A previous phase of work was undertaken by this Company and has been reported as HE551505 A417 Missing Link Ground Investigation – Phase 1 (reference 34888 dated 27th April 2019).

This revision of the report includes (and supersedes) all information contained within the following reports issued during 2019 and 2020: 35102, 35205, 35371/01, 35371/02 and 35560/01 to 35560/11.



2. SITE LOCATION AND GEOLOGY

The site comprises a series of fifteen private land packages within the vicinity of Birdlip, Cowley and Barrow Wake, Gloucestershire. The fieldwork was undertaken on a land package basis as summarised in Table 1, below.

Land Package Reference	Approximate National Grid Co-ordinates (Centre)	Site Description	Main Fieldwork Period(s)
987	SO 933 160	Land adjacent to (south of) the A417 carriageway.	05/03/2019 to 02/04/2019
1077	SO 928 156	Pastural fields and yard adjacent to (south of) the A417 carriageway.	15/04/2019 to 13/06/2019
948	SO 920 157	Land to south of the A417 carriageway near the base of Birdlip Hill.	26/06/2019 to 14/08/2019, 19/11/2019
1059	SO 928 158	Land to north of the A417 carriageway.	25/07/2019 to 12/08/2019
992	SO 926 158	Land to north of the A417 carriageway.	05/08/2019 to 08/08/2019 (CP217) and 24/09/2019 to 17/10/2019
1106	SO 932 159	Pastural land to west of A417 as it runs north, approaching the Air Balloon roundabout.	09/09/2019 to 07/11/2019
1118	SO 943 145	Arable and pastural land east of the A417, north of the Cowley roundabout and centred around Stockwell.	16/09/2019 to 29/10/2019, 28/05/2020 (TP211), 29/05/2020 to 04/06/2020 (DSRC315A).
1095	SO 931 164	Off access road to Crickley Hill Country Park.	14-22/11/2019

Table 1. Summary of land packages.



Land Package Reference	Approximate National Grid Co-ordinates (Centre)	Site Description	Main Fieldwork Period(s)
1245	SO 948 137	Disused quarry to northwest of Cowley roundabout.	27/11/2019 to 02/12/2019
1158	SO 943 145	Pastural land to east of the A417, centred around Stockwell.	10-19/12/2019 (DSRCOH308), 06-24/01/2020 and 22-28/04/2020
1098	SO 933 161	Land adjacent to A417 carriageway to west of Air Balloon roundabout.	03-23/03/2020
1	SO 949 132	The land lies west of the A417 and south-southeast of the Cowley roundabout.	09-11/03/2020
1084	SO 929 159	Private Land to north of A417 carriageway.	19-24/03/2020
1143	SO 938 152	Arable land at Shab Hill.	13/04/2020 to 10/06/2020
1219	SO 940 156	Arable land to north of Shab Hill.	19-22/10/2020

Table 1 continued.



British Geological Survey (BGS) England and Wales (Sheet No. 234, Gloucester 1:50,000, dated 1975 and Sheet No. 235, Cirencester 1:50 000, dated 1998) and the BGS online geology (1:50,000) indicate the site is underlain by the sequence described in Table 2 below.

Superficial Deposits

Made Ground	
Mass Movement Deposits / Foundered Strata (Landslip)	Widespread to north and west of site, typically associated with the Cotswold escarpment.
Head Deposits	

Solid Geology

Group	Formation	Lithologies
Great Oolite Group	White Limestone Formation	Limestone with subordinate mudstone and clay
	Hampen Formation	Limestone with subordinate mudstone and clay
	Fuller's Earth Formation	Mudstone with Limestone beds
Inferior Oolite Group	Salperton Limestone Formation	Limestone
	Aston Limestone Formation	Limestone
	Birdlip Limestone Formation	Limestone
Lias Group	Bridport Sand Formation	Siltstone and mudstone with beds of fine sand
	Whitby Mudstone Formation	Mudstone with limestone beds
	Marlstone Rock Formation	Limestone and sandstone with subordinate mudstone
	Dyrham Formation	Mudstone and siltstone
	Charmouth Mudstone Formation	Mudstone with limestone beds

Table 2. Summary of local geology.

Various faults orientated east-west are also shown running through the site. The anticipated geology at each land package is summarised in Table 3 below.



Land Package Reference	Approximate National Grid Co-ordinates	Anticipated Geology
987	SO 933 160	Birdlip Limestone Formation over Lias Group. Multiple faults trending northwest-southeast are shown adjacent to and dissecting the site. Made Ground anticipated at surface due to existing land use.
1077	SO 928 156	Landslip material over Inferior Oolite Group (Limestone) and the Lias Group. Multiple faults trending northwest-southeast are shown to the east of the site. Made Ground was anticipated at surface.
948	SO 920 157	Landslip material over the Lias Group. Multiple faults trending northwest-southeast are shown to the east of the site. Made Ground was anticipated at surface at locations within the car park.
1059	SO 928 158	Landslip material overlying the Lias Group. Multiple faults trending northwest-southeast are shown to the east and south of the site.
992	SO 926 158	Landslip material overlying the Lias Group. Multiple faults trending northwest-southeast are shown to the east and south of the site.
1106	SO 932 159	Birdlip Limestone Formation overlying the Lias Group. Multiple faults trending northwest-southeast are shown to the east and south of the site.
1118	SO 943 145	Great Oolite Group (Hampen Formation and Fuller's Earth Formation) over the Inferior Oolite Group (Salperton Limestone Formation, Aston Limestone Formation and Birdlip Limestone Formation), with Lias Group present at depth. Areas of landslip and founded strata are shown to be present within the surrounding area. A fault orientated east-west is also shown running through the site.
1095	SO 931 164	Birdlip Limestone Formation overlying the Lias Group. A fault orientated northwest-southeast is shown in close proximity of the site. Landslip material is recorded to the west of the site.
1245	SO 948 137	Great Oolite Group (Hampen Formation and Fuller's Earth Formation).
1158	SO 943 145	Great Oolite Group comprising the Hampen Formation (Limestone) and Fuller's Earth Formation (Mudstone), over the Inferior Oolite Group (Salperton Limestone Formation and Aston Limestone Formation). The Lias Group was recorded at depth. Areas of landslip and founded strata are shown to be present within the surrounding area. A fault orientated southeast-northwest is also shown running through the site.
1098	SO 933 161	Inferior Oolite Group comprising the Birdlip Limestone Formation over the Lias Group (Bridport Sand Formation). A fault orientated northwest-southeast is also shown running through the site.

Table 3. Anticipated geology at each land package.



1	SO 949 132	Fuller's Earth Formation of Great Oolite Group over Inferior Oolite Group (Limestones).
1084	SO 929 159	Landslip and founded strata over Lias Group (undifferentiated).
1143	SO 938 152	Fuller's Earth Formation of Great Oolite Group over Inferior Oolite Group (Limestones).
1219	SO 940 156	Inferior Oolite Group (Limestones).

Table 3 continued.



3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015 during several phases between 5th March 2019 and 22nd October 2020, as detailed in Table 1 above.

The exploratory hole locations were selected by the Consultant and set out by Osborne and this Company and are shown in the figures (see contents for listing). The ground level and co-ordinates of the exploratory holes were established by this Company using GPS techniques.

Prior to breaking ground, a utility survey was undertaken to mitigate the risk of encountering buried services. Following examination of the relevant statutory service drawings, both cable avoidance tools (CAT) and ground-penetrating radar (GPR) were used to identify the presence of any subsurface features and the hole locations were revised accordingly.

The exploratory holes undertaken for the scheme are summarised in Table 4 below.



Hole Type	Plant Used	Quantity	Maximum Depth
Dynamic Samples / Rotary Cored Boreholes	Geotechnical Pioneer Comacchio 305 Comacchio GEO602 Comacchio MC405 Geotechnical P60 slope climbing rig	66	105.05m
Cable Percussion Boreholes	Dando 2000	2	16.76m
Cone Penetration Testing	Lankelma 1.3t mini tracked rig In Situ SI 20t tracked rig	6	15.02m
Trial Pits	JCB 3CX, Doosan 62R 8t tracked excavator, 22t tracked excavator	30	5.00m

Table 4. Summary of Exploratory Holes

Dynamic Sample and Rotary Cored Boreholes (General Remarks)

The boreholes were formed using track-mounted, dual-purpose dynamic sampling/rotary coring rigs. Initially, an inspection pit was hand excavated to a maximum depth of 1.40m to check for buried services. Where present, rotary coring (300mm diameter) was undertaken to remove surface hardstanding (DSRC110 only). Disturbed samples were taken and retained in a combination of plastic tubs, bags and glass jars.

Where required, dynamic sampling techniques were used to produce continuous disturbed samples of 112mm, 97mm, 84mm and 70mm diameter, as described on the borehole logs. The samples were recovered in semi-rigid plastic liner.



On refusal to dynamic sampling, or from the base of the inspection pit, the boreholes were advanced by rotary core drilling techniques. Conventional rotary coring techniques were used to recover core of 120mm or 108mm nominal diameter. Geobor S wireline rotary coring techniques were used to recover core of 102mm nominal diameter. Water, polymer or air/mist was used as the flushing medium.

The dynamic samples and rotary core were extracted horizontally from the sampler and core barrel respectively, the semi-rigid liner was cut to length and sealed at each end to retain moisture content. All samples and core were retained in sequence in labelled, wooden coreboxes.

Undisturbed samples of 100mm nominal diameter were taken in suitable cohesive soils using a thin walled, open drive sampler (UT100). Samples were wax sealed and capped on site to prevent moisture loss.

Boreholes were monitored for groundwater ingress as dynamic sampling proceeded. Upon encountering water, sampling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.

Cable Percussion Boreholes

The boreholes, referenced CP104 and CP104A (Appendix A), were formed using a light cable tool (shell and auger) rig utilising 200mm and 150mm nominal diameter tools and casing. Initially, an inspection pit was hand excavated at both borehole locations to a depth of 1.20m to check for buried services. Borehole CP104A was advanced with the occasional use of a heavy chisel to assist boring. Borehole CP104 was terminated at 15.00m due to encountering a water strike and redrilled as CP104A.



Undisturbed samples of 100mm nominal diameter were taken in suitable cohesive soils using a thin walled, open drive sampler (UT100). Samples were wax sealed and capped on site to prevent moisture loss.

Boreholes were monitored for groundwater ingress as boring proceeded. Upon encountering water, sampling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.

In Situ Testing

Standard penetration tests (SPT) were carried out in cable percussion and dynamic sample/rotary cored boreholes in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel or a solid cone was used depending upon the materials encountered and the split barrel samples retained in airtight jars. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 or further 100 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

A single packer test was attempted in borehole DSRC332 in general accordance with BS EN ISO 22282-3:2012. A single pneumatic packer was used to isolate the test section and connected to the surface via 46mm diameter BQ internally flush coupled rods. The water pressure was measured using pressure transducers and the flow rate was measured at the surface. Due to the high permeability of the ground, the flow rate was high and it was not possible to achieve the specified test pressure.

Permeability testing using borehole packers was to have been undertaken at other borehole locations across the scheme (DSRC218, DSRC301, DSRC311, DSRC312, DSRC317, DSRC325,



DSRC401, DSRC420) but in each case the groundwater level encountered during drilling was found to be below the planned cutting depth and the testing was not carried out.

Borehole Installations

On completion, water monitoring standpipes were installed in boreholes as described on the borehole logs (Appendix A). Each installation generally consisted of a 50mm ID HDPE slotted tube set in a granular filter medium and sealed above and below with a bentonite plug.

A dual water monitoring installation was constructed in borehole CP212. The lower standpipe consisted of a 19mm ID PVC slotted tube set in a granular filter medium and sealed above and below with a bentonite plug. The upper instrument consisted of a standpipe comprising a 50mm ID HDPE tube set in a granular filter medium and sealed above and below with a bentonite plug.

A dual water monitoring installation was constructed in borehole CP215. The lower standpipe consisted of a 50mm ID HDPE slotted tube set in a granular filter medium and sealed above and below with a bentonite plug. The upper instrument consisted of a standpipe piezometer comprising a 19mm ID PVC tube set in a granular filter medium and sealed above and below with a bentonite plug.

The installations were protected at the surface by a lockable flush or raised covers set in concrete. Installation details are given on the borehole logs.

On completion, inclinometer tubing was installed in boreholes CP208, CP209, CP213, CP214, CP217, CP230 and DSRC207. Each inclinometer consisted of a 70mm OD access tube set in cement:bentonite grout with one of the four keyways aligned downslope. The installations were protected at the surface by a lockable, steel raised cover set in concrete. Installation details are given on the relevant borehole log.



Where monitoring instrumentation was not required, boreholes were backfilled with bentonite pellets and the surface reinstated.

Geophysical Surveys

As part of works undertaken at land package 987, a down-hole wireline geophysical survey was undertaken in boreholes DSRC110, DSRC302 and DSRC303 on completion of drilling. The work was undertaken on behalf of this Company by European Geophysical Services Limited and the results are presented in their combined report referenced MAR 2019/GENG1901_rpt/SO91 (ref 35102) in Appendix B.

As part of works undertaken at land package 1077, a down-hole wireline geophysical survey was undertaken in boreholes CP208, CP209, DSRC107, DSRC108 and DSRC207 and DSRC224 on completion of drilling. The work was undertaken on behalf of this Company by European Geophysical Services Limited and the results are presented in their combined report referenced MAR 2019/GENG1901_rpt/SO91 (ref 35205) in Appendix B.

A down-hole geophysical survey was undertaken in CP217, DSRC109, DSRC218, DSRC220, DSRC301, DSRC308, DSRC308A, DSRC312, DSRC314, DSRC319, DSRC403, DSRC418, DSRCOH304, DSRCOH400, DSRCOH412, OH411, OH413 on behalf of this Company by European Geophysical Services Limited and the results are presented in their combined report referenced NOV2020/GENG1901_A417_35560_Nov20_rpt/SO91 in Appendix B.

A down-hole geophysical survey was undertaken in DSRCOH414 on behalf of this Company by Robertson Geoservices and their plots are presented in Appendix B.

In addition to the geotechnical investigation, a bedrock mapping and sediment characterisation geophysical survey was undertaken at land package 1077 by TerraDat. A combined report of the findings is presented in Appendix B as Geophysical Survey Report 6466.



A further four areas were subject to a bedrock mapping and sediment characterisation geophysical survey. All works were undertaken by TerraDat and the results are presented in Appendix B as Geophysical Survey Report reference TD6688 Zones 1 to 4. At the time of reporting, two further survey lines are to be completed once land access has been granted (Line 20, Zone 1 and Line 2, Zone 2).

Trial Pits (General Remarks)

The trial pits were formed by a wheeled or tracked excavator, as detailed on the trial pit logs (Appendix A). A range of bucket sizes were used. Generally, a 0.90m or 1.20m plain bucket was used to expose near-surface soils for archaeological monitoring. The pits were excavated to depth using 0.60m or 0.90m plain and toothed buckets, depending upon the ground conditions encountered. A shoring box was used during the excavation of trial pits TP204, TP205, TP207 and TP601 to allow inspection of the sidewalls for evidence of shear surfaces and the collection of undisturbed samples.

Block samples were taken from trial pits TP211. Trial pits TP204, TP205, TP207, TP211 and TP601. On retrieval, the samples were wrapped in clingfilm and aluminium foil and wax-sealed to preserve moisture content. Representative disturbed samples were also taken and retained in sealed plastic bags and airtight containers to retain moisture content.

Hand vane tests were carried out in situ on suitable cohesive soils. The results are presented on the logs and tabulated in Appendix A.

Prior to logging, photographs of the trial faces and spoil were taken and are presented in Appendix C.



On completion, all trial pits were backfilled with arisings compacted in suitable layers by the excavator bucket. The ground surface was left slightly proud to accommodate the future inevitable settlement of the backfill.

Cone Penetration Testing

Within land package 1077, three Cone Penetration Tests (CPT) were carried out on behalf of this Company by Lankelma using a 1.3 tonne mini crawler rig. Each CPT continuously measured cone end resistance, sleeve friction and pore water pressure to determine the ground strength and material type. The results are presented in Lankelma report referenced P-107175-1 in Appendix B.

Within land package 948, three Cone Penetration Tests (CPT) were carried out on behalf of this Company by In Situ Site Investigation using a 20 tonne track mounted rig. Each CPT continuously measured cone end resistance, sleeve friction and pore water pressure to determine the ground strength and material type. A dissipation test was also carried out at depths specified by the Consultant. The results are presented in In Situ Site Investigation report referenced 1190295 in Appendix B.

General

Samples for chemical analyses were dispatched directly to i2 Analytical Limited under a Chain of Custody. The remaining samples were brought to this Company's laboratory for testing and storage.

3.2 Logging

The logging of soils and rocks was carried out by an Engineering Geologist in general accordance with BS5930:2015. A key to the exploratory hole logs is presented in Appendix A.



Following discussion with the Consultant and the British Geological Survey, geology codes describing the stratigraphy at formation level have been applied to the logs. A summary of the geology codes is presented in Appendix A. It should be noted that the geology codes provide a suggested interpretation of the stratigraphy encountered and should be verified during the design process.

Detailed descriptions of the samples and core are given in the borehole log, Appendix A, along with details of sampling, in situ testing, groundwater ingress, installations and relevant comments on drilling techniques.

Suitable core subsamples were selected by the GEL logging engineer. The core was carefully logged and prepared prior to preserving the subsample by wrapping in clingfilm and aluminium foil and coating with at least three layers of wax. The sample was further protected by a covering of waxed cheesecloth, labelled and transported horizontally in padded, wooden coreboxes.

Hand vane tests were carried out in situ on suitable cohesive soils. The results are presented on the logs and tabulated in Appendix A.

Prior to logging, photographs of the core were taken and are presented in Appendix C.

The trial pits were generally logged in situ to a depth of approximately 1.20m and thereafter from the surface. Trial pits TP204, TP205, TP207 and TP601 were logged in situ to full depth with the aid of a shoring box. Detailed descriptions are given in the trial pit logs, Appendix A, along with details of sampling and in situ testing, groundwater ingress and relevant comments on stability.



3.3 Monitoring Programme

Regular (generally weekly) groundwater monitoring was undertaken during periods of investigative fieldwork, reverting to monthly monitoring rounds following completion of a phase of investigation. At the time of reporting, monthly monitoring is planned to continue until August 2021.

Water sampling was undertaken in the 50mm diameter installations. Where possible, three samples were obtained on sequential monthly monitoring/sampling visits. Prior to water sampling, the water monitoring standpipes were developed by pumping and then purged until at least three well volumes of water had been removed. Temperature, dissolved oxygen levels, pH, resistivity, conductivity, dissolved solids, salinity and redox potential readings were also taken at various levels during well development and the readings are presented within the digital data submission (AGS4) which accompanies this report.

During water sampling, a borehole pump became stuck in the installation of borehole DSRC315. A replacement installation (details as above) was constructed in borehole DSRC315A, drilled adjacent to the original location.

Diver type data loggers were temporarily installed within each monitoring well in boreholes CP102, CP104A, CP200, CP202, CP204, CP206, CP212 (both installations), CP216, CP223, DSRC220, DSRC224, DSRC317 and DSRC420. The data logger is designed to measure pressure and temperature at regular intervals for extended periods. The measurements are subsequently stored within the internal memory of the data logger. Readings downloaded from the instrument are plotted in Appendix D.

The inclinometer installations were monitored using a digital, biaxial inclinometer probe. Displacement readings were taken at 0.50m intervals and an initial base set of inclinometer



readings were obtained for each increment. The inclinometer plots are presented in Appendix D.

Variable head permeability tests were carried out in selected standpipe installations during the period 16th to 18th November 2020. The testing was carried out in general accordance with the procedures given in BS EN ISO 22282-2:2012. Falling head tests were carried out by topping up the standpipe with clean water or by the use of a displacer (slug). Rising head tests were carried out by lowering the water level in the standpipe by use of a pump, surging or by removal of a displacer. Where possible, coefficients of permeability were calculated using the BS EN ISO 22282-2:2012 Hvorslev method and/or the Velocity Graph method. Intake factors have been derived from Hvorslev and are presented along with the results in Appendix D.

Borehole	Response zone	Target Stratum	Variable Head Permeability Testing Attempted
DSRC109	2.50-21.00m	Inferior Oolite (limestone)	Falling Head x 3
DSRC218	2.00-15.50m	Great Oolite (limestone)	Falling Head x 2 Rising Head x 1
DSRC220	3.00-13.50m	Great Oolite (limestone)	Falling Head x 2 Rising Head x 1
DSRC301	7.40-29.50m	Inferior Oolite (limestone)	Falling Head x 2
DSRC302	15.00-26.50m	Inferior Oolite (limestone)	Falling Head x 3
DSRC317	1.00-4.30m	Great Oolite (limestone)	Falling Head x 1
DSRC401	4.80-8.70m	Fuller's Earth Formation (limestone and mudstone)	Falling Head x 2 Rising Head x 1

Table 5. Summary of Permeability Testing.



3.4 Laboratory Testing

A schedule of laboratory tests was prepared by the Consultant, the following tests being carried out in accordance with BS1377:1990, unless stated otherwise. The number in brackets refers to the test number given in that standard. The results are presented in Appendix E.

The natural water content was determined on three-hundred-and-seventeen selected samples in accordance with BS EN ISO 17892-1:2014.

Liquid limit, plastic limit and plasticity index tests [Part 2:4.3, 5.3 and 5.4] were carried out on three-hundred-and-five selected samples. Atterberg line plots have also been presented.

Particle size distributions were determined in accordance with BS EN ISO 17892-4:2016 for ninety samples by wet sieving [5.2]. The fine fractions of eighty-six of these samples were further analysed by sedimentation using the pipette method [5.4]. The results are presented as grading curves.

The compaction characteristics of three selected soil samples were investigated using a 2.5kg rammer [Part 4:3.2 and 3.3/3.4]. The compaction characteristics of six selected soil samples were investigated using a 4.5kg rammer [Part 4:3.5 and 3.6]. The results are presented as a plot of dry density against moisture content.

The moisture condition value (MCV)/moisture content relation test [Part 4:5.5] was carried out on one selected soil sample. The results are presented as a graph of MCV against moisture content.

The California Bearing Ratio (CBR) test [Part 4:7] was carried out on three recompacted samples. For two of these samples, three sub-specimens were prepared at optimum moisture



content (OMC), OMC plus 3% and OMC minus 3%. A CBR test was undertaken on each sub-specimen. The results are presented as graphs of force against penetration.

The one-dimensional consolidation properties were determined in the oedometer in accordance with BS EN ISO 17892-5:2017. The tests were carried out on three 63.5mm diameter by 19mm thick specimens prepared from core samples. The results are presented in tabular form and also as graphs of void ratio versus log (effective pressure).

Eighteen specimens were remoulded at received moisture content. Three sub-specimens, each 60mm square in plan, were tested at different normal stresses, specified by the Consultant, in the small shear box apparatus [Part 7:4]. Following consolidation, the samples were sheared under drained conditions to give the peak and residual effective shear strength parameters.

The residual effective shear strength parameters of seventeen specimens were determined using the Bromhead ring shear apparatus [Part 7:6]. In each case, the remoulded specimen was prepared and tested at different normal stress. For each normal stress application, the specimen was allowed to consolidate and then sheared under drained conditions.

Unconsolidated undrained triaxial compression tests were carried out under a single cell pressure on twelve specimens prepared from full diameter UT100 and prepared core samples [Part 7:8]. A cell pressure specified by the Consultant was used. Fully saturated, $\phi_u = 0$, conditions were assumed and the undrained cohesion, c_u was taken as half the deviator stress at failure.

Consolidated undrained single stage triaxial compression tests with pore-water pressure measurements [Part 8:4, 5, 6, 7 and Head (2014)] were carried out on sixteen full diameter specimens prepared from UT100 samples, dynamic sample and prepared core samples. A further three consolidated undrained single stage triaxial compression tests with pore-water



pressure measurements were carried out on three sets of three 38mm diameter specimens prepared from two UT100 samples and one prepared core sample.

The following tests on rock samples were carried out in accordance with ISRM (2007) unless stated otherwise. Test results are presented in Appendix E.

The natural moisture content of rock was determined on eighty-one selected lengths of core.

Thirty-six rock cores were tested for their unconfined compressive strength.

Point load index tests were carried out on four-hundred-and-twenty-five selected lengths of core.

Fragmentation of aggregate testing (Los Angeles method) was carried out on fifteen samples by Celtest, Bangor, in accordance with BS EN 1097-2:2010.

The BRE SD1 (2005) suite of tests was carried out on sixteen samples by Chemtest, Newmarket, using in-house methods.

The BRE SD1 (2005) reduced suite; water soluble sulphate, total sulphate and total sulphur, together with pH were determined for thirty-six samples by Chemtest, Newmarket, using in-house methods.

Three samples were despatched to Chemtest, Newmarket, where organic matter content was determined to in-house methods.

One sample was tested for pH. by Chemtest, Newmarket, using in-house methods.



The carbonate content of thirty-three samples was determined by Chemtest, Newmarket, using the rapid titration method [Part 3:6.3].

Selected soil samples were despatched to i2 Analytical, Watford, where chemical analyses were carried out to in-house methods for a suite of contaminants. The results are presented in Appendix F.

The water samples obtained during post-fieldwork monitoring activities were despatched to i2 Analytical, Watford, where chemical analyses were carried out to in-house methods for a suite of contaminants. The results are presented in Appendix F.

GEOTECHNICAL ENGINEERING LIMITED



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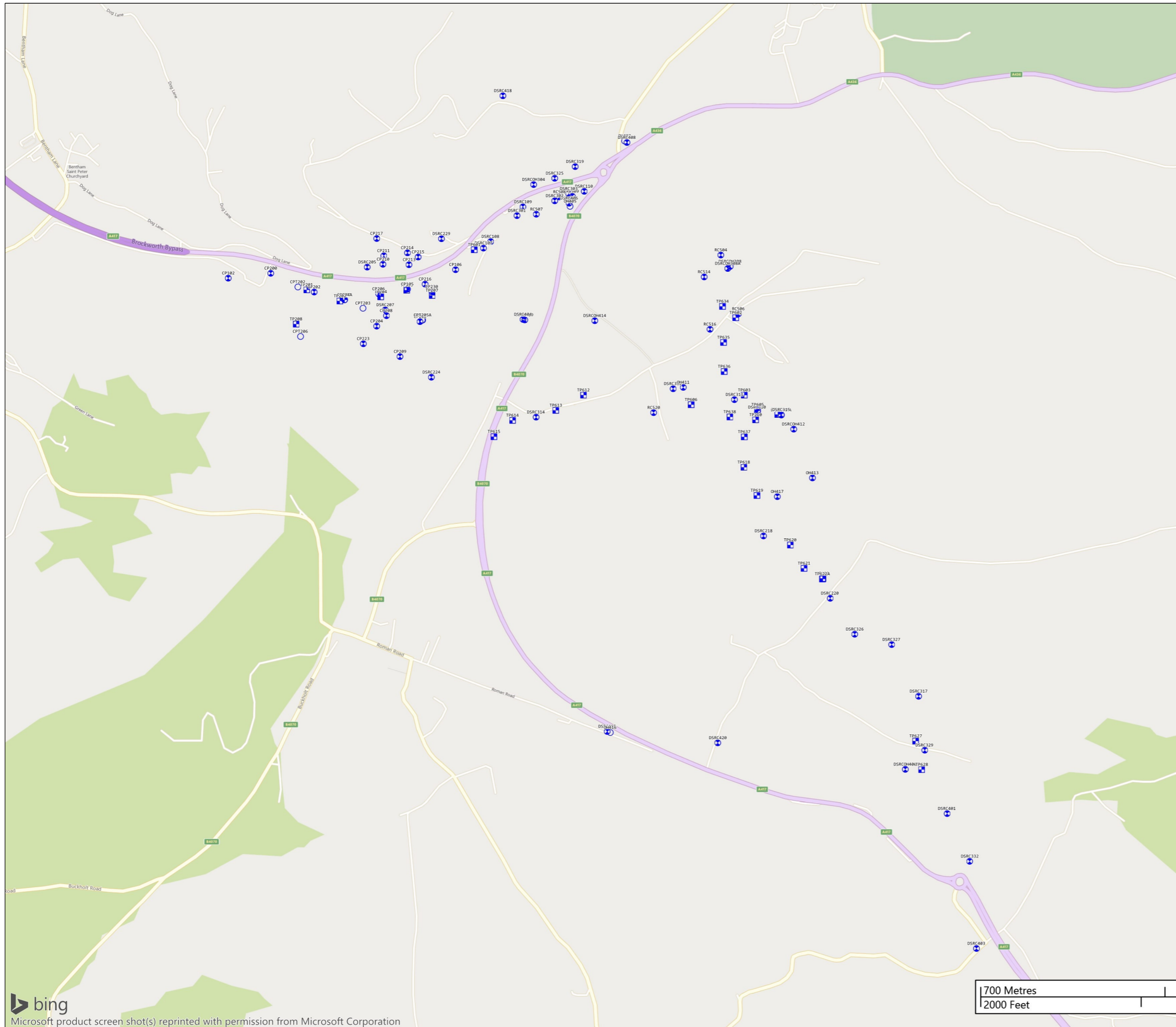
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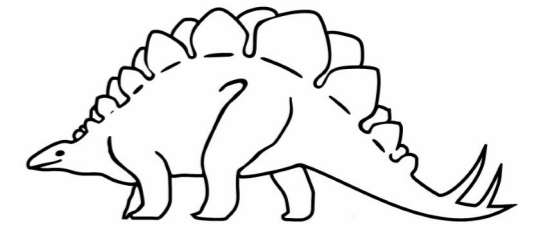
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Key.

- Locations By Type - CP
- Locations By Type - CPT
- Locations By Type - RC
- Locations By Type - RO
- Locations By Type - TP

Notes:



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Client:

HIGHWAYS ENGLAND

Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN - OVERVIEW

Drawn By:

EC

Checked By:

EL

Paper Size:

A3

Scale:

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Date:

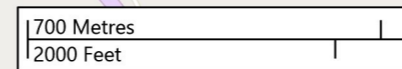
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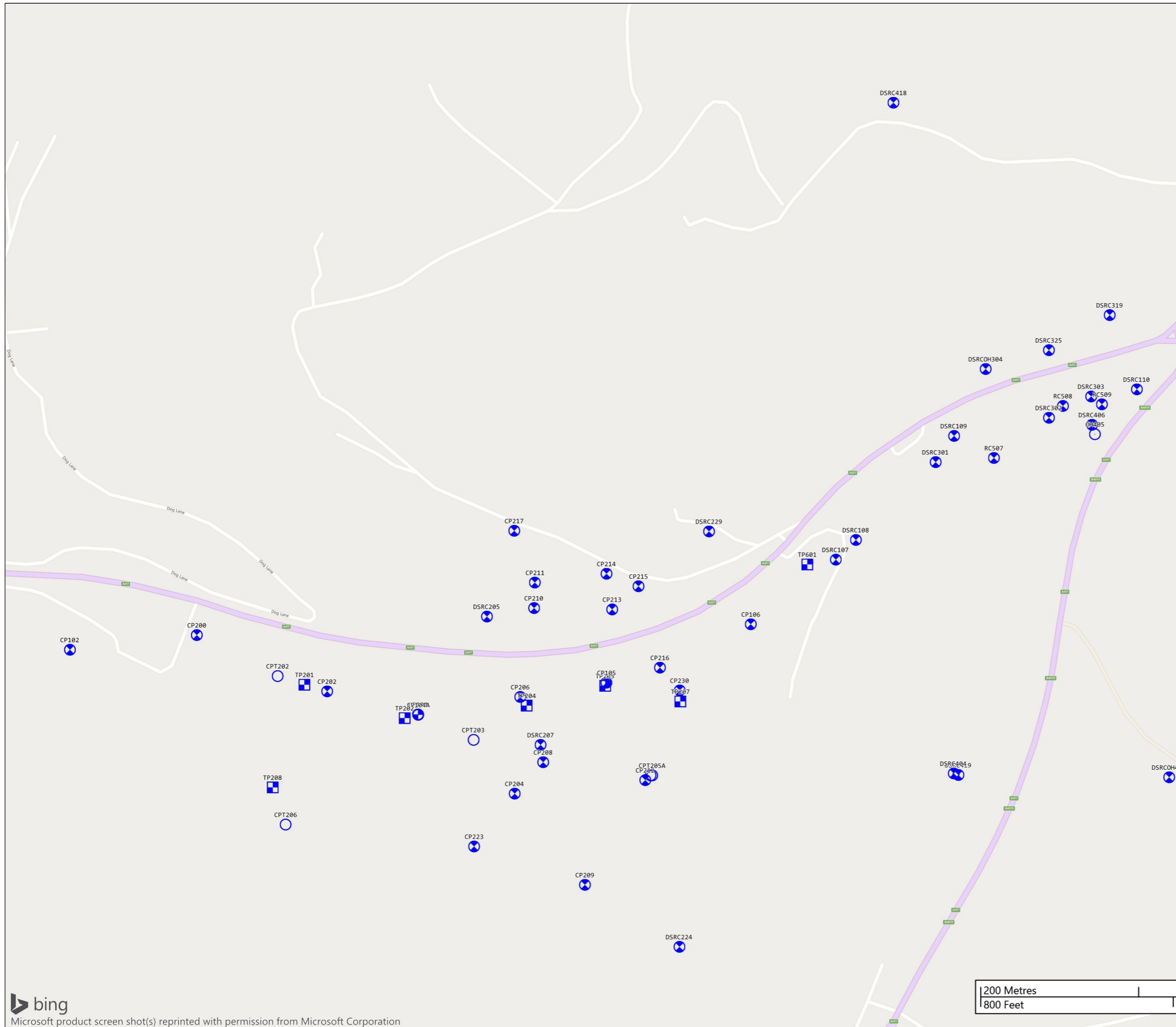
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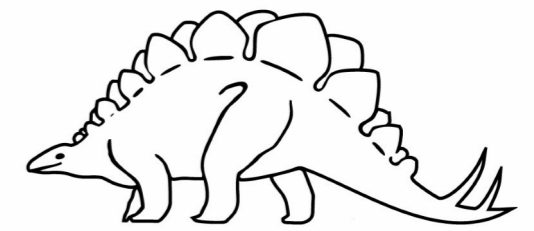




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Site:

HE551505 A417 MISSING LINK GROUND
 INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN

Drawn By:

EC

Checked By:

EL

Paper Size:

A3

Scale:

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Date:

December 2020

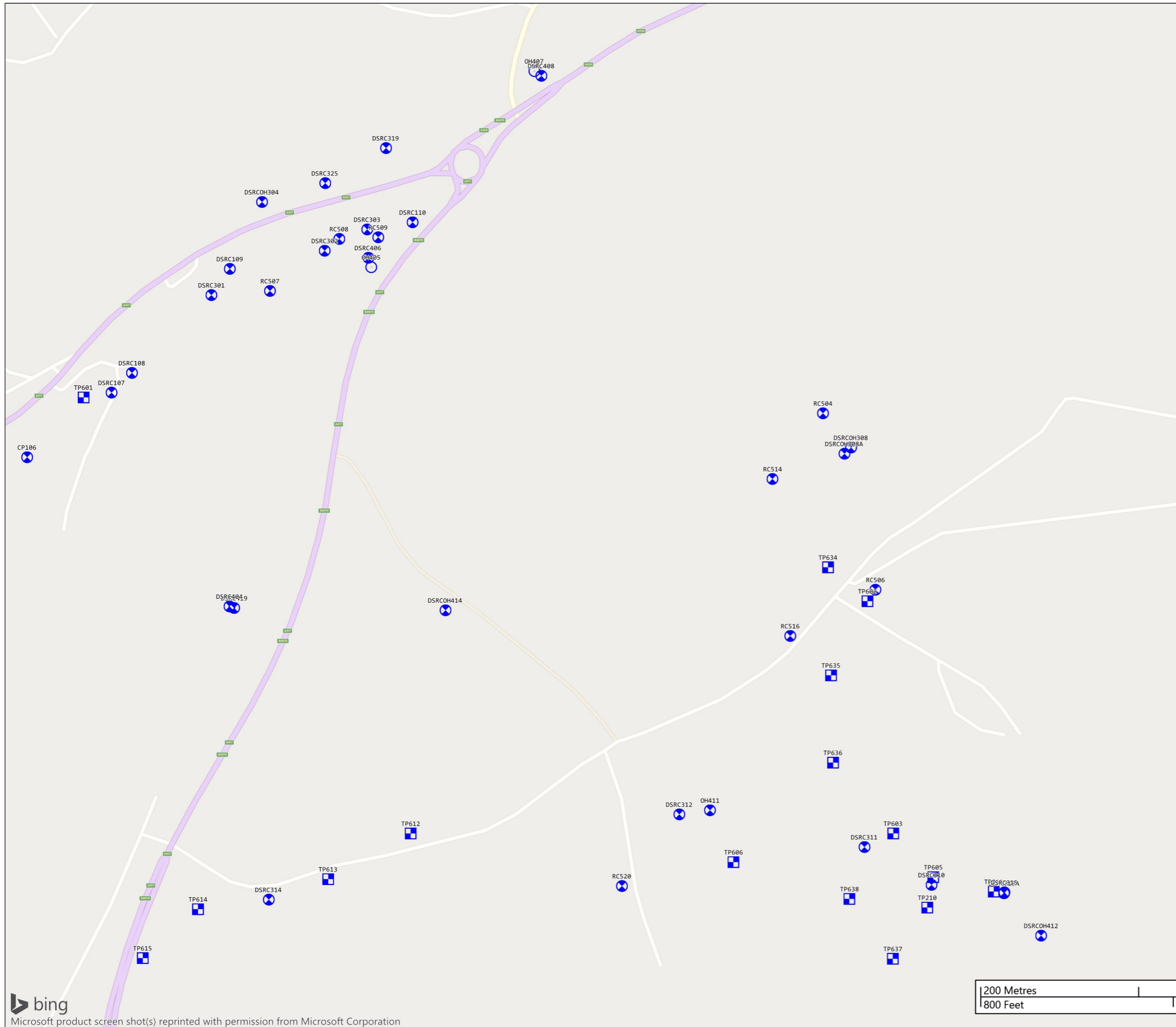
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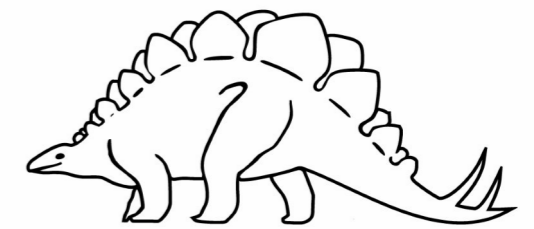




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HIGHWAYS ENGLAND

Site:

HE551505 A417 MISSING LINK GROUND
 INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN

Drawn By:

EC

Checked By:

EL

Paper Size:

A3

Scale:

1:5000

Date:

December 2020

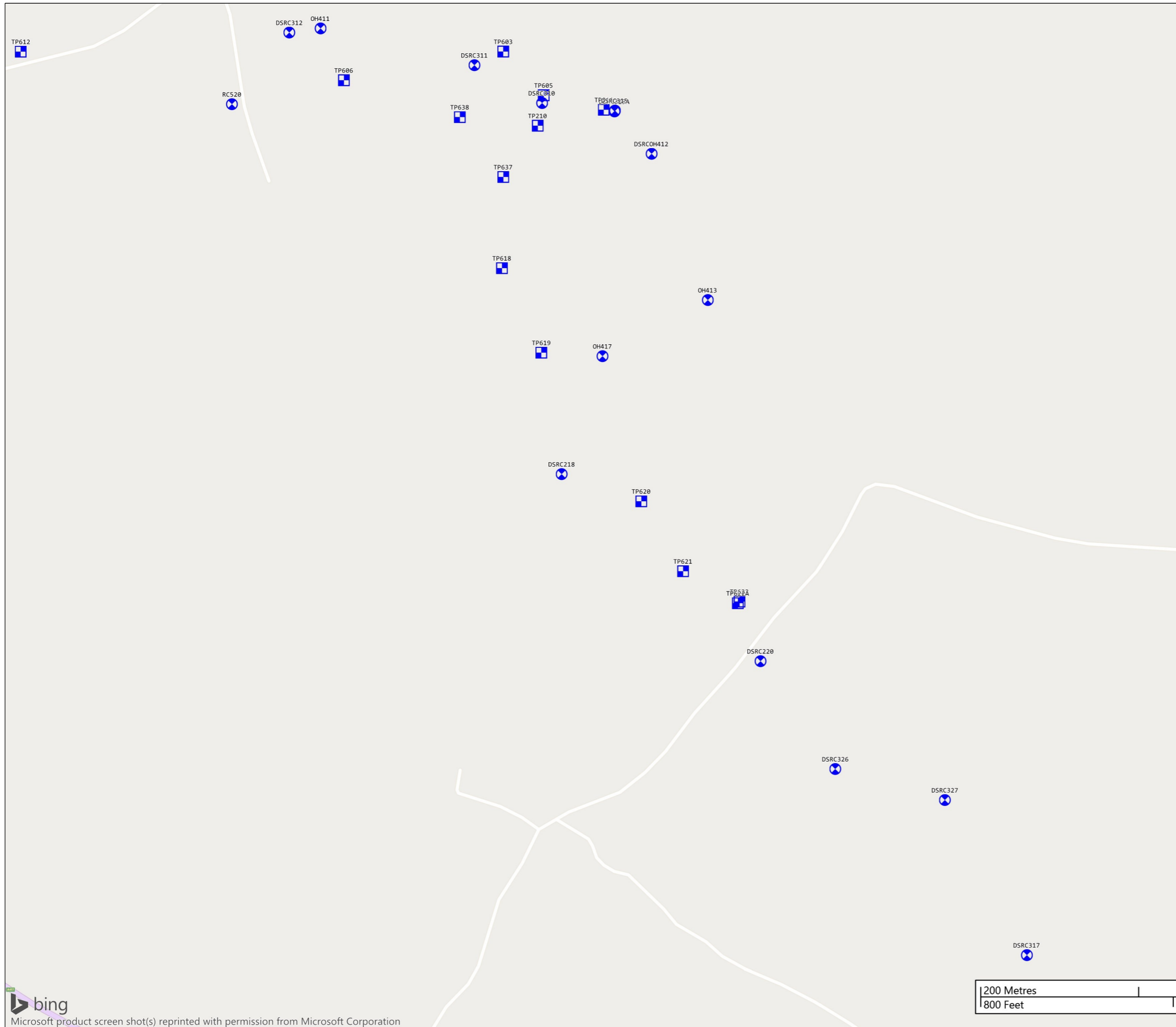
Contract:

35560






Figure:

3

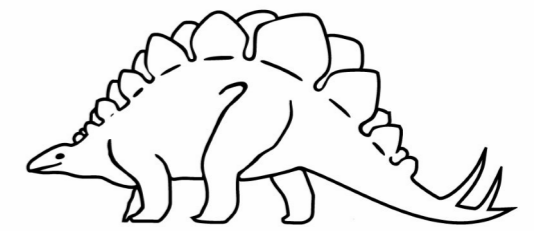




Key:

-  Locations By Type - CP
-  Locations By Type - CPT
-  Locations By Type - RC
-  Locations By Type - RO
-  Locations By Type - TP

Notes:



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 Web: www.geoeng.co.uk

Client:

HIGHWAYS ENGLAND

Site:

HE551505 A417 MISSING LINK GROUND
 INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN

Drawn By:

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Paper Size:

A3

Scale:

1:5000

Date:

December 2020

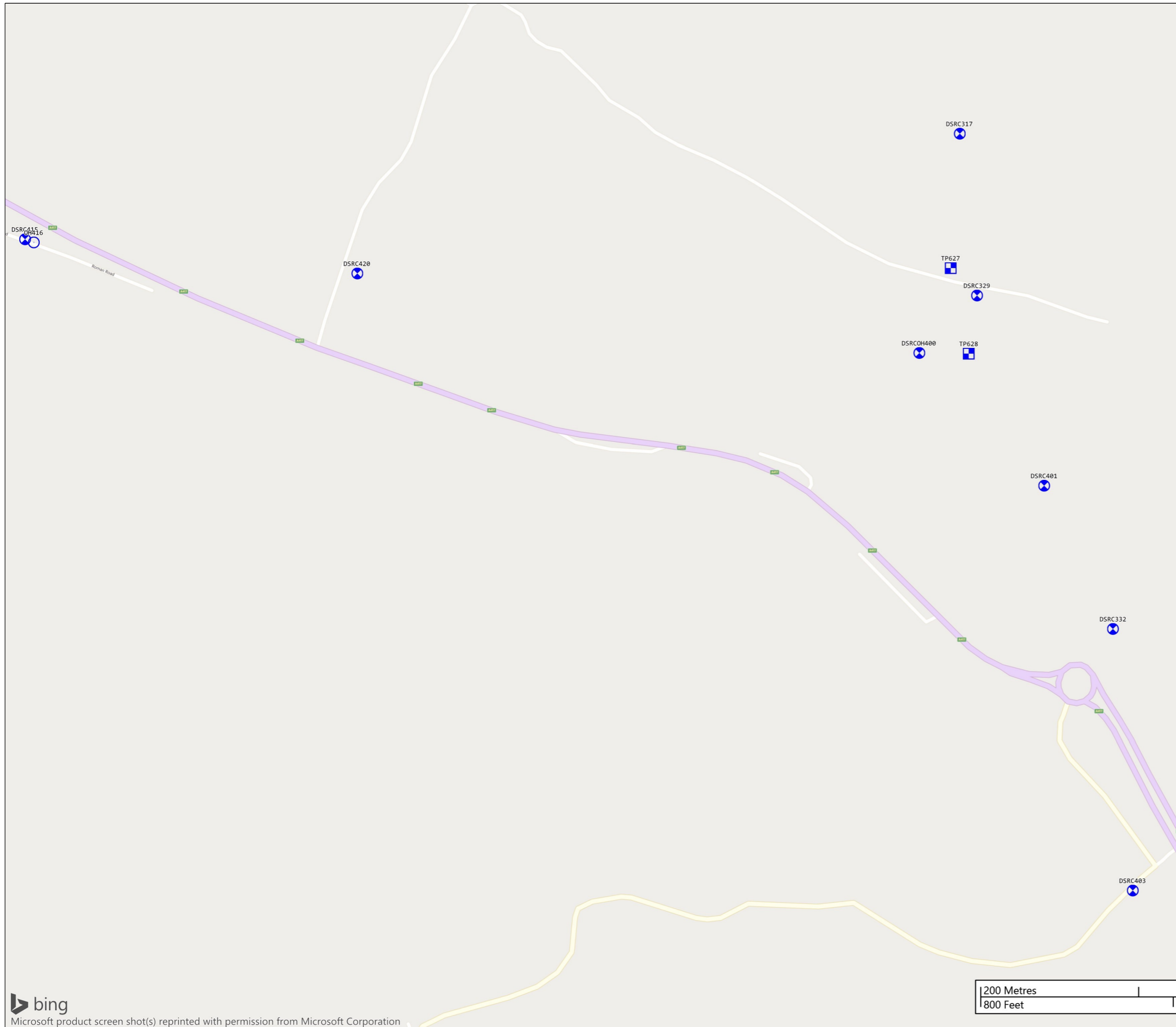
Contract:

35560






Figure:

4

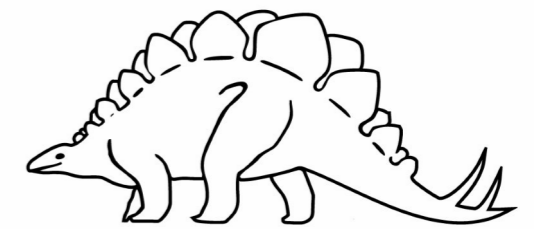




Key.

-  Locations By Type - CP
-  Locations By Type - CPT
-  Locations By Type - RC
-  Locations By Type - RO
-  Locations By Type - TP

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Site:

HE551505 A417 MISSING LINK GROUND
 INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN

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EL

Paper Size:

A3

Scale:

1:5000

Date:

December 2020

Contract:

35560

Figure:

5





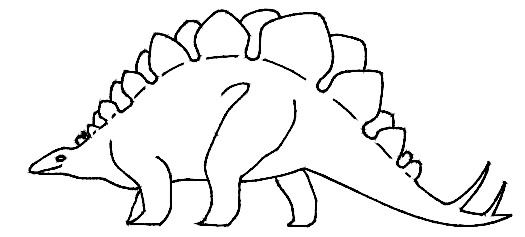
Key.



Borehole Location

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Client:

OSBORNE

Consultant:

MOTT MACDONALD SWECO JV

Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (987)

Title:

EXPLORATORY HOLE LOCATION PLAN

Drawn By:

ELe

Checked By:

CT

Paper Size:

A3

Scale:

1:3,000

Date:

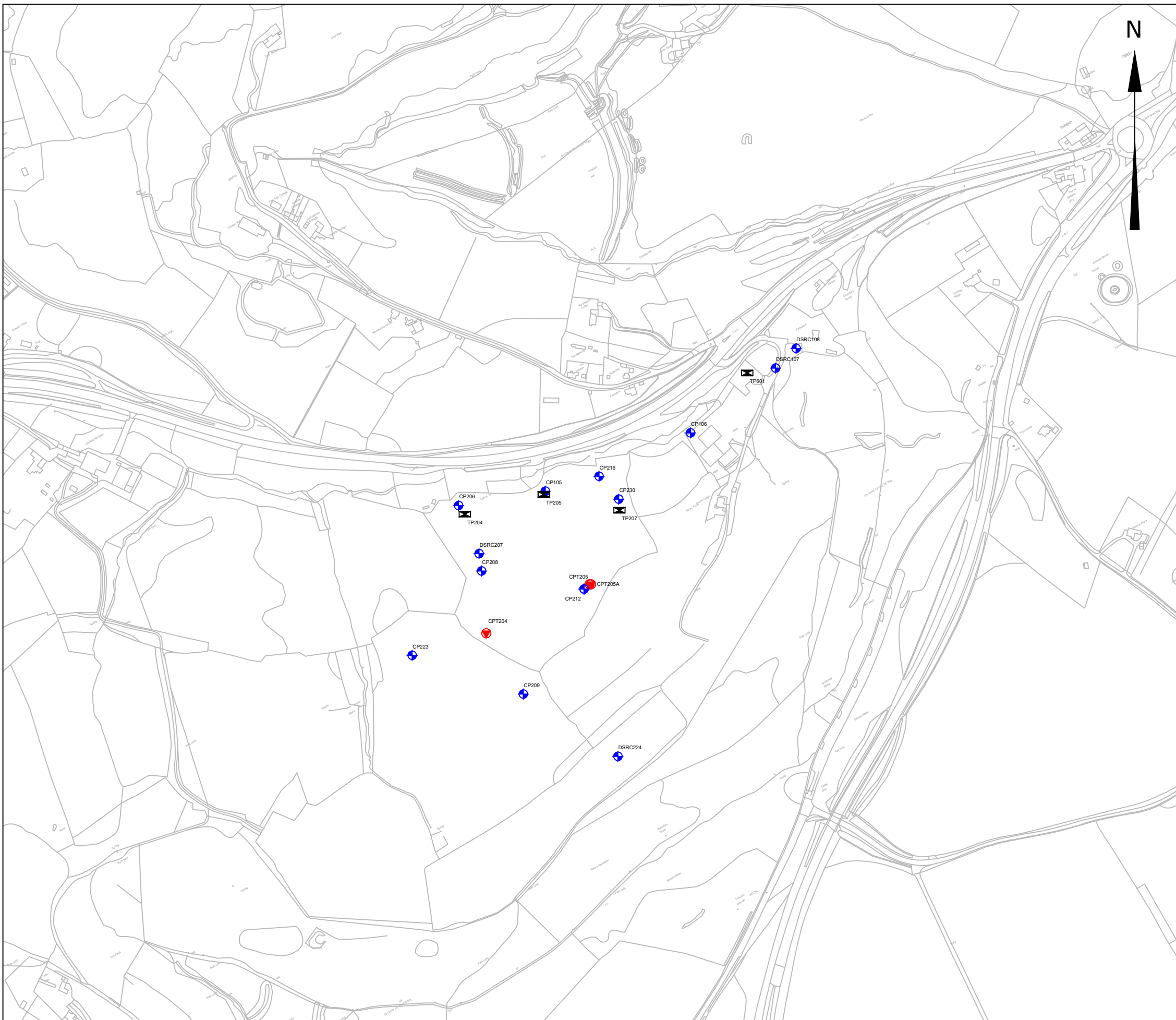
Oct 2019

Contract:




35102

Figure:

01

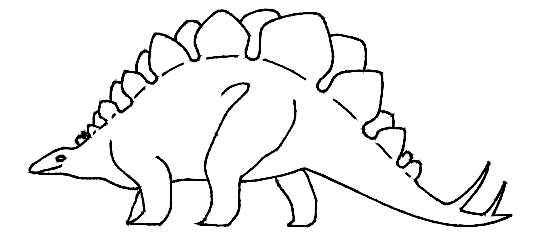


Key.

-  Borehole Location
-  Trial Pit Location
-  Cone Penetration Test Location

Notes:

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Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1077)

Title:

EXPLORATORY HOLE LOCATION PLAN

Drawn By:

ELe

Checked By:

CT

Paper Size:

A3

Scale:

1:5,000

Date:

Feb 2020

Contract:




35205

Figure:

01



Key:

-  Borehole Location
-  Trial Pit Location
-  Cone Penetration Test Location

Notes:
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Client:
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Consultant:
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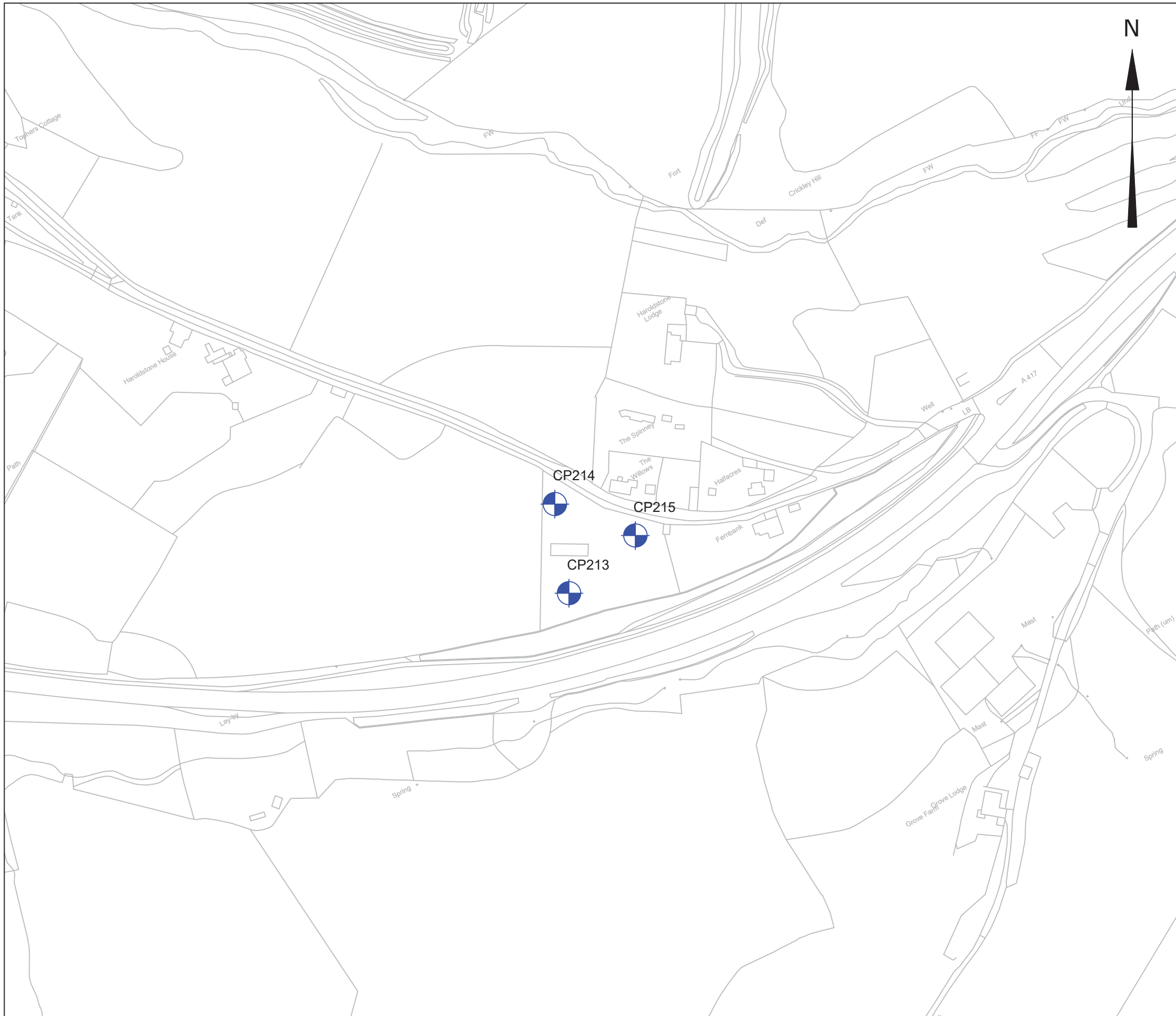
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HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (948)

Title:
EXPLORATORY HOLE LOCATION PLAN


Drawn By: ELe	Checked By: EC	Paper Size: A3
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Scale: 1:4,000	Date: Feb 2020
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Contract: 35371/01	Figure: 01
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Key:

 Borehole Location

Notes:

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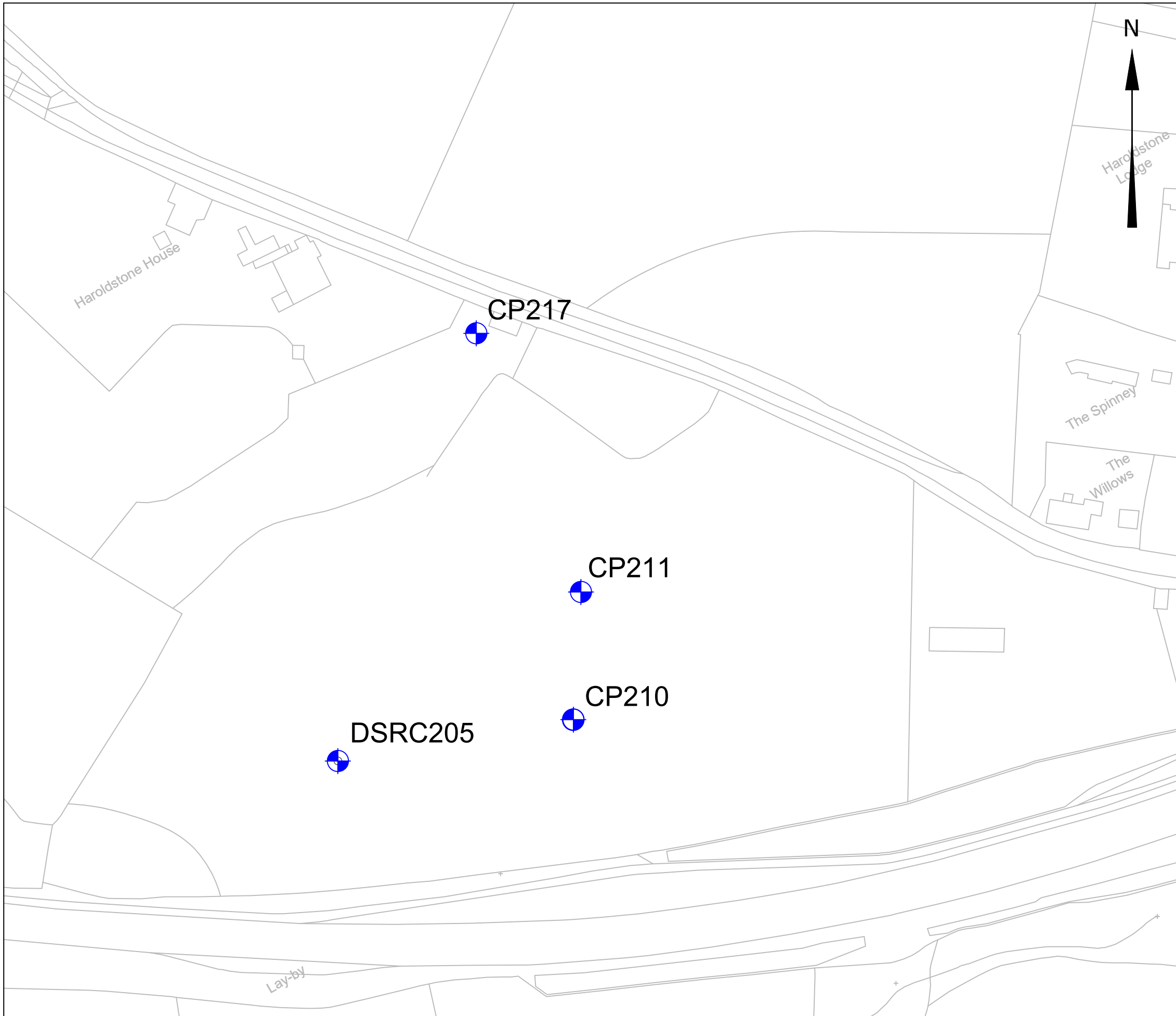
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Title: EXPLORATORY HOLE LOCATION PLAN


Drawn By: ELe	Checked By: EC	Paper Size: A3
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Scale: 1:2,000	Date: Nov 2019
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Contract: 35371/02	Figure: 01
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Key:

 Borehole Location

Notes:

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Consultant: ARUP

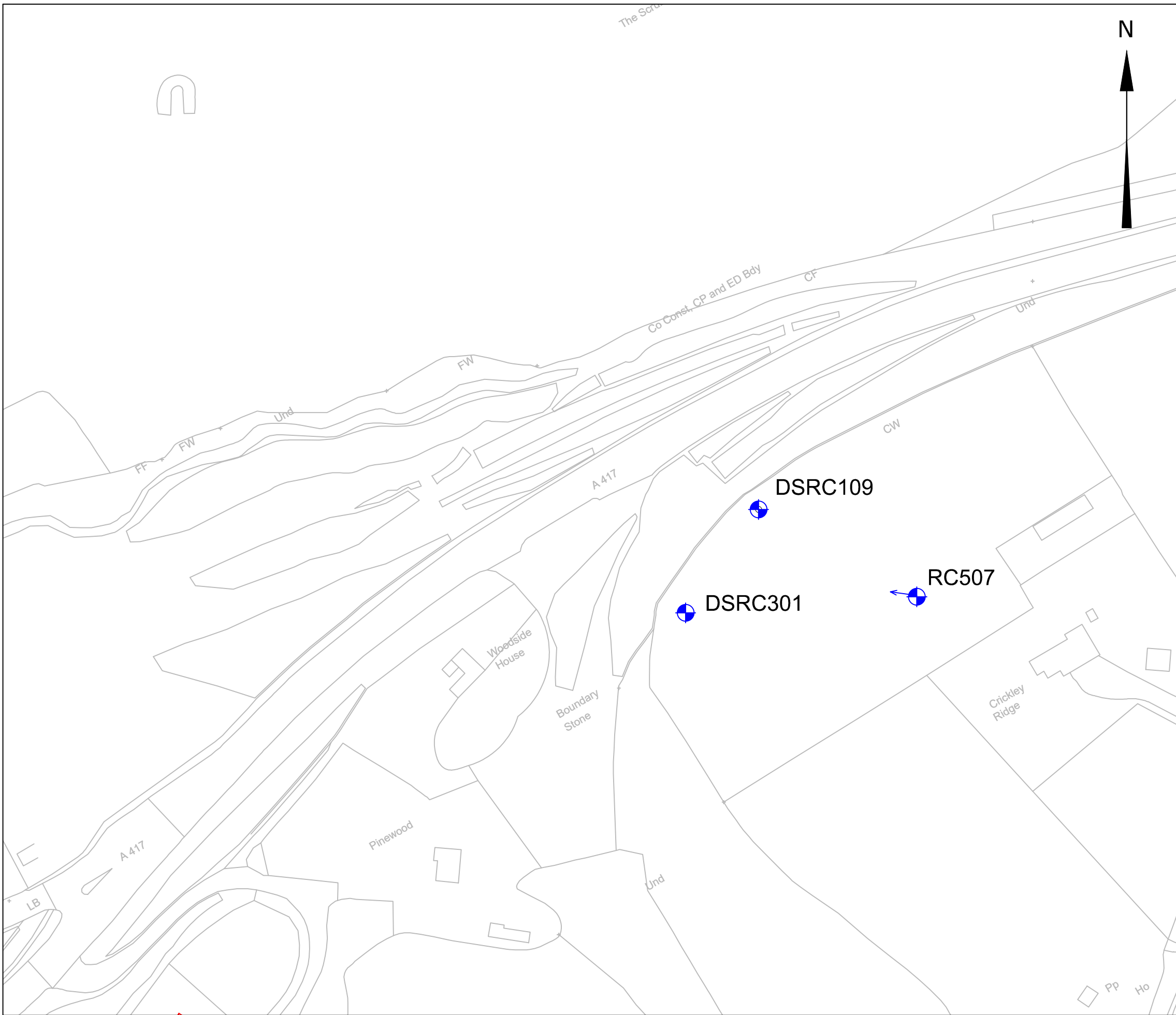
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Title: EXPLORATORY HOLE LOCATION PLAN



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Scale: 1:10,000	Date: Feb 2020
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Contract: 35560/01	Figure: 01
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Key.

-  Borehole Location
-  Inclined Borehole Location

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Site: HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1106)

Title: EXPLORATORY HOLE LOCATION PLAN


Drawn By: JBo	Checked By: EC	Paper Size: A3
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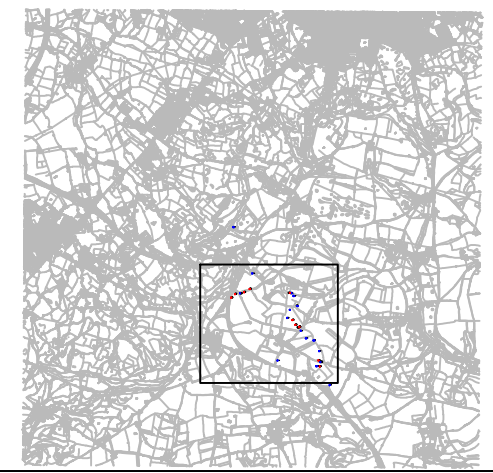
Contract: 35560/02	Figure: 01
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Key.

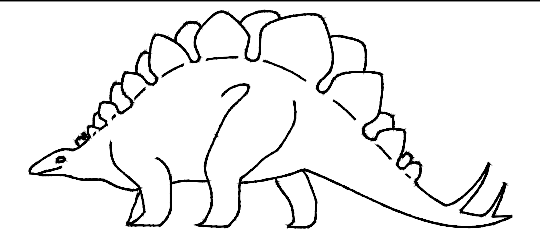
 Borehole Location

 Trial pit location



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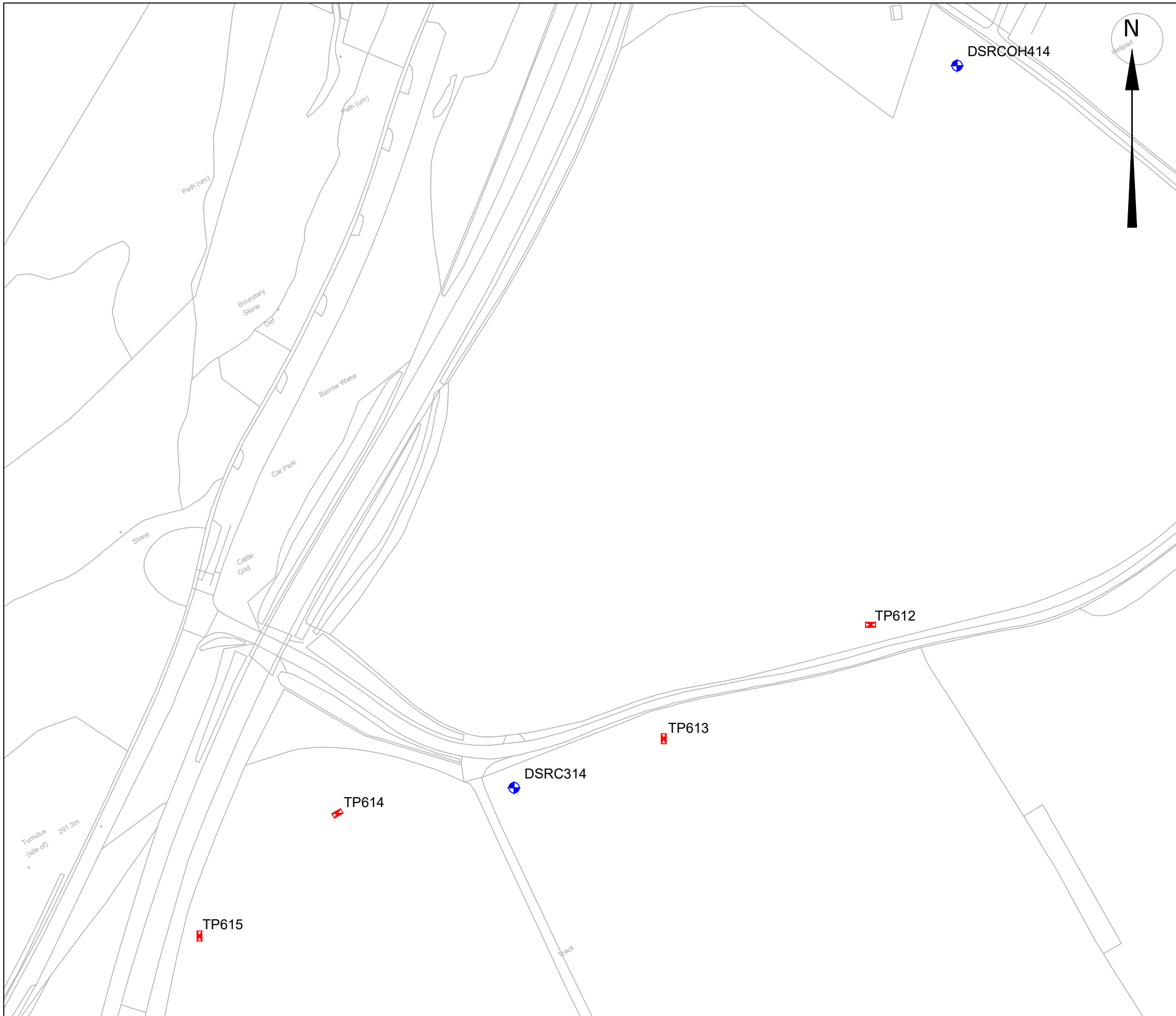
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Title: EXPLORATORY HOLE LOCATION PLAN



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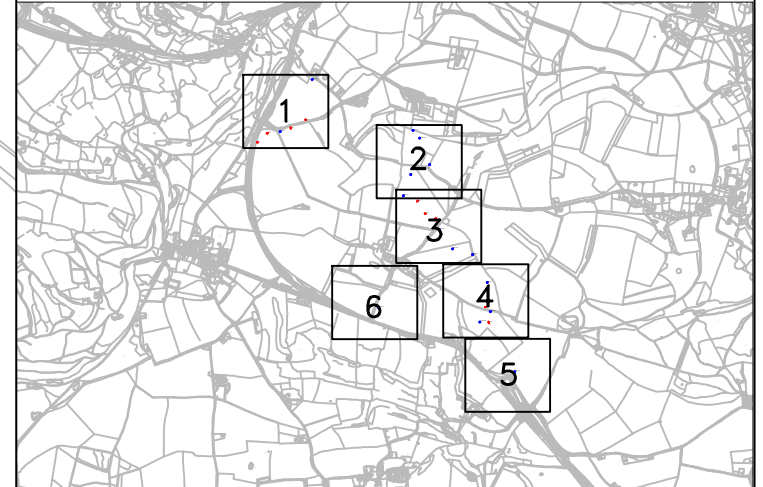
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Contract: 35560/03	Figure: OVERVIEW
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Key:

-  Borehole Location
-  Trial pit location



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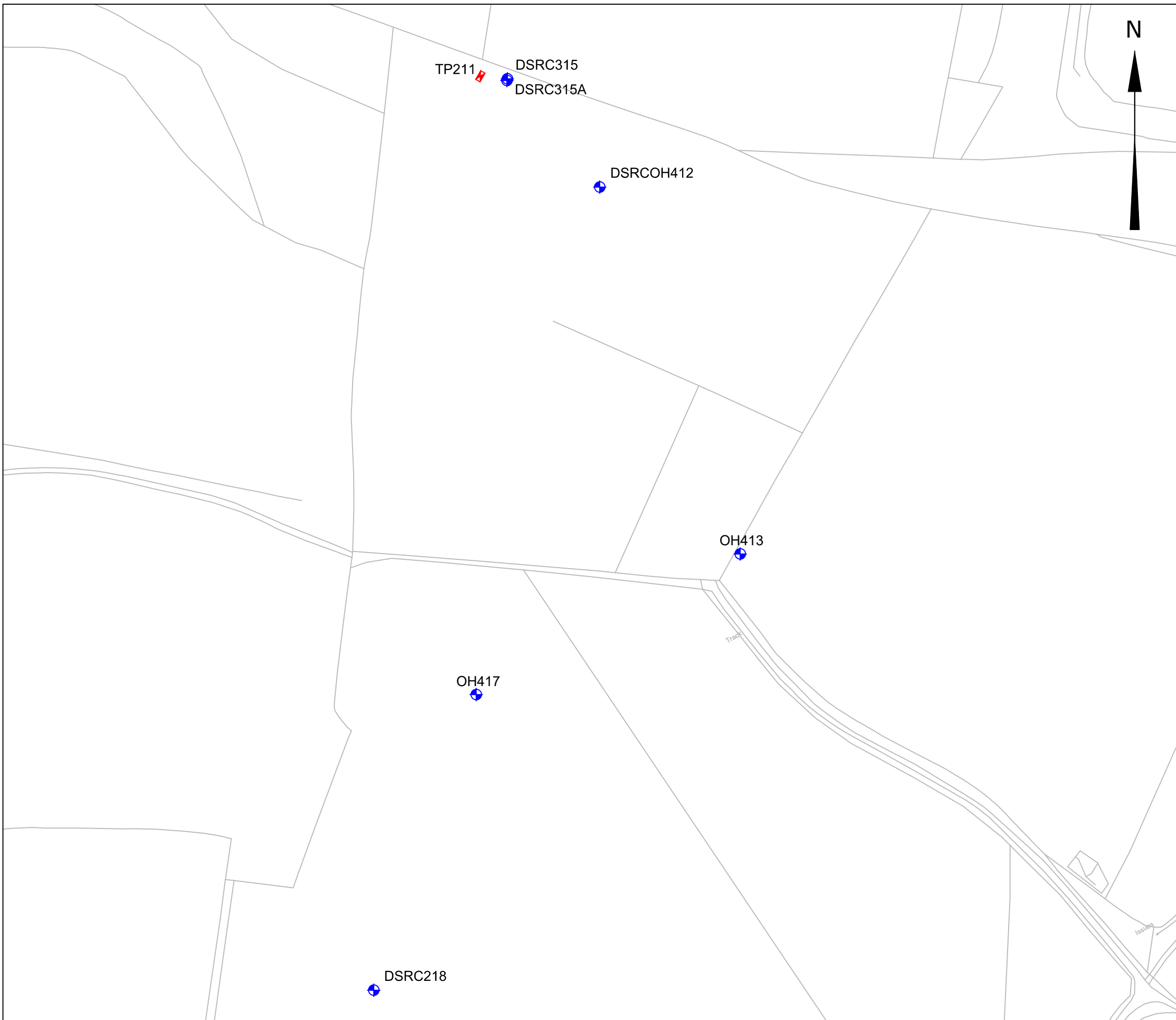
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Title: EXPLORATORY HOLE LOCATION PLAN

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Scale: 1:20,000	Date: Feb 2020
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Contract: 35560/03	Figure: 01
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N



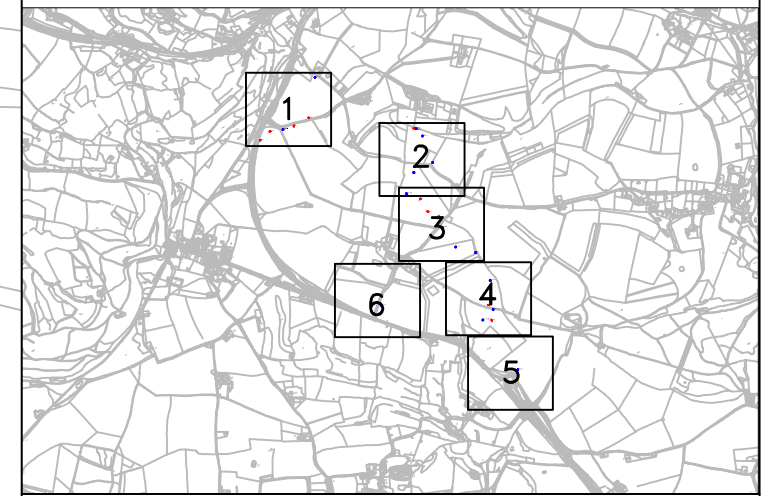
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Borehole Location

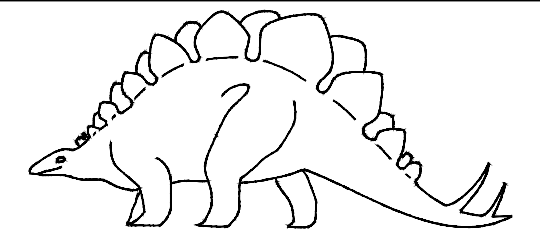


Trial pit location



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Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1118)

Title:

EXPLORATORY HOLE LOCATION PLAN

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JBo

Checked By:

EC

Paper Size:

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1:2,000

Date:

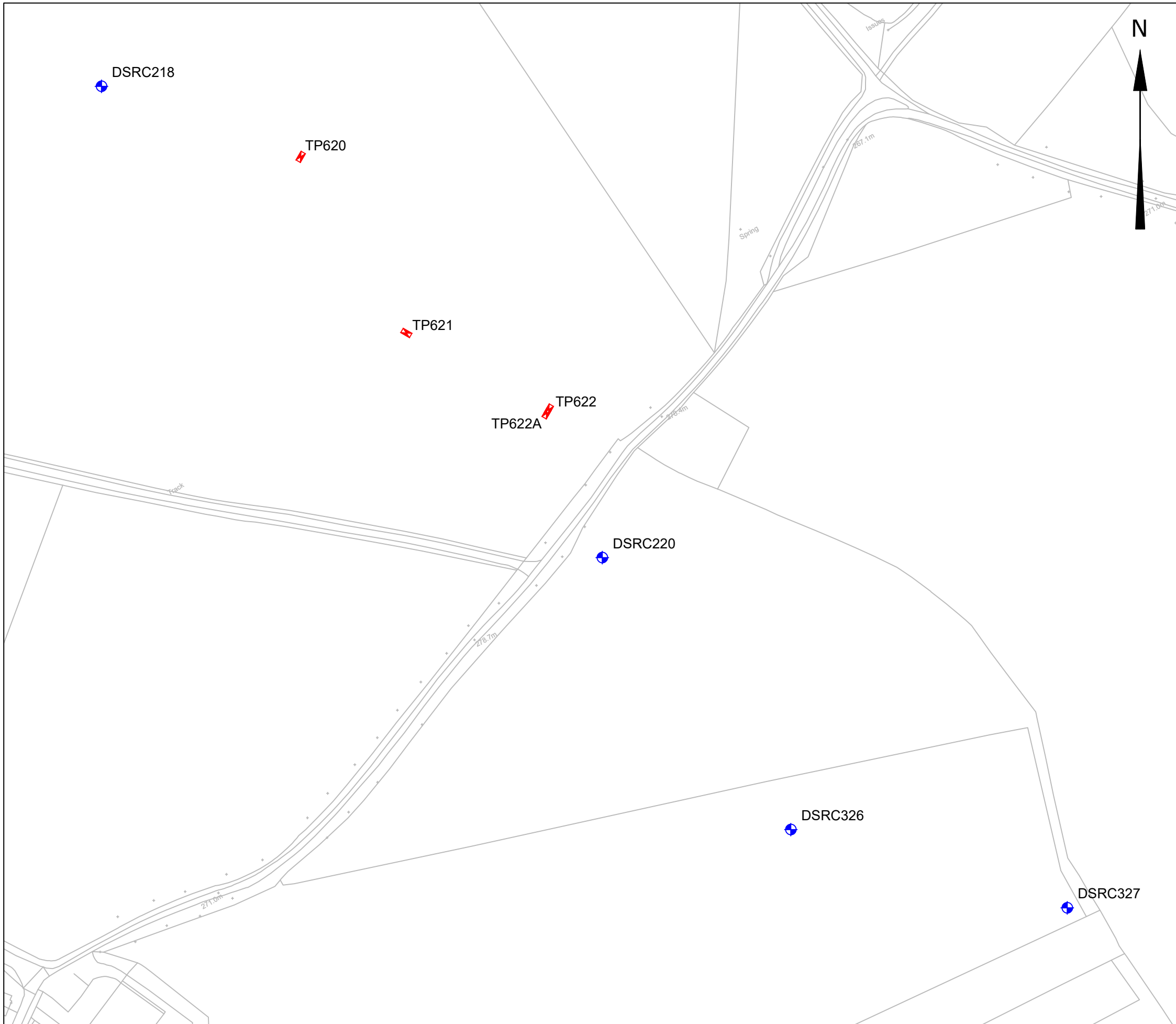
August 2020

Contract:



35560/03

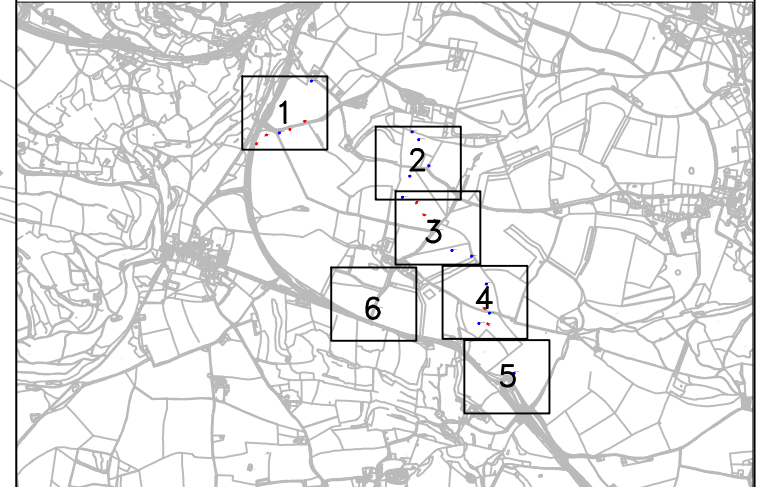
Figure:

02



Key:

-  Borehole Location
-  Trial pit location



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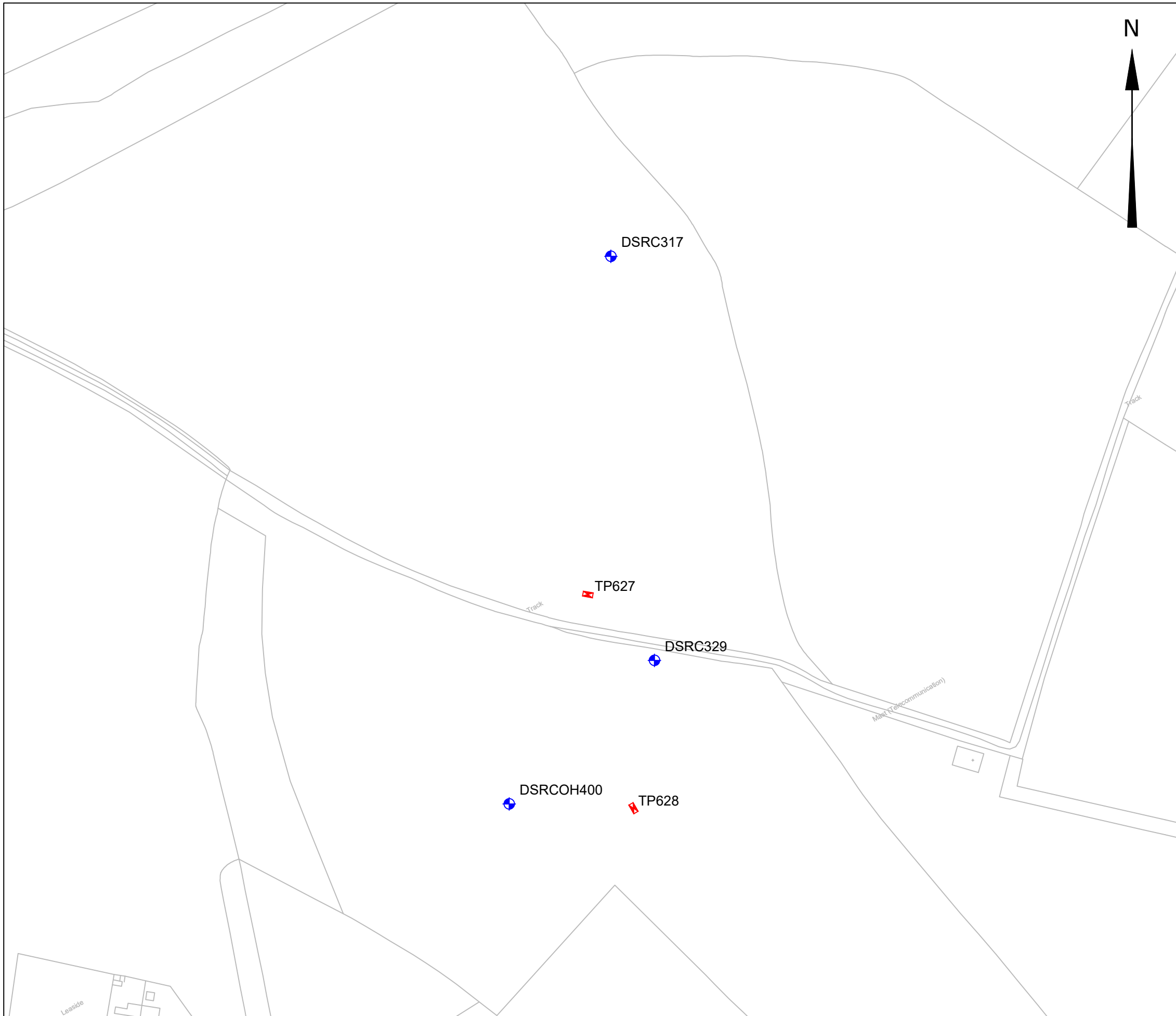
Site:
 HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1118)

Title:
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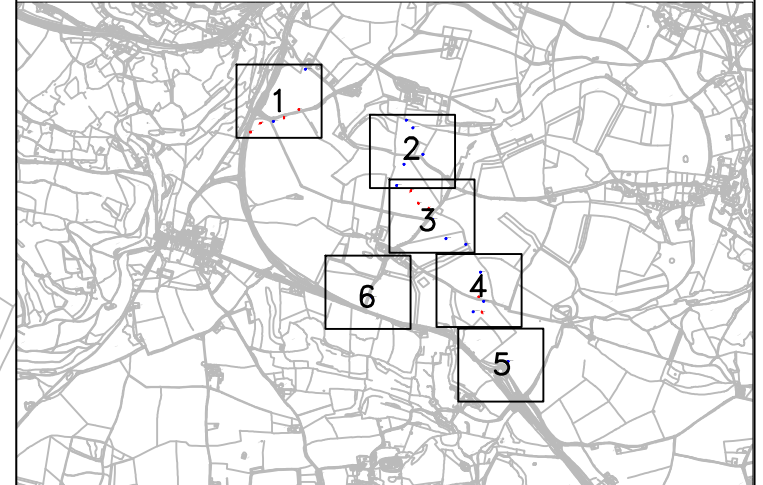
Contract: 35560/03	Figure: 03
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Key.

 Borehole Location

 Trial pit location



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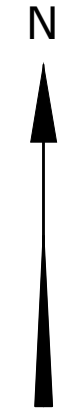
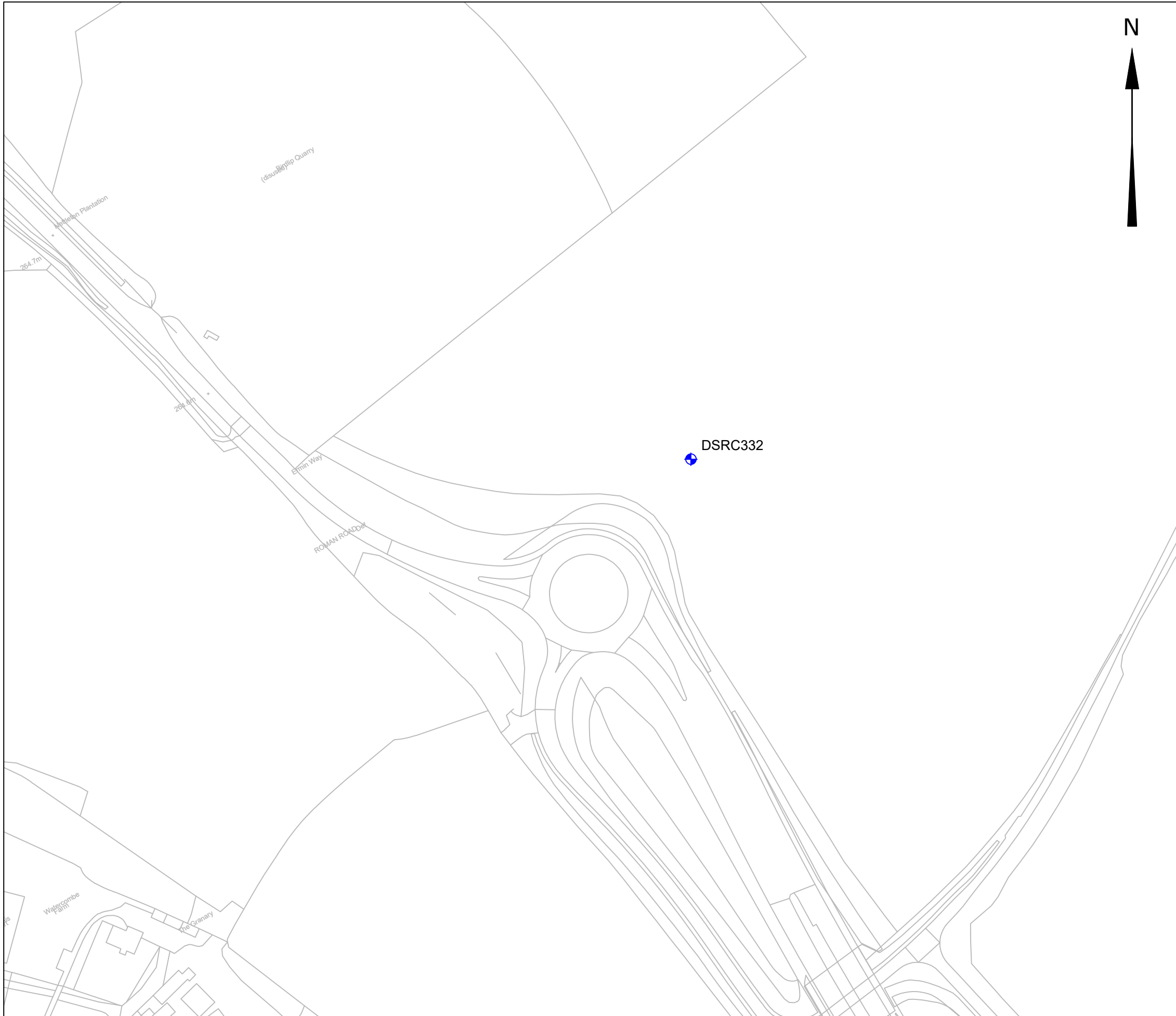
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Title: EXPLORATORY HOLE LOCATION PLAN

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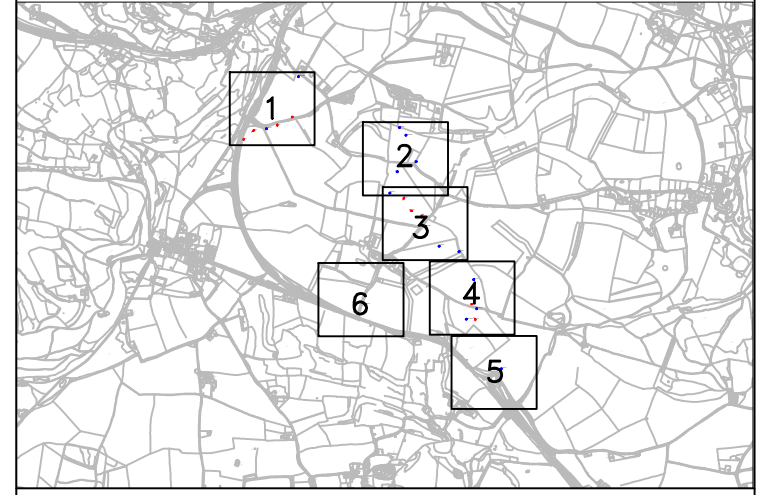
Contract: 35560/03	Figure: 04
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Key:



Borehole Location



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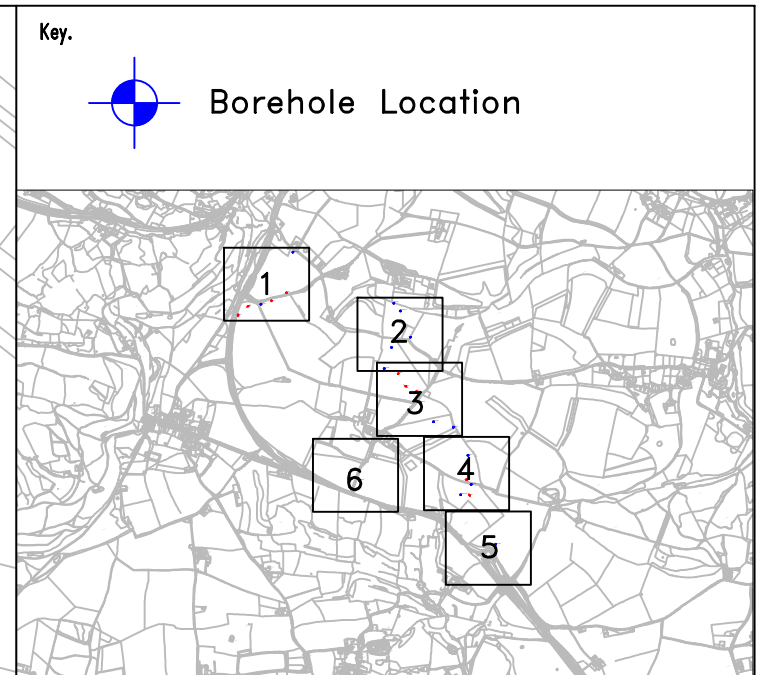
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Title:
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Contract: 35560/03	Figure: 05
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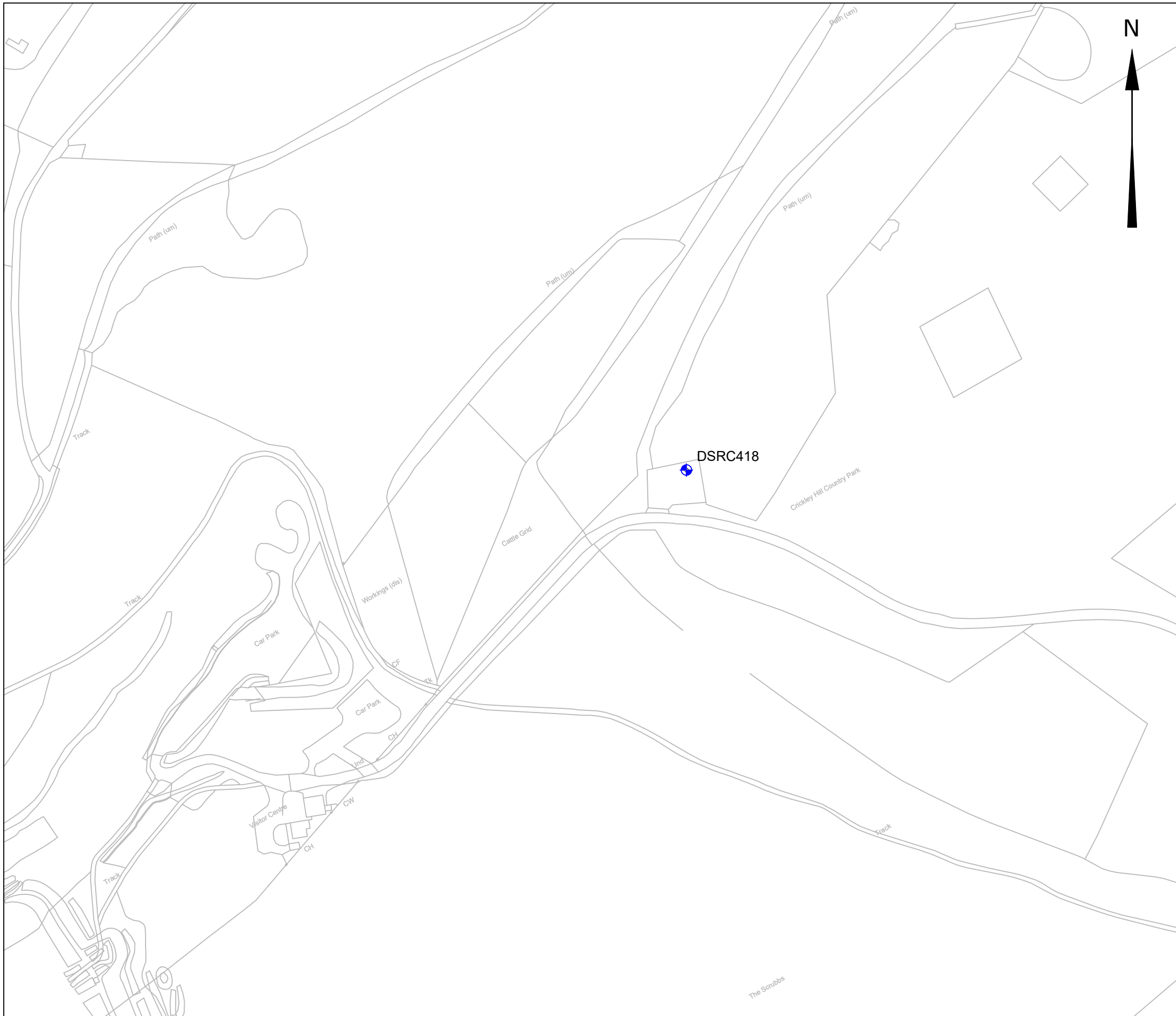
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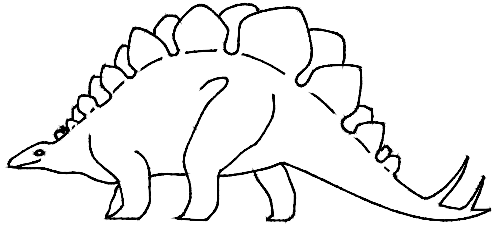
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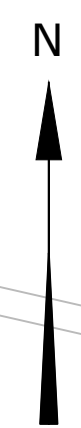
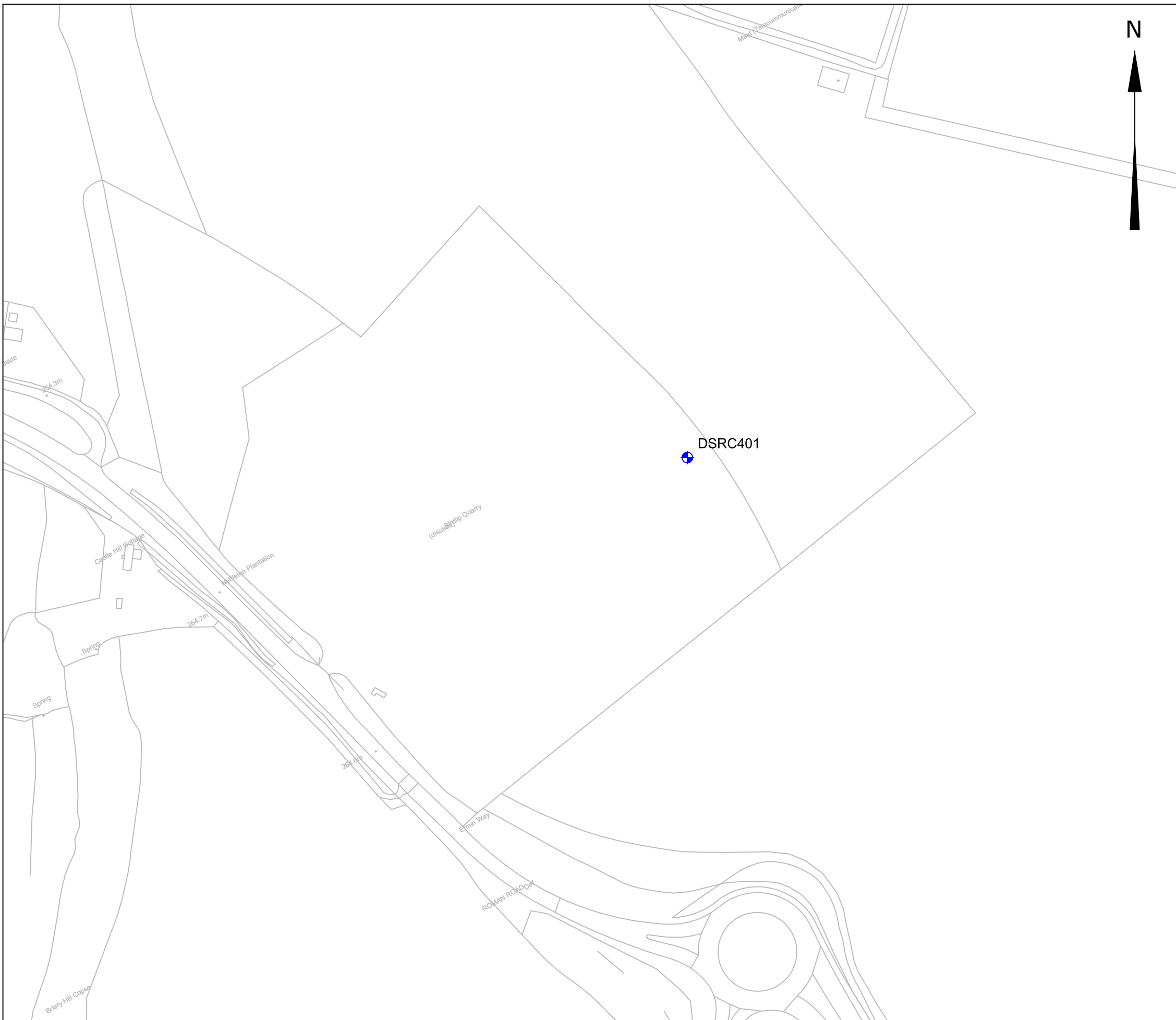
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Contract: 35560/03	Figure: 06
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Key:  Borehole Location		
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Consultant: ARUP		
Site: HE551505 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1095)		
Title: EXPLORATORY HOLE LOCATION PLAN		
Drawn By: JBo	Checked By: EC	Paper Size: A3
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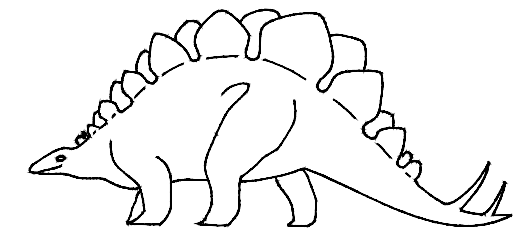


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Title:

EXPLORATORY HOLE LOCATION PLAN

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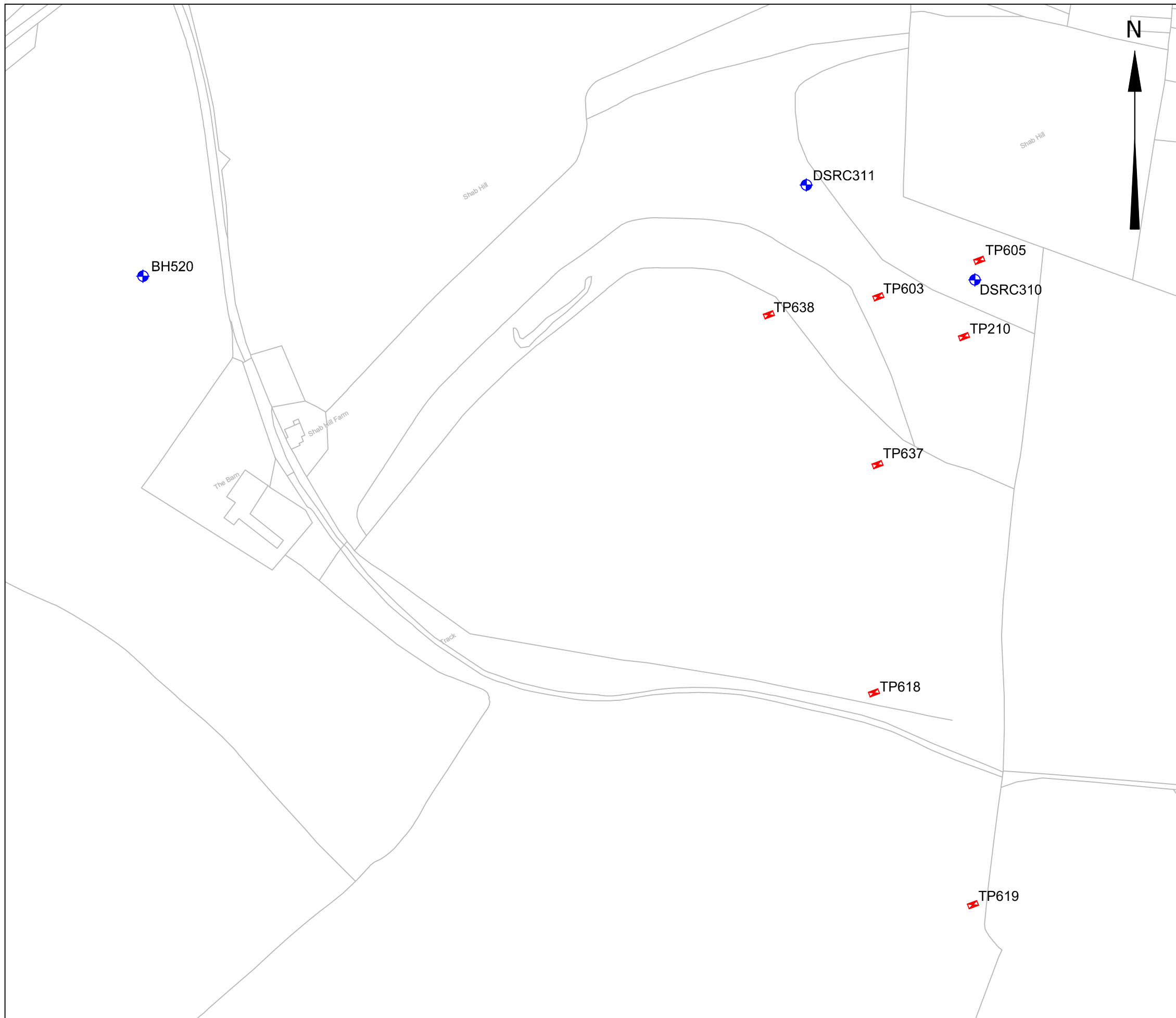
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Contract:

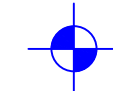
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Figure:

01



Key.



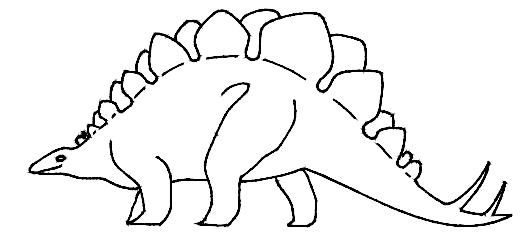
Borehole Location



Trail pit location

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Consultant:

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Site:

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Title:

EXPLORATORY HOLE LOCATION PLAN

Drawn By:

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Checked By:

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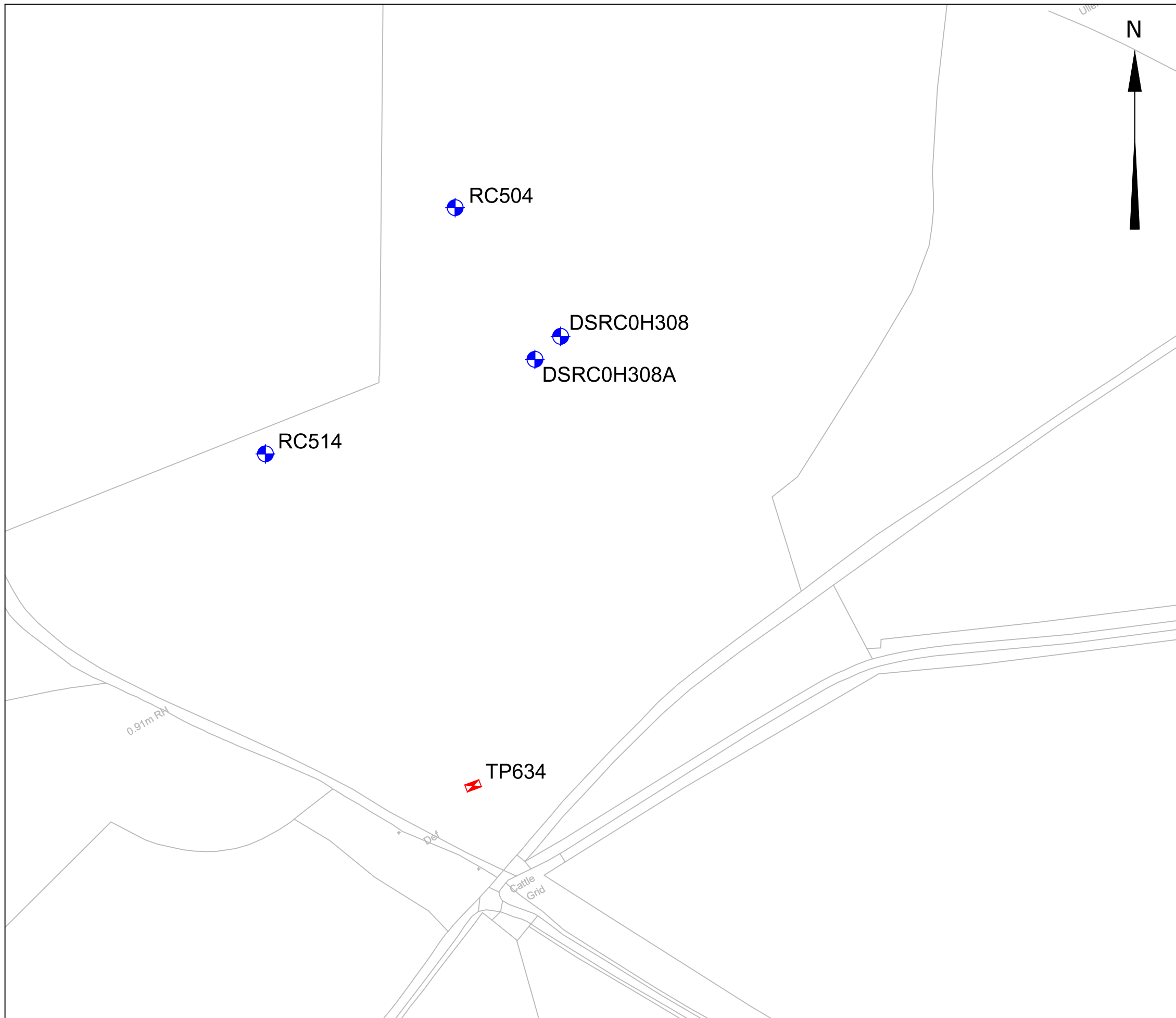
AUGUST 2020

Contract:



35560

Figure:

01

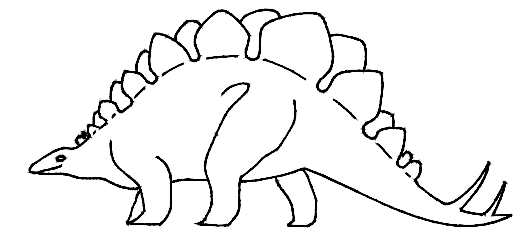


Key.

-  Borehole Location
-  Trail pit location

Notes:

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Title:

EXPLORATORY HOLE LOCATION PLAN

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Checked By:

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Paper Size:

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Date:

AUGUST 2020

Contract:


35560

Figure:

02



Key:

 Borehole Location

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Consultant: ARUP

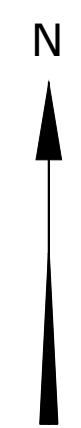
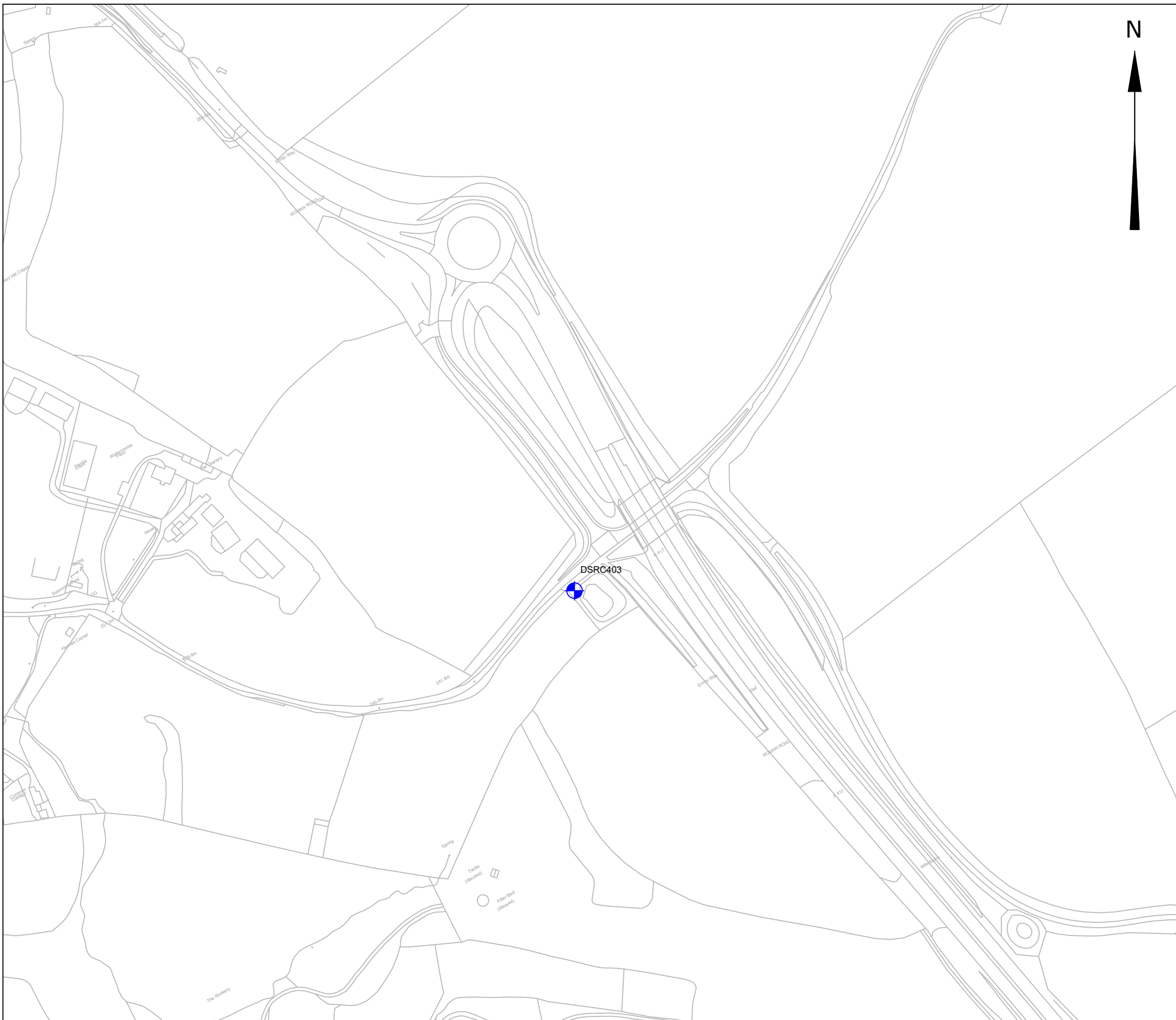
Site: HE551505 A417 MISSING LINK GROUND INVESTIGATION (1098)

Title: EXPLORATORY HOLE LOCATION PLAN

Drawn By: ELe	Checked By: EC	Paper Size: A3
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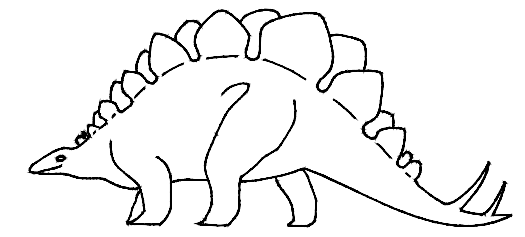
Scale: 1:3,000	Date: July 2020
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Contract: 35560/07	Figure: 01
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Key.
 Borehole Location

Notes:
 Drawing supplied by the Consultant



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Client:
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Consultant:
 ARUP

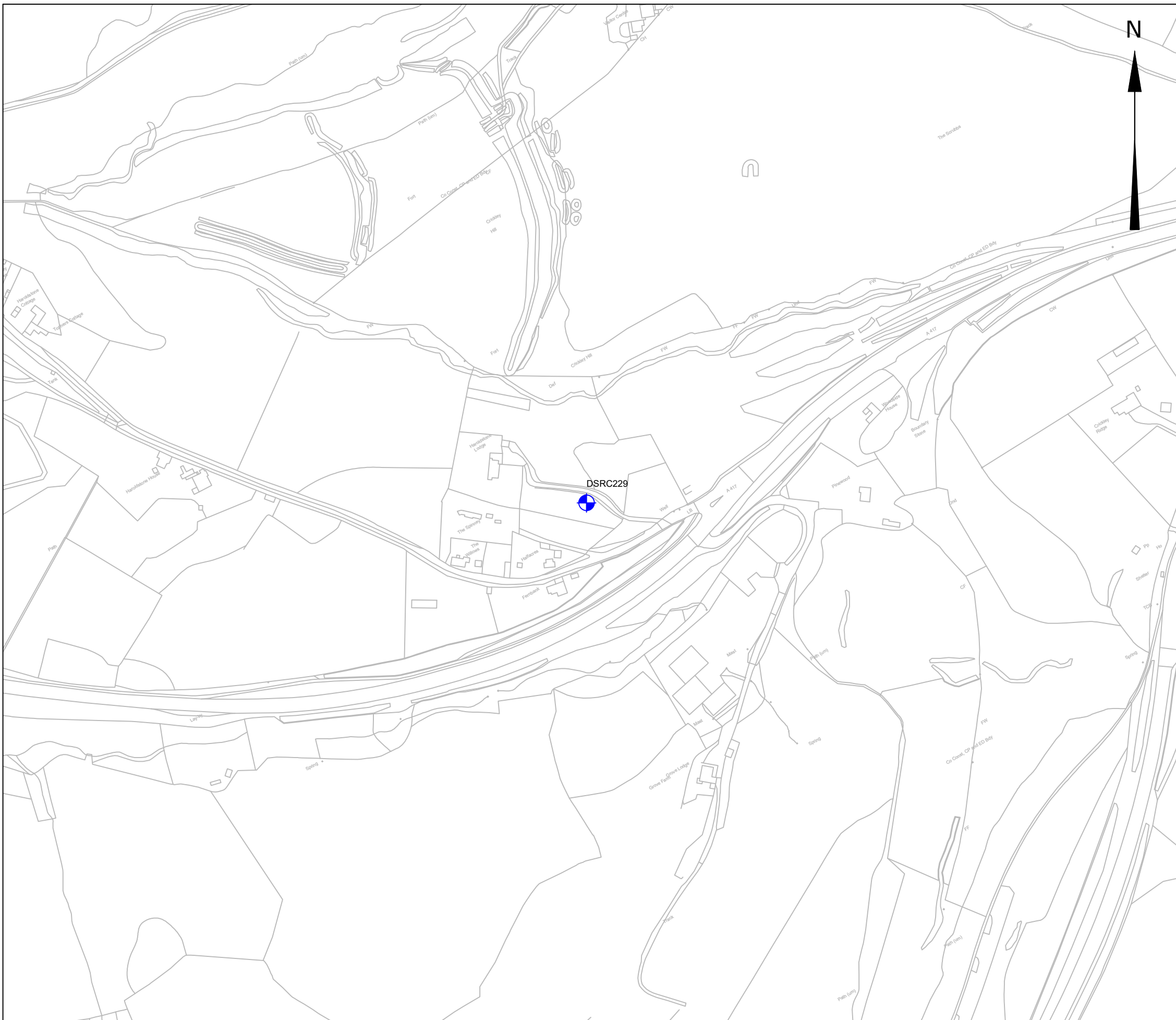
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 HE551505 A417 MISSING LINK GROUND INVESTIGATION (1)

Title:
 EXPLORATORY HOLE LOCATION PLAN

Drawn By: ELe	Checked By: EC	Paper Size: A3
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Scale: 1:3,000	Date: July 2020
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Contract: 35560/08	Figure: 01
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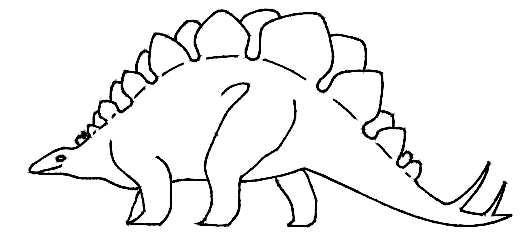


Key.



Notes:

Drawing supplied by the Consultant



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Consultant:

ARUP

Site:

HE551505 A417 MISSING LINK GROUND INVESTIGATION (1084)

Title:

EXPLORATORY HOLE LOCATION PLAN

Drawn By:

ELe

Checked By:

EC

Paper Size:

A3

Scale:

1:3,000

Date:

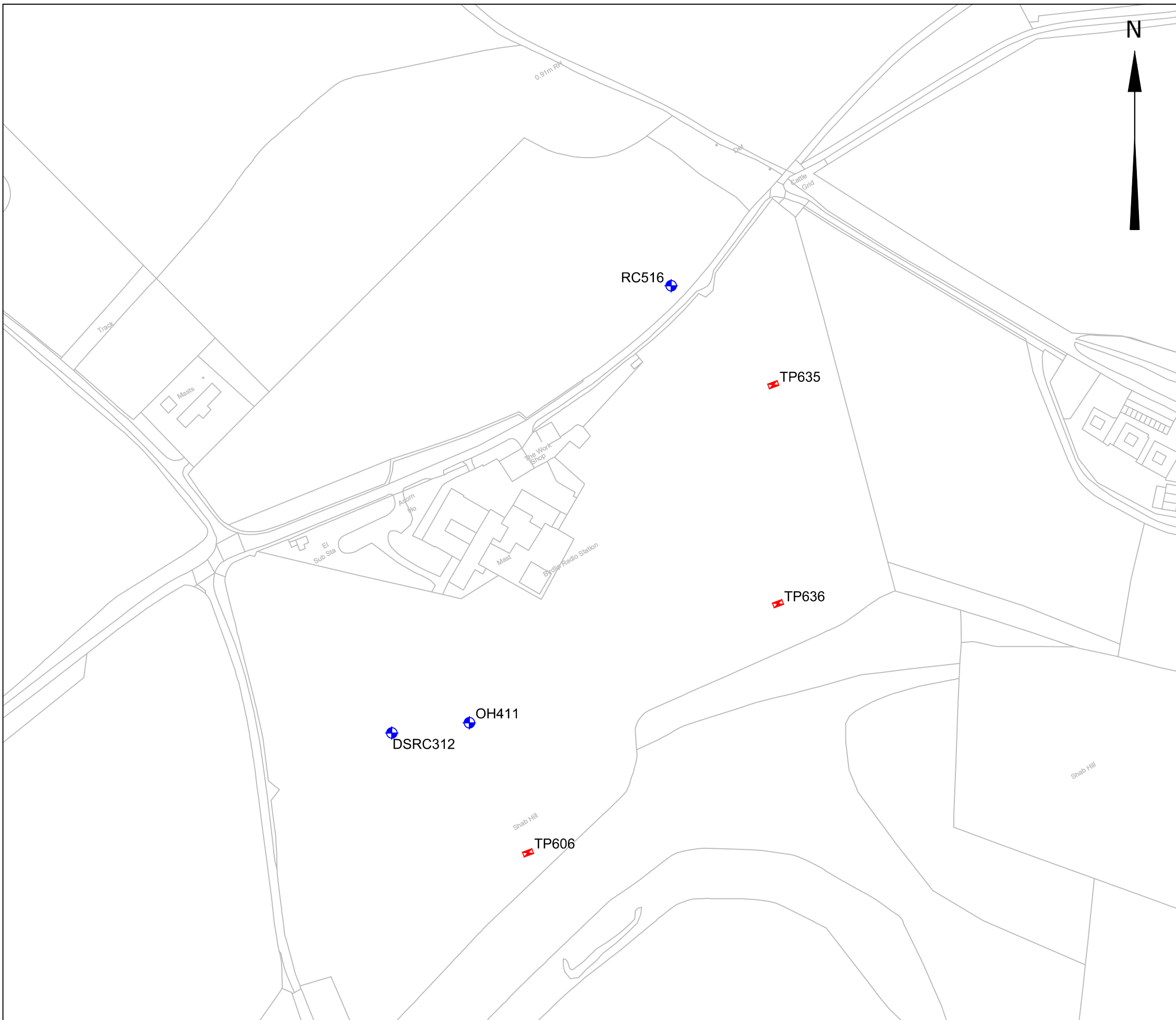
July 2020

Contract:

35560/09

Figure:

01



Key.

-  Borehole Location
-  Trail pit location

Notes:
Drawing supplied by the Consultant



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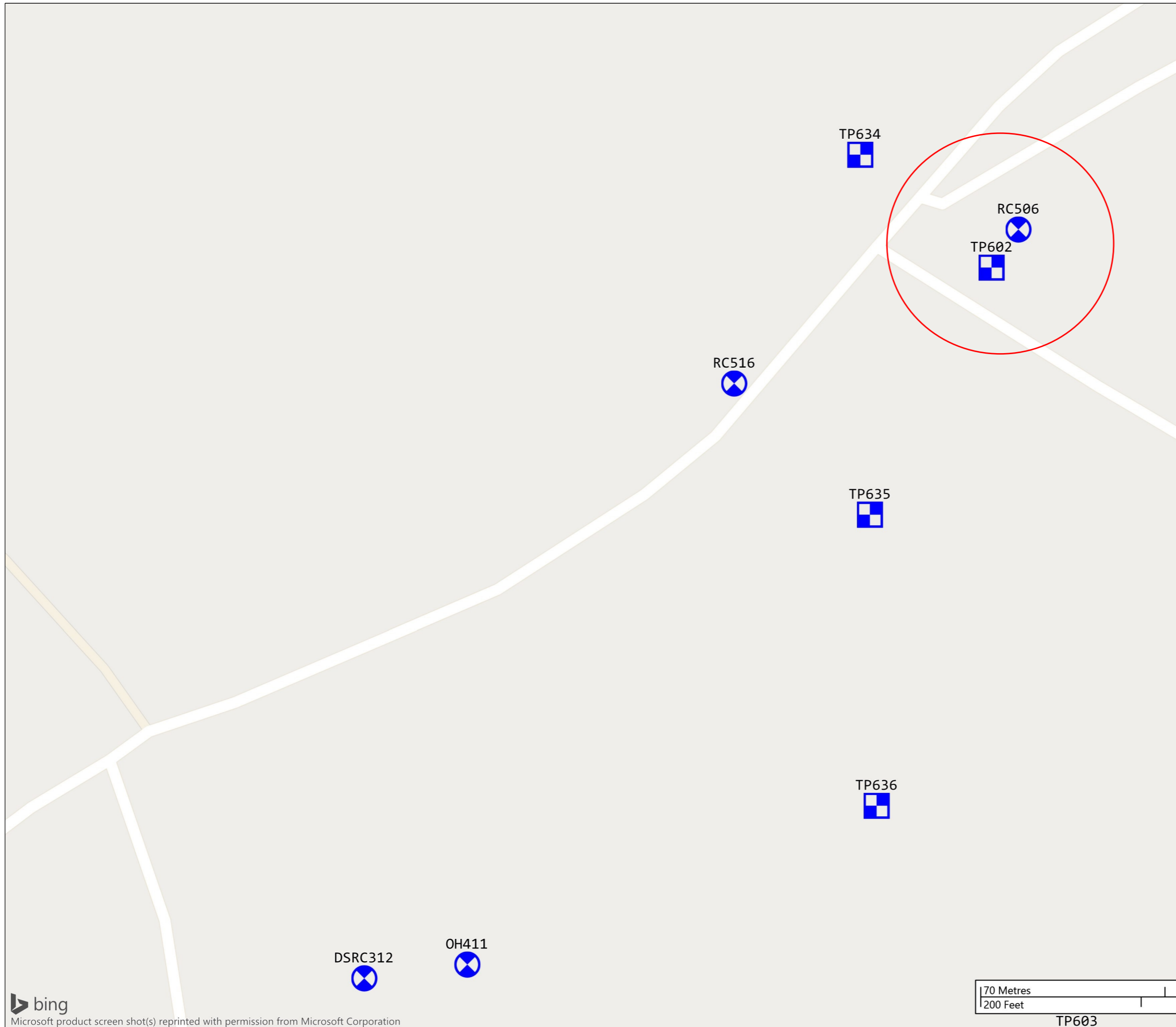
Site:
HE551505 A417 MISSING LINK GROUND INVESTIGATION

Title:
EXPLORATORY HOLE LOCATION PLAN





Drawn By: IS	Checked By: EC	Paper Size: A3
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Scale: 1:2000	Date: AUGUST 2020
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Contract: 35560	Figure: 01
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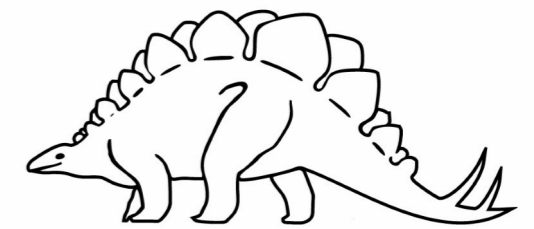


Key.

-  Locations By Type - CP
-  Locations By Type - CPT
-  Locations By Type - RC
-  Locations By Type - RO
-  Locations By Type - TP

Notes:

Land package 1219: RC506 and TP602 only.



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Client:

HIGHWAYS ENGLAND

Site:

HE551505 A417 MISSING LINK GROUND
 INVESTIGATION

Title:

EXPLORATORY HOLE LOCATION
 PLAN - LAND PACKAGE 1219

Drawn By:

EC

Checked By:

EL

Paper Size:

A3

Scale:

1:1500

Date:

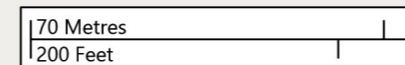
December 2020

Contract:

35560

Figure:

1



TP603





APPENDIX A

FIELDWORK DATA

KEY TO EXPLORATORY HOLE LOGS



Sample type

D Small disturbed	U Undisturbed	L Dynamic	ES Environmental - soil	Cs Core subsample (prepared)
B Bulk disturbed	UT Undisturbed thin wall	C Core	EW Environmental - water	Ls Dynamic subsample (prepared)
LB Large bulk disturbed	P Piston	W Water		

Test type

- S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value
- C SPT - Solid cone followed by uncorrected SPT 'N' Value
 (*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration). Arrow length reflects test depth range.
- H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal.
- M Mackintosh probe - number of blows to achieve 100mm penetration
- Mx Mexe cone - average reading of equivalent CBR value in %
- PP Pocket penetrometer - calculated reading in kPa
- Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with isobutylene, using a 10.6eV bulb)

Sample/core range/l_f

Dynamic sample Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

x x = Total Core Recovery (TCR) as percentage of core run

y y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter

z z = Rock Quality Designation (RQD). The amount of solid core greater than 100mm expressed as percentage of core run

Where SPT has been carried out at the beginning of core run, disturbed section of core excluded from SCR and RQD assessment

l_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are also given. NI = non-intact NA = not applicable

Instrumentation

Porous tip Perforated standpipe Inclinometer Extensometer

Backfill

Granular response zone Bentonite seal Cement/bentonite grout Soil backfill Concrete **Cover** Raised cover Stopcock cover

Stratum boundaries

----- Estimated boundary Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identified when, within the natural make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General comments

The process of drilling and sampling will inevitably lead to sample disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphical names/geological rock units are for guidance only and may not be wholly accurate.

GEOLOGY CODE SUMMARY



CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

Geology Codes: GEOL_GEOL

Code	Name
Superficial Deposits	
TOP	Topsoil
MG	Made Ground
ALV	Alluvium
PEAT	Peat
HDD	Head Deposits
CF	Clay with Flints
RTD	River Terrace Deposits
GTD	Glacial Till Deposits
COL	Colluvial Deposits
SLIP	Landslide Deposits (undifferentiated)
SLIP_LIAS	Landslide Deposits (Lias Group)
Solid Geology	
GOG	Great Oolite Group
FEF	Fuller's Earth Formation
IOG	Inferior Oolite Group
Lias Group	Lias Group

Secondary Geology Codes: GEOL_GEO2

Code	Name
Tops	Topsoil
Conc	Concrete
Trmc	Tarmac / blacktop
Wst	Waste (e.g. landfill)
FILL	Fill (e.g. embankment fill)
SST	Sandstone
SZT	Siltstone
MST	Mudstone
LST	Limestone
CONG	Conglomerate
UND	Undifferentiated

BGS Lexicon Codes: GEOL_BGS

Formation Codes: GEOL_FORM

Code	Name
Superficial Deposits	
MASMD	Mass Movement Deposits
MGR	Made Ground
ALV	Alluvium
-	Peat
HEAD/HDD	Head Deposits
-	Clay with flints
RTD	River Terrace Deposits
-	Glacial Till Deposits
COLV	Colluvial Deposits
SLIP	Landslide Deposits (undifferentiated)
Solid Geology	
WHL	White Limestone Formation
HMB	Hampden Formation
FE	Fuller's Earth Formation
SALS	Salperton Limestone Formation
ASLS	Aston Limestone Formation
BLPL	Birdlip Limestone Formation
BDS	Bridport Sand Formation
WHM	Whitby Mudstone Formation
MRB	Marlstone Rock Formation
DYS	Dyrham Formation
CHAM	Charmouth Mudstone Formation

Based on MMD specification HE551505-MMSJV-HGT-000-SP-CE-00001 (Sept 2018) and

Arup Addendum HE551505-ARP-VGT-X_XX_XXXX_X-SP-C-000003 (Aug 2019)

Additional GEOL_FORM codes from bgs.ac.uk

CONTRACT 35560

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BOREHOLE LOG



CP102

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 26 June 2019

Easting 392081

Scale 1:50

End Date 28 June 2019

Northing 215725

Ground Level 127.55mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50 0.30 - 0.50							Grass over soft dark brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone. Frequent rootlets and rare roots (up to 40mm diam). (TOP)	0.20	127.35	
2B 2ES 3B 3ES 4D 5L	0.70 - 0.90 0.70 - 0.90 0.90 - 1.20 0.90 - 1.20 1.20 - 1.65 1.20 - 2.00	Nil			1.20	S 7		Soft brown mottled grey and orange slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 40mm) of dark grey silt. Gravel is subangular fine and medium limestone. (SLIP) (SLIP)	1.20	126.35	
4ES 6D 7D 8L	1.80 - 2.00 1.80 - 2.00 2.00 - 2.45 2.00 - 3.00	Nil				S 10		Soft orangish brown mottled grey slightly sandy slightly gravelly silty CLAY with rare pockets (up to 15mm) of orange fine sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone and sandstone. Rare rootlets. (SLIP) (SLIP)	2.45	125.10	
9D 10D 11L	2.80 - 3.00 3.00 - 3.45 3.00 - 4.00	3.00				S 12		Firm indistinctly laminated brown mottled grey slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 5mm) of orange fine sand. Gravel is subangular to rounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 2.70 - 2.80m: Dark grey. Frequent lenses (up to 5mm) of grey silt.	3.05	124.50	
12D 13D 14L	3.60 - 3.80 4.00 - 4.45 4.00 - 5.00	3.00				S 9		Firm thinly laminated orangish brown mottled grey slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 10mm) of orange fine sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone and rare sandstone. (SLIP) (SLIP) 3.80m: Grey.	4.75	122.80	
15D 16D 17L	4.80 - 5.00 5.00 - 5.45 5.00 - 6.00	4.50				S 9		Firm indistinctly laminated dark brown mottled grey slightly sandy slightly gravelly silty CLAY with rare pockets (up to 5mm) of orange fine sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 5.45 - 5.50m: Frequent rootlets.	5.50	122.05	
18D 19D 20L	5.80 - 6.00 6.00 - 6.45 6.00 - 7.00	6.00				S 15		Firm to stiff thinly laminated dark grey rare mottled dark brown slightly sandy silty CLAY with rare lenses (up to 5mm) of grey silt. (SLIP_LIAS) (SLIP)	6.50	121.05	
21D 22D 23C	6.80 - 7.00 7.00 - 7.45 7.00 - 8.50	7.00	80	NA		S 18		Stiff thinly laminated dark brown and dark grey slightly sandy slightly gravelly silty CLAY with rare pockets (up to 5mm) of orange fine sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP_LIAS) (SLIP) 7.15 - 7.25m: Dark grey. 7.25 - 7.40m: Greenish grey.	7.65	119.90	
24D	7.80 - 8.00			NA				Stiff brown mottled grey slightly sandy silty CLAY. (Lias Group) (CHAM)			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				REMARKS
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	
0.00	1.20	Inspection Pit	Hand tools	1.20	Nil	1.10	20	
1.20	7.00	Windowless Sampler	Geotechnical Pioneer Rig					
7.00	20.00	Rotary Core	Geotechnical Pioneer Rig					
CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	948	
168	7.00	0.00	0.50	Concrete	6.00	Standpipe		
		0.50	3.00	Bentonite				
		3.00	6.00	Gravel				
		6.00	20.00	Bentonite				
BARREL DIAMETER		HOLE PROGRESS				REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
128	7.00	26-06-2019 11:00	0.00	Nil	Dry			
146	20.00	26-06-2019 16:45	1.20	Nil	1.10			
		27-06-2019 09:50	1.20	Nil	0.80			
		27-06-2019 17:00	19.00	7.00	4.80			
		28-06-2019 09:20	19.00	7.00	4.80			

CONTRACT

35560

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BOREHOLE LOG



CP102

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 26 June 2019

Easting 392081

Scale 1:50

End Date 28 June 2019

Northing 215725

Ground Level 127.55mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25C	8.50 - 10.00	7.00	100	NA				Very stiff orangish brown mottled grey silty CLAY. (Lias Group) (CHAM)	8.65	118.90	
26D	9.10 - 9.20			NA					9.30	118.25	
27CS	9.50 - 9.80							Very stiff orangish brown mottled grey and dark grey silty CLAY locally tending to extremely weak mudstone. (Lias Group) (CHAM)			
28D	9.80 - 10.00										
29C	10.00 - 11.50	7.00	100								
30D	10.80 - 11.00							Very stiff thickly laminated dark grey silty CLAY locally tending to extremely weak mudstone. (Lias Group) (CHAM) 11.36 - 11.65m: Mottled brown with frequent orangish staining.			
31C	11.50 - 13.00	7.00	80	NA							
32D	11.80 - 12.00										
33CS	12.40 - 12.70							Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff grey clay. Rare limestone nodules (up to 15mm). Fracture set 1: 20deg to 30deg closely spaced undulating smooth. Fracture set 2: 50deg to 70deg medium spaced planar smooth. (Lias Group) (CHAM)			
34C	13.00 - 14.50	7.00	100 84 57	NI 120 200							
35C	14.50 - 16.00	7.00	93 85 51	NI 120 170							
36C	16.00 - 17.50	7.00						Continued Next Page			

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		948			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
			28-06-2019 10:30	20.00	7.00	4.80				CHECKED		
									CT			

BOREHOLE LOG



CP102

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 26 June 2019

Easting 392081

Scale 1:50

End Date 28 June 2019

Northing 215725

Ground Level 127.55mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37C	17.50 - 19.00	7.00	100					Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fracture set 1: 20deg to 30deg closely spaced undulating smooth. Fracture set 2: 50deg to 70deg medium spaced planar smooth. (Lias Group) (CHAM)			
			72								
			45								
38C	19.00 - 20.00	7.00	98	NI				17.50 - 17.55m: Stiff dark brown mottled dark grey slightly sandy silty clay with rare orange staining. Extremely weak locally very weak thinly laminated dark grey MUDSTONE. Rare shell fragments (up to 7mm). Fractures are subhorizontal closely and medium spaced undulating smooth. (Lias Group) (CHAM)	17.55	110.00	
			89								
			61								
39CS	19.60 - 20.00			NI				18.00 - 18.05m: Subhorizontal very closely spaced planar smooth bedding fractures. 18.10 - 18.20m: 50deg undulating smooth fracture. Extremely weak to very weak thinly laminated dark grey MUDSTONE. Rare shell fragments (up to 4mm) and claystone nodules (up to 15mm). Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (CHAM)	18.70	108.85	
			100								
			93								
			93					19.15 - 19.20m: Grey limestone recovered as subangular coarse gravel sized fragments.	20.00	107.55	
Borehole Completed at 20.00m											

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	948
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
								CHECKED
								CT

BOREHOLE LOG



CLIENT HIGHWAYS ENGLAND

CP104

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 12 August 2019

Easting 392525

Scale 1:50

End Date 13 August 2019

Northing 215642

Ground Level 148.00mOD

Depth 15.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Grass over soft brown clayey SILT with abundant rootlets. (TOP)	0.30	147.70	
2ES	0.30							Soft orangish brown mottled grey silty CLAY with frequent rootlets. (SLIP) (SLIP)			
1B 3ES	0.50 - 0.80 0.50								1.00	147.00	
2B 4ES	1.00 - 1.20 1.00							Firm orangish brown mottled grey clayey SILT. (SLIP) (SLIP)	1.50	146.50	
3D	1.30										
4D 5ES	1.50 - 1.95 1.50	1.50					S 8	Firm brown mottled grey and orangish brown slightly sandy silty CLAY. (SLIP) (SLIP)			
5B	2.00 - 2.30										
6D	2.40								2.40	145.60	
7UT	3.00 - 3.45	1.50						Firm dark brown mottled dark grey and orangish brown slightly gravelly silty CLAY with rare pockets (up to 10mm) of grey silt and (up to 25mm) of orange coarse sand. Gravel is subrounded medium and coarse extremely weak mudstone. (SLIP) (SLIP)			
8D 9B	3.45 - 3.50 3.50 - 4.00										
10D	4.00 - 4.45	1.50					S 11	Firm dark grey mottled dark brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular and subrounded medium and coarse extremely weak mudstone. (SLIP) (SLIP)	4.20	143.80	
11B 6ES	4.50 - 5.00 4.50										
12UT	5.00 - 5.45	1.50									
13D 14B	5.45 - 5.50 5.50 - 6.00										
15D 16B	6.00 - 6.45 6.20 - 6.50	1.50					S 11	Firm dark grey silty CLAY. (SLIP) (SLIP)	6.05	141.95	
17B	6.50 - 7.00							Stiff dark grey silty CLAY with frequent pockets (up to 30mm) of orange fine sand. (SLIP) (SLIP)	6.50	141.50	
18UT	7.00 - 7.45	1.50							7.20	140.80	
19D 20B	7.45 - 7.50 7.50 - 8.00							Stiff dark grey mottled dark brown slightly gravelly silty CLAY with rare shell fragments (up to 5mm). Gravel is subangular and subrounded fine to coarse dark brown mudstone lithorelicts. (SLIP) (SLIP)			
21D	8.00 - 8.45	1.50					S 19				

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	15.00	Cable Percussion	Dando 2000					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	INSTRUMENT	948
150	1.50	0.00	0.50	Arisings			
		0.50	11.00	Gravel			
		11.00	15.00	Bentonite			

HOLE DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560
150	15.00	12-08-2019 11:30	0.00	Nil	Dry	Borehole terminated at 15.00m following water strike at 14.90m.		CHECKED CT
		12-08-2019 15:45	10.50	1.50	Dry	Borehole redrilled 0.50m to south east as CP104A.		
		13-08-2019 08:20	10.50	1.50	10.20			
		13-08-2019 10:15	15.00	1.50	11.00			

BOREHOLE LOG



CP104

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 2

Start Date 12 August 2019

Easting 392525

Scale 1:50

End Date 13 August 2019

Northing 215642

Ground Level 148.00mOD

Depth 15.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22B	8.50 - 9.00							Stiff dark grey and dark brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse dark brown mudstone lithorelicts. (SLIP) (SLIP)	8.30	139.70	
23UT	9.00 - 9.45	1.50						Very stiff dark grey slightly gravelly silty CLAY with rare fossil shells (up to 25mm). Gravel is subangular coarse limestone and subangular medium mudstone lithorelicts. (SLIP) (SLIP)	9.20	138.80	
24D 25B	9.45 - 9.50 9.50 - 10.00										
26B	10.00 - 10.50							Stiff dark grey mottled dark brown and rarely orangish brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium orange sandstone. (SLIP) (SLIP)	10.20	137.80	
27D	10.50 - 10.95	1.50									
28B	11.25 - 11.75				11.00		S 22	Stiff dark brown and dark grey slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (SLIP) (SLIP)	12.20	135.80	
29UT	12.00 - 12.45	1.50									
30D	12.45 - 12.50							Stiff dark brown mottled dark grey slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone and bioclastic limestone. (SLIP) (SLIP)	13.65	134.35	
31B	12.75 - 13.25										
32D	13.50 - 13.95	1.50					S 25	Dark brown clayey fine to coarse SAND with rare shell fragments (up to 7mm). (SLIP) (SLIP)	14.90	133.10	
33B	14.25 - 14.75										
34D	14.90				14.90				15.00	133.00	

Borehole Completed at 15.00m

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
								14.90	1.50	11.00	20	
CASING DEPTH				BACKFILL				INSTRUMENTATION				SUB LOCATION: 948
DIAM (mm)	BASE (m)			TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	INSTRUMENT				
150	1.50											
HOLE DIAMETER				HOLE PROGRESS				REMARKS				CONTRACT
DIAM (mm)	BASE (m)			DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Borehole terminated at 15.00m following water strike at 14.90m. Borehole redrilled 0.50m to south east as CP104A.				35560
150	15.00											CHECKED
												CT

BOREHOLE LOG



CLIENT HIGHWAYS ENGLAND

CP104A

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 13 August 2019

Easting 392525

Scale 1:50

End Date 14 August 2019

Northing 215642

Ground Level 148.00mOD

Depth 16.76 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Grass over soft brown clayey SILT with abundant rootlets. (TOP)	0.30	147.70	
								Soft orangish brown mottled grey clayey SILT with frequent rootlets. (SLIP) (SLIP)	1.00	147.00	
								Soft orangish brown and grey clayey SILT. (SLIP) (SLIP)	1.50	146.50	
								Soft brown mottled grey and orangish brown silty CLAY. (SLIP) (SLIP)	2.40	145.60	
								Firm dark brown mottled dark grey and orangish brown slightly gravelly silty CLAY with rare pockets (up to 10mm) of grey silt and (up to 25mm) of orange coarse sand. Gravel is subrounded medium and coarse extremely weak mudstone. (SLIP) (SLIP)	4.20	143.80	
								Firm dark grey mottled dark brown slightly gravelly silty CLAY. Gravel is subangular and subrounded medium and coarse extremely weak mudstone. (SLIP) (SLIP)	6.05	141.95	
								Firm dark grey silty CLAY with a faint organic odour. (SLIP) (SLIP)	6.50	141.50	
								Stiff dark grey silty CLAY with frequent pockets (up to 30mm) of orange fine sand. (SLIP) (SLIP)	7.20	140.80	
								Stiff dark grey mottled dark brown silty CLAY with rare shell fragments (up to 5mm). Gravel is subangular and subrounded fine to coarse dark brown mudstone lithorelicts. (SLIP) (SLIP)			

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit		Hand tools								
1.20	16.76	Cable Percussion		Dando 2000								

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	INSTRUMENT	948	
200	2.30	0.00	0.50	Concrete	15.80	Standpipe		
150	16.50	0.50	14.70	Bentonite				
		14.70	16.00	Gravel				
		16.00	16.76	Bentonite				

HOLE DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
200	15.00	13-08-2019 11:30	0.00	Nil	Dry	No samples retained 0.00-15.00m. Stratum descriptions inferred from adjacent borehole CP104 located 0.50m to north west. Borehole advanced by chiselling 16.50-16.60m (30mins). Borehole	CHECKED CT	
150	16.60	13-08-2019 12:30	1.20	Nil	Dry			
		14-08-2019 09:00	1.20	Nil	Dry			
		14-08-2019 16:00	16.76	16.50	11.60			

BOREHOLE LOG



CLIENT HIGHWAYS ENGLAND

CP104A

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 13 August 2019 Easting 392525

Scale 1:50

End Date 14 August 2019 Northing 215642 Ground Level 148.00mOD Depth 16.76 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Stiff dark grey and dark brown silty CLAY. Gravel is subangular and subrounded fine to coarse dark brown mudstone lithorelicts. (SLIP) (SLIP)	8.30	139.70	
								Very stiff dark grey slightly gravelly silty CLAY with rare fossil shells (up to 25mm). Gravel is subangular coarse limestone and subangular medium mudstone lithorelicts. (SLIP) (SLIP)	9.20	138.80	
								Stiff dark grey mottled dark brown and rarely orangish brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium orange sandstone. (SLIP) (SLIP)	10.20	137.80	
					11.00						
								Stiff dark brown and dark grey slightly gravelly silty CLAY. Gravel is subangular fine to coarse sandstone. (SLIP) (SLIP)	12.20	135.80	
								Stiff dark brown mottled dark grey slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone and bioclastic limestone. (SLIP) (SLIP)	13.65	134.35	
1D	15.00 - 15.45	15.00			14.90			Medium dense dark brown clayey fine to coarse SAND with rare shell fragments (up to 7mm). (SLIP) (SLIP)	14.90	133.10	
2B	15.75 - 16.25						S 26	Stiff grey mottled orangish brown slightly gravelly clayey SILT tending to extremely weak siltstone. Gravel is subangular medium and coarse siltstone lithorelicts. (SLIP LIAS) (SLIP)	15.80	132.20	

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
								14.90	2.30	11.00	20	
CASING DEPTH				BACKFILL				INSTRUMENTATION				SUB LOCATION: 948
DIAM (mm)	BASE (m)			TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	INSTRUMENT				
200	2.30						15.80	Standpipe				
150	16.50											
HOLE DIAMETER				HOLE PROGRESS				REMARKS				CONTRACT
DIAM (mm)	BASE (m)			DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	No samples retained 0.00-15.00m. Stratum descriptions inferred from adjacent borehole CP104 located 0.50m to north west. Borehole advanced by chiselling 16.50-16.60m (30mins). Borehole				35560
200	15.00											CHECKED
150	16.60											CT

BOREHOLE LOG



CLIENT HIGHWAYS ENGLAND

CP104A

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION




Sheet 3 of 3


Start Date 13 August 2019 Easting 392525

Scale 1:50

End Date 14 August 2019 Northing 215642 Ground Level 148.00mOD

Depth 16.76 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. range	chiselling details	water strike/ added (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
3D	16.50 - 16.76	16.50		16.50-16.60 m (30mins)			S *122	Extremely weak grey mottled orangish brown SILTSTONE. (SLIP_LIAS) (SLIP)	16.30	131.70	
								Borehole Completed at 16.76m	16.76	131.24	

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	INSTRUMENT	948
200	2.30					15.80	Standpipe	
150	16.50							CONTRACT
HOLE DIAMETER		HOLE PROGRESS			REMARKS			
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	No samples retained 0.00-15.00m. Stratum descriptions inferred from adjacent borehole CP104 located 0.50m to north west. Borehole advanced by chiselling 16.50-16.60m (30mins). Borehole		
200	15.00						35560	
150	16.60						CHECKED	
								CT

BOREHOLE LOG



CP105

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 29 April 2019

Easting 392765

Scale 1:50

End Date 01 May 2019

Northing 215682

Ground Level 169.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.30 - 0.50							Grass over firm light brown clayey SILT. Frequent rootlets. (MG) (MGR)	0.10	169.80	
1ES	0.30 - 0.50						Firm orangish brown silty CLAY. Rare rootlets. (MG) (MGR)				
2D	0.30 - 0.50										
2ES	0.70 - 0.90										
3B	0.70 - 0.90										
4D	0.70 - 0.90							0.80 - 1.20m: Rare subangular fine and medium limestone gravel.			
3ES	1.00 - 1.20										
5B	1.00 - 1.20	Nil					S 9	Firm brownish orange mottled greyish brown slightly sandy slightly gravelly clayey SILT. Gravel is angular to subrounded fine and medium charcoal. (MG) (MGR)	1.20	168.70	
6D	1.00 - 1.20										
7D	1.20 - 1.73										
8L	1.20 - 2.00										
1ES	1.60										
4ES	1.60 - 1.80						S 9				
9D	1.60 - 1.80	Nil									
10D	2.00 - 2.45										
11L	2.00 - 3.00										
12D	2.30 - 2.50										
13ES	2.30 - 2.50										
14D	3.00 - 3.45	Nil					S 11	2.65 - 2.75m: Soft reddish brown mottled orangish brown slightly sandy slightly gravelly silty clay. Gravel is angular and subangular fine charcoal and rare brick.	2.75	167.15	
15L	3.00 - 4.00							Medium dense light brown sandy very clayey subangular and subrounded fine to coarse bioclastic limestone GRAVEL. (SLIP) (SLIP)			
16D	3.50 - 3.70							3.35 - 3.45m: 50mm pocket of soft brown clay with frequent rootlets.			
17ES	3.50 - 3.70										
18D	4.00 - 4.30	Nil	70	NA			S *100	4.00m: Very dense.			
19C	4.00 - 4.50							4.20 - 4.65m: Fines washed away.			
20D	4.10 - 4.20										
21C	4.50 - 6.00	4.50	53								
22D	4.80 - 4.90							Soft light brown slightly sandy clayey SILT. (SLIP) (SLIP)	4.65	165.25	
								4.66 - 4.75m: Weak light grey bioclastic limestone.			
								Firm orangish brown mottled grey slightly sandy clayey SILT. (SLIP) (SLIP)	5.05	164.85	
								5.25 - 6.00m: Assessed zone of core loss.			
23D	5.80 - 5.90										
24C	6.00 - 7.50	6.00	70					Orangish brown locally light grey slightly sandy clayey angular to subrounded fine to coarse bioclastic limestone GRAVEL with a low angular bioclastic limestone cobble content. (SLIP) (SLIP)	6.00	163.90	
25D	7.10 - 7.20							Assessed zone of core loss.	7.00	162.90	
26C	7.50 - 9.00	7.50	73					Light brown slightly sandy clayey angular to subrounded fine to coarse bioclastic limestone GRAVEL with a high angular bioclastic limestone cobble content. (SLIP) (SLIP)	7.50	162.40	
27D	8.00 - 8.10										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	4.00	Window Sampler	Comacchio 305					
4.00	30.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	4.00		0.00	0.50	Concrete	9.50	Standpipe	
140	30.00		0.50	3.00	Grout			
			3.00	10.00	Gravel			CONTRACT
			10.00	15.00	Grout			
BARREL DIAMETER		HOLE PROGRESS		REMARKS			35560	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush returns 18.00-30.00m.		
128	4.00	29-04-2019 09:00	0.00	Nil	Dry			
146	30.00	29-04-2019 16:50	9.00	9.00	2.00			
		30-04-2019 09:05	9.00	9.00	5.10			
		30-04-2019 16:55	28.50	28.50	16.55		CHECKED	
		01-05-2019 09:00	28.50	28.50	16.55			
							CT	

BOREHOLE LOG



CP105

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 29 April 2019

Easting 392765

Scale 1:50

End Date 01 May 2019

Northing 215682

Ground Level 169.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
28C 29D	9.00 - 10.50 9.10 - 9.20	9.00	27	NR				Light brown slightly sandy clayey angular to subrounded fine to coarse bioclastic limestone GRAVEL with a high angular bioclastic limestone cobble content. (SLIP) (SLIP) 8.60 - 9.00m: Assessed zone of core loss. 9.00 - 9.25m: Firm dark grey mottled orangish brown slightly sandy gravelly silty clay. Gravel is subangular and subrounded fine to coarse bioclastic limestone. Assessed zone of core loss.	9.40	160.50	
30C	10.50 - 12.00	10.50	90	NA				Firm light grey mottled orangish brown slightly gravelly sandy silty CLAY. Gravel is subangular and subrounded fine and medium red sandstone. Rare fine sand sized pyrite crystals. (SLIP) (SLIP)	10.50	159.40	
31D	11.10 - 11.20							Stiff dark grey mottled dark brown slightly sandy silty CLAY with closely spaced thin laminae and rare lenses (up to 15mm) of light grey silt. (SLIP) (SLIP)	11.50	158.40	
32D 33C	11.90 - 12.00 12.00 - 13.50	12.00	71					12.25 - 12.40m: 40deg planar rough fissure. 12.40 - 12.45m: Firm light grey mottled orangish brown slightly sandy clayey silt. Stiff dark grey slightly sandy silty CLAY. (SLIP) (SLIP) 12.75m: Subhorizontal planar smooth fissure infilled with 2mm of dark brown fine sand.	12.45	157.45	
34D	12.70 - 12.80							Stiff dark grey mottled brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine and medium oolitic limestone and rare sandstone. (SLIP) (SLIP)	13.60	156.30	
35C 36D	13.50 - 15.00 13.70 - 13.80	13.50	97					Stiff grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular to rounded fine to coarse limestone and rare oolitic limestone. (SLIP) (SLIP) 14.45m: 20deg planar smooth fissure infilled with 2mm organic material. 14.95 - 15.00m: Subangular limestone cobble.	14.40	155.50	
37D	14.60 - 14.70							Stiff thinly laminated dark brown mottled grey and orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium bioclastic limestone and rare sandstone. (SLIP) (SLIP)	15.00	154.90	
38C 39D	15.00 - 16.50 15.10 - 15.20	15.00	16	NR				Assessed zone of core loss.	15.25	154.65	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	1077
		15.00	30.00			
		MATERIAL				
		Gravel				

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
		01-05-2019 10:00	30.00	30.00		16.25	CHECKED
						CT	

BOREHOLE LOG



CP105

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 29 April 2019

Easting 392765

Scale 1:50

End Date 01 May 2019

Northing 215682

Ground Level 169.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend					
40C	16.50 - 18.00	16.50	96	NA				Stiff dark brown mottled dark grey slightly gravelly sandy clayey SILT. Gravel is subrounded fine sandstone. (SLIP_LIAS) (SLIP)	16.50	153.40						
41D	16.70 - 16.80															
42CS	17.20 - 17.60		100 46 27	NI 140 250				Very stiff dark grey mottled dark brown slightly sandy silty CLAY with frequent shell fragments (up to 3mm). (SLIP_LIAS) (SLIP) 17.75m: Subhorizontal undulating rough fissure with 5mm shell fragment on surface. 17.95 - 18.10m: Very weak brown sandstone with frequent clasts (up to 70mm) of limestone and a bivalve mould (45mm wide). Weak light grey and dark grey LIMESTONE with frequent shell fragments replaced by calcite (up to 6mm) and fossil moulds (up to 10mm). Fractures are subhorizontal closely and medium spaced undulating rough with dark brown sand infill (up to 2mm). (Lias Group) (DYS) 18.25 - 18.45m: 70deg undulating rough fracture with a dark brown sand infill (up to 4mm). Very stiff thinly laminated dark grey mottled orangish brown slightly sandy silty CLAY. (Lias Group) (DYS) 19.30m: Subhorizontal undulating rough fissure. 19.65 - 19.70m: 40deg planar smooth fissure with brown sand infill (up to 2mm). Very weak dark grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal to 30deg closely and medium spaced planar smooth. Extremely closely spaced subhorizontal incipient fractures. (Lias Group) (DYS) 20.80 - 20.90m: Subvertical planar smooth fracture.	17.15	152.75						
43D	17.60 - 17.70															
44C	18.00 - 19.50	18.00														18.10
45D	19.10 - 19.20		100 73 40	NI 180 300					18.90	151.00						
46C	19.50 - 21.00	19.50														19.90
47C	21.00 - 22.50	21.00	100 0 0	NA												
48D	22.20 - 22.30		100 20 17	NI 150 250					21.75	148.15						
49C	22.50 - 24.00	22.50														
50D	23.50 - 23.60		NA													
51C	24.00 - 25.50	24.00	NI													

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1077		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560		
									CHECKED		
									CT		

BOREHOLE LOG



CP105

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 29 April 2019

Easting 392765

Scale 1:50

End Date 01 May 2019

Northing 215682

Ground Level 169.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100					Very stiff dark grey slightly sandy silty CLAY locally tending to extremely weak mudstone. (Lias Group) (DYS)	24.40	145.50	
				NA			24.00 - 24.10m: Subvertical undulating smooth fissure with orange staining. 24.15m: 20deg planar smooth fracture with 2mm orange penetrative staining.				
52C	25.50 - 27.00	25.50	100 30	NA			Very stiff dark grey sandy clayey SILT with frequent dark brown sand pockets (up to 60mm) and rare shell fragments (up to 15mm). (Lias Group) (DYS)	25.50	144.40		
53D	25.90 - 26.00		7								
				NI 200 300			26.40m: 40mm orange fine sand lens. Extremely weak dark grey SILTSTONE. Fractures are subhorizontal mainly medium spaced planar smooth. (Lias Group) (DYS)	26.45	143.45		
54C	27.00 - 28.50	27.00	100 100 34				27.30 - 27.40m: Light grey limestone. 27.40 - 27.60m: Locally disintegrated to stiff dark grey clayey silt.	27.60	142.30		
				NI 200			Weak dark grey LIMESTONE with frequent shell fragments replaced by calcite (up to 15mm). (Lias Group) (DYS)	27.95	141.95		
				55 NI 280 600			27.80 - 27.95m: 50deg stepped rough fracture.	28.05	141.85		
55C	28.50 - 30.00	28.50	100 100 73				Extremely weak dark grey SILTSTONE with rare orange sand pockets (up to 30mm). Fractures are subhorizontal very closely spaced undulating rough. (Lias Group) (DYS)				
							Extremely weak dark grey SILTSTONE. Fractures are subhorizontal medium spaced planar smooth. (Lias Group) (DYS)				
56CS	29.70 - 30.00						29.00 - 29.25m: 80deg planar rough fracture stained orange with 2mm of penetrative staining. 29.65 - 29.75m: Weak light grey locally stained dark red sandstone with randomly orientated extremely closely spaced planar smooth fractures.	30.00	139.90		
Borehole Completed at 30.00m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	35560	
							CHECKED	
							CT	

BOREHOLE LOG



CP106

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 15 April 2019

Easting 392949

Scale 1:50

End Date 24 April 2019

Northing 215756

Ground Level 186.25mOD

Depth 35.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2ES	0.10 - 0.30 0.10 0.30							Dark grey slightly clayey slightly sandy (ashy) angular to subrounded fine to coarse slag, concrete clinker and rare mudstone and sandstone GRAVEL with a low subangular concrete cobble content. (MG) (MGR) 0.10 - 0.12m: Light grey. 0.30m: Subangular oolitic limestone cobble.	0.40	185.85	
2B 3ES	0.50 - 0.70 0.50						0.75		185.50		
3B 4ES 4D 5L 5ES 6D	1.00 - 1.20 1.00 1.20 - 1.65 1.20 - 2.00 1.50 - 1.70 1.50 - 1.70	Nil					S 3	Dark grey slightly clayey sandy angular to subrounded fine to coarse concrete, slag, brick, mudstone, sandstone and oolitic limestone GRAVEL. Hydrocarbon odour. (MG) (MGR) Light brown clayey very sandy subangular and subrounded fine to coarse slag, oolitic limestone, crystalline and limestone GRAVEL. (MG) (MGR)	1.30	184.95	
7D 8L	2.00 - 2.45 2.00 - 3.00	2.00					S 6	Soft brown becoming light brown mottled orangish brown and reddish brown silty CLAY. (MG) (MGR) 1.85 - 1.90m: Soft dark grey gravelly silty clay. Gravel is angular fine and medium charcoal.	1.90	184.35	
6ES 9D	2.40 - 2.60 2.40 - 2.60							Soft dark greenish grey mottled grey slightly sandy slightly gravelly CLAY. Gravel is subangular and medium slag and crystalline. (MG) (MGR) 2.30 - 2.35m: Subangular sandstone cobble.	2.60	183.65	
10UT 12L	3.00 - 3.45 3.00 - 4.00							Soft becoming firm brown mottled orangish brown and grey silty CLAY. (SLIP) (SLIP) 2.60 - 2.65m: Angular oolitic limestone cobble.			
11D 13D	3.45 - 3.50 3.50 - 3.95	3.00					S 11	Firm dark grey locally orangish brown rarely mottled reddish brown slightly sandy silty CLAY. (SLIP) (SLIP)	4.20	182.05	
14D 7ES 15D 16L	3.80 - 4.00 3.80 - 4.00 4.00 - 4.45 4.00 - 5.00	3.00					S 12				
17D 8ES 18UT 21L	4.80 - 5.00 4.80 - 5.00 5.00 - 5.45 5.00 - 6.00							Stiff yellowish brown rarely mottled light grey and orangish brown gravelly sandy clayey SILT with a low subrounded oolitic limestone cobble content. Gravel is subangular and subrounded fine to coarse oolitic limestone. (SLIP) (SLIP) 6.35 - 6.45m: Soft dark grey silty clay. 6.45 - 6.80m: Greyish brown mottled grey and orangish brown. 6.80 - 6.90m: Subrounded fine to coarse oolitic limestone gravel.	5.55	180.70	
19D 20D	5.45 - 5.50 5.50 - 5.95	3.00					S 34				
22D 23L	6.00 - 6.45 6.00 - 7.00	3.00					S 19	Firm dark grey rarely mottled orangish brown silty CLAY. (SLIP) (SLIP)	6.90	179.35	
24D	6.55 - 6.65										
25D 26L	7.00 - 7.45 7.00 - 8.00	3.00					S 15				
27D	7.60 - 7.70										
28L	8.00 - 9.00	8.00									

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit		Hand tools								
1.20	10.00	Window Sampler		Comacchio 305								

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE			
168	8.00	0.00	0.50	Concrete	30.00	Standpipe	1077		
140	35.50	0.50	1.00	Gravel					
		1.00	20.00	Bentonite					
		20.00	30.50	Gravel					

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
128	10.00	15-04-2019 14:30		Nil	Dry	Driller notes loss of flush returns 25.00-35.50m.		
146	35.50	15-04-2019 16:00	1.20	Nil	Dry			
		16-04-2019 08:45	1.20	Nil	Dry			
		16-04-2019 16:30	8.00	8.00	8.00			
		17-04-2019 08:45	8.00	8.00	4.60			
							35560	
							CHECKED	
							CT	

BOREHOLE LOG



CP106

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 15 April 2019

Easting 392949

Scale 1:50

End Date 24 April 2019

Northing 215756

Ground Level 186.25mOD

Depth 35.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29D	8.70 - 8.80							Greyish brown mottled grey and orangish brown slightly sandy clayey subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a low subangular and subrounded bioclastic limestone cobble content. (SLIP) (SLIP)	8.45	177.80	
30D 31L	9.00 - 9.45 9.00 - 10.00	8.00				S 19	Stiff dark grey slightly sandy silty CLAY. Rare shell fragments (up to 2mm). (SLIP) (SLIP)		8.90	177.35	
32D	9.70 - 9.80							Greyish brown sandy silty subangular and subrounded fine to coarse bioclastic limestone and sandstone GRAVEL with low bioclastic limestone and sandstone cobble content. Rare pockets (up to 20mm) of orange silty sand. (SLIP) (SLIP)	11.30	174.95	
33UT 34C	10.00 - 10.45 10.00 - 11.50	8.00	87	NA			Assessed zone of core loss.		12.25	174.00	
35D 36D	10.50 - 10.95 10.70 - 10.80	8.00				S 23		Limited recovery probably greyish brown sandy clayey silty subangular and subrounded fine to coarse bioclastic limestone and sandstone GRAVEL with rare pockets (up to 20mm) of orange silty sand. (SLIP) (SLIP)	13.00	173.25	
37C 38D	11.50 - 13.00 11.70 - 11.80	11.50	50				Assessed zone of core loss.		13.30	172.95	
39C	13.00 - 14.50	13.00	20	NA				Stiff orangish brown mottled grey slightly sandy silty CLAY with rare elongated light grey silt pockets (up to 10mm). (SLIP) (SLIP)	14.50	171.75	
40C 41D	14.50 - 16.00 14.60 - 14.70	14.50	37	NR			Assessed zone of core loss.		15.00	171.25	
42C	16.00 - 17.50	16.00							16.00	170.25	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
10.00	35.50	Rotary Core	Comacchio 305								

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077	
		30.50	35.50	Grout				

BARREL DIAMETER		HOLE PROGRESS					REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560		
		17-04-2019 16:55	25.00	25.00	2.00			CHECKED		
		18-04-2019 09:20	25.00	25.00	8.00			CT		
		18-04-2019 13:35	28.00	28.00	21.36					
		23-04-2019 12:10	28.00	28.00	25.68					
		23-04-2019 16:05	32.50	32.50	21.35					

BOREHOLE LOG



CP106

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 15 April 2019

Easting 392949

Scale 1:50

End Date 24 April 2019

Northing 215756

Ground Level 186.25mOD

Depth 35.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43D	16.10 - 16.20		97					Very stiff dark grey slightly sandy silty CLAY. (Lias Group) (WHM)			
44CS	16.40 - 16.85										
45D	17.10 - 17.20										
46C	17.50 - 19.00	17.50	97								
47D	18.30 - 18.40			NA				Very stiff grey slightly sandy silty CLAY. Frequent shell fragments (up to 2mm). (Lias Group) (WHM)	18.15	168.10	
48C	19.00 - 20.50	19.00	100					18.85 - 18.86m: Abundant shell fragments (up to 2mm).			
49D	19.20 - 19.25										
50CS	19.25 - 19.70										
51D	20.20 - 20.30							Very stiff dark grey mottled dark greyish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium sandstone. Rare shell fragments (up to 2mm). (Lias Group) (WHM)	19.95	166.30	
52C	20.50 - 22.00	20.50	75								
53D	21.20 - 21.30							Stiff dark grey slightly sandy silty CLAY with rare pyrite nodules (up to 20mm). (Lias Group) (WHM)	20.95	165.30	
54C	22.00 - 23.50	22.00	97					Stiff dark greenish grey mottled dark grey slightly sandy slightly gravelly silty CLAY. Gravel is subrounded fine and medium sandstone. (Lias Group) (WHM)	21.45	164.80	
55D	22.10 - 22.20										
56D	22.30 - 22.40							22.10 - 22.15m: Subangular limestone cobble.	22.20	164.05	
57CS	22.80 - 23.25							Stiff dark brown gravelly silty CLAY. Gravel is subangular tabular fine and medium mudstone lithorelicts. (Lias Group) (WHM)	22.70	163.55	
58D	23.30 - 23.40							Very stiff greyish green mottled greenish grey slightly sandy silty CLAY. (Lias Group) (WHM)			
59C	23.50 - 25.00	23.50	97 65 47	400					23.25 - 23.35m: Extremely closely spaced thin laminae of greyish green silt.	23.60	162.65
								Extremely weak thinly laminated grey mottled greyish brown MUDSTONE locally tending to very stiff clay. (Lias Group) (WHM)	24.00	162.25	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1077
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			24-04-2019 09:15	32.50	32.50	21.68	
			24-04-2019 11:15	35.50	35.50	22.35	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



CP106

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 15 April 2019

Easting 392949

Scale 1:50

End Date 24 April 2019

Northing 215756

Ground Level 186.25mOD

Depth 35.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
60C	25.00 - 26.50	25.00	70	NI				Strong light grey mottled grey LIMESTONE with frequent shell moulds (up to 20mm), rare sand sized pyrite and calcite nodules (up to 3mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (Lias Group) (MRB) 24.05 - 24.20m: Subhorizontal to 20deg thick laminae of orangish brown limestone.	25.00	161.00	
			170								
61C	26.50 - 28.00	26.50	95	NI			Weak grey mottled dark orangish brown MUDSTONE locally tending to very stiff clay. (Lias Group) (DYS) 25.35 - 25.50m: Recovered non intact. Fractures are probably randomly orientated extremely closely spaced undulating smooth.	25.25	160.25		
			95								
62C	28.00 - 29.50	28.00	40	NI			Weak thinly laminated grey rarely mottled dark orangish brown MUDSTONE locally tending to very stiff clay. Rare thin laminae of light grey silt. Fractures are subhorizontal to 10deg medium spaced planar rough. (Lias Group) (DYS) 26.60 - 27.00m: Frequent thin laminae of light grey silt. 27.00 - 27.05m: Frequent subrounded clasts of grey limestone (up to 25mm) stained orangish brown. 27.55 - 27.80m: 60deg undulating rough intersecting fracture.	26.00	156.65		
			100								
63C	29.50 - 31.00	29.50	NI	NI			Extremely weak grey mottled dark brown MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal to 20deg closely spaced stepped smooth rarely stained orangish brown. Frequent incipient fractures subhorizontal to 60deg planar rough with up to 2mm brown penetrative orangish brown staining. (Lias Group) (DYS) 29.70 - 29.80m: Subvertical planar smooth fracture with orange brown staining. 30.50 - 30.60m: 40deg stepped rough fracture stained orangish brown. 30.50 - 30.95m: Weak and medium strong grey and dark grey mottled brown limestone.	29.60	155.30		
			200								
64C	31.00 - 32.50	31.00	240	NI			Extremely weak dark grey SILTSTONE with rare shell fragments (up to 3mm). Fractures are subhorizontal to 20deg closely spaced undulating rough. (Lias Group) (DYS) 31.25 - 31.40m: Medium strong light grey limestone.	30.95	155.30		
			200								
65CS	31.60 - 31.90										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS							
CASING DEPTH DIAM (mm) BASE (m)				BACKFILL TOP (m) BASE (m) MATERIAL				INSTRUMENTATION DEPTH (m) TYPE				SUB LOCATION: 1077 			
BARREL DIAMETER DIAM (mm) BASE (m)				HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS				CONTRACT 35560 CHECKED CT			

BOREHOLE LOG



CP200

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 01 July 2019

Easting 392243

Scale 1:50

End Date 02 July 2019

Northing 215743

Ground Level 129.70mOD

Depth 14.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D ES	0.30 - 0.50 0.30 - 0.50 0.30 - 0.50 0.30							MADE GROUND comprising black TARMACADAM. (MG) (MGR)	0.10	129.60	[Cross-hatch pattern]
3D 4L	1.20 - 1.65 1.20 - 2.00	1.20				S 4		Dark brown, red, yellow and grey clayey sandy angular to subrounded fine to coarse red and yellow brick, tile, clinker, concrete and thermolyte GRAVEL with a high subangular brick and concrete cobble content. Rare fragments of wood (up to 70mm) and plastic sheet (up to 200mm). (MG) (MGR)	0.90 0.95	128.80 128.75	[Cross-hatch pattern]
5D ES 6D 7L	1.80 - 2.00 1.80 2.00 - 2.45 2.00 - 3.00	2.00				S 3		MADE GROUND comprising grey CONCRETE. (MG) (MGR) Soft greenish grey mottled dark grey slightly sandy silty CLAY. (SLIP) (SLIP)	1.40	128.30	[Cross-hatch pattern]
2ES 8D 10L 9D	2.80 - 3.00 2.80 - 3.00 3.00 - 4.00 3.00 - 3.45	3.00				S 2		Very soft greenish brown mottled orangish brown and grey slightly sandy silty CLAY with rare pockets (up to 60mm) of brown coarse sand. (SLIP) (SLIP) 1.85 - 1.90m: Brown coarse sand.	2.50	127.20	[Cross-hatch pattern]
11D 12L	4.00 - 4.45 4.00 - 5.00	4.00				S 4		Very soft brownish grey mottled dark grey slightly sandy slightly organic silty CLAY. (SLIP) (SLIP)	3.85	125.85	[Cross-hatch pattern]
13D 3ES 14D 15L	4.80 - 5.00 4.80 - 5.00 5.00 - 5.45 5.00 - 6.00	4.00				S 3		4.60 - 4.70m: Frequent wood fragments (up to 120mm).			[Cross-hatch pattern]
16D 4ES 17D 18L	5.80 - 6.00 5.80 - 6.00 6.00 - 6.45 6.00 - 7.00	6.00				S 6		5.40 - 5.50m: Greenish grey and dark grey. Soft greenish brown mottled grey, orangish brown and light brown slightly sandy CLAY with rare pockets (up to 10mm) of orange coarse sand. (SLIP) (SLIP) 6.00 - 6.15m: Greenish grey and dark grey with rare wood fragments (up to 15mm).	5.50	124.20	[Cross-hatch pattern]
19D 5ES 20D 21L	6.80 - 7.00 6.80 - 7.00 7.00 - 7.45 7.00 - 8.00	7.00				S 23		Soft greenish grey mottled grey and orangish brown slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 20mm) of orange coarse sand. Gravel is subangular and subrounded fine and medium bioclastic limestone. Rare wood fragments (up to 70mm). (SLIP) (SLIP)	7.00	122.70	[Cross-hatch pattern]
22D 6ES	7.40 - 7.50 7.40 - 7.50							Medium dense brown and greenish grey silty sandy angular to subrounded fine to coarse bioclastic limestone and rare limestone GRAVEL with rare wood fragments (up to 10mm). (SLIP) (SLIP)			[Cross-hatch pattern]
23D	8.00 - 8.45	7.00				S 30			8.00	121.70	[Cross-hatch pattern]

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit		Hand tools								
1.20	10.00	Window Sampler		Geotechnical Pioneer Rig								

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE			
168	10.00	0.00	0.50	Concrete	11.00	Standpipe	948		
		0.50	1.00	Gravel			[AGS logo]		
		1.00	8.50	Bentonite					
		8.50	12.00	Gravel					

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					
128	10.00	01-07-2019 09:30	0.00	Nil	Dry	Hole advanced by reaming casing (168mm) through concrete obstruction 0.90-1.20m.				
146	14.50	01-07-2019 16:50	10.00	10.00	1.10					
		02-07-2019 08:40	10.00	10.00	1.80					
		02-07-2019 10:30	14.50	10.00	2.10					
							35560		CHECKED	
									CT	

BOREHOLE LOG



CP200

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 2

Start Date 01 July 2019

Easting 392243

Scale 1:50

End Date 02 July 2019

Northing 215743

Ground Level 129.70mOD

Depth 14.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
24L	8.00 - 9.00							Medium dense to dense greenish grey sandy silty angular to subrounded fine to coarse bioclastic limestone GRAVEL. Rare pockets of grey silt (up to 10mm). (SLIP) (SLIP) 8.20 - 8.30m: Soft dark grey clayey silt. 8.60 - 8.70m: Soft greenish grey mottled dark grey sandy silty clay. Dense brown and brownish grey locally mottled dark grey clayey sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL. Rare pockets (up to 15mm) of light grey silt. (SLIP) (SLIP) Extremely weak dark grey MUDSTONE. (SLIP) (SLIP) Stiff dark brown and dark grey slightly sandy gravelly silty CLAY with rare pockets (up to 5mm) of orange sand. Gravel is subangular to rounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 10.30 - 10.50m: Tending to slightly sandy silty clay with rare pockets (up to 5mm) of orange coarse sand. Greyish brown and brown slightly clayey sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL. (SLIP) (SLIP) Assessed zone of core loss. Very stiff/extremely weak thinly laminated dark grey silty CLAY/MUDSTONE. (Lias Group) (CHAM) 12.00 - 12.10m: Strong grey limestone. 13.20 - 13.50m: Laminae inclined 30deg. Borehole Completed at 14.50m				
25D	8.40 - 8.50											
7ES	8.40 - 8.50											
26D	9.00 - 9.45	9.00					S 37			9.00	120.70	
27L	9.00 - 10.00											
28D	9.40 - 9.50											
29C	10.00 - 11.50	10.00	50	NA			C 41			10.00	119.70	
30D	10.20 - 10.30		3							10.05	119.65	
31D	10.50 - 10.60		0							10.50	119.20	
				NR						10.75	118.95	
32C	11.50 - 13.00	10.00	100	NA						11.50	118.20	
33CS	11.60 - 12.00		5									
				80								
				NA								
34D	12.40 - 12.50											
35C	13.00 - 14.50	10.00	100									
36D	13.70 - 13.80											
37CS	14.10 - 14.50											
									14.50	115.20		

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE			
TOP (m)	BASE (m)	TYPE		Geotechnical Pioneer Rig				Groundwater not encountered prior to use of flush			
10.00	14.50	Rotary Core						DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH				BACKFILL				INSTRUMENTATION			
DIAM (mm)	BASE (m)			TOP (m)	BASE (m)	MATERIAL		DEPTH (m)	TYPE		SUB LOCATION:
				12.00	14.50	Bentonite					948
BARREL DIAMETER				HOLE PROGRESS				REMARKS			
DIAM (mm)	BASE (m)			DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				
								CONTRACT 35560 CHECKED CT			

BOREHOLE LOG



CP202

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 03 July 2019

Easting 392409

Scale 1:50

End Date 05 July 2019

Northing 215672

Ground Level 135.70mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D	0.10 - 0.30 0.10 - 0.30 0.10 - 0.30 0.40 - 0.60 0.40 - 0.60 0.40 - 0.60							Grass over soft brown mottled grey slightly sandy clayey SILT with frequent rootlets. (TOP)	0.30	135.40	
								Soft orangish brown mottled grey slightly sandy silty CLAY. (SLIP) (SLIP)	0.70	135.00	
								Soft brown mottled grey rarely orangish brown slightly sandy CLAY. (SLIP) (SLIP)			
3ES 5B 6D 7D 8L 9D	1.00 - 1.20 1.00 - 1.20 1.00 - 1.20 1.20 - 1.65 1.20 - 2.00 1.60 - 1.80	Nil			1.20	S 22	S 22	1.20m: SPT suggests stiff.			
10D 11L	2.00 - 2.45 2.00 - 3.00	Nil				S 4	S 4				
12D	2.70 - 2.90										
13D 14L	3.00 - 3.45 3.00 - 4.00	3.00				S 10	S 10	Soft dark grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium bioclastic limestone. (SLIP) (SLIP)	2.95	132.75	
								Firm orangish brown mottled grey and light brown slightly sandy silty CLAY. (SLIP_LIAS) (SLIP)	3.20	132.50	
15D	3.70 - 3.90							3.80 - 4.00m: Orangish brown and grey.			
16D 17L	4.00 - 4.45 4.00 - 5.00	3.00				S 16	S 16	Stiff becoming very stiff thickly laminated brown and grey mottled orangish brown slightly sandy slightly gravelly silty CLAY with rare subangular medium gravel sized mudstone lithorelicts. (Lias Group) (CHAM)	4.00	131.70	
18D	4.70 - 4.90							Very stiff thinly laminated dark grey and brown mottled dark brown slightly sandy silty CLAY locally tending to extremely weak mudstone. Fissures are subhorizontal very closely spaced undulating rough stained orange. (Lias Group) (CHAM)			
19D 20C	5.00 - 5.45 5.00 - 6.50	4.50 5.00	100	NA		S 32	S 32	6.15 - 6.25m: Stained dark red.	5.70	130.00	
21D	5.80 - 6.00							Stiff to very stiff fissured thickly laminated grey mottled brown and orangish brown slightly sandy silty CLAY locally tending to extremely weak mudstone. Fissures are subhorizontal very closely spaced undulating rough stained orange with (up to 5mm) penetrative staining. (Lias Group) (CHAM)	6.25	129.45	
22D 23C	6.30 - 6.50 6.50 - 8.00	5.00	85					6.45m: Thin lamination of black silt.			
24CS	6.90 - 7.20							7.80 - 7.90m: Subhorizontal very closely spaced undulating rough fissures stained dark grey.			
25D	7.60 - 7.80							Extremely weak grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal and subvertical very closely and closely spaced undulating rough with red staining and orange penetrative staining (up to 5mm). (Lias Group) (CHAM)	7.85	127.85	
26C	8.00 - 9.50	8.00		NI				7.85 - 8.05m: Brown and grey.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				SUB LOCATION: 948	
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		REMARKS
0.00	1.20	Inspection Pit	Hand tools	1.20	Nil	1.15	20		
1.20	5.00	Window Sampler	Geotechnical Pioneer Rig						
5.00	20.00	Rotary Core	Geotechnical Pioneer Rig						
CASING DEPTH		BACKFILL			INSTRUMENTATION		CONTRACT 35560 CHECKED CT		
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE				
168	8.00	0.00	0.50	5.70	Standpipe				
		0.50	1.00	5.70					
		1.00	3.70						
		3.70	5.70						
BARREL DIAMETER		HOLE PROGRESS			REMARKS				
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				
128	5.00	03-07-2019 14:15	0.00	Nil	Dry				
146	20.00	03-07-2019 17:00	3.00	3.00	0.20				
		04-07-2019 08:40	3.00	3.00	0.40				
		04-07-2019 17:00	18.50	8.00	1.80				
		05-07-2019 08:45	18.50	8.00	1.90				

BOREHOLE LOG



CP202

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 03 July 2019

Easting 392409

Scale 1:50

End Date 05 July 2019

Northing 215672

Ground Level 135.70mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	9.50 - 11.00	8.00	92 56 52	NI 60 100				Extremely weak thinly laminated grey MUDSTONE with rare orange staining (up to 10mm). Fractures are subhorizontal closely and medium spaced undulating smooth with orange staining. (Lias Group) (CHAM) 8.60 - 8.70m: Two 50deg planar rough fractures with orange and red staining. 8.70 - 8.80m: Very stiff brown and grey slightly sandy silty clay. 9.05 - 9.25m: Subhorizontal undulating rough fracture with orange and red staining. 9.70 - 10.10m: Fractures are very closely spaced.	8.45	127.25	
			83 50 11	NI 160 230					50	10.10	
28C	11.00 - 12.50	8.00	100 45 23	NI 90 230				Extremely weak becoming very weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal to 20deg and 70deg to subvertical closely rarely medium spaced stepped rough. (Lias Group) (CHAM) 10.10 - 10.70m: Rarely mottled brown. 11.85 - 12.05m: 50deg stepped rough fracture.			
29C 30CS	12.50 - 14.00 12.70 - 13.00	8.00	83 65 42	NI 190 300				Very weak thinly laminated dark grey MUDSTONE with rare shell fragments (up to 5mm). Fracture set 1: subhorizontal to 20deg medium spaced planar rough. Fracture set 2: 60deg closely spaced undulating rough. (Lias Group) (CHAM)			
31C	14.00 - 15.50	8.00	97 70 47	NI 190 250				Very weak thinly laminated dark grey MUDSTONE with rare shell fragments (up to 5mm). Fracture set 1: subhorizontal to 20deg closely rarely medium spaced undulating rough. Fracture set 2: subvertical stepped rough. (Lias Group) (CHAM) 15.00 - 15.25m: Subvertical undulating rough fracture. 15.15 - 15.25m: Weak, light brown.			
32C	15.50 - 17.00	8.00	98 80 80					Very weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal to 20deg and 70deg medium spaced planar rough. (Lias Group) (CHAM)	15.90	119.80	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
			5.70	6.20	Bentonite		
			6.20	20.00	Grout		
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			05-07-2019 09:30	20.00	8.00	1.90	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



CP202

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 03 July 2019

Easting 392409

Scale 1:50

End Date 05 July 2019

Northing 215672

Ground Level 135.70mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	17.00 - 18.50	8.00	99 70 70	NI 250 400					17.40	118.30	
34CS	17.85 - 18.05			NI 220 300				Very weak thinly laminated dark grey MUDSTONE with rare shell fragments (up to 5mm). Fractures are subhorizontal to 20deg medium spaced undulating smooth. (Lias Group) (CHAM)			
35C	18.50 - 20.00	8.00	93 39 39	NI 150 240				Very weak thinly laminated dark grey MUDSTONE with rare shell fragments (up to 5mm). Fracture set 1: subhorizontal closely and medium spaced stepped smooth. Fracture set 2: 80deg planar rough. (Lias Group) (CHAM) 19.00 - 19.05m: Weak, light brown. 19.40 - 19.60m: 70deg to subvertical very closely spaced incipient fractures.	18.50	117.20	
Borehole Completed at 20.00m									20.00	115.70	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



CP204

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 08 July 2019

Easting 392647

Scale 1:50

End Date 12 July 2019

Northing 215541

Ground Level 178.90mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 3ES 5B 6D 7D 8L	0.20 - 0.40 0.20 - 0.40 0.20 - 0.40 0.60 - 0.80 0.60 - 0.80 0.60 - 0.80 1.00 - 1.20 1.00 - 1.20 1.00 - 1.20 1.20 - 1.65 1.20 - 2.00							Grass over soft light brown silty CLAY with frequent rootlets. (TOP) Soft becoming firm light orangish brown mottled light grey silty CLAY. (SLIP) (SLIP)	0.20	178.70	
9D 10D 11L	1.80 - 1.90 2.00 - 2.45 2.00 - 3.00	Nil					S 8 S 22	Stiff brown mottled grey and orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 2.20 - 2.40m: Pocket of orange sandy subangular and subrounded fine to coarse bioclastic limestone gravel.	1.70	177.20	
12D 13D 14L	2.80 - 2.90 3.00 - 3.45 3.00 - 4.00	3.00					S 22	Stiff dark brown mottled grey slightly sandy slightly gravelly silty CLAY with rare pockets (up to 5mm) of orange coarse sand. Gravel is angular to subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 2.95 - 3.00m: Brown silt.	3.10	175.80	
15D 16D 17L	3.80 - 3.90 4.00 - 4.45 4.00 - 5.00	3.00					S 7	Stiff becoming firm dark grey locally mottled dark brown slightly sandy CLAY with frequent shell fragments (up to 4mm). (SLIP_LIAS) (SLIP)			
18D 19D 20L	4.80 - 4.90 5.00 - 5.45 5.00 - 6.00	3.00					S 10	Stiff dark grey slightly sandy CLAY with rare pockets (up to 15mm) of light grey silt. (SLIP) (SLIP) 5.95 - 6.30m: Firm dark grey mottled grey and greenish grey slightly sandy gravelly silty clay with rare pockets of coarse orange sand. Gravel is subangular and subrounded fine and medium bioclastic limestone.	5.50	173.40	
21D 22D 23L	5.80 - 5.90 6.00 - 6.45 6.00 - 7.00	6.00					S 19	Stiff becoming very stiff greenish grey mottled grey and orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is subrounded medium mudstone lithorelicts. (Lias Group) (WHM) 6.50 - 6.55m: Dark grey.	6.30	172.60	
24D 25D 26C	6.80 - 6.90 7.00 - 7.45 7.00 - 8.00	6.00 7.00	100				S 39	Very stiff fissured thickly laminated brown and grey silty CLAY locally tending to extremely weak mudstone. Fissures are subhorizontal and 40deg closely spaced planar smooth. (Lias Group) (WHM) 7.90 - 8.00m: Strong dark brown mottled grey limestone with one subhorizontal black thick lamination. Subvertical undulating rough fracture.	7.40	171.50	
27D 28C	7.80 - 7.90 8.00 - 9.50	7.00		NA							

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Hand tools				
1.20	7.00	Window Sampler	Comacchio 305				
7.00	25.00	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	7.00	0.00	0.50	Concrete	9.90	Standpipe Piezometer	948
		0.50	8.50	Bentonite	13.90	Standpipe	
		8.50	10.00	Gravel			
		10.00	12.50	Bentonite			



BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes loss of flush 11.00-12.50m and reduced flush returns 12.50-25.00m (50-60% returned).	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	7.00	08-07-2019 14:30		Nil	Dry		CHECKED
146	25.00	08-07-2019 15:00	1.20	Nil	Dry		CT

BOREHOLE LOG



CP204

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 08 July 2019

Easting 392647

End Date 12 July 2019

Northing 215541

Ground Level 178.90mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29D	8.80 - 8.90		100	NA				Very stiff thinly laminated dark brown mottled grey and greenish grey silty CLAY locally tending to extremely weak mudstone. Fissures are 70deg to subvertical closely spaced undulating smooth. (Lias Group) (WHM)	8.25	170.65	
30C	9.50 - 11.00	7.00	100	NA				Very stiff fissured greenish grey becoming greenish brown mottled grey silty CLAY locally tending to extremely weak mudstone with rare orange staining (up to 7mm). Fissures are subhorizontal and 70deg medium spaced undulating rough. (Lias Group) (WHM)	9.40	169.50	
31D	9.80 - 9.90			NA					10.45	168.45	
32D	10.80 - 10.90			NA				Very stiff fissured grey CLAY locally tending to extremely weak mudstone. Fissures are subhorizontal extremely closely spaced undulating smooth. (Lias Group) (WHM)	10.95	167.95	
33C	11.00 - 12.50	7.00	93 23 7	NI 20 100				10.45 - 10.60m: Orangish brown mottled grey. Weak grey and light brown LIMESTONE. Fractures are 20deg and 80deg extremely closely and very closely rarely closely spaced undulating rough stained black and orange with rare orange sand infill (up to 3mm). (Lias Group) (WHM)			
34D	12.30 - 12.40			NI 30 50				Extremely weak thickly laminated greenish grey mottled grey and orangish brown MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal very closely spaced undulating smooth. (Lias Group) (WHM)	12.10	166.80	
35C	12.50 - 14.00	7.00	84 0 0	NI				Very weak orangish brown and grey MUDSTONE locally tending to very stiff clay. Fractures are randomly orientated very closely spaced planar smooth. (Lias Group) (WHM)	12.45	166.45	
36D	13.30 - 13.40			NA				Very stiff fissured thinly and thickly laminated brown and grey mottled orangish brown silty CLAY locally tending to extremely weak mudstone. Fissures are subhorizontal to 20deg very closely spaced undulating smooth with red staining and grey silt infill (up to 3mm). (Lias Group) (WHM)	13.10	165.80	
37C	14.00 - 15.50	7.00	97	NA				13.35m: Fracture infilled with grey silt (up to 10mm) and stained orange.	14.10	164.80	
38D	14.70 - 14.80							Very stiff fissured thickly laminated brown mottled grey and orange silty CLAY with rare thin laminae of grey silt locally tending to extremely weak mudstone. Fissures are subhorizontal and subvertical closely spaced undulating smooth surfaces stained greenish grey. (Lias Group) (WHM)			
39C	15.50 - 17.00	7.00	100					14.15 - 14.60m: 60deg very closely spaced stepped smooth fissures locally stained orange.			
40D	15.80 - 15.90		42 37					14.95 - 15.10m: Subvertical undulating smooth fissure stained red.			
								15.95m: Thick lamination of limestone.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	948
		12.50	14.00	Gravel			
		14.00	15.50	Bentonite			
		15.50	25.00	Grout			

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
		10-07-2019 18:15	20.00	7.00		8.76	
		11-07-2019 09:00	20.00	7.00		9.14	
		11-07-2019 12:00	25.00	7.00	9.99		
						CHECKED	
						CT	

BOREHOLE LOG



CP204

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 08 July 2019

Easting 392647

Scale 1:50

End Date 12 July 2019

Northing 215541

Ground Level 178.90mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
41C	17.00 - 18.50	7.00	100 83 69	NI 170 240				Very stiff fissured thickly laminated brown mottled grey and orange silty CLAY with rare thin laminae of grey silt locally tending to extremely weak mudstone. Fissures are subhorizontal and subvertical closely spaced undulating smooth surfaces stained greenish grey. (Lias Group) (WHM) 16.00 - 16.15m: 60deg stepped smooth fissure.	16.20	162.70	
42CS	18.15 - 18.35			NI 190 200				Very weak thinly laminated dark grey rarely mottled orange MUDSTONE. Fractures are 40deg closely rarely medium spaced undulating smooth with rare orange staining. (Lias Group) (WHM) 16.20m: Boundary inclined 70deg. 16.88 - 16.90m: 40deg stepped rough fracture. 17.00 - 17.25m: Brown and dark grey. 17.45 - 17.50m: Stained orange.	17.50	161.40	
43C	18.50 - 20.00	7.00	100 0 0	NA				Strong grey and dark grey LIMESTONE with rare shell fragments (up to 3mm). Fractures are subhorizontal to 10deg undulating rough. (Lias Group) (MRB) 17.55 - 17.65m: Stained orange. Strength reduced to very weak with very closely spaced fractures. 17.95m: Fracture infilled with grey silt (up to 4mm). 18.15m: PLT suggests weak.	18.55	160.35	
44C	20.00 - 21.50	7.00	100 13 13	NA				Very stiff/extremely weak fissured dark grey and orange clayey SILT/SILTSTONE. Fissures are 40deg medium spaced planar rough with rare red staining. (Lias Group) (DYS)	20.30	158.60	
45C 46CS	21.50 - 23.00 21.65 - 22.00	7.00	97 97 97	260 470 690				Very stiff/extremely weak dark grey mottled orange clayey SILT/SILTSTONE. No natural fissures observed. (Lias Group) (DYS)	21.30	157.60	
47C	23.00 - 24.50	7.00	87 77 71	NI 190 350				Very weak thinly laminated grey MUDSTONE with frequent thin laminae of grey silt. Fractures are subhorizontal medium and widely spaced undulating smooth with rare grey silt infill (up to 3mm). (Lias Group) (DYS) 23.15 - 23.40m: 70deg undulating rough incipient fracture with penetrative orange staining (up to 3mm). Very weak to weak thinly laminated dark grey MUDSTONE with frequent shell fragments (up to 3mm). Fractures are 40deg medium spaced planar smooth with orange penetrative staining (up to 10mm). (Lias Group) (DYS)	23.55	155.35	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 948		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		



BOREHOLE LOG



CP204

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 08 July 2019

Easting 392647

Scale 1:50

End Date 12 July 2019


Northing 215541

Ground Level 178.90mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
48C	24.50 - 25.00	7.00	90 50 50					Very weak to weak thinly laminated dark grey MUDSTONE with frequent shell fragments (up to 3mm). Fractures are 40deg medium spaced planar smooth with orange penetrative staining (up to 10mm). (Lias Group) (DYS) 24.75m: Subhorizontal undulating rough fracture with rare grey silt infill (up to 2mm). 24.75 - 24.90m: Shell fragments up to 25mm. 24.85 - 24.90m: 60deg planar smooth incipient fracture with orange penetrative staining (up to 3mm). Borehole Completed at 25.00m	25.00	153.90	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 948		 CONTRACT 35560	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CHECKED CT	
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BOREHOLE LOG



CP206

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 02 May 2019

Easting 392655

Scale 1:50

End Date 07 May 2019

Northing 215664

Ground Level 162.85mOD

Depth 19.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp./core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.30 - 0.60							Grass over firm light brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.20	162.65	[Cross-hatch pattern]
1ES	0.30 - 0.60							Firm yellowish brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. (SLIP) (SLIP) 0.60 - 0.80m: Low subangular limestone cobble content. 0.80 - 1.00m: Very gravelly.			[Diagonal lines pattern]
2D	0.30 - 0.60										[Diagonal lines pattern]
2ES	0.80 - 1.00										[Diagonal lines pattern]
3B	0.80 - 1.00										[Diagonal lines pattern]
4D	0.80 - 1.00							Loose light brownish yellow slightly sandy clayey angular to subrounded fine to coarse oolitic limestone GRAVEL. (SLIP) (SLIP)	1.20	161.65	[Diagonal lines pattern]
3ES	1.00 - 1.20						S 8				[Diagonal lines pattern]
5B	1.00 - 1.20	Nil						Firm light orangish brown mottled grey silty CLAY with a medium angular oolitic limestone cobble content. (SLIP) (SLIP)			[Diagonal lines pattern]
6D	1.00 - 1.20										[Diagonal lines pattern]
7D	1.20 - 1.65										[Diagonal lines pattern]
8L	1.20 - 2.00							Firm dark yellowish brown slightly sandy slightly gravelly clayey SILT. Gravel is angular and subangular fine and medium siltstone lithorelicts. (SLIP) (SLIP)	2.10	160.75	[Diagonal lines pattern]
4ES	1.70 - 1.80						S 8				[Diagonal lines pattern]
10L	2.00 - 3.00	Nil			▼ 2.00			Firm greyish brown and greenish grey slightly sandy silty CLAY. (SLIP) (SLIP) 3.30 - 3.35m: Subangular siltstone cobble.			[Diagonal lines pattern]
9D	2.00 - 2.45										[Diagonal lines pattern]
11D	2.40 - 2.50							Soft becoming firm bluish grey locally greenish grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine and medium siltstone. (SLIP) (SLIP)	2.55	160.30	[Diagonal lines pattern]
12D	2.60 - 2.70						H 35				[Diagonal lines pattern]
13D	3.00 - 3.45	Nil						5.70 - 6.10m: Frequent pockets (up to 10mm) of grey silt. 5.95m: Subhorizontal planar smooth fissure with dark orangish brown penetrative staining (up to 2mm).	2.95	159.90	[Diagonal lines pattern]
14L	3.00 - 4.00						S 7				[Diagonal lines pattern]
15D	3.40 - 3.50							Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP) 7.30m: Locally stained dark orangish brown.	3.60	159.25	[Diagonal lines pattern]
17D	4.00 - 4.60	3.00					H 66				[Diagonal lines pattern]
18L	4.00 - 5.00							7.30m: Locally stained dark orangish brown.			[Diagonal lines pattern]
16D	3.80 - 3.90						S 3				[Diagonal lines pattern]
19D	4.70 - 4.80										[Diagonal lines pattern]
20L	5.00 - 6.00	5.00						Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP)	6.20	156.65	[Diagonal lines pattern]
21UT	5.00 - 5.45										[Diagonal lines pattern]
55UT	5.00 - 5.45							Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP)	6.60	156.25	[Diagonal lines pattern]
22D	5.45 - 5.50						S 12				[Diagonal lines pattern]
23D	5.70 - 5.80							Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP)			[Diagonal lines pattern]
24D	6.00 - 6.45	5.00									[Diagonal lines pattern]
25L	6.00 - 7.00							Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP)			[Diagonal lines pattern]
26D	6.30 - 6.40						S 10				[Diagonal lines pattern]
27D	6.70 - 6.80							7.30m: Locally stained dark orangish brown.			[Diagonal lines pattern]
28D	7.00 - 7.45	5.00									[Diagonal lines pattern]
29L	7.00 - 8.00							7.30m: Locally stained dark orangish brown.			[Diagonal lines pattern]
30D	7.60 - 7.70						H 55				[Diagonal lines pattern]
31D	8.00 - 8.45	5.00					H 64			[Diagonal lines pattern]	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED	WATER STRIKE				REMARKS
TOP (m)	BASE (m)	TYPE	Hand tools	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	
0.00	1.20	Inspection Pit	Comacchio 305	2.00	Nil	2.00	20	
1.20	11.00	Window Sampler						

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	10.00	0.00	0.50	Concrete	16.00	Standpipe	
140	19.70	0.50	9.00	Grout	16.00		
		9.00	10.00	Bentonite			
		10.00	16.50	Gravel			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	11.00	02-05-2019 11:20	0.00	Nil	Dry	CHECKED CT	
146	19.70	02-05-2019 12:40	1.20	Nil	Dry		
		03-05-2019 08:40	1.20	Nil	Dry		
		03-05-2019 17:00	10.00	5.00	5.40		
		07-05-2019 09:00	10.00	5.00	5.50		

BOREHOLE LOG



CP206

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 02 May 2019

Easting 392655

Scale 1:50

End Date 07 May 2019

Northing 215664

Ground Level 162.85mOD

Depth 19.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
32L	8.00 - 9.00							Firm greenish brown locally mottled bluish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse siltstone. (SLIP) (SLIP)			
33D	8.60 - 8.70						H 74 H 40				
34D 35L	9.00 - 9.45 9.00 - 10.00	5.00					S 16	9.05 - 9.95m: Frequent pockets (up to 10mm) and 80deg to subvertical thin laminae of light grey silt.			
36D	9.60 - 9.70						H 38 H 58 H 62				
37D 38L	10.00 - 10.45 10.00 - 11.00	5.00					S 19		10.20	152.65	
39D	10.40 - 10.50							Stiff dark bluish grey CLAY. (SLIP) (SLIP) 10.40 - 10.45m: Subrounded limestone cobble. 10.50 - 10.80m: Locally dark greenish brown and orangish yellow and slightly gravelly. Gravel is angular and subangular fine to coarse oolitic limestone.	10.80	152.05	
40D 41C	11.00 - 11.45 11.00 - 12.20	10.00 11.00	69 7 0	NA			S 46	Very stiff dark orangish brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse oolitic limestone. (SLIP) (SLIP) 10.80 - 10.85m: Subrounded limestone cobble.	11.50	151.35	
				NI 90				Medium strong light yellow bioclastic LIMESTONE. Fracture set 1: 30deg extremely closely to closely spaced planar rough. Fracture set 2: subvertical planar rough and intersecting. (SLIP) (SLIP)	12.00	150.85	
42C	12.20 - 13.70	12.20	77	NA				Very stiff orangish brown slightly sandy gravelly CLAY with a medium to high subangular limestone cobble content. Gravel is angular to subrounded fine to coarse oolitic limestone. (SLIP) (SLIP) 12.20 - 12.80m: Yellowish brown.			
43D	12.80 - 12.90										
44D 45C 46D	13.70 - 14.15 13.70 - 15.20 13.90 - 14.00	13.70	49				S 38	13.90 - 14.10m: Mottled bluish grey. 14.40 - 15.20m: Assessed zone core loss.			
47C	15.20 - 16.70	15.20	96								
48D	15.80 - 15.90								16.00	146.85	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
11.00	19.70	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
			16.50	19.70	Grout			
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
		07-05-2019 14:30	19.70	18.20	3.15		CHECKED	
							CT	

BOREHOLE LOG



CP206

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 02 May 2019

Easting 392655

Scale 1:50

End Date 07 May 2019

Northing 215664

Ground Level 162.85mOD

Depth 19.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
49C	16.70 - 18.20	16.70	100					Very stiff dark bluish grey locally dark greenish grey slightly sandy CLAY with rare pockets (up to 20mm) of yellowish brown silt and fine sand. (SLIP) (SLIP) 16.20 - 16.35m: Subrounded limestone cobble. 16.60m: Subhorizontal planar smooth fissure with a dusting of light grey silt. 16.70 - 16.90m: Slightly gravelly with a subangular limestone cobble. Gravel is subangular fine to coarse limestone. 16.95 - 17.00m: 20deg planar smooth fissure. Very stiff dark greenish grey locally mottled bluish grey and orangish brown slightly gravelly slightly sandy silty CLAY with frequent pockets (up to 20mm) of grey silt. Gravel is subrounded fine and medium siltstone lithorelicts. (SLIP) (SLIP) 17.25 - 17.30m: Very thin bed of dark orangish yellow gravelly clay. Gravel is subangular fine and medium limestone. Stiff greenish brown locally yellowish brown and bluish grey slightly sandy gravelly CLAY with a high subangular limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP) 18.40 - 18.60m: Very gravelly. 19.20 - 19.30m: Very gravelly.	17.10	145.75		
50D	16.90 - 17.00											
51D	17.40 - 17.50									17.80	145.05	
52C	18.20 - 19.70	18.20	97									
53D	18.20 - 18.30											
54D	19.30 - 19.40								19.70	143.15		
Borehole Completed at 19.70m												

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



CP208

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 05 June 2019

Easting 392684

Scale 1:50

End Date 12 June 2019

Northing 215581

Ground Level 175.35mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.30 - 0.50							Grass over firm light brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.20	175.15	
1ES	0.30 - 0.50							Firm orangish brown gravelly CLAY with rare pockets (up to 50mm) of brown fine sand. Gravel is subangular and subrounded fine and medium limestone, sandstone and siltstone. Rare rootlets. (MG) (MGR)	0.50	174.85	
2B	0.50 - 0.90								0.95	174.40	
2ES	0.50 - 0.90										
3B	1.00 - 1.20										
3ES	1.00 - 1.20	Nil					S 5	Firm light orangish brown slightly sandy gravelly CLAY. Gravel is subangular fine and medium limestone. (SLIP) (SLIP)			
4D	1.20 - 1.65							Soft becoming firm brown locally mottled light grey clayey SILT. (SLIP) (SLIP)			
5L	1.20 - 2.00										
4ES	1.50 - 1.60										
6D	1.60 - 1.70										
7D	2.00 - 2.45	1.20					S 13				
8L	2.00 - 3.00										
								Stiff grey mottled orangish brown slightly sandy silty CLAY. (SLIP) (SLIP)	2.50	172.85	
10L	3.00 - 4.00	1.20					S 17				
9D	3.00 - 3.45										
11D	3.50 - 3.60							Stiff greenish brown and grey slightly sandy silty CLAY. (SLIP) (SLIP)	3.30	172.05	
12D	4.00 - 4.45	1.20					S 22				
13L	4.00 - 5.00	4.00									
14D	4.50 - 4.60										
15D	5.00 - 5.45	4.00					S 26				
16L	5.00 - 6.00										
17D	6.00 - 6.45	5.00					S 36				
18L	6.00 - 7.00							6.10 - 6.30m: Very stiff bluish grey clay.			
19D	7.00 - 7.45	5.80					S 28		7.00	168.35	
20L	7.00 - 8.00							Stiff to very stiff greenish brown slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 30mm) of yellowish brown medium sand. Medium and widely spaced thin and medium beds of yellowish brown clayey sandy fine to coarse oolitic limestone gravel with frequent pockets (up to 30mm) of greenish brown slightly sandy silty clay. (SLIP) (SLIP)			
21D	7.40 - 7.50										
22D	8.00 - 8.45	7.00					S 28				

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HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE	Hand tools		DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Geotechnical Pioneer Rig				
1.20	10.00	Window Sampler					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	10.00	0.00	0.30	Concrete	25.00	Inclinometer	
140	25.00	0.30	25.00	Grout			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	10.00	05-06-2019 13:10	0.00	Nil	Dry		CHECKED
146	25.00	05-06-2019 13:40	1.20	Nil	Dry		
		11-06-2019 10:30	1.20	Nil	Dry		
		11-06-2019 17:00	10.00	10.00	1.90		CT
		12-06-2019 10:40	10.00	10.00	2.80		

BOREHOLE LOG



CP208

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 05 June 2019

Easting 392684

Scale 1:50

End Date 12 June 2019

Northing 215581

Ground Level 175.35mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
23L	8.00 - 9.00										
24D	8.75 - 8.80										
25D 26L	9.00 - 9.45 9.00 - 10.00	8.80					S 26				
27D 28C	10.00 - 10.45 10.00 - 11.50	10.00	40	NA			S 36	Dense orangish brown sandy clayey subrounded fine to coarse bioclastic limestone GRAVEL. (SLIP) (SLIP) 10.00 - 10.20m: Fines probably washed away.	10.00	165.35	
								Very stiff greenish brown and bluish grey slightly sandy silty CLAY with frequent pockets (up to 30mm) of orangish brown and grey silt. (SLIP) (SLIP) 10.60 - 11.50m: Assessed zone of core loss.	10.60	164.75	
29C 30D	11.50 - 13.00 11.70 - 11.80	11.50	100								
31C	13.00 - 14.50	13.00	100								
32D	13.70 - 13.80										
33C	14.50 - 16.00	14.50	100					Very stiff greenish brown slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 20mm) of orangish brown and grey silt. Gravel is subrounded fine to coarse bioclastic limestone and mudstone. (SLIP) (SLIP)	14.40	160.95	
34D	15.00 - 15.10							Very stiff fissured greyish brown slightly sandy clayey SILT with closely and medium spaced very thin and thin beds of very stiff grey slightly sandy silty clay. Fissures are 70deg to subvertical very closely and closely spaced planar and undulating smooth and rough infilled (up to 1mm) with light grey silt. (SLIP) (SLIP)	15.90	159.45	
35C	16.00 - 17.50	16.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) 10.00 BASE (m) 25.00 TYPE Rotary Core			PLANT USED Geotechnical Pioneer Rig		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1077
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME 12-06-2019 11:45 DEPTH (m) 25.00 CASING (m) 25.00 WATER (m) 2.90			REMARKS		CONTRACT 35560
							CHECKED CT

BOREHOLE LOG



CP208

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 05 June 2019

Easting 392684

Scale 1:50

End Date 12 June 2019

Northing 215581

Ground Level 175.35mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
36CS	16.10 - 16.50		100								
37C	17.50 - 19.00	17.50	100					Very stiff thinly laminated dark grey slightly sandy slightly gravelly silty CLAY with rare shell fragments (up to 5mm). Gravel is subrounded fine and medium limestone. (SLIP) (SLIP)	17.60	157.75	
38C	19.00 - 20.50	19.00	43					Very stiff brownish grey becoming brown and orangish brown slightly sandy slightly gravelly silty CLAY with abundant becoming rare shell fragments (up to 10mm). Gravel is subangular and subrounded fine and medium limestone and siltstone. (SLIP) (SLIP)	17.85	157.50	
								Recovered as brown sandy clayey subangular and subrounded fine to coarse bioclastic limestone and siltstone GRAVEL. Fines probably washed away. (SLIP) (SLIP)	19.10	156.25	
								19.85 - 20.50m: Assessed zone of core loss.			
39C	20.50 - 22.00	20.50	97						20.70	154.65	
								Very stiff fissured grey slightly sandy silty CLAY locally tending to clayey silt. Fissures are subhorizontal and 70deg to subvertical very closely spaced planar and undulating rough stained orangish brown. (Lias Group) (DYS)			
40C	22.00 - 23.50	22.00	100								
41CS	22.55 - 22.90										
42C	23.50 - 25.00	23.50	93 30 14	NI 70 210				Strong thickly laminated bluish grey bioclastic LIMESTONE. Fractures are subhorizontal to 20deg closely spaced undulating rough stained orangish brown. (Lias Group) (DYS)	23.60	151.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP208

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 05 June 2019

Easting 392684

Scale 1:50

End Date 12 June 2019

Northing 215581

Ground Level 175.35mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NI				Weak greenish brown LIMESTONE. Fractures are subhorizontal and subvertical closely spaced undulating rough stained orangish brown. (Lias Group) (DYS) 24.45 - 24.50m: Fractures are extremely closely spaced. Very stiff grey slightly sandy silty CLAY locally clayey silt. Fissures are subhorizontal and 70deg to subvertical planar and undulating rough stained orangish brown. (Lias Group) (DYS)	24.30	151.05	
				NA					24.50	150.85	
									25.00	150.35	
Borehole Completed at 25.00m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



CP209

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 17 May 2019

Easting 392737

Scale 1:50

End Date 28 May 2019

Northing 215425

Ground Level 203.00mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50 0.30 - 0.50							Grass over firm brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.30	202.70	
2B 2ES	0.70 - 0.90 0.70 - 0.90							Firm orangish brown slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone and siltstone. Rare rootlets. (MG) (MGR)	0.60	202.40	
3B 3ES	1.00 - 1.20 1.00 - 1.20	Nil					S 12	Firm brown and yellowish brown gravelly becoming very gravelly CLAY. Gravel is subangular and subrounded fine and medium limestone. (SLIP) (SLIP)	1.00	202.00	
4D	1.20 - 1.65							Yellowish brown slightly clayey gravelly coarse SAND. Gravel is subrounded fine limestone. (SLIP) (SLIP)	1.20	201.80	
5B	1.20 - 1.90							Medium dense light brown slightly clayey sandy subangular and subrounded fine to coarse strong light grey bioclastic limestone GRAVEL with a high bioclastic limestone cobble content and frequent calcite crystals (up to 3mm). (SLIP) (SLIP)			
6D 7C	1.90 - 2.35 1.90 - 3.00							Nil	95	NA	S 13
8D	2.55 - 2.65										
10C 9D	3.00 - 4.50 3.00 - 3.45	2.00	47				S 3	Light brown slightly clayey sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a medium bioclastic limestone cobble content and frequent calcite crystals (up to 60mm). (SLIP) (SLIP) 3.20m: Very loose.	3.20	199.80	
11D	3.60 - 3.70							Medium strong light grey bioclastic LIMESTONE with abundant interlocking cobble sized fragments of weak orange sandstone with frequent burrows (up to 20mm) infilled with orange sand. Fractures are 20deg very closely and closely spaced undulating rough. (SLIP) (SLIP) 5.50 - 5.60m: 50deg undulating rough fracture. 6.00 - 6.35m: Recovered non intact.			
12C 13D	4.50 - 6.00 4.70 - 4.80	2.00	93 7 7					Very strong light grey bioclastic LIMESTONE with frequent burrows (up to 20mm) infilled with light brown sand and rare shell fragments (up to 40mm). No natural fractures observed. (SLIP) (SLIP) 6.75 - 6.85m: Firm indistinctly laminated brown mottled grey slightly sandy silty clay with frequent pockets (up to 20mm) of light grey silt.	5.20	197.80	
14C	6.00 - 7.50	2.00	85 72 47	400				Strong orangish brown SANDSTONE with thin beds of firm dark grey mottled brown slightly sandy clayey silt and frequent coarse limestone clasts (up to 40x60mm). No natural fractures observed. (SLIP) (SLIP)	6.35	196.65	
15C	7.50 - 9.00	2.00	53	NA				Firm indistinctly laminated orangish brown mottled brown and grey slightly sandy slightly gravelly clayey SILT with rare pockets (up to 20mm) of orange coarse sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone and sandstone. (SLIP) (SLIP)	6.85	196.15	
									7.70	195.30	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	1.90	Window Sampler	Comacchio 305					
1.90	35.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	10.50		0.00	0.50	Concrete	20.00	Inclinometer	
			0.50	20.00	Grout			
			20.00	21.00	Bentonite			
			21.00	35.00	Gravel			
BARREL DIAMETER			HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
143	1.90		17-05-2019 13:30	0.00	Nil	Dry		Driller notes loss of flush returns 1.90-10.50m and 24.00-35.00m.
146	35.00		17-05-2019 14:00	1.20	Nil	Dry		
			21-05-2019 09:20	1.20	Nil	Dry		
			21-05-2019 14:30	10.50	2.00	10.00		
			22-05-2019 10:05	10.50	2.00	9.00		
								CONTRACT
								35560
								CHECKED
								CT

BOREHOLE LOG



CP209

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 17 May 2019

Easting 392737

Scale 1:50

End Date 28 May 2019

Northing 215425

Ground Level 203.00mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C 17D	9.00 - 10.50 9.10 - 9.20	2.00	100					Firm indistinctly laminated orangish brown mottled brown and grey slightly sandy slightly gravelly clayey SILT with rare pockets (up to 20mm) of orange coarse sand . Gravel is subangular and subrounded fine to coarse bioclastic limestone and sandstone. (SLIP) (SLIP) 8.40 - 9.00m: Assessed zone of core loss.			
18D	9.60 - 9.70			NA				9.30 - 9.50m: Light grey mottled brown.	9.50	193.50	
19D 20C	10.40 - 10.50 10.50 - 12.00	10.50	83					Firm greenish grey mottled brown slightly sandy clayey SILT. (SLIP) (SLIP) Very stiff thinly laminated dark grey CLAY with frequent nodules (up to 35mm) of limestone. (Lias Group) (WHM)	9.90	193.10	
21D	11.40 - 11.50							Very stiff thinly laminated dark grey CLAY locally tending to extremely weak mudstone. (Lias Group) (WHM) 11.35 - 11.55m: 70deg planar smooth fissure infilled (up to 1mm) with light grey silt.	10.75	192.25	
22C	12.00 - 13.50	10.50	76 74 74					12.00 - 12.20m: 20deg stepped rough fissure.	12.30	190.70	
23C	13.50 - 15.00	10.50	92 16 0	NA				Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding fractures are subhorizontal closely spaced undulating rough. (Lias Group) (WHM)	13.75	189.25	
24D 25CS	14.40 - 14.50 14.50 - 14.85							Very stiff thinly laminated dark grey slightly gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is subangular fine to coarse mudstone lithorelicts. (Lias Group) (WHM)			
26C	15.00 - 16.50	10.50	100 72 72					Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding fractures are subhorizontal to 20deg closely spaced undulating rough. (Lias Group) (WHM)	15.40	187.60	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS							
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 				
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS				REMARKS							
		DATE TIME				DEPTH (m)		CASING (m)		WATER (m)		CONTRACT 35560	
		22-05-2019 17:00				16.50		10.50		2.85		CHECKED	
		23-05-2019 08:30				16.50		10.50		2.85			
		23-05-2019 17:00				27.00		10.50		6.00			
		24-05-2019 10:35				27.00		10.50		6.00			
		24-05-2019 16:30				31.50		10.50		6.00		CT	

BOREHOLE LOG



CP209

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 17 May 2019

Easting 392737

Scale 1:50

End Date 28 May 2019

Northing 215425

Ground Level 203.00mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.50 - 18.00	10.50	100 0 0					Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding fractures are subhorizontal to 20deg closely spaced undulating rough. (Lias Group) (WHM) 16.65 - 16.80m: 50deg undulating rough fracture infilled (up to 2mm) with light grey silt.	16.80	186.20	
28CS	16.90 - 17.30			NA							
29C	18.00 - 19.50	10.50	100 98 98					Very stiff fissured thinly laminated dark grey slightly gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is subangular fine to coarse mudstone lithorelicts. Fissures are subhorizontal widely spaced undulating rough. (Lias Group) (WHM)	19.30	183.70	
30C	19.50 - 21.00	10.50	95 79 62	NI 60 220							
31C	21.00 - 22.50	10.50	100 17 11					21.20m: Subhorizontal stepped rough fracture infilled (up to 2mm) with light grey silt. 21.30 - 21.50m: 70deg to subvertical planar smooth conjugating fractures. Very stiff fissured thinly laminated dark grey CLAY. Fissures are subvertical planar and undulating smooth. (Lias Group) (WHM) 21.50 - 21.55m: Light grey.	21.50	181.50	
32C	22.50 - 24.00	10.50	99 68 38	NI 60 380						22.30	180.70
33CS	23.60 - 24.00							23.50 - 23.60m: 60deg planar smooth fracture.			
34C	24.00 - 25.50	10.50									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH				BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
BARREL DIAMETER				HOLE PROGRESS				REMARKS
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
				28-05-2019 09:10	31.50	10.50	6.00	CONTRACT 35560
				28-05-2019 13:00	35.00	10.50	4.80	
								CHECKED CT



BOREHOLE LOG



CP209

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 17 May 2019

Easting 392737

Scale 1:50

End Date 28 May 2019

Northing 215425

Ground Level 203.00mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
35C	25.50 - 27.00	10.50	100 62 45						26.25	176.75	
			88 63 43								
36C 37CS	27.00 - 28.50 27.00 - 27.40	10.50	100 58 44	NI 70 405				Weak thinly laminated dark grey MUDSTONE with rare limestone lenses (up to 30mm). Fracture set 1: Bedding fractures are subhorizontal closely and medium spaced planar smooth. Fracture set 2: 70deg to subvertical planar rough and smooth. (Lias Group) (WHM) 26.40 - 26.80m: Subvertical undulating rough fracture intersecting subhorizontal closely spaced smooth fractures. Very weak thinly laminated dark grey MUDSTONE with closely spaced thin beds of very stiff dark grey clay. Frequent lenses of limestone (up to 40mm). Fracture set 1: Bedding fractures are subhorizontal medium spaced undulating rough. Fracture set 2: 70deg to subvertical very closely spaced incipient. (Lias Group) (WHM)	27.30	175.70	
			NI 210 402								
38C	28.50 - 30.00	10.50	73 54 45								
39C 40CS	30.00 - 31.50 30.20 - 30.70	10.50	95 79 67					30.70 - 30.90m: Medium strong grey mottled dark grey limestone with frequent shell moulds (up to 40mm). Weak dark grey MUDSTONE with abundant ammonite moulds and casts (up to 35mm). Fractures are subvertical very closely spaced planar smooth. (Lias Group) (WHM) 30.90 - 31.00m: Randomly orientated very closely spaced fractures.	30.90	172.10	
			NI 50 120								
41C 42CS	31.50 - 32.50 31.55 - 31.85	10.50	100 92 83	NI 190 310				Very weak grey and dark grey SILTSTONE. Fractures are 50deg closely and medium spaced stepped rough stained orangish red. (Lias Group) (WHM) 31.95 - 32.35m: 70deg incipient fracture with up to 2mm yellow penetrative staining.	31.55	171.45	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP209

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 5

Start Date 17 May 2019

Easting 392737

Scale 1:50

End Date 28 May 2019

Northing 215425

Ground Level 203.00mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43C	32.50 - 34.00	10.50	97 88 72	NI 170 400				Weak dark grey MUDSTONE with rare thin beds and nodules (up to 20mm) of limestone. Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (WHM) 32.35 - 32.50m: Very stiff dark grey gravelly silty clay. Gravel is subangular fine to coarse mudstone lithorelicts. 32.90m: 60deg planar and undulating rough fracture stained orangish brown. 33.60 - 33.75m: 50deg planar incipient fracture with up to 3mm orange penetrative staining.	32.15	170.85	
44C 45CS	34.00 - 35.00 34.15 - 34.50	10.50	85 78 70					Strong dark grey and grey LIMESTONE with abundant ammonite and brachiopod moulds and casts (up to 80mm). No natural fractures observed. (Lias Group) (WHM)	34.70	168.30	
				300				No natural fractures observed. (Lias Group) (WHM)	35.00	168.00	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 1077
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



CP210

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 02 October 2019

Easting 392672

Scale 1:50

End Date 07 October 2019

Northing 215777

Ground Level 174.30mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend		
1ES	0.10 - 0.20							Grass over brown slightly gravelly silty fine and medium SAND. Gravel is subangular and subrounded fine to coarse flint. Rare roots (up to 10mm diam) and rootlets. (TOP)	0.30	174.00			
2ES	0.30 - 0.40												
1B	0.50 - 0.60							Soft orangish brown slightly sandy slightly gravelly CLAY with a low subangular limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	1.20	173.10			
3ES	0.50 - 0.60												
2B	0.70 - 0.80												
3B	1.00 - 1.10												
4ES	1.00 - 1.10	Nil					S 16	Medium dense dark yellowish brown and light brown sandy very clayey subangular and subrounded fine to coarse limestone GRAVEL. (SLIP) (SLIP)	1.90	172.40			
4D	1.20 - 1.65												
5L	1.20 - 2.00												
6D	2.00 - 2.45						S 29		Medium dense light yellowish brown slightly silty sandy angular to subrounded fine to coarse limestone GRAVEL with a low subangular limestone cobble content. Frequent pockets (up to 10mm) of light and dark yellowish brown sandy silty clay. (SLIP) (SLIP)	2.50		171.80	
7L	2.00 - 3.00												
8D	3.00 - 3.45	2.00					S 11	Soft dark greenish brown mottled dark orangish brown and yellowish brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse shelly limestone. (SLIP) (SLIP)	3.05	171.25			
9L	3.00 - 4.00												
10L	4.00 - 4.50												
11L	4.50 - 5.00							4.25m: Becoming slightly gravelly. Gravel is subangular and subrounded fine to coarse limestone.	4.45	169.85			
12D	5.00 - 5.45	4.00					S 13	Dark yellowish brown gravelly very clayey medium and coarse SAND. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	4.90	169.40			
13L	5.00 - 6.00							Firm dark yellowish brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse limestone. (SLIP) (SLIP)	5.35	168.95			
14L	6.00 - 6.50							Firm becoming stiff greenish brown and light grey mottled orangish brown slightly gravelly becoming gravelly silty CLAY. Gravel is angular and subangular fine and medium lithorelicts of mudstone. Frequent pockets (up to 5mm) of yellowish brown fine sand and frequent thin laminae of light yellowish brown silt. Frequent relict rootlets. (SLIP_LIAS) (SLIP)	6.10	168.20			
15UT	6.50 - 6.95	6.00						Firm becoming stiff fissured brown and greenish brown slightly sandy CLAY. Fissures are subhorizontal to 10deg extremely closely spaced undulating smooth stained orangish brown and black. (SLIP_LIAS) (SLIP)					
17L	6.50 - 8.00												
16D	6.95 - 7.10												
18D	8.00 - 8.45	6.00					S 28						

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	8.00	Window Sampler	Comacchio 305					
8.00	25.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	992
168	6.00		0.00	0.50	Concrete	5.50	Standpipe	
			0.50	2.50	Bentonite	17.00	Standpipe	
			2.50	6.20	Gravel			CONTRACT
			6.20	13.00	Bentonite			
BARREL DIAMETER		HOLE PROGRESS		REMARKS			35560	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush returns 10.50-25.00m. Dynamic sampling undertaken to recover dropped core 10.50-12.00m (1.50m recovered) and 16.50-18.00m (1.43m recovered).		
128	8.00	02-10-2019 12:40	0.00	Nil	Dry			
146	25.00	02-10-2019 16:40	2.00	2.00	1.18			
		03-10-2019 08:00	2.00	2.00	1.33			
		03-10-2019 17:00	13.50	6.00	9.00		CHECKED	
		04-10-2019 07:50	13.50	6.00	9.10			
							CT	

BOREHOLE LOG



CP210

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 02 October 2019

Easting 392672

Scale 1:50

End Date 07 October 2019

Northing 215777

Ground Level 174.30mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
19C	8.00 - 9.00	6.00	85						8.50	165.80	
				NA							
20D 21C	9.00 - 9.45 9.00 - 10.50	6.00	92				S 29	Stiff to very stiff fissured thinly laminated greenish brown clayey SILT locally tending to claybound siltstone lithorelicts. Fissures are subhorizontal to 10deg closely spaced undulating smooth stained orangish brown infilled (up to 5mm) with orangish brown sandy silt. (SLIP_LIAS) (SLIP)			
				NA							
22C	10.50 - 12.00	6.00	100					10.40 - 10.50m: Infilled bivalve shell mould (50mm).	10.70	163.60	
				NA							
23CS	11.70 - 11.90										
24D 25C	12.00 - 12.45 12.00 - 13.50	6.00	84				S 42				
				NA							
26C	13.50 - 15.00	6.00	70								
				NA							
27C	15.00 - 16.50	6.00	100				C 48	Very stiff/Extremely weak medium bedded bluish grey CLAY/ MUDSTONE locally tending to claybound mudstone lithorelicts. Fissures are subhorizontal and 75deg closely and medium spaced planar smooth rarely stained orange and infilled (up to 10mm) with orangish brown clay. (SLIP_LIAS) (SLIP)	14.50	159.80	
28CS	16.00 - 16.30										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	992
		13.00	17.50	Gravel			
		17.50	25.00	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		04-10-2019 17:00	19.50	6.00	12.10		
		07-10-2019 07:55	19.50	6.00	Dry		
		07-10-2019 17:15	25.00	6.00	18.82		CHECKED
		08-10-2019 14:00	25.00	6.00	18.88		CT

BOREHOLE LOG



CP210

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 02 October 2019

Easting 392672

Scale 1:50

End Date 07 October 2019

Northing 215777

Ground Level 174.30mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29C	16.50 - 18.00	6.00	95					Very stiff/Extremely weak medium bedded bluish grey CLAY/ MUDSTONE locally tending to claybound mudstone lithorelicts. Fissures are subhorizontal and 75deg closely and medium spaced planar smooth rarely stained orange and infilled (up to 10mm) with orangish brown clay. (SLIP_LIAS) (SLIP) 16.00 - 16.20m: Two parallel 45deg closely spaced (180mm) planar smooth fissures (possibly slickensided). 16.00 - 18.10m: Greyish brown mottled bluish grey. 16.90 - 17.40m: Medium bed of extremely weak orangish brown siltstone.			
30C	18.00 - 19.50	6.00	85 80 80	650			C *750	Medium strong to strong grey bioclastic LIMESTONE with frequent shell fossils. Contacts above and below are 30deg undulating rough stained orange. (Lias Group) (MRB)	18.10	156.20	
31CS	18.90 - 19.20							Extremely weak to very weak medium bedded bluish grey MUDSTONE. Fractures are subhorizontal to 10deg and 75deg closely spaced planar smooth rarely stained orange and infilled (up to 2mm) with orangish brown clay. (Lias Group) (DYS)	19.00	155.30	
32C	19.50 - 20.50	6.00	100 100 100								
33C	20.50 - 22.00	6.00	100 100 95				C *130				
34CS	21.00 - 21.40							20.80 - 20.90m: 75deg planar smooth fracture.			
35C	22.00 - 23.50	6.00	100 85 75					22.30 - 22.35m: Thin bed of orangish brown siltstone. 22.75 - 22.90m: Stained orange. 22.90 - 23.00m: Thin bed of medium strong bluish grey bioclastic limestone. 23.00 - 23.40m: 80deg planar smooth fracture stained orange with up to 40mm penetrative discolouration.			
36C	23.50 - 25.00	6.00	90 80 40	20 100 200			C *176	23.70 - 23.75m: Frequent bivalve fossil fragments (up to 20mm).			
37CS	23.90 - 24.15										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush						
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		992			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			



BOREHOLE LOG



CP210

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 02 October 2019

Easting 392672

Scale 1:50

End Date 07 October 2019


Northing 215777

Ground Level 174.30mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Extremely weak to very weak medium bedded bluish grey MUDSTONE. Fractures are subhorizontal to 10deg and 75deg closely spaced planar smooth rarely stained orange and infilled (up to 2mm) with orangish brown clay. (Lias Group) (DYS) 24.30 - 24.50m: 70-80deg planar smooth fracture stained orange with up to 40mm penetrative discolouration. 24.60 - 25.00m: 70deg planar smooth fracture stained orange with up to 40mm penetrative discolouration. Borehole Completed at 25.00m	25.00	149.30	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 992		 CONTRACT 35560	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CHECKED CT	
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BOREHOLE LOG



CP211

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 09 October 2019

Easting 392674

Scale 1:50

End Date 17 October 2019

Northing 215809

Ground Level 183.45mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.30							Turf over soft brown gravelly CLAY. Gravel is subangular fine to coarse limestone. (TOP)	0.10	183.35	
2B 2ES	0.30 - 0.50							Soft brown and orangish brown gravelly CLAY with medium limestone cobble content. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP)	0.30	183.15	
3B 3ES	0.50 - 0.80							Soft to firm light orangish brown gravelly CLAY with high limestone cobble content. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP)	1.10	182.35	
4B 4ES	0.80 - 1.10							Medium dense light yellowish brown and light brown slightly clayey sandy angular and subangular fine to coarse limestone GRAVEL with low angular limestone cobble content. (SLIP) (SLIP)			
7D 8L	1.10 - 1.55 1.10 - 2.00	Nil				S 24					
10L 9D	2.00 - 3.00 2.00 - 2.45	Nil				S 17					
11D 12C	3.00 - 3.45 3.00 - 4.00	3.00	60			S 12					
13D 14L	4.00 - 4.45 4.00 - 5.00	3.00				S 13		Firm light greenish grey silty CLAY with rare medium and coarse gravel sized mudstone lithorelicts. Rare pockets (up to 30mm) of orangish brown silt. (SLIP_LIAS) (SLIP)	3.80	179.65	
15UT 17L	5.00 - 5.45 5.00 - 6.00	5.00						4.70 - 4.80m: Frequent pockets (up to 30mm) of orangish brown silt.	5.30	178.15	
16D	5.45 - 5.60							Stiff indistinctly fissured bluish grey mottled greenish grey silty CLAY. Rare decomposing rootlets. (SLIP_LIAS) (SLIP)			
18D 19C	6.00 - 6.45 6.00 - 7.50	6.00	100			S 17		6.30 - 6.90m: Frequent subangular fine to coarse gavel sized mudstone lithorelicts.	6.90	176.55	
20C	7.50 - 9.00	6.00	100	NA		C 44		Very stiff fissured thinly laminated greyish brown and greenish grey CLAY with closely spaced thin laminae of extremely weak mudstone. Locally tending to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fissures are subhorizontal and randomly orientated very closely spaced planar smooth. (SLIP_LIAS) (SLIP)			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.10	Inspection Pit	Hand tools					
1.10	3.00	Window Sampler	Geotechnical P60 Slope Climbing Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION: 992
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	7.50		0.00	0.50	Concrete	3.30	Standpipe	
			0.50	1.10	Bentonite			
			1.10	3.80	Gravel			
			3.80	10.60	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT 35560 CHECKED CT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush 13.50-35.00m.		
128	3.00	09-10-2019 10:30	0.00	Nil	Dry			
146	4.00	09-10-2019 16:50	3.00	3.00	0.53			
128	6.00	10-10-2019 08:35	3.00	3.00	0.58			
146	35.00	10-10-2019 16:05	9.00	6.00	4.72			
		11-10-2019 07:50	9.00	6.00	3.90			

BOREHOLE LOG



CP211

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 09 October 2019

Easting 392674

Scale 1:50

End Date 17 October 2019

Northing 215809

Ground Level 183.45mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	9.00 - 10.50	6.00	67	NR			C *71	Very stiff fissured thinly laminated greyish brown and greenish grey CLAY with closely spaced thin laminae of extremely weak mudstone. Locally tending to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fissures are subhorizontal and randomly orientated very closely spaced planar smooth. (SLIP_LIAS) (SLIP) 8.20 - 8.50m: Subvertical stepped smooth fissure. Assessed zone of core loss.	9.00	174.45	
				NA					9.50	173.95	
22CS	10.30 - 10.50										
23C	10.50 - 12.00	7.50	100 30 21	NI 140 170			C *61	Very stiff fissured grey silty CLAY. Fissures are subhorizontal and randomly orientated very closely spaced planar and undulating smooth stained brownish grey. (SLIP_LIAS) (SLIP) 10.30m: Ammonite (30mm).	10.60	172.85	
				NA					10.80	172.65	
				NA					11.70	171.75	
24C	12.00 - 13.50	7.50	97	NA				Very stiff/extremely weak light brown clayey SILT/ SILTSTONE. Fractures are 50-70deg very closely spaced and intersecting planar rough stained brown and black. (SLIP_LIAS) (SLIP) Weak light greyish brown calcareous SILTSTONE. Fractures are 10-30deg and 60deg to subvertical closely spaced undulating rough stained orange and black. (SLIP_LIAS) (SLIP) 11.20 - 11.40m: Medium strong grey bioclastic limestone. 11.40m: 10deg fracture infilled (10mm) with brown clay. Stiff greenish brown silty CLAY. (SLIP_LIAS) (SLIP)	12.00	171.45	
25CS	13.31 - 13.50										
26C	13.50 - 15.00	7.50	100 0 0				C *65	Very stiff/extremely weak fissured thinly laminated dark brownish grey silty CLAY/MUDSTONE. Fissures are subhorizontal, 50-70deg and subvertical very closely spaced planar and undulating smooth stained orange and brown. (SLIP_LIAS) (SLIP) 13.85 - 13.90m: Mottled yellow. 13.90 - 14.50m: Tending to extremely weak mudstone.	14.80	168.65	
				NI							
27C	15.00 - 16.50	7.50	94 0 0					Extremely weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal and subvertical (intersecting) very closely spaced planar smooth stained orange, dark brown and purple. (Lias Group) (WHM) 15.25 - 15.50m: Subvertical stepped smooth fracture with reddish brown staining.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE	Geotechnical P60 Slope			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
3.00	4.00	Rotary Core	Climbing Rig								
4.00	6.00	Window Sampler	Geotechnical P60 Slope								
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE				
			10.60	14.60	Gravel						
			14.60	35.00	Bentonite						
BARREL DIAMETER			HOLE PROGRESS				REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					
			11-10-2019 18:00	18.00	7.50	16.10					
			14-10-2019 07:50	18.00	7.50	16.23					
			14-10-2019 12:45	25.00	7.50	Dry					
			15-10-2019 08:45	25.00	7.50	Dry					
			15-10-2019 15:30	30.00	7.50	Dry					
										35560	
										CHECKED	
										CT	

BOREHOLE LOG



CP211

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 09 October 2019

Easting 392674

Scale 1:50

End Date 17 October 2019

Northing 215809

Ground Level 183.45mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
28C	16.50 - 18.00	7.50	98 83 80	NI 300 800			C *143	Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fractures are 5deg, 40-50deg and 70-80deg medium spaced planar rough stained orange up to 60mm penetrative discolouration. Rare 50deg and vertical incipient planar smooth fractures. (Lias Group) (WHM) 16.60 - 16.75m: Subvertical planar smooth fracture with reddish brown staining. 16.75 - 17.20m: Subvertical undulating rough fracture with reddish brown staining. 16.95 - 17.10m: Extremely weak orange calcareous siltstone with thin laminae of shell debris and rare dark purple ironstone nodules. 17.10 - 17.30m: Medium strong grey limestone with intersecting 20deg and 80deg planar rough fractures stained orange. 17.30 - 17.65m: Extremely weak light brown calcareous siltstone. 17.40 - 17.65m: Subvertical undulating rough fracture with reddish brown staining. 17.65 - 17.75m: Medium strong grey limestone. 18.75 - 19.35m: 70deg planar rough fracture with orange, brown and black staining, penetrating up to 70mm. 19.35 - 19.50m: Poorly cemented thinly laminated light brown silt. 19.95 - 20.20m: Subvertical undulating rough fracture with orangish brown staining (penetrating 20mm). 20.45 - 20.80m: Intersecting 70deg and subvertical planar rough fractures with reddish brown staining (penetrating 20mm). 22.00 - 22.40m: Two subparallel 60-70deg very closely spaced planar smooth fractures with orangish brown staining. 23.70 - 24.00m: Intersecting horizontal and vertical fractures stained orange.	16.60	166.85	
29CS	17.75 - 17.95										
30C	18.00 - 19.50	7.50	85 73 63								
31C	19.50 - 21.00	7.50	98 98 98				C *130				
32CS	20.15 - 20.40										
33C	21.00 - 22.50	7.50	100 100 100								
34C	22.50 - 24.00	7.50	100 81 72				C *136				
35CS	23.10 - 23.35										
36C	24.00 - 25.00	7.50									

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED Climbing Rig Geotechnical P60 Slope Climbing Rig			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
6.00	35.00	Rotary Core								
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 992	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS				CONTRACT 35560
		16-10-2019 09:00 30.00 7.50 Dry								CHECKED CT
		16-10-2019 12:45 35.00 7.50 Dry								

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 09 October 2019

Easting 392674

Scale 1:50

End Date 17 October 2019

Northing 215809

Ground Level 183.45mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37CS	24.58 - 25.00		100 100 100					Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fractures are 5deg, 40-50deg and 70-80deg medium spaced planar rough stained orange up to 60mm penetrative discolouration. Rare 50deg and vertical incipient planar smooth fractures. (Lias Group) (WHM) 24.25 - 24.50m: 70deg planar smooth clean fracture.			
38C	25.00 - 26.00	7.50	100 94 94				C *176	25.00 - 25.80m: Three parallel 70-80deg closely spaced (70mm) planar rough fractures stained orange with up to 40mm penetrative discolouration.			
39C	26.00 - 27.50	7.50	100 100 94	550				Medium strong light grey bioclastic LIMESTONE. (Lias Group) (MRB) 26.35 - 26.50m: Dark grey.	26.00	157.45	
40CS	26.75 - 27.05		NI 180 360					Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal and 50-70deg closely and medium spaced planar rough locally with a veneer of clay. (Lias Group) (DYS) 26.50 - 26.70m: Frequent fine to coarse sand sized shell debris.	26.50	156.95	
41C	27.50 - 29.00	7.50	100 96 77				C *214	27.25 - 27.50m: 70-80deg planar smooth fracture stained orangish brown with 50mm penetrative discolouration. 27.75 - 28.05m: 80deg planar smooth incipient fracture.			
42C 43CS	29.00 - 30.00 29.00 - 29.33	7.50	60 55 55	330				Weak light grey bioclastic LIMESTONE. Single subhorizontal undulating rough fracture. (Lias Group) (DYS)	29.00	154.45	
			110 NI 180 360					Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal closely and medium spaced undulating rough. Frequent vertical and randomly orientated planar and undulating smooth clean incipient fractures. (Lias Group) (DYS) 29.60 - 30.00m: Assessed zone of core loss.	29.45	154.00	
44C	30.00 - 31.50	7.50	96 96 72				C *250	30.50 - 30.60m: Tending to stiff clay. 31.85 - 32.20m: Subvertical planar rough fracture with orangish brown staining. 31.90m: Coarse gravel sized limestone nodule with shell debris.			
45C	31.50 - 33.00	7.50	89 83 57					31.95 - 32.30m: Medium strong grey bioclastic limestone. Fractures are 10-30deg and 80deg closely spaced undulating rough stained orange and brown.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 992 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP211

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 5

Start Date 09 October 2019

Easting 392674

Scale 1:50

End Date 17 October 2019

Northing 215809

Ground Level 183.45mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
46CS	32.50 - 32.70							Extremely weak to very weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal closely and medium spaced undulating rough. Frequent vertical and randomly orientated planar and undulating smooth clean incipient fractures. (Lias Group) (DYS)			
47C	33.00 - 34.00	7.50	100 97 91				C *136	32.40 - 32.60m: 80deg planar rough fracture with orangish brown staining (penetrating 20mm). 32.75 - 32.80m: Thin bed of light grey limestone with ironstone nodules and brown veining.			
48CS	33.70 - 33.95							33.50 - 33.55m: Thin bed of light grey limestone. Intersecting vertical planar smooth fractures stained brown.			
49C	34.00 - 35.00	7.50	95 87 65					34.40 - 35.00m: Fractures are subhorizontal to 10deg and 50-70deg and subvertical planar rough stained orange.			
		7.50					C *250	34.90 - 34.95m: Thin bed of light grey nodular limestone with brown staining and 10mm bed of shell debris. <small>Borehole Completed at 35.00m</small>	35.00	148.45	

HOLE CONSTRUCTION			WATER STRIKE		
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



CP212

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 31 May 2019

Easting 392814

Scale 1:50

End Date 04 June 2019

Northing 215558

Ground Level 191.60mOD

Depth 24.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.40 0.30 - 0.40							Grass over firm brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.10	191.50	[Cross-hatch pattern]
2B 2ES	0.70 - 0.80 0.70 - 0.80							Brown slightly clayey gravelly fine and medium SAND. Gravel is subangular fine and medium limestone, sandstone and siltstone. (MG) (MGR)	0.55	191.05	[Dotted pattern]
3B 3ES	1.00 - 1.20 1.00 - 1.20							Yellowish brown gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse limestone and sandstone. (SLIP) (SLIP)	1.20	190.40	[Horizontal lines]
4D 5B 5ES 6D 7C	1.20 - 1.65 1.20 - 1.80 1.36 - 1.46 1.46 - 1.56 1.80 - 2.20	Nil				S 34		Stiff light orangish brown sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse bioclastic and argillaceous limestone. (SLIP) (SLIP) 1.20 - 1.30m: Bioclastic limestone cobble.	1.70	189.90	[Vertical lines]
8D 9L	2.20 - 2.65 2.20 - 3.00	2.20				S 27		Dark grey clayey sandy subangular and subrounded fine to coarse limestone GRAVEL. Fines probably washed away. (SLIP) (SLIP)	2.40	189.20	[Diagonal lines]
10D 11D 12L	2.80 - 2.90 3.00 - 3.45 3.00 - 3.70	2.20				S 21		Stiff light brown sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP) 2.70m: Bioclastic limestone cobble.	3.15	188.45	[Cross-hatch pattern]
13D 14D 15C	3.40 - 3.50 3.70 - 4.15 3.70 - 5.20	3.70	78 35 35	NI 70 250		S 40		Medium dense light brown slightly sandy clayey subangular and subrounded fine and medium bioclastic limestone GRAVEL. (SLIP) (SLIP) 3.60m: Bioclastic limestone cobble.	3.70	187.90	[Diagonal lines]
16D 17C	5.20 - 5.65 5.20 - 6.70	5.20	80 47 12			S 36		Strong yellowish brown bioclastic LIMESTONE with closely and medium spaced bands (up to 180mm) and cobble sized pockets of yellowish brown very clayey fine and medium sand. Frequent burrows (up to 20x60mm) infilled with yellowish brown clayey fine and medium sand. Fractures are 20-40deg closely spaced planar and undulating rough stained orangish brown. (SLIP) (SLIP) 4.90m: 50deg planar rough fracture.			[Horizontal lines]
18C	6.70 - 8.20	5.20	80	NA		C 42		5.35m: 100mm bivalve. Yellowish brown clayey very sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL with medium spaced thin beds and cobbles of strong light yellowish brown bioclastic limestone with frequent burrows (up to 20x60mm) infilled with yellowish brown clayey fine and medium sand. (SLIP) (SLIP)	6.55	185.05	[Dotted pattern]

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Hand Tools				
1.20	1.80	Window Sampler	Geotechnical Pioneer Rig				
1.80	2.20	Rotary Core	Geotechnical Pioneer Rig				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	15.20	0.00	0.30	Concrete	13.90	Standpipe	
		0.30	7.00	Grout	24.50	Standpipe	
		7.00	8.00	Bentonite			
		8.00	14.20	Gravel			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	1.80	31-05-2019 08:45	0.00	Nil	Dry		CHECKED CT
146	2.20	31-05-2019 16:30	8.20	8.20	0.20		
128	3.70	03-06-2019 09:15	8.20	8.10	8.00		
146	24.50	03-06-2019 17:00	16.20	13.70	4.60		
		04-06-2019 08:50	16.20	13.70	5.70		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 31 May 2019

Easting 392814

Scale 1:50

End Date 04 June 2019


Northing 215558

Ground Level 191.60mOD

Depth 24.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
19C	8.20 - 9.20		95					Yellowish brown clayey very sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL with medium spaced thin beds and cobbles of strong light yellowish brown bioclastic limestone with frequent burrows (up to 20x60mm) infilled with yellowish brown clayey fine and medium sand. (SLIP) (SLIP)			
20C	9.20 - 10.20	8.20	60					9.80 - 10.20m: Assessed zone of core loss. 10.20 - 10.75m: Fines probably washed away.			
21C	10.20 - 11.20	10.20	55					Very stiff brownish grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP) 10.75 - 11.20m: Assessed zone of core loss. 11.20 - 11.80m: Gravelly.	10.75	180.85	
22C	11.20 - 12.70	10.20	88					12.90 - 13.90m: Gravelly.			
23D 24CS	11.90 - 12.00 12.00 - 12.35							14.20 - 14.70m: Assessed zone of core loss.			
25C	12.70 - 13.70	12.10	50					Extremely weak thinly laminated dark grey MUDSTONE. Bedding fractures are subhorizontal mainly closely spaced planar smooth. (Lias Group) (WHM)	14.90	176.70	
26C 27CS	13.70 - 14.70 13.90 - 14.20	13.70	50								
28C	14.70 - 16.20	13.70	100 98 23	NI 98 250							

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HOLE CONSTRUCTION TOP (m) 2.20 BASE (m) 3.70 TYPE Window Sampler 3.70 24.50 Rotary Core			PLANT USED Geotechnical Pioneer Rig Geotechnical Pioneer Rig			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL 14.20 17.50 Grout 17.50 18.50 Bentonite 18.50 24.50 Gravel			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1077 	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME 04-06-2019 14:45 DEPTH (m) 24.50 CASING (m) 15.20 WATER (m) 8.40			REMARKS			CONTRACT 35560 CHECKED CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 31 May 2019

Easting 392814

Scale 1:50

End Date 04 June 2019

Northing 215558

Ground Level 191.60mOD

Depth 24.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29C	16.20 - 17.00	15.20	90 83 76						16.60	175.00	
30C	17.00 - 18.50	15.20	93 86 81	NI 150 170				Weak thinly laminated dark grey MUDSTONE. Bedding fractures are subhorizontal closely spaced planar smooth. (Lias Group) (WHM) 17.00 - 17.15m: Frequent ammonites (up to 50mm). 17.00 - 17.50m: Subvertical undulating smooth fracture. 17.80m: Subhorizontal to 20deg undulating smooth fracture. 18.10 - 18.25m: 60deg planar smooth fracture.	18.20	173.40	
31C	18.50 - 20.00	15.20	100 69 66	NI 90 250				Weak thinly laminated grey and light grey MUDSTONE. Bedding fractures are subhorizontal medium spaced planar smooth. (Lias Group) (WHM) 18.50 - 18.75m: Subvertical undulating smooth fracture. 18.85 - 19.00m: Subvertical fracture with 15mm orange penetrative staining. 19.50 - 19.60m: Strong grey stained yellowish brown limestone. 19.85 - 20.00m: 50deg planar smooth fracture infilled (4mm) with grey clay. 20.10 - 20.50m: 70deg planar smooth fracture with 4mm yellowish brown penetrative staining. 21.15 - 21.30m: 50deg planar smooth fracture stained orange.			
32C	20.00 - 21.50	15.20	100 70 70								
33C	21.50 - 23.00	15.20	100 33 33								
34C	23.00 - 24.50	15.20	100 42 26	NI 130				21.90 - 22.00m: Strong light grey limestone. 22.05 - 22.25m: 60deg planar smooth fracture with orange staining. Weak thinly laminated light grey MUDSTONE. Fracture set 1: Bedding fractures are subhorizontal closely and medium spaced planar smooth. Fracture set 2: 80deg to subvertical very closely and closely spaced intersecting undulating smooth and rough stained orangish brown. (Lias Group) (WHM) 23.00 - 23.10m: 50deg planar smooth fracture with orange staining. 23.50 - 24.10m: 70deg planar smooth fracture with orange staining.	22.10	169.50	

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP212

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 31 May 2019

Easting 392814

Scale 1:50

End Date 04 June 2019

Northing 215558

Ground Level 191.60mOD

Depth 24.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Borehole Completed at 24.50m	24.50	167.10	

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush							
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS			

CASING DEPTH			BACKFILL				INSTRUMENTATION		SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077			

BARREL DIAMETER		HOLE PROGRESS				REMARKS					
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)						
											CONTRACT
											35560
											CHECKED
											CT

BOREHOLE LOG



CP213

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 06 August 2019

Easting 392772

Scale 1:50

End Date 12 August 2019

Northing 215775

Ground Level 177.70mOD

Depth 26.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES 1B 2ES 2B 3ES	0.10 0.20 - 0.40 0.30 0.50 - 0.70 0.50							Vegetation over firm locally soft yellowish brown mottled light grey and orangish brown CLAY with rare ceramic fragments (up to 5mm). Frequent rootlets and roots (up to 5mm diam). (MG) (MGR)			
3B 4ES 4D 5L	0.90 - 1.20 1.00 1.20 - 1.65 1.20 - 2.00	Nil					S 11	Firm light grey mottled orangish brown silty CLAY. (SLIP) (SLIP)	0.90	176.80	
6D 7D 8L 9D	1.70 - 1.80 2.00 - 2.45 2.00 - 3.00 2.30 - 2.40	Nil					S 15	Firm brownish orange slightly sandy silty CLAY with rare relict rootlets. (SLIP) (SLIP)	2.10	175.60	
10D 11L	3.00 - 3.45 3.00 - 4.00	Nil					S 17	Reddish brown mottled light yellowish brown clayey gravelly fine to coarse SAND with a low subangular limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	2.40	175.30	
12D 13L	4.00 - 4.45 4.00 - 5.00	4.00					S 18	Medium dense greyish yellow mottled orangish yellow slightly clayey gravelly fine to coarse SAND with frequent pockets (up to 20mm) of orangish yellow clay. Gravel is angular and subangular fine to coarse limestone. (SLIP) (SLIP)	3.00	174.70	
14D 15L 16D	5.00 - 5.45 5.00 - 6.00 5.40 - 5.50	4.00					S 26	Medium dense greyish yellow and mottled orangish brown sandy angular to subrounded fine to coarse limestone GRAVEL with a low subangular limestone cobble content. (SLIP) (SLIP)	4.20	173.50	
17D 18L 19D	6.00 - 6.45 6.00 - 7.00 6.40 - 6.50	4.00					S 18	Stiff brown mottled orangish brown and light grey slightly sandy gravelly silty CLAY. Gravel is angular and subangular fine to coarse limestone. (SLIP_LIAS) (SLIP)	5.80	171.90	
20D 21L 22UT	7.00 - 7.45 7.00 - 8.00 8.00 - 8.45	7.00 7.00					S 22	Stiff light greenish grey mottled grey and orangish brown silty CLAY. (SLIP_LIAS) (SLIP)	7.90	169.80	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE	Hand tools			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
0.00	1.20	Inspection Pit	P60 Slope Climbing Rig								
1.20	4.00	Window Sampler	P60 Slope Climbing Rig								
4.00	12.50	Window Sampler									
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1059		
140	10.00		0.00	0.50	Concrete	26.50	Inclinometer		AGS		
			0.50	26.50	Grout				CONTRACT		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			35560		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush 24.00-26.50m.			CHECKED	
128	4.00		06-08-2019 13:30	0.00	Nil	Dry				CT	
113	12.50		06-08-2019 14:00	1.20	Nil	Dry					
116	16.50		07-08-2019 14:30	1.20	Nil	Dry					
113	18.00		07-08-2019 14:45	3.00	Nil	Dry					
116	19.50		08-08-2019 08:00	3.00	Nil	Dry					

BOREHOLE LOG



CP213

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 06 August 2019

Easting 392772

Scale 1:50

End Date 12 August 2019

Northing 215775

Ground Level 177.70mOD

Depth 26.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
23L	8.00 - 9.00										
24D	8.45 - 8.50										
25D	8.60 - 8.70										
26D	9.00 - 9.45	7.00					S 22	Stiff bluish grey silty CLAY with rare pockets (up to 10mm diam) of white silt. (SLIP_LIAS) (SLIP)	9.10	168.60	
27L	9.00 - 10.00										
28D	9.50 - 9.60										
29D	10.00 - 10.45	10.00					S 29	11.10 - 11.70m: Slightly gravelly. Gravel is rounded fine and medium mudstone lithorelicts.			
30L	10.00 - 11.50										
31D	11.00 - 11.10										
32D	11.50 - 11.95	10.00					S 28	12.70 - 13.80m: Locally mottled orangish brown and brown.			
33L	11.50 - 12.50										
34D	12.10 - 12.20										
35D	12.50 - 12.95	10.00	83	NA			S 29	Very stiff dark grey becoming grey silty CLAY with frequent fine to coarse sand sized shell debris. (SLIP_LIAS) (SLIP) 13.50 - 15.85m: Very stiff.	13.50	164.20	
36C	12.50 - 13.50										
37D	13.40 - 13.50	10.00	99				S 50	Stiff orangish brown mottled brown and grey gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP_LIAS) (SLIP)			
38D	13.50 - 13.95										
39C	13.50 - 15.00										
40D	14.30 - 14.40										
41D	15.00 - 15.45	10.00	63				S 32		15.85	161.85	
42C	15.00 - 16.50										
43D	15.60 - 15.70										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE	P60 Slope Climbing Rig		DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
12.50	16.50	Rotary Core								
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1059		
								AGS		
BARREL DIAMETER			HOLE PROGRESS				REMARKS			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				
113	20.20		08-08-2019 18:00	13.50	10.00	5.38				
116	26.50		09-08-2019 08:30	13.50	10.00	5.15				
			09-08-2019 17:45	22.50	10.00	7.89				
			12-08-2019 06:30	22.50	10.00	7.92				
			12-08-2019 14:00	26.50	10.00	26.05				
								CONTRACT		
								35560		
								CHECKED		
								CT		

BOREHOLE LOG



CP213

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 06 August 2019

Easting 392772

Scale 1:50

End Date 12 August 2019

Northing 215775

Ground Level 177.70mOD

Depth 26.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
44D 45L	16.50 - 16.95 16.50 - 18.00	10.00					S 23	Stiff orangish brown mottled brown and grey gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP_LIAS) (SLIP)			
46D	17.40 - 17.50							17.30m: Grey mottled orangish brown and brown. 17.60 - 18.50m: Greyish brown mottled orangish brown.			
47D 48C	18.00 - 18.45 18.00 - 19.50	10.00	48	NA			S 29				
				NA					18.50	159.20	
				NR				Stiff grey mottled orangish brown, brown and reddish brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse limestone. (SLIP_LIAS) (SLIP) Assessed zone of core loss.	18.70	159.00	
49D 50L	19.50 - 19.95 19.50 - 20.20	10.00					S 25	Stiff becoming very stiff indistinctly fissured bluish grey silty CLAY with rare shell fragments (up to 2mm). (Lias Group) (DYS)	19.50	158.20	
51D	20.00 - 20.10							19.50 - 20.00m: Mottled yellowish brown.			
52C	20.20 - 21.00	10.00	83	NA			H 92				
53D	20.80 - 20.90										
54D 55C	21.00 - 21.31 21.00 - 22.50	10.00	100				S *97				
56CS	21.70 - 22.00										
57D	22.20 - 22.30										
58D 59C	22.50 - 22.84 22.50 - 24.00	10.00	90				S *65				
60CS	23.20 - 23.50							22.90m: Subhorizontal planar rough fissure infilled (up to 2mm) with yellowish brown clay. 22.90 - 23.10m: 70deg planar rough fissure infilled (up to 2mm) with yellowish brown clay. 22.90 - 24.00m: Mottled yellowish brown.			
61D	23.80 - 23.90							23.80m: Subhorizontal planar rough fissure stained orangish brown infilled (up to 2mm) with yellowish brown clay.			
62D	24.00 - 24.34	10.00					S *71				

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush						
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS		
16.50	18.00	Window Sampler	P60 Slope Climbing Rig								
18.00	19.50	Rotary Core	P60 Slope Climbing Rig								
19.50	20.20	Window Sampler	P60 Slope Climbing Rig								
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL		DEPTH (m)	TYPE		1059	
									AGS		
BARREL DIAMETER			HOLE PROGRESS				REMARKS				
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)				
							CONTRACT				
							35560				
							CHECKED				
							CT				

BOREHOLE LOG



CP213

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 06 August 2019

Easting 392772

Scale 1:50

End Date 12 August 2019

Northing 215775

Ground Level 177.70mOD

Depth 26.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
63C	24.00 - 25.50		100 33 27								
64D	24.70 - 24.90		NI					Extremely weak brownish grey MUDSTONE recovered non intact. (Lias Group) (DYS) Weak light grey and grey LIMESTONE with frequent shell fragments (up to 20mm). Fractures are subhorizontal closely and medium spaced undulating rough. (Lias Group) (DYS) 25.10 - 25.20m: Recovered non intact. Very stiff fissured thinly laminated bluish grey CLAY. Fissures are subhorizontal and subvertical extremely closely spaced planar smooth. (Lias Group) (DYS)	24.70	153.00	
65CS	24.90 - 25.10		NI 100 250						24.90	152.80	
66C	25.50 - 26.50	10.00	100	NA			C *91		25.50	152.20	
67D	26.25 - 26.35	10.00					C *88				
									26.50	151.20	
									Borehole Completed at 26.50m		

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
20.20	26.50	Rotary Core	P60 Slope Climbing Rig								

CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1059		

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
								CHECKED	
								CT	

BOREHOLE LOG**CP214**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 25 July 2019

Easting 392765

Scale 1:50

End Date 29 July 2019

Northing 215820

Ground Level 186.40mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Grass over soft brown slightly gravelly clayey SILT with abundant rootlets. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (TOP)	0.10	186.30	
1B 2ES 3ES	0.30 - 0.50 0.30 0.50							Soft light brown slightly sandy clayey SILT with frequent rootlets. (SLIP) (SLIP)	0.75	185.65	
2B 4ES 3UT 4L	0.80 - 1.00 1.00 1.20 - 1.75 1.20 - 2.00							Soft light brown slightly sandy slightly gravelly clayey SILT. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	1.40	185.00	
5ES 5D 6D 7L	1.70 1.80 - 1.90 2.00 - 2.45 2.00 - 3.00							Firm orangish brown mottled grey clayey SILT. (SLIP) (SLIP)			
		Nil					S 11	2.50 - 2.70m: Becoming brown.	2.70	183.70	
8D 10L 9UT	2.80 - 2.90 3.00 - 4.00 3.00 - 3.55	3.00						Stiff brown mottled grey clayey SILT with rare red staining (spots up to 15mm). (SLIP_LIAS) (SLIP)			
							S 22	Stiff dark grey mottled orangish brown silty CLAY with dark red staining (spots up to 25mm). (SLIP_LIAS) (SLIP)	3.65	182.75	
								4.50 - 4.60m: Frequent angular medium gravel sized mudstone lithorelicts.			
14D 15D 16L	4.80 - 4.90 5.00 - 5.45 5.00 - 6.00	3.00						5.10 - 5.20m: Subrounded mudstone cobble.	5.20	181.20	
							S 38	Very stiff dark grey rarely mottled orangish brown slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP_LIAS) (SLIP)	5.60	180.80	
								5.40 - 5.60m: Orangish brown.			
17D 18UT 19L	5.80 - 5.90 6.00 - 6.45 6.00 - 7.00	5.00						Very stiff fissured locally thinly laminated dark grey silty CLAY with rare shell fragments (up to 5mm). Fissures are 30deg and 60deg extremely closely and very closely spaced undulating rough. (SLIP_LIAS) (SLIP)			
								5.80m: Frequent angular fine and medium gravel sized mudstone lithorelicts with medium sand sized pyrite (up to 5mm).			
20D 21D 22C	6.70 - 6.80 7.00 - 7.45 7.00 - 8.00	5.00	100	NA				6.85 - 7.00m: Frequent shell fragments (up to 25mm).	7.35	179.05	
				NA			S 50	Very stiff fissured dark grey slightly sandy silty CLAY with rare shell fragments (up to 5mm). Fissures are 70deg to subvertical undulating smooth. (SLIP_LIAS) (SLIP)			
23D 24C	7.90 - 8.00 8.00 - 9.00	6.50						7.75 - 7.85m: Strong light grey subrounded limestone cobble with rare calcite veins (up to 5mm).			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand Tools					Groundwater not encountered prior to use of flush
1.20	7.00	Windowless Sampler	Geotechnical Pioneer Rig					
7.00	25.00	Rotary Core	Geotechnical Pioneer Rig					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
146	11.20	0.00	0.30	Concrete	25.00	Inclinometer	1059
		0.30	25.00	Grout			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
128	7.00	25-07-2019 11:30		Nil	Dry		35560
146	25.00	25-07-2019 16:40	5.00	3.00	1.50		CHECKED
		26-07-2019 08:35	5.00	3.00	1.60		
		26-07-2019 16:40	17.50	11.20	5.80		
		29-07-2019 10:20	17.50	11.20	14.92		CT

BOREHOLE LOG



CP214

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 25 July 2019

Easting 392765

Scale 1:50

End Date 29 July 2019

Northing 215820

Ground Level 186.40mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25CS	8.00 - 8.30		100					Very stiff fissured dark grey slightly sandy silty CLAY with rare shell fragments (up to 5mm). Fissures are 70deg to subvertical undulating smooth. (SLIP_LIAS) (SLIP)			
26D	8.80 - 8.90			NA				8.40 - 8.45m: Strong light grey subrounded limestone cobble with rare calcite veins (up to 35mm).	8.80	177.60	
27D	9.00 - 9.45	6.50	60				S 57	Very stiff dark brown gravelly CLAY with a low angular bioclastic limestone cobble content and rare pockets (up to 5mm) of orange coarse sand. Gravel is subangular and subrounded fine to coarse bioclastic limestone and rare sandstone. (SLIP_LIAS) (SLIP)			
28C	9.00 - 10.00							8.81 - 9.00m: Mottled dark grey.			
29D	9.70 - 9.80							9.90 - 10.20m: Subangular fine to coarse bioclastic limestone gravel.			
30C	10.00 - 11.50	6.50	100					10.20 - 10.40m: Mottled dark grey.	10.40	176.00	
31CS	10.80 - 11.10			NA				Very stiff fissured locally thinly laminated greenish grey mottled grey silty CLAY. Fissures are 10deg extremely closely spaced undulating rough. (Lias Group) (WHM)			
32D	11.30 - 11.40							10.50 - 10.75m: Orangish brown.			
33C	11.50 - 13.00	11.20	73 3 0				C 56	10.60 - 10.70m: Strong light grey subangular limestone cobble.			
34D	11.90 - 12.00			NA				Very stiff fissured thinly and thickly laminated dark grey and greenish grey CLAY locally tending to extremely weak mudstone. Fissures are 10deg very closely spaced stepped smooth. (Lias Group) (WHM)			
35D	12.40 - 12.50							12.30 - 12.40m: Medium strong greyish brown limestone.			
36C	13.00 - 14.50	11.20	100 11 11					12.40 - 12.60m: Very stiff/extremely weak greenish brown mottled dark grey clay/mudstone.			
37D	13.50 - 13.60							12.60 - 13.00m: Assessed zone of core loss.			
38D	14.30 - 14.40			NA				13.65 - 13.90m: 60deg undulating smooth fissure.	14.15	172.25	
39C	14.50 - 16.00	11.20	100 37 37				C *115	Very stiff fissured greenish brown mottled grey CLAY tending to extremely weak mudstone. Fissures are 10deg very closely spaced undulating smooth. (Lias Group) (WHM)			
40CS	15.05 - 15.35							14.95 - 15.35m: Greenish grey mottled orangish brown and grey.			
41D	15.50 - 15.60			350				Very weak orangish brown mottled grey calcareous SILTSTONE. Incipient fractures stained orange. (Lias Group) (WHM)	15.35	171.05	
42C	16.00 - 17.50	11.20		NI 120				Medium strong light grey LIMESTONE. (Lias Group) (MRB)	15.70	170.70	
								15.70 - 15.80m: Disintegrated to subangular coarse gravel. Stained orange.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush						
TOP (m)		BASE (m)	TYPE				DEPTH (m)		CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)		BASE (m)		TOP (m)		BASE (m)	MATERIAL		DEPTH (m)	TYPE		1059
BARREL DIAMETER			HOLE PROGRESS			REMARKS						
DIAM (mm)		BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)						
			29-07-2019 17:30	25.00	11.20	9.32						
CONTRACT												
35560												
CHECKED												
CT												

BOREHOLE LOG



CP214

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 25 July 2019

Easting 392765

Scale 1:50

End Date 29 July 2019

Northing 215820

Ground Level 186.40mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43CS	16.80 - 17.10		100 10 8	200 NA				Medium strong light grey LIMESTONE. (Lias Group) (MRB) 16.00 - 16.10m: Extremely weak greyish brown and orange calcareous siltstone. 16.10 - 16.45m: Light grey becoming greyish brown. Single subvertical undulating rough fracture and randomly orientated closely spaced undulating rough fractures.	16.45	169.95	[Pattern]
44D	17.20 - 17.30							Very stiff very closely fissured dark brown mottled grey CLAY locally tending to extremely weak mudstone. Fissures are stained orangish brown. (Lias Group) (DYS)	17.35	169.05	[Pattern]
45C	17.50 - 19.00	11.20	100			C *120		16.60 - 16.80m: Mottled red. Very stiff thinly and thickly laminated dark grey mottled grey CLAY locally tending to extremely weak mudstone with extremely closely spaced to very closely spaced thin and thick laminae of orange fine sand. (Lias Group) (DYS)			[Pattern]
46D	18.20 - 18.30							17.45 - 17.50m: 60deg planar rough fissure. 17.75 - 17.95m: 80deg undulating rough fissure with red staining. 17.95 - 18.20m: 60deg planar rough fissure with red staining.	18.90	167.50	[Pattern]
47C	19.00 - 20.50	11.20	100					Very stiff thinly laminated greenish grey and dark grey silty CLAY locally tending to extremely weak mudstone with frequent orange staining (up to 40mm). Rare grey silt pockets (up to 15mm). Fissures are 50deg stepped smooth with orange staining. (Lias Group) (DYS)			[Pattern]
48D	19.60 - 19.70										[Pattern]
49CS	19.80 - 20.15										[Pattern]
50C	20.50 - 22.00	11.20	90 11 0			C 79		Very stiff thinly laminated greenish grey mottled dark grey CLAY locally tending to extremely weak mudstone with rare orange staining (up to 15mm) and calcite veins (3x10mm). Fissures are 60deg to 70deg planar smooth with a grey surface. (Lias Group) (DYS)	20.75	165.65	[Pattern]
51D	21.10 - 21.20							Extremely weak thinly laminated greenish grey MUDSTONE locally tending to very stiff clay with rare calcite veins (3x20mm) and orange staining (up to 5mm). Fractures are 40deg and 60deg closely spaced planar smooth slightly polished. (Lias Group) (DYS)	21.45	164.95	[Pattern]
52C	22.00 - 23.50	11.20	100 61 46	NI 130 270				21.80 - 21.82m: Firm orange gravelly clay. Gravel is fine and medium mudstone lithorelicts. Strong locally medium strong light grey and grey LIMESTONE with rare shell fragments (up to 15mm). Fractures are 20deg closely and medium spaced undulating rough with orange staining. (Lias Group) (DYS)	22.00	164.40	[Pattern]
				NI 100 200				Extremely weak thinly and thickly laminated dark grey mottled orangish brown SILTSTONE with frequent thin laminae of grey silt. Fractures are 70deg closely spaced undulating rough. (Lias Group) (DYS)	22.60	163.80	[Pattern]
53C	23.50 - 25.00	11.20	100 100 100	1550		C *429		Very weak thinly laminated dark grey SILTSTONE with rare thick laminae of grey silt. No natural fractures observed. (Lias Group) (DYS)	23.45	162.95	[Pattern]

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1059 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP214

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 25 July 2019 Easting 392765

Scale 1:50

End Date 29 July 2019 Northing 215820 Ground Level 186.40mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
54CS	24.15 - 24.50							Very weak thinly laminated dark grey SILTSTONE with rare thick laminae of grey silt. No natural fractures observed. (Lias Group) (DYS) 24.80 - 24.90m: Stained orange and red. Borehole Completed at 25.00m			

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE		PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1059 	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560 CHECKED CT

BOREHOLE LOG



CP215

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 30 July 2019

Easting 392806

Scale 1:50

End Date 02 August 2019

Northing 215804

Ground Level 186.05mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Grass over soft dark brown slightly sandy slightly gravelly clayey SILT. Gravel is subrounded fine to coarse limestone. (MG) (MGR)	0.30	185.75	
1B	0.20 - 0.40						0.40		185.65		
2ES	0.30							Soft dark brown slightly sandy gravelly clayey SILT with a low subangular brick and limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone, brick and rare glass. (MG) (MGR)	0.70	185.35	
3ES	0.50						1.00		185.05		
2B	0.70 - 0.90							Soft dark brown mottled orangish brown slightly sandy gravelly silty CLAY with a medium subangular limestone, brick and concrete cobble content. Gravel is angular to subrounded fine to coarse limestone with rare brick and slate. (MG) (MGR)	1.70	184.35	
3B	1.00 - 1.20						1.00		185.05		
4ES	1.00	Nil					S 2				
4D	1.25 - 1.78										
5L	1.25 - 2.20										
5ES	1.50										
6D	1.90 - 2.00										
10L	2.20 - 3.20	1.30						Soft brown mottled orangish brown and grey slightly sandy CLAY with rare black specks (up to 5mm). Gravel is subangular and subrounded fine and medium limestone. (SLIP) (SLIP)			
7UT	2.20 - 2.65										
8D	2.65 - 2.75							Very soft dark brown mottled brown and red slightly gravelly slightly sandy clayey SILT. Gravel is subangular fine and medium limestone. (SLIP) (SLIP)	3.30	182.75	
9D	2.75 - 2.80						S 7				
11D	2.80 - 2.90										
6ES	2.90										
12D	3.20 - 3.65	2.20									
13L	3.20 - 4.20										
14D	3.80 - 3.90							Soft becoming firm orangish brown mottled grey slightly sandy silty CLAY with rare pockets (up to 5mm) of orange coarse sand. Rare rootlets. (SLIP) (SLIP)			
15UT	4.20 - 4.65	2.20					H 88				
18L	4.20 - 5.20										
16D	4.65 - 4.75							Firm locally stiff orangish brown, brown and grey slightly sandy silty CLAY with frequent orange staining. Rare pockets (up to 5mm) of orange coarse sand and light grey silt. (SLIP) (SLIP)	4.45	181.60	
17D	4.75 - 4.80										
19D	4.90 - 5.00							Stiff dark grey slightly gravelly silty CLAY. Gravel is subrounded fine and medium mudstone lithorelicts. (SLIP_LIAS) (SLIP)			
20D	5.20 - 5.65	2.20					H 96				
21L	5.20 - 6.20						S 16				
22D	5.80 - 5.90							4.45 - 5.00m: Mottled orange.			
23D	6.20 - 6.65	2.20									
24L	6.20 - 7.20								5.80 - 6.15m: Mottled orange.	6.15	179.90
25D	6.90 - 7.00						S 20				
26UT	7.20 - 7.65	2.20						Stiff dark grey slightly gravelly silty CLAY with rare shell fragments (up to 10mm). Gravel is subangular fine bioclastic limestone. (SLIP_LIAS) (SLIP)			
27L	7.20 - 8.20										
28D	7.65 - 7.75							Stiff brown becoming dark brown mottled grey and rarely orangish brown slightly sandy silty CLAY. (SLIP_LIAS) (SLIP)	7.30	178.75	
29D	7.75 - 7.80										
30D	7.90 - 8.00										

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HOLE CONSTRUCTION TOP (m) 0.00 BASE (m) 1.25 TYPE Inspection Pit 1.25 9.10 Window Sampler				PLANT USED Hand tools Geotechnical Pioneer Rig		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) 146 BASE (m) 11.50		BACKFILL TOP (m) 0.00 BASE (m) 0.50 MATERIAL Concrete 0.50 2.00 Bentonite 2.00 3.00 Gravel 3.00 14.50 Bentonite			INSTRUMENTATION DEPTH (m) 3.00 TYPE Standpipe Piezometer 15.50 Standpipe		SUB LOCATION: 1059		
BARREL DIAMETER DIAM (mm) 128 BASE (m) 9.10 146 25.00		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 30-07-2019 08:00 Nil Dry 30-07-2019 17:00 1.20 Nil Dry 31-07-2019 08:25 1.20 Nil Dry 31-07-2019 17:00 13.00 11.50 1.01 01-08-2019 08:00 13.00 11.50 1.51			REMARKS Driller notes loss of flush returns 17.20-25.00m.		CONTRACT <h3>35560</h3> CHECKED <h3>CT</h3>		

BOREHOLE LOG



CP215

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 30 July 2019

Easting 392806

Scale 1:50

End Date 02 August 2019

Northing 215804

Ground Level 186.05mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31D 32L	8.20 - 8.65 8.20 - 9.10	7.20					S 18				
33D 34D 35C	8.90 - 9.00 9.10 - 9.55 9.10 - 10.00	7.20	100				S 15				
36D 37CS	9.60 - 9.70 9.70 - 10.00			NA				Stiff dark grey locally mottled orange slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium limestone and rare sandstone. (SLIP_LIAS) (SLIP)	9.45	176.60	
38D 39C	10.00 - 10.45 10.00 - 11.50	7.20	85				S 18	9.50 - 9.55m: One subangular coarse limestone gravel.			
40D	11.00 - 11.10							10.70 - 10.85m: Gravelly with abundant orange staining (up to 100mm) and one subangular limestone cobble.	11.15	174.90	
41C 42CS 43D	11.50 - 13.00 11.50 - 11.80 11.80 - 11.90	11.50	100					Stiff to very stiff locally thinly laminated greenish grey and greyish green silty CLAY with rare pockets (up to 3mm) of coarse orange sand. (Lias Group) (WHM)			
								12.10 - 12.15m: Dark grey clayey silt.			
44D 45C	12.80 - 12.90 13.00 - 14.50	11.50	100 0 0				H 95 C *122	Very stiff fissured thinly and thickly laminated dark grey and greenish grey silty CLAY locally tending to extremely weak mudstone. Fissures are 10deg very closely spaced undulating rough and 70deg planar smooth. (Lias Group) (WHM)	12.80	173.25	
46D 47CS	13.70 - 13.80 13.80 - 14.10							13.35 - 13.45m: Medium strong grey limestone with a subvertical planar rough fracture.			
48C 49D	14.50 - 16.00 14.70 - 14.80	11.50	100								
50D	15.40 - 15.50							Very stiff fissured locally thinly laminated greyish green CLAY. Fissures are 70deg to subvertical closely spaced undulating smooth with grey surfaces. (Lias Group) (WHM)	15.00	171.05	
51C	16.00 - 17.40	11.50					C *133	15.55 - 15.95m: Very stiff/extremely weak dark grey and greenish grey clay/mudstone. Fissures are 10deg very closely spaced undulating rough and 70deg planar smooth.			

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HOLE CONSTRUCTION				PLANT USED				WATER STRIKE			
TOP (m)		BASE (m)		TYPE		ROSE TO (m)		AFTER (min)		REMARKS	
9.10		25.00		Rotary Core		Geotechnical Pioneer Rig		Groundwater not encountered prior to use of flush			
CASING DEPTH				BACKFILL				INSTRUMENTATION			
DIAM (mm)		BASE (m)		TOP (m)		BASE (m)		DEPTH (m)		TYPE	
				14.50		15.50					
				15.50		25.00					
BARREL DIAMETER				HOLE PROGRESS				REMARKS			
DIAM (mm)		BASE (m)		DATE TIME		DEPTH (m)		CASING (m)		WATER (m)	
				01-08-2019 17:00		23.50		11.50		14.81	
				02-08-2019 08:00		23.50		11.50		15.12	
				02-08-2019 10:00		25.00		11.50		15.16	

SUB LOCATION:

1059



CONTRACT

35560

CHECKED

CT

BOREHOLE LOG



CP215

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 30 July 2019

Easting 392806

Scale 1:50

End Date 02 August 2019

Northing 215804

Ground Level 186.05mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
52CS	16.35 - 16.65		100 32 28					<p>Medium strong grey LIMESTONE with frequent brachiopod casts (up to 35mm) and shell fragments (up to 15mm). Fractures are 20deg and 40deg closely rarely medium spaced undulating rough stained orange locally infilled (2mm) with orange sand. (Lias Group) (MRB)</p> <p>16.95 - 17.20m: Randomly orientated closely spaced fractures with grey and orange clay infill (up to 30mm).</p> <p>17.20 - 17.40m: Subvertical undulating rough fracture with orange staining and grey silt infill (up to 3mm).</p> <p>17.40 - 17.55m: Weak with abundant shell fragments (up to 10mm).</p> <p>Very stiff fissured thinly and thickly laminated greenish brown mottled grey and rarely orange CLAY locally tending to extremely weak mudstone. Fissures are 10deg very closely spaced undulating rough and 70deg planar smooth. (Lias Group) (DYS)</p> <p>17.80 - 17.85m: Medium strong grey limestone.</p> <p>18.40 - 18.45m: Extremely weak orange sandstone.</p> <p>18.55 - 18.70m: Thinly laminated with rare thick laminae of orange sand.</p> <p>18.70 - 18.75m: Thinly laminated, grey with frequent thick laminae of orange sand.</p> <p>19.60 - 19.90m: Frequent thick laminae of orange sand.</p> <p>21.30 - 21.40m: Rare thick laminae of orange sand.</p> <p>Very stiff fissured dark grey CLAY locally tending to extremely weak mudstone. Fissures are 50deg very closely spaced planar smooth slightly polished. (Lias Group) (DYS)</p> <p>Medium strong grey LIMESTONE with frequent orange staining (up to 15mm). Single fracture 70deg to subvertical undulating rough with orange staining. (Lias Group) (DYS)</p> <p>23.00 - 23.25m: Weak, stained orange.</p> <p>23.50 - 23.60m: Dark grey mottled orange silty clay.</p> <p>Strong grey mottled dark grey LIMESTONE. Fractures are 10deg to 30deg closely spaced undulating rough. (Lias Group) (DYS)</p> <p>23.70 - 23.75m: Fracture infilled with dark grey clay (up to 15mm).</p> <p>23.90m: Fracture with orange penetrative staining (up to 20mm).</p>	16.75	169.30	
53C	17.40 - 18.90	11.50	100 5 0	NA			17.55		168.50		
54D	18.20 - 18.30										
55C	18.90 - 19.60	11.50	100				C 73				
56CS	19.35 - 19.60										
57C	19.60 - 21.00	11.50	100								
58D	19.70 - 19.80										
59D	20.70 - 20.80										
60C	21.00 - 22.00	11.50	100								
61CS	21.50 - 21.80										
62D	21.80 - 21.90										
63C	22.00 - 23.50	11.50	100 31 31	NA							
64D	22.80 - 22.90										
65C	23.50 - 25.00	11.50	100 92 89	NI 230 240 NI 140 150							

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HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
BARREL DIAMETER			HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		

CONTRACT

35560

CHECKED

CT

BOREHOLE LOG



CP215

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 30 July 2019

Easting 392806

Scale 1:50

End Date 02 August 2019

Northing 215804

Ground Level 186.05mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
66CS	24.20 - 24.50			120 200 650				Extremely weak thinly laminated dark grey mottled grey SILTSTONE. Fractures are 40-50deg medium to widely spaced undulating and stepped rough stained orange. (Lias Group) (DYS) 24.55 - 25.00m: Mottled orange with frequent orange staining (up to 50mm).			
		11.50				C *176		Borehole Completed at 25.00m	25.00	161.05	

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush													
TOP (m)		BASE (m)		TYPE		PLANT USED		DEPTH (m)		CASING (m)		ROSE TO (m)		AFTER (min)		REMARKS	
CASING DEPTH				BACKFILL				INSTRUMENTATION				SUB LOCATION:					
DIAM (mm)		BASE (m)		TOP (m)		BASE (m)		MATERIAL		DEPTH (m)		TYPE		1059			
BARREL DIAMETER				HOLE PROGRESS				REMARKS				CONTRACT					
DIAM (mm)		BASE (m)		DATE TIME		DEPTH (m)		CASING (m)		WATER (m)		35560					
												CHECKED					
												CT					

BOREHOLE LOG



CP216

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 24 May 2019

Easting 392833

Scale 1:50

End Date 29 May 2019

Northing 215701

Ground Level 173.50mOD

Depth 25.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp./core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50							Grass over soft yellowish brown slightly sandy silty CLAY with frequent rootlets. (SLIP) (SLIP)	0.50	173.00	X
2B 2ES	0.50 - 0.80							Firm light brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone and sandstone. Rare rootlets. (SLIP) (SLIP)	0.80	172.70	X
3B 3ES	0.80 - 1.20						Soft light brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine and medium bioclastic limestone. (SLIP) (SLIP)		1.30	172.20	X
4D 5L	1.20 - 1.65 1.20 - 2.20	Nil					S 5	Soft orangish brown mottled greenish grey slightly sandy CLAY. (SLIP) (SLIP)			
6D	1.65 - 1.75										
7D 8L	2.20 - 2.65 2.20 - 3.20	2.20					S 6				
								Firm light orangish brown slightly sandy gravelly CLAY with a low subangular bioclastic limestone cobble content. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	2.50	171.00	
10L 9D	3.20 - 4.20 3.20 - 3.65	3.20					S 8				
11D	3.65 - 3.75										
12D 13L	4.20 - 4.65 4.20 - 5.20	4.20					S 35				
14D 15L	5.20 - 5.65 5.20 - 6.20	5.20					S 11				
16D 17L 18D	6.20 - 6.65 6.20 - 7.20 6.45 - 6.55	6.20					S 15	Stiff orangish brown and grey slightly sandy gravelly silty CLAY. Gravel is subangular to rounded fine to coarse bioclastic limestone and sandstone. (SLIP) (SLIP)	5.65	167.85	
19D 20C 21D	7.20 - 7.65 7.20 - 8.20 7.20 - 7.40	7.20	100	NA			S 15	Stiff yellowish brown locally orangish brown slightly sandy slightly gravelly silty CLAY. Gravel is subrounded and rounded fine to coarse sandstone and oolitic limestone. (SLIP) (SLIP) 7.65 - 8.00m: Light grey mottled brownish orange clayey silt.	7.20	166.30	X

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Hand tools				
1.20	8.20	Window Sampler	Comacchio 305				
CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	1077	
168	8.20	0.00	0.50	7.00	Standpipe	AGS	
140	25.60	0.50	2.00				
		2.00	7.50			CONTRACT	
		7.50	15.00			35560	
BARREL DIAMETER		HOLE PROGRESS				REMARKS	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes reduced flush returns 8.20-9.10m and 12.10-25.60m (approx 60% returned).	
128	8.20	24-05-2019 14:00		Nil	Dry	CHECKED	
146	25.60	24-05-2019 17:00	3.20	3.20	1.00	CT	
		28-05-2019 08:15	3.20	3.20	Dry		
		28-05-2019 17:00	12.10	12.10	1.00		
		29-05-2019 08:00	12.10	12.10	3.00		

BOREHOLE LOG



CP216

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 24 May 2019

Easting 392833

Scale 1:50

End Date 29 May 2019

Northing 215701

Ground Level 173.50mOD

Depth 25.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend		
22D 23C	8.20 - 8.65 8.20 - 9.10	8.20	88				S 23	Stiff light brownish yellow slightly sandy gravelly CLAY. Gravel is subrounded and rounded fine to coarse limestone. (SLIP) (SLIP)	8.20	165.30			
24D	8.70 - 8.80											9.00	164.50
25C 26D	9.10 - 10.60 9.20 - 9.30	9.10	100									9.65	163.85
27CS	9.85 - 10.20												
28D	10.30 - 10.40												
29C	10.60 - 12.10	10.60	100										
30C	12.10 - 13.60	12.10	100										
31D	12.60 - 12.70												
32C	13.60 - 15.10	13.60	100 57 51	NI 47 100									
33C 34D	15.10 - 16.60 15.20 - 15.30	15.10	100 79 79	NA NI 480 530									
								11.60m: Lens of ferruginous mudstone (60mm thick).					
								Very stiff light grey silty CLAY locally tending to extremely weak mudstone. Medium spaced very thin and thin beds of extremely weak orangish brown fine sandstone and very closely spaced thick laminae of orange clayey silt. (Lias Group) (WHM)	12.50	161.00			
								13.95 - 14.10m: Extremely weak dark orangish brown and brownish red fine sandstone. Fractures are subhorizontal medium spaced undulating smooth.	14.10	159.40			
								Medium strong light grey calcareous MUDSTONE. Fractures are subhorizontal very closely and closely spaced undulating smooth. (Lias Group) (MRB) 14.10 - 14.60m: Subhorizontal to 20deg and subvertical very closely spaced intersecting fractures undulating rough weakened (up to 50mm) either side of fractures.	14.95	158.55			
								Very stiff dark grey slightly sandy clayey SILT with frequent lenses (up to 80mm) of orange silt. (Lias Group) (DYS)	15.45	158.05			
								Extremely weak dark grey SILTSTONE with frequent subvertical incipient fractures with up to 4mm of penetrative orange staining. Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (DYS)					

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE	Comacchio 305			Groundwater not encountered prior to use of flush						
8.20	25.60	Rotary Core				DEPTH (m) CASING (m) ROSE TO (m) AFTER (min)						
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077				
			15.00	25.60	Gravel							
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
			29-05-2019 17:00	25.60	25.60	3.00				CHECKED		
									CT			

BOREHOLE LOG



CP216

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 24 May 2019

Easting 392833

Scale 1:50

End Date 29 May 2019

Northing 215701

Ground Level 173.50mOD

Depth 25.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43C	24.10 - 25.60	24.10	100 78 62					Very weak dark grey SILTSTONE. No natural fractures observed. (Lias Group) (DYS) 24.30 - 24.50m: Very weak dark grey mudstone.	24.50	149.00	
			NI 30 80		Strong grey and dark grey LIMESTONE with frequent calcite veins (up to 25mm thick). Fractures are randomly orientated very closely and closely spaced undulating rough. (Lias Group) (DYS)		25.15	148.35			
			70 370		Extremely weak dark grey MUDSTONE. Fractures are 60deg medium and closely spaced stepped rough. (Lias Group) (DYS) 25.15m: Boundary inclined 80deg. <small>Borehole Completed at 25.60m</small>		25.60	147.90			

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1077			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	



CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 05 August 2019

Easting 392648

Scale 1:50

End Date 08 August 2019

Northing 215875

Ground Level 194.95mOD

Depth 33.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Brown slightly sandy silty subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a low subangular bioclastic limestone cobble content. Frequent rootlets and rare roots (up to 10mm diam). (TOP)	0.30	194.65	
1B	0.30 - 0.50										
2ES	0.30							0.00 - 0.05m: Dark brown silt with abundant rootlets. Soft orangish brown slightly sandy gravelly clayey SILT with frequent rootlets. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	1.00	193.95	
3ES	0.50										
2B	0.75 - 0.95							Soft brownish orange slightly sandy gravelly silty CLAY with rare rootlets. Gravel is subangular and subrounded fine to coarse bioclastic and rarely oolitic limestone. (SLIP) (SLIP) 1.45 - 1.60m: Becoming light brown.	1.60	193.35	
3B	1.00 - 1.25										
4ES	1.00										
4D	1.25 - 1.70	1.25					S 12	Loose brownish yellow clayey sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a low subangular bioclastic limestone cobble content. Rare rootlets. (SLIP) (SLIP)			
5L	1.25 - 2.20										
5ES	1.50										
6D	1.90 - 2.00										
7L	2.20 - 3.20	1.25			2.25		C 9				
8D	2.90 - 3.00							3.20m: Medium dense.			
9L	3.20 - 4.20	3.20					C 21				
10D	3.90 - 4.00										
11L	4.20 - 4.55	4.20					C 45	Dense light brown slightly clayey sandy subangular and subrounded fine to coarse bioclastic limestone GRAVEL. (SLIP) (SLIP) 4.00 - 4.20m: Subangular bioclastic limestone cobble.	3.90	191.05	
12C	4.55 - 5.20	4.20	100 23 23	NI 150						4.55	190.40
13C	5.20 - 6.20	4.20	100					Weak light brown bioclastic LIMESTONE locally subangular and subrounded fine to coarse gravel. Fractures are 60deg and randomly orientated stepped rough with orange staining. (SLIP) (SLIP) 5.10 - 5.20m: Soft dark grey mottled orange clayey silt.			
14D	5.70 - 5.80			NA						5.45	189.50
15CS	5.80 - 6.10							Firm fissured orangish brown mottled grey clayey SILT. Fissures are 10deg very closely spaced undulating rough stained red. (SLIP_LIAS) (SLIP)			
16D	6.20 - 6.65	4.20					S 14				
17L	6.20 - 7.20							Firm fissured locally thinly laminated dark brown mottled dark grey clayey SILT. Fissures are 20deg very closely spaced undulating rough. (SLIP_LIAS) (SLIP) 7.20m: Becoming stiff.	6.60	188.35	
18D	7.00 - 7.10										
19UT	7.20 - 7.65	7.20									
22L	7.20 - 8.20										
20D	7.65 - 7.75										
21D	7.75 - 7.80										
23D	8.00 - 8.10										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				REMARKS
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	
0.00	1.20	Inspection Pit	Hand Tools	2.25	1.25	2.25	20	
1.20	4.55	Windowless Sampler	Geotechnical Pioneer Rig					
4.55	6.20	Rotary Core	Geotechnical Pioneer Rig					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	10.15	0.00	0.50	Concrete	33.50	Inclinometer	992
		0.50	33.50	Grout			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
128	4.55	05-08-2019 12:00		Nil	Dry		
146	6.20	05-08-2019 16:40	6.20	4.20	2.25		
128	8.20	06-08-2019 08:30	6.20	4.20	2.25		
146	33.50	06-08-2019 16:50	16.10	7.20	0.70		
		07-08-2019 08:15	16.10	7.20	1.62		

AGS
35560
 CHECKED
CT

BOREHOLE LOG



CP217

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 05 August 2019

Easting 392648

Scale 1:50

End Date 08 August 2019

Northing 215875

Ground Level 194.95mOD

Depth 33.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24D 25C	8.20 - 8.65 8.20 - 9.20	7.20	96				S 24		8.85	186.10	
26D 27C	9.00 - 9.10 9.20 - 10.10	7.20	100				Firm fissured locally thinly laminated dark grey slightly gravelly clayey SILT. Gravel is subangular medium mudstone lithorelicts. Fissures are 10deg very closely spaced undulating rough. (SLIP_LIAS) (SLIP) 8.85 - 9.00m: Mottled orange. 9.35 - 9.50m: Soft dark grey and orange gravelly clay. Gravel is subrounded fine to coarse mudstone.	9.50	185.45		
28D 29D 30C	9.90 - 10.00 10.10 - 10.52 10.10 - 11.60	7.20	100 10 0				S *103	Very stiff fissured thinly laminated dark grey CLAY with frequent shell fragments (up to 5mm). Locally tending to extremely weak mudstone. Fissures are 10deg closely spaced undulating rough and 40deg closely spaced undulating rough slightly polished. (Lias Group) (WHM)	10.10	184.85	
31D 32CS	10.80 - 10.90 10.90 - 11.30							Very stiff fissured thinly laminated greenish grey mottled grey CLAY locally tending to extremely weak mudstone. Fissures are 20deg very closely spaced undulating rough and 60deg planar smooth slightly polished. Rare shell moulds and casts (up to 25mm). (Lias Group) (WHM)			
33C	11.60 - 13.10	7.20	100					11.20 - 11.30m: Weak dark grey mudstone. 11.45 - 11.50m: Weak dark grey mudstone. 12.00 - 12.05m: Weak dark grey mudstone.			
34CS 35C	12.80 - 13.10 13.10 - 14.60	7.20	96 55 43				C *200	Extremely weak thinly laminated greenish grey MUDSTONE locally tending to very stiff clay. Rare shell moulds and casts (up to 10mm). Fractures are 30deg closely spaced planar smooth and 50deg planar smooth with orange staining. (Lias Group) (WHM)	13.65	181.30	
36C	14.60 - 16.10	7.20	100 77 77	NI 140 180				Medium strong grey LIMESTONE with thin and thick beds of extremely weak thinly laminated dark grey mudstone. Rare shell moulds and casts (up to 20mm). Fractures are 60deg and 80deg closely and widely spaced undulating rough with orange staining. (Lias Group) (MRB) 15.15m: 20deg undulating rough fracture with rare orange staining.	14.60	180.35	
				NI 160 360				Extremely weak thinly laminated greenish grey and dark grey MUDSTONE with rare subhorizontal, 40deg and subvertical calcite veins (up to 3mm thick). Fractures are 50deg closely and medium spaced and 80deg undulating rough with rare red staining. (Lias Group) (DYS) 15.90m: 20deg planar rough fracture.	15.50	179.45	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
6.20	8.20	Windowless Sampler	Geotechnical Pioneer Rig					
8.20	33.50	Rotary Core	Geotechnical Pioneer Rig					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	992

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		07-08-2019 16:25	24.80	10.15	4.20		
		08-08-2019 08:15	24.80	10.15	5.67		CHECKED
		08-08-2019 16:20	33.50	10.15	3.75		CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 05 August 2019

Easting 392648

Scale 1:50

End Date 08 August 2019

Northing 215875

Ground Level 194.95mOD

Depth 33.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37C	16.10 - 17.30	7.20 10.15	98 88 88				C *194				
38CS	17.05 - 17.25			NI 50 200				Extremely weak thinly laminated brownish grey mottled grey MUDSTONE. Fractures are subvertical undulating smooth slightly polished, 20deg very closely spaced undulating smooth and 40deg closely spaced undulating rough. (Lias Group) (DYS)	16.90	178.05	
39C	17.30 - 18.80	10.15	100 63 31					Extremely weak thinly and thickly laminated dark grey and brownish grey MUDSTONE. Fractures are 60deg closely spaced and subvertical planar smooth. (Lias Group) (DYS)	17.85	177.10	
40C	18.80 - 20.30	10.15	100 71 47				C *128				
41CS	19.45 - 19.65			NI 150 200				Extremely weak thinly laminated brownish grey mottled dark grey MUDSTONE with frequent subhorizontal, 40deg and subvertical gypsum veins (up to 4mm thick). Fractures are 60deg closely spaced and subvertical planar rough. (Lias Group) (WHM) 19.65 - 19.85m: 20deg closely spaced planar rough fractures intersecting a 60deg fracture infilled with gypsum (up to 4mm). 20.30 - 20.45m: Medium strong grey limestone.	19.10	175.85	
42C	20.30 - 21.80	10.15	100 100 100						20.75	174.20	
43CS	21.10 - 21.55		140 340 450					Medium strong locally strong dark grey LIMESTONE with rare gypsum veins (up to 2mm thick). Fractures are 20deg medium spaced stepped rough. (Lias Group) (MRB) 21.00 - 21.10m: 50deg undulating rough incipient fracture with gypsum infill (up to 2mm).	21.85	173.10	
44C	21.80 - 23.30	10.15	100 100 100				C *316	Extremely weak thinly and thickly laminated greenish grey mottled grey and rarely orangish brown MUDSTONE. Rare gypsum veins (up to 2x15mm), thin laminae of grey silt and orange fine sand. Fractures are 50deg medium and widely spaced and subvertical undulating smooth with a grey clay infill (up to 2mm). (Lias Group) (DYS)			
45C	23.30 - 24.80	10.15	100 97 94								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		992			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560			
									CHECKED			
									CT			

BOREHOLE LOG



CP217

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 05 August 2019

Easting 392648

Scale 1:50

End Date 08 August 2019

Northing 215875

Ground Level 194.95mOD

Depth 33.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
46C	24.80 - 26.30	10.15	100 70 70				C *194		25.30	169.65	
47CS	25.60		120 130 450					Extremely weak thinly and thickly laminated brownish grey mottled dark grey MUDSTONE. Rare lenses (up to 2x6mm) and veins (up to 2mm thick) of gypsum. Fractures are 30deg and 60deg closely rarely medium spaced undulating rough. (Lias Group) (DYS)			
48C	26.30 - 27.80	10.15	100 91 85								
49CS	26.75 - 27.00							27.10 - 27.35m: Very weak.	27.35	167.60	
50C	27.80 - 29.30	10.15	100 83 74	NA			C *750	Strong grey and dark grey LIMESTONE. Fractures are 10deg closely spaced undulating rough stained orange and one 80deg undulating rough with up to 5mm red penetrative staining. (Lias Group) (DYS) 27.35 - 27.55m: Stained orange.	27.80	167.15	
51D	28.60 - 28.70							Very stiff thinly and thickly laminated orangish brown mottled dark grey and rarely red clayey SILT locally tending to extremely weak siltstone. (Lias Group) (DYS) 27.80m: Boundary inclined 70deg. 27.80 - 28.00m: Medium strong grey limestone. 28.15 - 28.35m: Very weak thinly laminated dark grey mottled dark brown mudstone.	28.85	166.10	
52C 53CS	29.30 - 30.80 29.30 - 29.50	10.15	80 65 65	100 230 250				28.35 - 28.45m: Strong dark grey limestone. 28.45 - 28.60m: Very weak thinly laminated dark grey mottled dark brown mudstone.	29.30	165.65	
54C	30.80 - 32.00	10.15	100 83 83	280 300 430				Extremely weak thinly laminated dark grey SILTSTONE with rare gypsum veins (up to 2x30mm). Fractures are 80deg planar rough stained red. (Lias Group) (DYS) Extremely weak thickly laminated dark grey SILTSTONE. Laminae inclined 60deg. Fractures are 50deg closely spaced undulating rough. (Lias Group) (DYS) 30.10 - 30.50m: Laminae are subhorizontal.	30.80	164.15	
55C	32.00 - 33.50	10.15					C *375				

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HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		992			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560			
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 5

Start Date 05 August 2019

Easting 392648

Scale 1:50

End Date 08 August 2019

Northing 215875

Ground Level 194.95mOD

Depth 33.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
56CS	32.95 - 33.25		100	NI 300 710				Very weak thinly and thickly laminated dark grey MUDSTONE with rare lenses (up to 2x10mm) of grey silt. Fractures are 70deg widely spaced undulating rough with grey clay infill (up to 2mm). (Lias Group) (DYS)	32.30	162.65	
			80						33.50	161.45	
Borehole Completed at 33.50m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



CP223

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 10 May 2019

Easting 392596

Scale 1:50

End Date 16 May 2019

Northing 215474

Ground Level 179.75mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50							Grass over firm light brown locally mottled orangish brown silty CLAY. Frequent rootlets. (SLIP) (SLIP)	0.20	179.55	X
2B 2ES	0.60 - 0.80							Firm orangish brown mottled light grey CLAY with rare pockets (up to 10mm) of light grey silt. (SLIP) (SLIP)			X
3B 3ES	1.00 - 1.20							Soft grey mottled brownish yellow CLAY. Frequent lenses (up to 30mm) of yellowish brown fine sand. (SLIP) (SLIP)	1.20	178.55	X
4D	1.20 - 1.65										X
5L	1.20 - 2.00									1.45	178.30
4ES	1.65 - 1.75							Firm becoming stiff fissured dark grey CLAY. Fissures are 20deg closely and medium spaced planar smooth. (SLIP) (SLIP)			X
6UT 8L	2.00 - 3.00										X
7D	2.45 - 2.50									X	
10L 9D	3.00 - 4.00							3.35m: Belemnite fragment (20mm).			X
	3.00 - 3.45										X
11D 12L	4.00 - 4.45							4.25 - 4.50m: Subrounded mudstone cobble recovered non intact.			X
	4.00 - 5.00										X
13D 14D 15C	4.85 - 4.95							Stiff indistinctly laminated dark grey CLAY. Frequent shell fragments (up to 10mm) and rare subrounded fine mudstone gravel. (SLIP) (SLIP)			X
	5.00 - 5.45										X
	5.00 - 6.00		100	NA					5.00 - 5.15m: Grey locally yellowish brown slightly sandy slightly gravelly clay.		
16D 17C	5.80 - 5.90							Very stiff indistinctly laminated dark grey CLAY. Rare shell fragments (up to 1mm). (SLIP) (SLIP)	5.55	174.20	X
	6.00 - 7.50								5.90 - 6.30m: Grey and brown slightly sandy clay. Frequent pockets (up to 4mm) of yellowish brown fine sand.		
18CS	7.10 - 7.40							Stiff greyish brown slightly sandy silty CLAY. Frequent pockets (up to 45mm) of yellowish brown fine sand, rare lenses and pockets of light grey silt (up to 2mm). (SLIP) (SLIP)	6.70	173.05	X
19C	7.50 - 9.00								6.75 - 6.85m: Subrounded mudstone cobble.		
								Stiff brown and grey slightly gravelly silty CLAY. Gravel is subrounded fine to coarse mudstone and limestone. Frequent pockets (up to 15mm) of yellowish brown fine sand. (SLIP) (SLIP)	7.50	172.25	X

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					Groundwater not encountered prior to use of flush
1.20	5.00	Window Sampler	Comacchio 305					
5.00	25.50	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	5.00		0.00	0.50	Concrete	22.60	Standpipe	1077
140	25.50		0.50	5.00	Bentonite			
			5.00	18.00	Grout			
			18.00	19.00	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes reduced flush returns 12.00-13.50m (approx 30% returned) and 13.50-15.00m (approx 10% returned) and loss of flush returns 15.00-25.50m.		35560
128	5.00	10-05-2019 11:00		Nil	Dry			CHECKED
146	25.50	10-05-2019 16:20	5.00	Nil	Dry			CT
		13-05-2019 13:15	5.00	Nil	Dry			
		13-05-2019 14:20	7.50	7.50	1.00			
		14-05-2019 14:50	7.50	7.50	1.00			

BOREHOLE LOG



CP223

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 10 May 2019

Easting 392596

Scale 1:50

End Date 16 May 2019

Northing 215474

Ground Level 179.75mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
20C	9.00 - 10.50	9.00	83								
21D	9.19 - 9.34										
22CS	9.99 - 10.30							Stiff and very stiff indistinctly laminated dark grey slightly gravelly silty CLAY. Gravel is subrounded fine and medium mudstone lithorelicts. (SLIP_LIAS) (SLIP)	9.60	170.15	
23C	10.50 - 12.00	10.50	93								
24CS	11.25 - 11.60										
25D	11.60 - 11.70										
26C	12.00 - 13.50	12.00	100					12.05m: Thin lamination of yellowish brown fine sand. 12.20m: Ammonite shell (40mm).	12.45	167.30	
27D	12.70 - 12.80							Stiff and very stiff light grey and dark grey slightly gravelly slightly sandy silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	13.05	166.70	
28D	13.30 - 13.40							Very stiff light brown mottled orangish grey slightly sandy silty CLAY. (SLIP) (SLIP)			
29C	13.50 - 15.00	13.50	100					13.05 - 13.15m: Stiff greenish brown mottled grey slightly sandy silty clay. 13.70 - 14.10m: Weak light brown fine sandstone			
								14.10 - 14.70m: Strong light grey limestone. Fractures are subvertical planar smooth.	14.70	165.05	
30C	15.00 - 16.50	15.00	93					Very stiff orangish brown slightly sandy silty CLAY locally tending to extremely weak mudstone. (SLIP) (SLIP)			
								Very stiff dark grey slightly sandy silty CLAY locally tending to extremely weak mudstone. (SLIP) (SLIP) 15.60 - 16.20m: Greyish brown. Frequent lenses of orange and yellowish brown sand.	15.60	164.15	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
		19.00	23.10	Gravel			
		23.10	25.50	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		14-05-2019 16:50	13.50	13.50	0.50		
		15-05-2019 09:10	13.50	13.50	0.50		
		15-05-2019 10:35	19.50	19.50	14.30		
		16-05-2019 09:10	19.50	19.50	14.30		
		16-05-2019 11:10	25.50	25.50	14.50		CHECKED
							CT

BOREHOLE LOG



CP223

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 10 May 2019

Easting 392596

Scale 1:50

End Date 16 May 2019

Northing 215474

Ground Level 179.75mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31D	16.30 - 16.40							Very stiff dark grey slightly sandy silty CLAY locally tending to extremely weak mudstone. (SLIP) (SLIP)			
32C	16.50 - 18.00	16.50	100					16.95m: Subrounded limestone cobble.			
33C	18.00 - 19.50	18.00	100 43 43					18.55m: 60deg planar smooth fissure. 18.75m: 60deg planar smooth fissure.			
34CS	18.98 - 19.28			250				Extremely weak indistinctly laminated dark grey and greenish brown MUDSTONE locally tending to slightly sandy silty clay. Fractures are subhorizontal medium spaced planar smooth. (Lias Group) (DYS)	18.85	160.90	
35C	19.50 - 21.00	19.50	99 90 50	NI 140 180				Extremely weak dark grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal closely spaced undulating rough with rare orange staining. (Lias Group) (DYS)	19.50	160.25	
								19.90 - 20.00m: 40deg undulating rough fracture. 20.60 - 20.70m: Subrounded limestone cobble.			
36C	21.00 - 22.50	21.00	93 87 63	60 80 90 70 330 430				Extremely weak dark grey mottled orange SILTSTONE. Fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS)	20.70	159.05	
								Extremely weak orange mottled grey fine and medium SANDSTONE. Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (DYS)	21.10	158.65	
37CS	21.75 - 22.00							21.10 - 21.20m: 30deg undulating rough fracture. 21.10 - 21.40m: Coarse gravel sized clasts of limestone and ironstone. 21.30 - 21.40m: 80deg undulating rough fracture stained grey. 21.40 - 21.50m: Very weak orange and grey sandstone gravel. 21.50 - 21.70m: Weak light grey limestone. 21.75 - 22.00m: Very weak orange and grey siltstone.			
38C	22.50 - 24.00	22.50	100 100 88	90 440 530				22.00 - 22.15m: Medium strong grey limestone. Very weak dark grey MUDSTONE. Fractures are subhorizontal medium spaced stepped rough. (Lias Group) (DYS)	22.60	157.15	
								23.10 - 23.30m: 50deg undulating rough fracture with rare orange staining. 23.30 - 23.40m: 50deg undulating rough fracture with rare orange staining. 23.50 - 23.60m: Grey concretion (90x110mm). 23.90m: Fracture with penetrative orange staining (up to 20mm).			
39C	24.00 - 25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP223

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 10 May 2019

Easting 392596

Scale 1:50

End Date 16 May 2019

Northing 215474

Ground Level 179.75mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
40CS	24.00 - 24.30		100 91 79					Weak dark grey MUDSTONE. Fractures are 60deg mainly closely spaced planar rough with orange and red staining and penetrative orange staining (up to 30mm). (Lias Group) (DYS)	24.40	155.35	
				NI 80 250					25.50	154.25	
Borehole Completed at 25.50m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	
						1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



CP230

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 05 June 2019

Easting 392858

Scale 1:50

End Date 10 June 2019

Northing 215672

Ground Level 180.70mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.20 - 0.30 0.20 - 0.30							Grass over firm brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.20	180.50	
2ES 3B	0.50 - 0.60 0.50 - 0.60							Firm light brown slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone and siltstone. Rare rootlets. (MG) (MGR)	0.45	180.25	
3ES 4B 5D 6L 7D 4ES	1.00 - 1.20 1.00 - 1.20 1.20 - 1.65 1.20 - 2.00 1.40 - 1.50 1.50 - 1.60	Nil				S 17		0.30 - 0.45m: Gravelly. Firm light orangish brown locally mottled grey slightly gravelly CLAY with rare pockets (up to 10mm) of orange silt. Gravel is subangular and subrounded fine and medium limestone. (SLIP) (SLIP)	1.20	179.50	
8D 9C	2.00 - 2.45 2.00 - 2.80	Nil 2.00	73	NA		S 16		Firm light orangish brown locally orange clayey SILT with rare pockets (up to 30mm) of yellow fine sand. (SLIP) (SLIP) Stiff orangish brown slightly gravelly slightly sandy silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	1.95	178.75	
10D 11C	2.80 - 3.25 2.80 - 4.00	2.00	83			S 18		1.30 - 1.40m: Bioclastic limestone cobble. Medium dense orangish brown slightly sandy clayey GRAVEL. Gravel is subangular and subrounded fine and medium bioclastic limestone. (SLIP) (SLIP)			
12C 23D	4.00 - 5.00 4.30 - 4.40	4.00	75					2.60 - 3.00m: Assessed zone of core loss. Strong yellowish brown bioclastic LIMESTONE. (SLIP) (SLIP)	3.70	177.00	
14C	5.00 - 6.50	4.00	39					3.70m: Boundary inclined 60deg. 3.70 - 3.80m: 60deg planar smooth fracture. Light brown slightly sandy slightly clayey subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a high subangular and subrounded bioclastic limestone cobble content. Fines probably washed away. (SLIP) (SLIP)	4.00	176.70	
15C 16D	6.50 - 7.50 6.80 - 6.90	5.50	50	NR				4.00m: Boundary inclined 60deg. 4.00 - 4.10m: Subangular coarse limestone gravel. 5.00 - 5.10m: Burrows infilled with orange sandstone (up to 30x40mm) within the gravel. 5.40 - 5.50m: Very sandy.			
17L 18D	7.50 - 9.00 8.00 - 8.10	7.50		NA				6.90 - 7.00m: Orange mottled light grey. Assessed zone of core loss. Firm dark brown mottled orangish brown and grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone. (SLIP) (SLIP)	6.70	174.00	
									7.00	173.70	
									7.50	173.20	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	2.00	Window Sampler	Geotechnical Pioneer Rig					
2.00	7.50	Rotary Core	Geotechnical Pioneer Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	12.00		0.00	0.50	Concrete	30.00	Inclinometer	1077
			0.50	30.00	Grout			
			30.00	35.00	Gravel			
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
128	2.00		05-06-2019 13:10	0.00	Nil	Dry		35560
146	7.50		05-06-2019 13:40	1.20	Nil	Dry		CHECKED
128	9.00		06-06-2019 09:30	1.20	Nil	Dry		CT
146	35.00		06-06-2019 17:20	15.00	12.00	2.80		
			07-06-2019 08:00	15.00	12.00	2.80		

BOREHOLE LOG



CP230

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 5

Start Date 05 June 2019

Easting 392858

Scale 1:50

End Date 10 June 2019

Northing 215672

Ground Level 180.70mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
19D	8.50 - 8.60			NA							
20C	9.00 - 10.50	9.00	100	NA				Stiff dark grey and greyish brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse bioclastic limestone and rare sandstone. (SLIP) (SLIP)	8.90	171.80	
21D	9.70 - 9.80			NA					10.05	170.65	
22C	10.50 - 12.00	9.00	100 13	NA				Very stiff dark grey and greenish grey slightly sandy silty CLAY. (SLIP) (SLIP) 10.15 - 10.40m: Very stiff greenish brown slightly sandy silty clay with a high subangular and subrounded limestone and sandstone cobble content.	10.85	169.85	
23D	10.90 - 11.00		0	NA				10.45 - 10.50m: Subrounded limestone cobble. Very stiff thickly laminated dark grey and greenish grey slightly sandy silty CLAY locally tending to extremely weak mudstone. Rare shell casts (up to 3mm). (SLIP_LIAS) (SLIP)	11.80	168.90	
24C	12.00 - 13.50	12.00	92 61 47	NI 220 310				Very weak thinly laminated dark brown and grey MUDSTONE. Bedding fractures are subhorizontal medium spaced undulating rough. (Lias Group) (WHM) 12.30 - 12.40m: 70deg undulating rough fracture. 13.10 - 13.20m: Strong light grey limestone.			
25C	13.50 - 15.00	12.00	100 23	NA				Very stiff thinly locally thickly laminated greenish grey mottled grey silty CLAY locally tending to extremely weak mudstone. (Lias Group) (WHM) 14.90 - 15.00m: Extremely weak greenish grey mottled grey and brown mudstone.	13.75	166.95	
26D	14.20 - 14.30							Medium strong dark grey LIMESTONE with rare calcite crystals (up to 25mm). Fracture set 1: Subhorizontal to 20deg closely spaced undulating rough rarely stained orange with brown silt infill (up to 2mm). Fracture set 2: 70deg to subvertical closely spaced undulating rough rarely stained orange. (Lias Group) (MRB)			
27C	15.00 - 16.50	12.00	100 53 0	NI 40 80				Medium strong light grey LIMESTONE with frequent calcite veins (up to 3mm thick) and shell casts (up to 25mm). Rare thick laminae of orange sandstone. Fractures are randomly orientated very closely spaced undulating rough with rare orange staining. (Lias Group) (MRB)	15.10	165.60	
									15.90	164.80	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
7.50	9.00	Window Sampler	Geotechnical Pioneer Rig				
9.00	35.00	Rotary Core	Geotechnical Pioneer Rig				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
		07-06-2019 17:15	32.00	12.00		5.30	CHECKED
		10-06-2019 08:35	32.00	12.00	5.30	CT	
		10-06-2019 11:00	35.00	12.00	14.80		

BOREHOLE LOG



CP230

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 05 June 2019

Easting 392858

Scale 1:50

End Date 10 June 2019

Northing 215672

Ground Level 180.70mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
28C	16.50 - 18.00	12.00	80 63 50	NI 40 70				Medium strong light grey LIMESTONE with frequent calcite veins (up to 3mm thick) and shell casts (up to 25mm). Rare thick laminae of orange sandstone. Fractures are randomly orientated very closely spaced undulating rough with rare orange staining. (Lias Group) (MRB) 16.10 - 16.15m: Grey rarely mottled brown silty clayey subangular and subrounded fine to coarse limestone gravel.	16.40	164.30	
				NI 130 200					17.05	163.65	
29C	18.00 - 19.50	12.00	100 100 60	NI 120 550				Extremely weak thickly laminated greenish grey mottled brown MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS) 16.40 - 16.45m: Stiff orange slightly sandy gravelly silty clay. Gravel is subangular and subrounded fine to coarse sandstone. 16.50 - 16.60m: Dark grey mottled greenish grey.	18.30	162.40	
				NI 240 550							
30CS	18.70 - 19.00							Extremely weak thinly laminated grey mottled greenish grey and orangish brown MUDSTONE locally tending to very stiff clay. Fractures are 70deg closely spaced undulating smooth. (Lias Group) (DYS) 18.05 - 18.30m: Dark grey with frequent lenses (up to 5x40mm) of light brown silt.			
31C	19.50 - 21.00	12.00	92 58 51	NI 150 600				Extremely weak to very weak thinly laminated greenish grey MUDSTONE locally tending to very stiff clay. Rare lenses of silt (up to 5x15mm) orange. Fractures are 70deg to subvertical closely spaced undulating smooth. (Lias Group) (DYS) 19.55 - 19.60m: 40deg planar rough fracture.	19.95	160.75	
				NI 180 280							
32CS	20.50 - 20.90							Extremely weak thinly laminated dark grey mottled dark brown MUDSTONE locally tending to very stiff grey clay. Rare lenses (up to 4x15mm) of orange silt and thick laminae of claystone. (Lias Group) (DYS) 20.05 - 20.25m: 70deg undulating smooth fracture.			
33C	21.00 - 22.50	12.00	100 89 76	NI 180 280				Very weak thinly laminated dark grey MUDSTONE with rare shell fragments (up to 4mm). Fracture set 1: subvertical closely spaced undulating rough. Fracture set 2: 20deg closely and medium spaced planar smooth with frequent orange staining. (Lias Group) (DYS) 22.45m: 20mm orange staining. 22.45 - 22.50m: Extremely weak dark grey mottled orange siltstone.	21.00	159.70	
				NI 50 150							
34C	22.50 - 24.00	12.00	100 95 81	NI 50 150				Weak dark grey and grey LIMESTONE with frequent shell fragments (up to 8mm). (Lias Group) (DYS) 22.55 - 22.70m: 40deg closely spaced stepped rough fracture with up to 4mm orange penetrative staining.	22.50	158.20	
				NI 220 330 540					22.85	157.85	
35CS	23.40 - 23.70							Extremely weak to very weak thinly laminated dark grey SILTSTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough with rare orange penetrative staining (up to 3mm). (Lias Group) (DYS) 23.50 - 23.70m: Extremely weak calcareous mudstone with abundant shell fragments (up to 4mm).			
36C	24.00 - 24.60	12.00									

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



CP230

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 5

Start Date 05 June 2019

Easting 392858

Scale 1:50

End Date 10 June 2019

Northing 215672

Ground Level 180.70mOD

Depth 35.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
46C	33.50 - 35.00	12.00	95 77 65	NI 160 220				Weak thinly laminated dark grey SILTSTONE with rare shell fragments (up to 4mm). Fractures are subhorizontal medium spaced planar smooth rarely infilled (up to 2mm) with grey silt. (Lias Group) (DYS) 32.00 - 32.25m: Tending to very stiff clay.	32.25	148.45	
			Very strong grey and dark grey LIMESTONE with rare shell moulds and casts (up to 5mm). Fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS) 32.55 - 32.70m: 60deg undulating rough fracture. 32.80 - 32.90m: Abundant shell fragments replaced with calcite (up to 7mm).					33.00	147.70		
			78 65 65	NI 190 200				Weak thinly laminated dark grey MUDSTONE. Fractures are subhorizontal closely spaced undulating smooth. (Lias Group) (DYS) 33.10 - 33.15m: 30deg planar smooth fracture. 33.40 - 33.50m: 50deg undulating rough fracture. 34.00 - 34.05m: 20deg planar smooth fracture. 34.20 - 35.00m: Subvertical planar rough fracture.	35.00	145.70	
Borehole Completed at 35.00m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush							
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS			

CASING DEPTH			BACKFILL				INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE			1077	

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
								CHECKED	
								CT	

BOREHOLE LOG



DSRC107

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 25 April 2019

Easting 393057

Scale 1:50

End Date 01 May 2019

Northing 215838

Ground Level 191.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 3ES 5B 6D 7D 8L	0.20 - 0.50 0.20 - 0.50 0.20 - 0.50 0.60 - 0.90 0.60 - 0.90 0.60 - 0.90 0.90 - 1.20 0.90 - 1.20 0.90 - 1.20 1.20 - 1.65 1.20 - 2.20							Grass over firm brown clayey SILT. Frequent rootlets. (MG) (MGR) Brown locally orangish brown slightly gravelly clayey fine and medium SAND. Gravel is subangular to rounded fine to coarse limestone, mudstone, sandstone and brick. (MG) (MGR) Greyish brown locally slightly clayey gravelly fine and medium SAND. Gravel is angular to subrounded fine to coarse limestone, brick, sandstone and bituminous material. (MG) (MGR)	0.10 0.55 0.90 1.20	191.80 191.35 191.00 190.70	
4ES 9D	1.80 - 1.90 1.90 - 2.00						S 29 Firm light brown slightly gravelly sandy CLAY. Gravel is angular and subangular fine to coarse limestone, concrete, mudstone, brick and bituminous material. (MG) (MGR)				
10D 11L	2.20 - 2.65 2.20 - 3.20	2.20					S 9 Loose to medium dense greyish yellow locally orangish yellow clayey very sandy angular to subrounded fine to coarse oolitic limestone GRAVEL. (SLIP) (SLIP) 1.70 - 1.75m: Subrounded limestone cobble. 2.10 - 2.20m: Subrounded limestone cobble.	2.60	189.30		
12D	2.90 - 3.00						S 6 Yellow slightly gravelly silty medium and coarse SAND. Gravel is subangular and subrounded fine and medium oolitic limestone. (SLIP) (SLIP)	3.00	188.90		
13D 14L	3.20 - 3.65 3.20 - 4.20	3.20					S 6 Yellow slightly sandy slightly silty subangular fine limestone GRAVEL. (SLIP) (SLIP)	3.20	188.70		
15D	3.60 - 3.70						S 5 Loose yellow locally greyish brown gravelly silty fine to coarse SAND. Gravel is subrounded and rounded fine to coarse limestone. (SLIP) (SLIP)	3.70	188.20		
16D 17L	4.20 - 4.65 4.20 - 5.20	4.20					S 5 Loose dark yellow slightly sandy slightly silty subangular and subrounded fine to coarse limestone GRAVEL. (SLIP) (SLIP)	4.90	187.00		
18D 19D 20L	5.10 - 5.20 5.20 - 5.65 5.20 - 6.20	5.20					S 15 Stiff greenish brown slightly sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP) 4.90 - 5.00m: Frequent pockets of grey silt (up to 30mm).				
21D 22L	6.00 - 6.10 6.20 - 7.20						S 20 Stiff bluish grey slightly sandy silty CLAY. (SLIP_LIAS) (SLIP) 6.10 - 6.50m: Dark greenish grey. 6.60 - 6.90m: Frequent pockets of light bluish grey fine sand (up to 40mm).	6.10	185.80		
23D 24D 25C	7.00 - 7.10 7.20 - 7.65 7.20 - 7.70	7.20	100	NA			S 20				
26D 27C 28D	7.60 - 7.70 7.70 - 9.20 7.90 - 8.00	7.70	82				S 20 Stiff becoming very stiff dark grey slightly sandy silty CLAY with frequent partings of light grey silt. (Lias Group) (WHM)	7.50	184.40		

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	7.20	Window Sampler	Comacchio 305					
7.20	30.20	Rotary Core	Comacchio 305					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	7.20	0.00	0.50	Concrete	5.50	Standpipe	
140	30.20	0.50	2.00	Bentonite			
		2.00	2.50	Sand			
		2.50	6.00	Gravel			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	7.20	25-04-2019 10:00	0.00	Nil	Dry		CHECKED
146	30.20	25-04-2019 10:20	1.20	Nil	Dry		CT
		29-04-2019 12:30	1.20	Nil	Dry		
		29-04-2019 17:00	4.20	4.20	1.00		
		30-04-2019 08:15	4.20	4.20	1.00		

BOREHOLE LOG



DSRC107

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 25 April 2019

Easting 393057

Scale 1:50

End Date 01 May 2019

Northing 215838

Ground Level 191.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29C	9.20 - 10.70	9.20	100					Stiff becoming very stiff dark grey slightly sandy silty CLAY with frequent partings of light grey silt. (Lias Group) (WHM)			
30D	9.50 - 9.60										
31CS	10.00 - 10.50							9.70 - 9.75m: Frequent subrounded fine and medium lithorelicts of siltstone.			
32C	10.70 - 12.20	10.70	97								
33D	11.00 - 11.10							11.40 - 11.90m: Frequent pyrite nodules (up to 30mm).			
34C	12.20 - 13.70	12.20	100					Very stiff dark grey slightly sandy locally silty CLAY. (Lias Group) (WHM)	12.00	179.90	
35CS	12.50 - 13.00							13.00 - 13.25m: Subvertical planar smooth incipient fissure.			
36D	13.40 - 13.50							13.50 - 13.70m: 60deg planar smooth incipient fissure.			
37C	13.70 - 15.20	13.70	100								
38D	14.50 - 14.60							14.70 - 14.75m: Frequent subrounded nodules of limestone (up to 25mm).			
39C	15.20 - 16.70	15.20	100					14.90 - 15.10m: Frequent white shell fragments (up to 1mm). 15.20 - 15.25m: Frequent subrounded limestone nodules (up to 20mm).			
40CS	15.95 - 16.30							15.60 - 15.70m: 50deg planar smooth fissure.			

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
		6.00	11.00	Bentonite			
		11.00	30.20	Gravel			

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
		30-04-2019 17:00	18.20	18.20	1.00			CHECKED	
		01-05-2019 08:30	18.20	18.20	2.00			CT	
		01-05-2019 17:00	30.20	30.20	2.00				

BOREHOLE LOG



DSRC107

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 25 April 2019

Easting 393057

Scale 1:50

End Date 01 May 2019

Northing 215838

Ground Level 191.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
41D	16.50 - 16.60							Very stiff dark grey slightly sandy locally silty CLAY. (Lias Group) (WHM)			
42C	16.70 - 18.20	16.70	99 20 10	NI 70 220 NA				16.30 - 16.60m: Abundant brownish grey limestone nodules (up to 30mm).	16.75	175.15	
43D	17.40 - 17.50							Very weak dark greenish grey MUDSTONE with frequent ammonite shells (up to 30mm). Fractures are subhorizontal to 20deg closely and medium spaced planar rough. (Lias Group) (WHM)	17.05	174.85	
								16.75 - 17.00m: 70deg planar smooth fracture. 17.00 - 17.05m: Subangular limestone cobble.			
44C	18.20 - 19.70	18.20	99					Very stiff dark grey CLAY locally tending to extremely weak mudstone. (Lias Group) (WHM)			
45CS	18.60 - 19.00							17.05 - 17.85m: Frequent white shell fragments (up to 40mm). 17.20 - 17.30m: 40deg planar rough fissure. 17.60 - 17.90m: 80deg to subvertical undulating smooth fissure.			
46D	19.20 - 19.30							18.30 - 18.45m: 80deg very closely spaced planar smooth fissures.			
47C	19.70 - 21.20	19.70	100					18.55 - 18.65m: Subrounded limestone cobble. 18.60 - 19.45m: Frequent 45deg very closely to closely spaced planar smooth incipient fissures. 19.05 - 19.15m: Subrounded limestone cobble. 19.45 - 19.60m: Subrounded limestone cobble with abundant calcite veins (up to 10mm wide). 19.80 - 19.90m: 70deg planar smooth fissure.			
48D	20.50 - 20.60										
49C	21.20 - 22.70	21.20	100					21.10 - 21.20m: 70deg planar smooth fissure. 21.20 - 21.90m: Frequent white shell fragments (up to 1mm).			
50D	22.00 - 22.10										
51CS	22.20 - 22.70										
52C	22.70 - 24.20	22.70	78					22.85 - 22.90m: Subrounded limestone cobble. 22.95 - 23.00m: Abundant pyrite crystals (up to 1mm).			
53D	23.50 - 23.60							23.65 - 23.70m: Subrounded limestone cobble.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC107

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 25 April 2019

Easting 393057

Scale 1:50

End Date 01 May 2019

Northing 215838

Ground Level 191.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
54C	24.20 - 25.70	24.20	100					Very stiff dark grey CLAY locally tending to extremely weak mudstone. (Lias Group) (WHM)			
55D	24.60 - 24.70							24.55 - 24.60m: 30deg planar smooth fissure.			
56C	25.70 - 27.20	25.70	97 81 79	NI 300 1000				Extremely weak dark grey MUDSTONE locally tending to very stiff dark grey clay. Fracture set 1: Subhorizontal to 10deg medium and widely spaced planar smooth. Fracture set 2: 50deg closely to widely spaced planar smooth. (Lias Group) (WHM)	25.80	166.10	
57CS	26.70 - 27.20							25.80 - 25.85m: Subrounded limestone cobble. 25.80 - 28.95m: 80deg planar smooth fracture. 26.10 - 26.70m: Fractures are 50deg closely spaced planar smooth.			
58C	27.20 - 28.70	27.20	90 67 60					26.25 - 26.50m: Frequent randomly orientated extremely closely and very closely spaced planar smooth incipient fractures. 27.40 - 28.70m: 3x 80deg medium spaced planar smooth fractures. 28.10 - 28.55m: 80deg planar smooth fracture.			
59C	28.70 - 30.20	28.70	100 93 93					28.95 - 29.10m: 80deg to subvertical planar smooth fracture.			
60CS	29.65 - 29.95							29.95 - 30.05m: Disintegrated to very stiff dark grey gravelly clay. Gravel is angular fine to coarse mudstone lithorelicts.	30.20	161.70	
Borehole Completed at 30.20m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
							CHECKED	
							CT	

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 7

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2ES	0.10 - 0.20 0.10 0.30							Grass over soft brown silty CLAY. (MG) (MGR)	0.10 0.20	193.50 193.40	
2B 3ES	0.50 - 0.70 0.50							Yellowish brown slightly sandy gravelly SILT with abundant rootlets and roots (up to 3mm diam). Gravel is angular to subrounded fine to coarse limestone. (MG) (MGR)			
3B 4ES 4D 5L	1.00 - 1.20 1.00 1.20 - 1.65 1.20 - 2.20	Nil					S 4	Loose to very loose yellowish brown silty sandy angular to subrounded fine to coarse limestone, terracotta, tarmacadam and glass GRAVEL with a medium to high angular and subangular limestone, ceramic and tarmacadam cobble content. (MG) (MGR)	1.45	192.15	
6D 5ES	1.70 - 1.80 1.80 - 1.90							Soft orangish brown slightly sandy gravelly CLAY. Gravel is angular and subangular fine and medium oolitic limestone and dark grey limestone. (MG) (MGR)			
7D 8L	2.20 - 2.65 2.20 - 3.20	2.20					S 4	1.45 - 1.70m: Dark brown and dark grey. 2.20 - 2.30m: Frequent charcoal fragments (up to 20mm). 2.30 - 2.50m: Sandy.			
9D 6ES	2.60 - 2.70 2.70 - 2.80										
10D 11L	3.20 - 3.65 3.20 - 4.20	3.20			3.20		S 5	Yellowish brown sandy clayey subangular and subrounded fine to coarse limestone GRAVEL. (MG) (MGR)	3.10	190.50	
7ES 12D	3.70 - 3.80 3.80 - 3.90							Soft greenish grey locally mottled yellowish brown and orangish brown silty CLAY. (MG) (MGR)			
13D 14L	4.20 - 4.65 4.20 - 5.20	4.20					S 15	3.40m: Subangular siltstone gravel. 3.60 - 3.70m: Mottled orangish brown. 3.70 - 4.00m: Indistinctly fissured with frequent gleyed relict rootlets and partings of grey silt. 4.00 - 4.10m: Dark orangish brown. Frequent fragments (up to 20mm) of subrounded brick.	4.20	189.40	
15D 8ES	4.70 - 4.80 4.80 - 4.90							Firm to stiff yellowish brown locally orangish brown, grey and greyish brown clayey SILT. (SLIP_LIAS) (SLIP)			
16L 17UT	5.20 - 6.00 5.20 - 5.65							4.80m: 10deg planar smooth fissure.			
18D	5.65 - 5.70										
19D 20C	6.00 - 6.42 6.00 - 7.00	6.00	95	NA			S *56	Very stiff fissured grey locally greyish brown silty CLAY with frequent pockets of grey silt (up to 40mm). Fissures are randomly orientated very closely spaced planar smooth with orangish brown penetrative staining (up to 20mm). (SLIP_LIAS) (SLIP)	5.65	187.95	
21D	6.50 - 6.60										
22C	7.00 - 7.50	7.00	100								
23D 24C	7.40 - 7.50 7.50 - 9.00	7.50	89					7.30m: 30mm nodule of dark reddish orange ferruginous sandstone.			

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HOLE CONSTRUCTION				WATER STRIKE				REMARKS
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	
0.00	1.20	Inspection Pit	Hand tools	3.20	2.20	2.40	20	
1.20	6.00	Window Sampler	Comacchio 305					
6.00	49.50	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	6.00		0.00	5.00	Grout	16.00	Standpipe	1077
140	49.50		5.00	8.00	Bentonite			
			8.00	8.50	Sand			
			8.50	16.40	Gravel			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
128	6.00	15-04-2019 12:00	0.00	Nil	Dry			35560
146	49.50	15-04-2019 13:00	1.20	Nil	Dry			CHECKED
		16-04-2019 08:15	1.20	Nil	Dry			
		16-04-2019 17:00	10.50	10.50	1.00			
		17-04-2019 08:10	10.50	10.50	2.40			CT

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 7

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25D	8.40 - 8.50							Very stiff fissured grey locally greyish brown silty CLAY with frequent pockets of grey silt (up to 40mm). Fissures are randomly orientated very closely spaced planar smooth with orangish brown penetrative staining (up to 20mm). (SLIP_LIAS) (SLIP) 8.15 - 8.20m: Light grey subrounded siltstone cobble.	8.50	185.10	
26D	8.80 - 8.90										
27C	9.00 - 10.50	9.00	100					Very stiff dark bluish grey locally sandy silty CLAY with frequent lenses and pockets of light grey silt (up to 40mm). (Lias Group) (WHM) 9.15 - 9.20m: Subrounded limestone cobble. 9.85 - 10.10m: Frequent thin laminae of grey silt.			
28D	10.00 - 10.10										
29C	10.50 - 12.00	10.50	100					10.60 - 10.75m: 45deg planar smooth fissure. 11.10m: Thin lamination of extremely weak siltstone. 11.30m: Thick lamination of grey clay with frequent nodules of pyrite (up to 5mm). 11.70 - 11.80m: Rounded medium strong limestone cobble.			
30D	10.90 - 11.00										
31D	11.90 - 12.00	12.00	100					12.30 - 12.35m: Rare pyrite nodules (up to 5mm). 12.45 - 12.50m: Subrounded limestone cobble.			
32C	12.00 - 13.50										
33D	12.80 - 12.90							12.90 - 13.25m: Frequent thin and thick laminae of extremely weak light grey siltstone. 13.25m: Thick lamination of abundant pyrite.	13.30	180.30	
34C	13.50 - 15.00	13.50	99								
35D	13.90 - 14.00							Very stiff dark grey slightly sandy silty CLAY locally tending to very weak mudstone. (Lias Group) (WHM) 13.65 - 13.70m: 20deg planar smooth fissure. 14.80 - 14.85m: 10deg planar smooth fissure. 14.95 - 15.00m: 20deg planar smooth fissure.			
36CS	14.20 - 14.60										
37D	14.90 - 15.00	15.00	100								
38C	15.00 - 16.50										
39CS	15.50 - 15.95										

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HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH				BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
			16.40	20.00	Bentonite			
			20.00	49.50	Sand			CONTRACT
BARREL DIAMETER		HOLE PROGRESS			REMARKS			35560
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			CHECKED
		17-04-2019 17:30	30.00	30.00	2.00			CT
		18-04-2019 11:15	30.00	30.00	2.60			
		18-04-2019 17:00	37.50	37.50	2.00			
		23-04-2019 09:00	37.50	37.50	2.60			
		23-04-2019 16:00	49.50	49.50	2.00			

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 7

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
40C	16.50 - 18.00	16.50	97 82 79	NI				Very stiff dark grey slightly sandy silty CLAY locally tending to very weak mudstone. (Lias Group) (WHM)	16.25	177.35	
								16.00m: Thick lamination of siltstone.	16.40	177.20	
								Medium strong light grey LIMESTONE. (Lias Group) (WHM)			
41C	18.00 - 19.50	18.00	100 100 85					16.30m: Subhorizontal planar rough fracture.			
								Extremely weak and very weak dark grey and light grey MUDSTONE locally tending to very stiff silty clay. Frequent shells and shell fragments (up to 50mm). (Lias Group) (WHM)	17.00	176.60	
								Extremely weak dark grey MUDSTONE locally tending to very stiff dark grey silty clay. Fractures are subhorizontal to 10deg very closely to medium spaced planar smooth. (Lias Group) (WHM)			
42CS	18.80 - 19.25		60 500 600					17.35 - 17.40m: 30deg planar smooth fracture.			
								17.65m: Shell fragment (40mm).			
								18.50 - 18.55m: Subrounded limestone cobble.	18.60	175.00	
43C	19.50 - 21.00	19.50	100 87 59					Very weak dark grey MUDSTONE with frequent shell fragments (up to 10mm) locally tending to very stiff dark grey clay. Fracture set 1: Subhorizontal to 20deg closely and medium spaced planar smooth. Fracture set 2: 30deg medium and widely spaced planar smooth. (Lias Group) (WHM)			
								18.80 - 19.20m: Frequent shells (up to 20mm) and subrounded phosphate nodules (up to 70mm).			
								19.75 - 19.80m: 30deg planar smooth fracture.			
44C	21.00 - 22.50	21.00	100 100 97					19.90 - 19.95m: 30deg planar smooth fracture.			
								20.30 - 20.40m: 70 to 80deg undulating smooth fracture.			
								20.65 - 20.75m: Medium strong grey limestone cobble with abundant light greyish green calcite veins (up to 60mm).			
45C 46CS	22.50 - 24.00 22.55 - 23.00	22.50	100 98 98					21.20m: Thin lamination of weak grey limestone.			
								22.85 - 23.15m: 80deg to subvertical planar smooth incipient fracture.			
								23.10 - 23.15m: 40deg planar smooth fracture.			
47C	24.00 - 25.50	24.00	60 170 500					23.15 - 23.25m: 60deg planar smooth fracture intersecting a subrounded limestone nodule (40mm).			
								23.35 - 23.40m: Subrounded limestone cobble.			
								Extremely weak dark grey MUDSTONE with frequent pyrite seams (up to 15mm) and nodules (up to 10mm) and limestone nodules (up to 40mm) locally tending to very stiff dark grey clay. Fracture set 1 are subhorizontal to 10deg closely and medium spaced planar smooth. Fracture set 2 are 70deg planar smooth incipient fractures probably medium and widely spaced. (Lias Group) (WHM)	23.50	170.10	
								23.95m: Belemnite fossil (20mm diam.).			

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HOLE CONSTRUCTION			PLANT USED			WATER STRIKE				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1077	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560
										CHECKED
										CT

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 7

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
48C	25.50 - 27.00	25.50	100 79 79					Extremely weak dark grey MUDSTONE with frequent pyrite seams (up to 15mm) and nodules (up to 10mm) and limestone nodules (up to 40mm) locally tending to very stiff dark grey clay. Fracture set 1 are subhorizontal to 10deg closely and medium spaced planar smooth. Fracture set 2 are 70deg planar smooth incipient fractures probably medium and widely spaced. (Lias Group) (WHM) 24.60 - 24.65m: Subangular limestone cobble. 25.30 - 25.50m: Subvertical planar smooth fracture. 26.25 - 26.40m: 60deg undulating smooth fracture. 26.65 - 26.85m: 60deg planar smooth fracture.			
			85 79 76								
49C	27.00 - 28.50	27.00	100 90 85	100 280 550				Extremely weak dark grey MUDSTONE with frequent white shell fragments (up to 20mm) locally tending to and disintegrating to very stiff dark grey clay. Fracture set 1 are subhorizontal to 20deg closely to widely spaced planar smooth. Fracture set 2 are 50deg medium spaced planar smooth. (Lias Group) (WHM) 27.25 - 27.35m: 50deg planar smooth fracture. 27.40 - 27.50m: Gravelly with a subangular limestone cobble. Gravel is subangular fine and medium limestone. Recovered non-intact. 29.20 - 29.25m: 40deg planar smooth fracture.	27.00	166.60	
50C	28.50 - 30.00	28.50	100 98 89								
51C	30.00 - 31.50	30.00	100 93 87					Extremely weak dark grey MUDSTONE locally tending to very stiff dark grey clay. Fractures are subhorizontal to 10deg medium and widely spaced planar rough and stepped rough. Incipient fractures are subhorizontal to 10deg extremely closely and very closely spaced planar smooth. (Lias Group) (WHM) 31.50 - 32.10m: Frequent subrounded limestone nodules (up to 60mm). 31.90 - 32.05m: Frequent pyrite nodules (up to 60mm).	30.80	162.80	
52C	31.50 - 33.00	31.50	100 88 88	320 350 710							

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 7

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
53C	33.00 - 34.50	33.00	100 84 65	NI 110 250				Extremely weak dark grey MUDSTONE locally tending to very stiff dark grey clay. Fractures are subhorizontal to 10deg medium and widely spaced planar rough and stepped rough. Incipient fractures are subhorizontal to 10deg extremely closely and very closely spaced planar smooth. (Lias Group) (WHM) 32.35 - 32.75m: 80deg to subvertical stepped rough fracture.	32.90	160.70	
54C	34.50 - 36.00	34.50	87 69 63	NI 130 270				Extremely weak dark grey MUDSTONE. Fracture set 1 are subhorizontal to 10deg very closely to medium spaced planar smooth. Fracture set 2 are 60 to 80deg very closely and closely spaced undulating smooth. Incipient fractures are subhorizontal extremely closely to very closely spaced planar smooth. (Lias Group) (WHM) Extremely weak dark grey MUDSTONE. Fractures are 20deg to 30deg closely and medium spaced planar rough. Incipient fractures are subhorizontal extremely closely and very closely spaced planar smooth. (Lias Group) (WHM) 34.95 - 35.15m: 70deg planar smooth fracture. 35.35m: Thick lamination of light grey limestone. 35.50 - 35.60m: Fractures are randomly orientated extremely closely and very closely spaced planar smooth. Recovered non-intact.	34.15	159.45	
55C	36.00 - 37.50	36.00	95 91 91	60 260 290				Extremely weak thin and thickly laminated dark grey MUDSTONE. Fractures are subhorizontal to 10deg closely and medium spaced planar rough. (Lias Group) (WHM)	36.10	157.50	
56C	37.50 - 39.00	37.50	100 100 100	90 300 520				Very weak to weak thinly laminated to very thinly bedded dark grey MUDSTONE with frequent light brown siltstone and silt pockets (up to 50mm). Fractures are subhorizontal to 10deg closely and medium spaced planar rough and smooth. (Lias Group) (WHM) 37.30 - 37.45m: Subvertical planar rough fracture. 37.70 - 37.75m: Thin lamination of siltstone with frequent sand sized pyrite.	36.90	156.70	
57CS	38.50 - 39.00										
58C	39.00 - 40.50	39.00	99 94 90					Extremely weak thinly laminated to very thinly bedded dark grey MUDSTONE with frequent pockets of light brown siltstone and silt (up to 40mm). Fractures are subhorizontal to 20deg closely and medium spaced planar smooth and rough. (Lias Group) (WHM)	39.90	153.70	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC108

CLIENT HIGHWAYS ENGLAND

Sheet 6 of 7

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 15 April 2019

Easting 393083

Scale 1:50

End Date 23 April 2019

Northing 215863

Ground Level 193.60mOD

Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
59C	40.50 - 42.00	40.50	100 91 90					Extremely weak thinly laminated to very thinly bedded dark grey MUDSTONE with frequent pockets of light brown siltstone and silt (up to 40mm). Fractures are subhorizontal to 20deg closely and medium spaced planar smooth and rough. (Lias Group) (WHM) 40.05 - 40.50m: Very closely spaced 80deg undulating smooth fractures. 40.80 - 41.00m: 80deg planar smooth fracture truncated by 2x 20deg closely spaced planar smooth fractures.			
60CS	41.45 - 41.85										
61C	42.00 - 43.50	42.00	100 100 100					42.00 - 42.20m: 80deg planar smooth fracture.			
62C	43.50 - 45.00	43.50	100 100 100								
63C	45.00 - 46.50	45.00	98					Extremely weak and very weak dark grey MUDSTONE. Fractures are subhorizontal to 20deg closely to widely spaced planar smooth. (Lias Group) (WHM) 44.45 - 45.00m: Frequent subrounded siltstone pockets (up to 30mm).	44.45	149.15	
64CS	45.20 - 45.60		98 85					45.90m: Thin lamination of abundant sand sized pyrite. 45.90 - 45.95m: 30deg planar rough fracture.			
65C	46.50 - 48.00	46.50	100 100 95					46.30 - 46.40m: 30deg planar rough fracture. 46.70 - 46.80m: 40deg planar smooth fracture.			
66CS	47.30 - 47.85							47.20 - 47.25m: 30deg planar smooth fracture.			
67C	48.00 - 49.50	48.00									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1077			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 7 of 7

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 15 April 2019 Easting 393083

End Date 23 April 2019 Northing 215863 Ground Level 193.60mOD Depth 49.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
68CS	48.30 - 48.75		97 97 97					Extremely weak and very weak dark grey MUDSTONE. Fractures are subhorizontal to 20deg closely to widely spaced planar smooth. (Lias Group) (WHM) 48.30 - 48.35m: Abundant pyrite nodules (up to 20mm).	49.50	144.10	
Borehole Completed at 49.50m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1077
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 14

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10 - 0.20							Grass over brown slightly sandy slightly gravelly SILT. Gravel is subangular and subrounded fine and medium limestone. Frequent rootlets. (TOP)	0.25	232.75	XXXXXX
2ES	0.30 - 0.40										XXXXXX
1B 3ES	0.50 - 0.70 0.50 - 0.60										XXXXXX
2B 4ES 3D 4L	1.00 - 1.20 1.00 - 1.10 1.20 - 1.65 1.20 - 2.20	Nil					S 39	Soft becoming firm light brown slightly sandy gravelly CLAY with a low subrounded limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (HDD) (HEAD)	1.20	231.80	XXXXXX
5C	2.20 - 3.20	Nil	100 75 36	NI 100 290			C *71	Dense light brown clayey very sandy subangular and subrounded fine to coarse limestone GRAVEL with a low subrounded limestone cobble content. (IOG) (BLPL)	2.45	230.55	XXXXXX
6CS	2.70 - 2.95							Weak becoming medium strong light yellowish brown locally peloidal bioclastic LIMESTONE locally disintegrated to dark yellowish brown clayey gravel. Fractures are subhorizontal to 20deg and randomly orientated closely and medium spaced planar and undulating rough. (IOG) (BLPL)			XXXXXX
7C	3.20 - 4.20	3.20	96 48 13				C *214				
8C	4.20 - 5.20	4.20	82 32 17				C *128				XXXXXX
9CS	4.90 - 5.50										XXXXXX
10C	5.20 - 6.50	5.20	88 67 32				C *109				XXXXXX
11C	6.50 - 8.00	6.50	78 28 15								XXXXXX
12C	8.00 - 9.50	8.00					C *750				XXXXXX

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	2.20	Window Sampler	Comacchio 305					
2.20	105.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106
168	8.00		0.00	1.00	Concrete	20.50	Standpipe	
140	43.40		1.00	2.50	Bentonite			
140	105.00		2.50	21.00	Gravel			
			21.00	105.00	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes reduced flush returns 55.10-62.60m (30-40% returned) and loss of flush 76.00-105.00m. Conventional rotary coring terminated at 76.00m and borehole continued by wireline rotary coring		35560
128	2.20	09-09-2019 09:00	0.00	Nil	Dry			CHECKED
146	46.10	09-09-2019 17:00	3.20	3.20	0.50			
116	76.00	10-09-2019 09:00	3.20	3.20	1.10			
146	105.00	10-09-2019 17:00	12.50	8.00	12.20			
		11-09-2019 08:30	12.50	8.00	12.20			CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 2 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13CS	8.70 - 9.00		100 58 50								
14C	9.50 - 11.00	8.00	99 85 61								
15C	11.00 - 12.50	8.00	100 90 75	NI 300 390			C *600	Weak to medium strong light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough. (IOG) (BLPL)	11.00	222.00	
16CS	11.50 - 11.90										
17C	12.50 - 14.00	8.00	91 87 85	250 280 380				12.10 - 12.20m: Subhorizontal fracture infilled with clay, surfaces weakened (up to 20mm from surface), recovered non intact. Medium strong light yellowish brown and orange bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough stained orange, surfaces weakened (up to 20mm from surface). (IOG) (BLPL)	12.50	220.50	
18CS	13.20 - 13.60										
19C	14.00 - 14.50	8.00	80 70 70				C **				
20C	14.50 - 15.50	8.00	100 100 96	NI 300 630				Medium strong light grey and light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough stained light orangish brown. Frequent voids (up to 20mm diam). (IOG) (BLPL) 14.50 - 14.70m: Grey bioclastic limestone. 15.35 - 15.50m: Grey bioclastic limestone.	14.50	218.50	
21C	15.50 - 17.00	8.00	95 88 81								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS methods. Break in drilling 24-30/10/19 awaiting rig with wireline capability. Due to deviation of hole from vertical, first wireline rotary core run advanced 75.50-77.00m (presented as	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		11-09-2019 17:45	25.60	8.00	23.30		CHECKED CT
		12-09-2019 08:20	25.60	8.00	25.30		
		12-09-2019 17:15	39.10	8.00	24.80		
		13-09-2019 08:40	39.10	8.00	25.20		
		13-09-2019 16:30	46.10	8.00	24.20		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 3 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22C	17.00 - 18.50	8.00	100 67 61	600		C 50		Medium strong grey argillaceous bioclastic LIMESTONE. (IOG) (BLPL)	16.55	216.45	
				17.00m: Tending to very weak.				17.15	215.85		
22CS	18.20 - 18.50	8.00	95 88 88	250		C *600		Medium strong light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough stained light orangish brown. Frequent voids (up to 20mm diam). Rare shell fragments (up to 70mm). (IOG) (BLPL)	18.25	214.75	
23CS	18.20 - 18.50			NI				18.75	214.25		
24C	18.50 - 20.00			250				600	18.75	214.25	
25CS	19.60 - 20.00	8.00	95 73 73	800		C *600		Medium strong light grey and light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough stained light orangish brown. Frequent burrows (up to 20mm diam). Rare shell fragments (up to 70mm). (IOG) (BLPL)	20.00	213.00	
26C	20.00 - 21.10			800				20.00	213.00		
27C	21.10 - 22.60	8.00	100 30 30	NA				Weak to medium strong light grey bioclastic LIMESTONE. No fractures observed. (IOG) (BLPL)	20.95	212.05	
28CS	22.15 - 22.55	8.00	90 13 13	NA				Very stiff/extremely weak dark grey silty CLAY/MUDSTONE with frequent thin laminae of light grey silt. (Lias Group) (BDS)	22.15	210.85	
29C	22.60 - 24.10	8.00	90 13 13	NA				Weak grey SILTSTONE. No fractures observed. (Lias Group) (BDS)	22.60	210.40	
								Very dense poorly cemented orangish brown slightly sandy SILT. Frequent thin laminae of dark orangish brown silt. (Lias Group) (BDS)	23.40	209.60	
								Very stiff/extremely weak thinly laminated dark grey silty CLAY/MUDSTONE with frequent thin laminae of light grey silt. (Lias Group) (BDS)	23.75	209.25	
								Extremely weak thinly laminated grey SILTSTONE. Dark reddish brown staining and veins (5mm). (Lias Group) (BDS)			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1106	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	76.00-77.00m on log).			35560
			16-09-2019 09:30	46.10	8.00	24.20				CHECKED
			16-09-2019 17:20	46.10	44.40	12.70				CT
			17-09-2019 12:20	46.10	44.40	21.60				
			17-09-2019 16:20	49.10	43.40	9.00				
			18-09-2019 08:45	49.10	43.40	11.25				

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 14

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
30C 31CS	24.10 - 25.60 24.10 - 24.30	8.00	100 13 13	200 NA				Extremely weak thinly laminated grey SILTSTONE. Dark reddish brown staining and veins (5mm). (Lias Group) (BDS) 24.10m: PLT suggests weak. Poorly cemented dark yellowish brown slightly sandy SILT with frequent thin laminae of dark orangish brown silt. (Lias Group) (BDS)	24.30	208.70	XXXXXX XXXXXX XXXXXX
				NI				Extremely weak grey SILTSTONE. with frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal to 10deg and randomly orientated very closely and closely spaced planar smooth. Rare trace fossils (up to 10mm) infilled with grey silt. (Lias Group) (BDS) 25.10 - 26.00m: Subvertical planar and undulating rough stained orangish brown fracture. 25.15 - 25.60m: Light grey.	24.80	208.20	XXXXXX XXXXXX XXXXXX
32C	25.60 - 27.10	8.00	97 0 0			C *462		26.75 - 27.25m: Light grey.			XXXXXX XXXXXX XXXXXX
33C 34CS	27.10 - 28.60 27.25 - 27.45	8.00	98 0 0								XXXXXX XXXXXX XXXXXX
35C	28.60 - 30.10	8.00	99 0 0			C *353					XXXXXX XXXXXX XXXXXX
36C	30.10 - 31.60	8.00	100 20 20								XXXXXX XXXXXX XXXXXX
37CS	31.00 - 31.30							31.00m: PLT suggests weak.			XXXXXX XXXXXX XXXXXX
38C	31.60 - 33.10	8.00	100 0 0			C *353					XXXXXX XXXXXX XXXXXX

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		18-09-2019 16:15	55.10	43.40	16.90		CHECKED CT
		19-09-2019 08:30	55.10	43.40	25.60		
		19-09-2019 17:00	62.00	43.40	15.10		
		20-09-2019 08:30	62.00	43.40	19.20		
		20-09-2019 16:30	67.40	43.30	12.20		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 14

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
46C	40.10 - 41.60	8.00	84 65 55				C *462	Extremely weak and very weak thinly laminated dark grey MUDSTONE locally disintegrated to very stiff clay. Fractures are subhorizontal to 20deg medium spaced planar smooth. (Lias Group) (WHM)			
47CS	40.75 - 41.10										
48C	41.60 - 43.10	8.00	100 100 100					42.85 - 43.10m: Subvertical undulating rough fracture.			
49C	43.10 - 44.60	8.00	100 87 87				C *316				
50CS	43.60 - 43.90										
51C	44.60 - 46.10	8.00	100 93 93					Strong light grey LIMESTONE. (Lias Group) (WHM)			
52CS	45.90 - 46.10										
53C	46.10 - 47.60	43.40	100 80 80	350					46.30	186.70	
				NI 190 300				Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Locally disintegrated to friable dark grey silty clay. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)	46.55	186.45	
54C	47.10 - 47.60	43.40	100 100 86								
55C	47.60 - 49.10	43.40	96 81 81				C *286				

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		29-10-2019 16:50	76.00	67.90	22.87		CHECKED CT
		30-10-2019 09:05	76.00	76.00	24.42		
		30-10-2019 17:05	79.50	77.00	22.11		
		31-10-2019 08:00	79.50	77.00	25.19		
		31-10-2019 16:55	88.50	87.30	19.72		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 7 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 09 September 2019 Easting 393208

Depth 105.00 m

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
56CS	48.15 - 48.50										
57C	49.10 - 50.60	43.40	92 83 83	NI 650 800				Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg widely spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)	48.85	184.15	
58CS	50.00 - 50.35							50.10m: PLT suggests extremely weak.			
59C	50.60 - 52.10	43.40	97 85 85				C **				
60C	52.10 - 53.60	43.40	100 100 100								
61CS	52.95 - 53.15										
62C	53.60 - 55.10	43.40	98 90 90				C *353	54.75m: Bivalve fragment (50mm).			
63C	55.10 - 56.60	43.40	100 87 80								
64CS	55.75 - 56.05										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1106
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			01-11-2019 07:50	88.50	88.50	24.98	
			01-11-2019 13:15	92.00	92.00	23.46	
			04-11-2019 09:45	92.00	92.00	26.90	
			04-11-2019 16:00	95.00	95.00	26.90	
			05-11-2019 10:30	95.00	95.00	30.21	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 14

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
65C	56.60 - 58.10	43.40	100 100 90				C *600	Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg widely spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)			
66C	58.10 - 59.60	43.40	84 77 77					58.30m: Bivalve shell fragment (25mm).			
67CS	58.45 - 58.70								58.95	174.05	
				NI 135 250				Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)			
68C	59.60 - 61.10	43.40	100 100 83				C *500	59.30 - 59.40m: Shell fragments (up to 15mm).			
69C	61.10 - 62.00	43.30	100 92 71					61.55 - 61.80m: Subvertical planar smooth fracture.			
70C	62.00 - 62.90	43.30	100 100 99					61.95 - 62.00m: Thin bed of fine sandstone with calcite. 62.00 - 70.00m: Rare greenish grey mottling.			
71C	62.90 - 64.40	43.30	100 99 99				C *353				
72CS	63.45 - 63.75			NI 200 550				63.30 - 63.50m: Subvertical planar smooth fracture.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		05-11-2019 15:50	99.50	99.50	31.90		CHECKED
		06-11-2019 08:40	99.50	99.50	31.98		
		06-11-2019 16:00	104.00	104.00	32.72		
		07-11-2019 07:50	104.00	104.00	33.80		
		07-11-2019 11:00	105.00	33.00	34.61	CT	

BOREHOLE LOG



DSRC109

CLIENT HIGHWAYS ENGLAND

Sheet 9 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
73C	64.40 - 65.90	43.30	93 89 89					Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM) 64.15m: Belemnite rimmed by calcite (15mm diam). 64.50 - 64.80m: Frequent shell fragments (up to 10mm). 65.50 - 65.65m: Frequent shell fragments (up to 10mm).			
74C	65.90 - 67.40	43.30	100 87 57				C *462	66.30 - 66.60m: Subvertical planar smooth fracture.			
75CS	66.70 - 66.95							67.00 - 67.15m: Subvertical planar smooth fracture.			
76C	67.40 - 68.50	43.30	79 59 59	NI 80 160				67.40 - 71.70m: Fractures are closely spaced.			
77C	68.50 - 70.00	43.60	100 91 91				C *136	69.30 - 69.35m: Frequent shell fragments (up to 5mm).			
78CS	69.70 - 69.95							71.10 - 71.50m: Disintegrated to clay.			
79C	70.00 - 71.50	43.60	99 73 73					71.50 - 73.00m: Rare greenish grey mottling.			
80C	71.50 - 73.00	43.60	100 93 93	NI 215			C *500				
81CS	72.00 - 72.15										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 10 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
82C	73.00 - 74.50	43.60	100 100 83	300				Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM) 72.15 - 72.25m: Frequent shell fragments (up to 5mm). 73.00 - 73.15m: Subvertical undulating smooth fracture.			
83C	74.50 - 76.00	43.60	90 78 78			↓ C *375		73.75 - 73.85m: Subvertical undulating smooth fracture. 73.85 - 73.95m: Bivalve fragments (up to 20mm). 74.65m: Ammonite (10mm diam). 75.15m: Ammonite (20mm diam). 75.25m: Ammonite (20mm diam).			
84CS	75.55 - 75.70			NI 300 440							
85C	76.00 - 77.00	76.00	100 100 89								
86C	77.00 - 78.50	77.00	100 89 85			↓ C *545		77.45 - 77.55m: Subvertical planar smooth fracture.			
87CS	77.87 - 78.31										
88C	78.50 - 79.50	78.50	100 100 80					78.30 - 81.50m: Rare shell fragments (up to 5mm). 78.90 - 79.30m: Subvertical planar smooth fracture.			
89C	79.50 - 80.00	79.50	100 100 70								
90C	80.00 - 81.50	80.00				C *500					

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1106	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
									CHECKED	
									CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 11 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 09 September 2019 Easting 393208

Depth 105.00 m

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
91CS	80.38 - 80.80		100 88 72					Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)			
92C	81.50 - 83.00	81.50	100 95 73					82.05 - 82.20m: Subvertical planar smooth fracture.			
93CS	82.46 - 82.78										
94C	83.00 - 84.50	83.00	98 67 49				C *270				
95C	84.50 - 86.00	84.50	100 100 89	35 350 600				84.50 - 92.00m: Rare shell fragments (up to 5mm).			
96CS	85.10 - 85.41										
97C	86.00 - 87.50	86.00	100 85 85				C *545				
98C	87.50 - 88.50	87.50	100 100 71					87.87m: Thin band (20mm) of yellowish grey pyrite.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 12 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
99CS 100C	88.40 - 89.00 88.50 - 89.00	88.50	100 100 100					Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)			
101C	89.00 - 90.50	89.00	100 85 85			↓ C *545					
102C 103C S	90.50 - 92.00 90.71 - 91.13	90.50	100 100 90								
104C	92.00 - 93.50	92.00	93 71 68	35 260 520		↓ C *545	92.00 - 95.00m: Rare shell fragments (up to 5mm).				
105C S	92.93 - 93.20										
106C	93.50 - 95.00	93.50	97 97 97				94.15 - 94.20m: Rare spots (up to 2mm) of yellowish grey pyrite.				
107C	95.00 - 96.50	95.00	100 100 83	65 300 450		↓ C *333					

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 13 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
108C	96.50 - 98.00	96.50	96 96 91					Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg closely and medium spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)			
109C S	97.02 - 97.34						97.50 - 97.55m: 30-40deg undulating smooth fracture.				
110C	98.00 - 99.50	98.00	97 95 70	45 350 810			C *182	Very weak to weak thinly laminated dark grey MUDSTONE with frequent thin beds of siltstone. Fractures are subhorizontal to 20deg medium and widely spaced planar smooth. Frequent thin laminae and lenses of light grey silt. (Lias Group) (WHM)	98.00	135.00	
111C S	98.30 - 98.63										
112C	99.50 - 101.00	99.50	100 97 82					99.25 - 99.35m: 20-40deg closely spaced planar smooth fractures.			
113C	101.00 - 102.50	101.00	100 97 88				C *240				
114C S	101.60 - 101.88										
115C	102.50 - 104.00	102.50	100 100 100								
		104.00					C *250				

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 14 of 14

Start Date 09 September 2019 Easting 393208

Scale 1:50

End Date 07 November 2019 Northing 215995 Ground Level 233.00mOD

Depth 105.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
116C	104.00 - 105.00		84 81 73								
117C S	104.40 - 104.60										
		105.00					C *222	Borehole Completed at 105.00m	105.00	128.00	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 16

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.06 - 0.30		100					MADE GROUND comprising black TARMACADAM. (MG)	0.06	239.94	
2ES 3B 4D 4DES	0.30 - 0.50							Light orangish brown and dark brown sandy clayey angular and subangular fine to coarse limestone GRAVEL with a low angular and subangular limestone cobble content. (MG) (MGR)	0.30	239.70	
3ES 5B 6D	0.60 - 0.75							Light orangish brown slightly clayey sandy angular and subangular fine to coarse limestone GRAVEL with a high angular and subangular limestone cobble content. (IOG) (BLPL)			
7B 8D 10C 9D	1.00 - 1.10	Nil	100				S 45	1.10m: Dense.			
11C	1.70 - 3.20	1.10	87 18 8	NI				Medium strong and strong light grey oolitic LIMESTONE bound by sparry calcite matrix with frequent randomly orientated calcite veins (up to 10mm thick) recovered non intact. Fractures are probably randomly orientated very closely spaced intersecting undulating rough stained dark orangish brown. (IOG) (BLPL)	1.40	238.60	
				NI				Weak and medium strong light brownish grey oolitic LIMESTONE bound by a sparry calcite matrix with abundant black flecks (up to 1mm) and frequent randomly orientated light grey calcite veins (up to 5mm thick) recovered non-intact. Fractures are probably randomly orientated very closely spaced intersecting undulating rough stained dark brownish orange. (IOG) (BLPL)	2.30	237.70	
12C	3.20 - 4.70	3.20	91 23 18	NI 60 100				Very weak light yellowish grey oolitic LIMESTONE with abundant black flecks (up to 1mm) and frequent 30deg to 60deg light grey calcite veins (up to 7mm thick). Fractures set 1: subhorizontal and 30deg very closely and closely spaced undulating rough stained brownish orange. Fracture set 2: 70deg and subvertical undulating rough stained brownish orange with subhorizontal slickensides. (IOG) (BLPL)	2.95	237.05	
									4.00	236.00	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	0.06	Rotary Core	Comacchio 305					
0.06	1.10	Inspection Pit	Hand tools					
1.10	60.20	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	987
140	60.20		0.00	0.50	Concrete	34.50	Standpipe	
			0.50	5.00	Grout			
			5.00	12.00	Gravel			
			12.00	22.00	Grout			
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Down hole geophysical survey undertaken 03/04/19 prior to backfilling borehole. Driller notes loss of flush returns 1.10-60.20m.	35560	
146	60.20	27-03-2019 11:20	0.00	Nil	Dry		CHECKED	
		27-03-2019 15:50	4.70	4.70	4.58		CT	
		28-03-2019 09:10	4.70	4.70	4.45			
		28-03-2019 16:15	22.70	22.70	17.79			
		29-03-2019 08:45	22.70	22.70	22.18			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 16

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13C	4.70 - 6.20	4.70	85 12 12	NI				Very weak light brownish grey oolitic LIMESTONE with abundant black flecks (up to 1mm), rare shell fragments (up to 5mm) and rare dark grey calcite veins (up to 6mm thick) recovered non intact. Fractures are probably randomly orientated extremely closely and very closely spaced intersecting undulating rough stained light brownish orange infilled (2mm) with light brownish orange clayey fine and medium sand. (IOG) (BLPL)	4.70	235.30	
									Weak light brownish grey LIMESTONE with abundant black flecks (up to 1mm) and rare shell fragments (up to 5mm). Fractures are randomly orientated very closely and extremely closely spaced intersecting undulating rough infilled (2mm) with light brownish orange clayey fine and medium sand. (IOG) (BLPL)	5.30	
14C	6.20 - 7.70	6.20	100 38 25	NI 40 140				Medium strong light grey oolitic LIMESTONE bound by a sparry calcite cement with abundant black flecks (up to 1mm), frequent shell fragments (up to 5mm) and rare voids (up to 50mm). Fracture set 1: subhorizontal very closely to medium spaced undulating rough stained orangish brown intersected by fracture set 2. Fracture set 2: 80deg and subvertical undulating rough stained dark orangish brown with subhorizontal slickensides on fracture surface. (IOG) (BLPL)	6.60	233.40	
									Weak light greyish yellow oolitic LIMESTONE with abundant shell fragments (up to 5mm), frequent black flecks (up to 1mm) and rare veins of white calcite (up to 3mm thick). Fractures are 20deg very closely and closely spaced undulating rough stained orangish brown. (IOG) (BLPL) 6.70 - 6.90m: 70deg undulating rough fracture stained orangish brown.	7.10	
15C	7.70 - 9.20	7.70	100 17 0					Weak light greyish yellow oolitic LIMESTONE with abundant shell fragments (up to 5mm), frequent black flecks (up to 1mm) and rare veins of white calcite (up to 15mm thick). Fractures are randomly orientated very closely and closely spaced undulating rough stained orangish brown strength reduced to extremely weak (up to 20mm) either side of fracture. (IOG) (BLPL)			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION: 987
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
		22.00	23.00	Bentonite			
		23.00	34.70	Gravel			
		34.70	45.00	Bentonite			
		45.00	60.20	Gravel			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		29-03-2019 15:30	39.20	39.20	31.82		CHECKED CT
		01-04-2019 08:45	39.20	39.20	31.73		
		01-04-2019 16:15	52.70	52.70	30.81		
		02-04-2019 08:45	52.70	52.70	31.11		
		02-04-2019 12:45	60.20	60.20	30.95		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 3 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C	9.20 - 10.70	9.20	100 29 24								
17C	10.70 - 12.20	10.70	100 53 26	NI 90 250				<p>Very weak light orangish brown bioclastic LIMESTONE. Fracture set 1: subhorizontal to 20deg closely and medium spaced undulating rough stained orangish brown. Fracture set 2: 70deg to subvertical undulating rough stained orangish brown. (IOG) (BLPL)</p> <p>10.90 - 10.95m: 40deg intersecting fractures infilled with clay (2mm) with strength reduced to extremely weak (up to 15mm) either side of fracture surface.</p> <p>11.45 - 11.50m: Light brown sandy clay infill. 11.50 - 11.55m: Extremely weak highly fractured limestone recovered as angular claybound gravel. 11.80 - 11.90m: 30deg undulating rough fractures with extremely weak highly fractured limestone recovered as angular claybound gravel. 11.95 - 12.05m: Frequent shell fragments (up to 40mm) infilled with white calcite.</p>	10.60	229.40	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 16

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
18C	12.20 - 13.70	12.20	100 83 68	NI 120 250				Weak light yellowish grey bioclastic LIMESTONE with abundant voids (up to 100mm) infilled with brownish orange clay. Fractures are subhorizontal closely and medium spaced undulating rough stained light brownish orange. (IOG) (BLPL) 12.50 - 12.65m: 50deg undulating smooth fracture stained brownish orange. 13.30 - 13.35m: 40deg stepped rough fracture intersected by subhorizontal undulating rough fracture with strength reduced to extremely weak (up to 25mm) either side of fracture surface. 13.50 - 13.70m: 80deg undulating rough fracture stained brownish orange.	12.20	227.80	
19C	13.70 - 15.20	13.70	91 24 0	NI 50 80				Very weak light yellowish grey LIMESTONE locally disintegrated to extremely weak light greyish orange limestone with abundant voids (up to 80mm). Fracture set 1: subhorizontal and 30deg very closely spaced undulating rough stained greyish brown. Fracture set 2: 70deg to subvertical stepped rough stained greyish brown strength reduced to extremely weak (up to 20mm) either side of fracture surface. (IOG) (BLPL) 14.75 - 15.30m: Recovered non intact. Probably highly fractured.	13.80	226.20	
20C	15.20 - 16.70	15.20	100 45 33	NI 140 350				15.50 - 15.70m: Subvertical white calcite vein (up to 8mm). Very weak greyish yellow and light grey bioclastic LIMESTONE locally disintegrated to extremely weak light greyish orange limestone with abundant voids (up to 40mm). Fractures are subhorizontal and 20deg closely and medium spaced undulating rough infilled (2mm) with brownish orange clay. (IOG) (BLPL) 15.90m: 20deg light grey undulating calcite vein (up to 7mm).	15.70	224.30	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 987
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 5 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	16.70 - 18.20	16.70	95 77 73					Very weak greyish yellow and light grey bioclastic LIMESTONE locally disintegrated to extremely weak light greyish orange limestone with abundant voids (up to 40mm). Fractures are subhorizontal and 20deg closely and medium spaced undulating rough infilled (2mm) with brownish orange clay. (IOG) (BLPL) 16.00 - 16.50m: Subvertical stepped rough fracture stained orangish brown. 16.30 - 16.50m: Subvertical white calcite vein (up to 6mm). 17.40 - 17.70m: 70deg planar rough fracture.			
22C	18.20 - 19.70	18.20	60 12 11					18.20 - 18.45m: 70deg planar rough fracture.			
				NI 90 200				Weak light grey oolitic LIMESTONE with abundant pisoids (up to 15mm). Fractures are subhorizontal closely spaced undulating rough. (IOG) (BLPL) 19.10 - 19.70m: Assessed zone of core loss.	18.60	221.40	
23C	19.70 - 21.20	19.70	79 40 35					19.85 - 19.95m: 70deg fracture undulating rough stained orangish brown along surface of light grey calcite vein.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 6 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	21.20 - 22.70	21.20	49 18 14	NI 50 80				Weak light grey oolitic LIMESTONE with abundant pisoids (up to 15mm). Fractures are subhorizontal closely spaced undulating smooth stained dark orangish brown. (IOG) (BLPL) 20.10 - 20.30m: 80deg undulating rough fracture stained orangish brown with 20deg slickensides on surface.	20.10	219.90	
				NI 70 200				Weak to medium strong locally disintegrated to very weak light brownish grey bioclastic LIMESTONE with abundant voids (up to 90mm) and frequent subvertical white calcite veins (up to 15mm thick). Fractures are subhorizontal to 30deg closely spaced undulating rough infilled (2mm) with brownish orange clay with strength reduced (up to 30mm) either side of fracture surface. (IOG) (BLPL) 21.40 - 21.70m: Subvertical undulating rough fracture stained light brownish orange. 21.70 - 22.20m: Recovered non intact. Probably highly fractured. 21.95 - 22.70m: Assessed zone of core loss.	21.20	218.80	
25C	22.70 - 24.20	22.70	90 53 35					22.85 - 22.90m: 40deg undulating rough fractures stained light brownish orange.			
								23.20 - 23.40m: 70deg undulating rough fracture stained orangish brown.			
								23.90 - 24.20m: Recovered non intact. Probably highly fractured.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 7 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26C	24.20 - 25.70	24.20	100	NI 140 250				Weak to medium strong locally disintegrated to very weak light brownish grey bioclastic LIMESTONE with abundant voids (up to 90mm) and frequent subvertical white calcite veins (up to 15mm thick). Fractures are subhorizontal to 30deg closely spaced undulating rough infilled (2mm) with brownish orange clay with strength reduced (up to 30mm) either side of fracture surface. (IOG) (BLPL) 24.20 - 24.30m: 80deg undulating rough fracture stained orangish brown. 24.35 - 24.60m: 80deg undulating rough fracture stained orangish brown.	24.60	215.40	
			75 75								
27C	25.70 - 27.20	25.70	73	NI 90 290				Weak to medium strong light brownish grey bioclastic LIMESTONE with rare voids (up to 30mm), frequent subvertical white calcite veins (up to 15mm thick) Fractures are subhorizontal to 30deg closely and medium spaced undulating rough infilled (2mm) with brownish orange clay with strength reduced (up to 15mm) either side of fracture surface. (IOG) (BLPL) 25.25 - 25.40m: Recovered non intact Probably highly fractured. 25.45 - 25.60m: Intersecting 40deg and 70deg undulating rough fractures stained orangish brown. 25.70 - 26.00m: Recovered non intact. Probably highly fractured.	26.00	214.00	
			25 19								
28C	27.20 - 28.70	27.20	75	NA				Very weak and weak yellowish grey bioclastic LIMESTONE with a subvertical light grey calcite vein (25mm thick). Fractures are subhorizontal very closely to medium spaced undulating rough infilled (2mm) with orangish brown clay. (IOG) (BLPL) 26.00 - 26.10m: Stiff light brown slightly gravelly sandy clay. Gravel is angular fine and medium limestone. 26.10 - 26.20m: Recovered non intact. Probably highly fractured. 26.20 - 26.55m: Subvertical and 80deg undulating incipient fracture. 26.50 - 26.80m: Recovered non intact. Probably highly fractured.	27.20	212.80	
			37 35								
									Continued Next Page		

HOLE CONSTRUCTION			WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	REMARKS		
			Groundwater not encountered prior to use of flush				
			ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m) TYPE		
						987	
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
							CHECKED
							CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 8 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29C	28.70 - 30.20	28.70	83 74 70	NI 110 400				Weak and medium strong light yellowish grey LIMESTONE with rare voids (up to 60mm). Fractures are subhorizontal and 20deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL)	28.20	211.80	
30C	30.20 - 31.70	30.20	70 53 35	NI 45 130				Weak light yellowish grey LIMESTONE with frequent voids (up to 30mm). Fractures are subhorizontal and 20deg very closely and closely spaced undulating rough stained orangish brown. (IOG) (BLPL)	29.50	210.50	
31CS	31.15							30.90 - 31.15m: Subvertical and 70deg light grey calcite vein (up to 30mm thick).			
32C	31.70 - 33.20	31.70	60 5 0	NI				Weak to medium strong highly fractured light brownish grey bioclastic LIMESTONE with rare ooids (up to 1mm) recovered non-intact. Probably highly fractured. (IOG) (BLPL) 31.30 - 31.70m: Assessed zone of core loss.	31.20	208.80	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 9 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:25

Start Date 27 March 2019

Easting 393441

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	33.20 - 34.70	33.20	40 0 0					Weak to medium strong highly fractured light brownish grey bioclastic LIMESTONE with rare ooids (up to 1mm) recovered non-intact. Probably highly fractured. (IOG) (BLPL) 32.00 - 32.60m: Assessed zone of core loss. Driller notes probable voids. 32.60 - 32.95m: Subvertical and 50deg undulating rough stained dark orangish brown.			
				NR				NO RECOVERY. Assessed zone of core loss, driller notes possible voids.	33.80	206.20	
34C	34.70 - 36.20	34.70	100	NA					34.70	205.30	
35D	34.80 - 34.90										
						H 140			35.10	204.90	
36D	35.40 - 35.50							Very stiff fissured dark grey clayey SILT with extremely closely spaced thin laminae of light grey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS) 35.35 - 35.38m: Light grey silt.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 16

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37C	36.20 - 37.70	36.20	97 42 41					Very stiff fissured dark grey clayey SILT with extremely closely spaced thin laminae of light grey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS) 36.20 - 36.30m: Very stiff silty clay. 36.45 - 36.55m: Very closely spaced thinly bedded grey silt.			
38CS	36.65 - 37.05							Very weak to weak light grey SILTSTONE. Fractures are subhorizontal medium spaced undulating smooth. (Lias Group) (BDS)	36.65	203.35	
				220 250 320							
				NA				Very stiff fissured dark grey clayey SILT with very closely spaced thin laminae of light grey silt. Fissures are randomly orientated very closely spaced. (Lias Group) (BDS)	37.30	202.70	
39C 40D	37.70 - 39.20 37.70 - 37.80	37.70	100								
				NA				Fissured dark grey SILT locally very stiff clayey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS)	38.10	201.90	
41C	39.20 - 40.70	39.20	97								
42D	40.00 - 40.10										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43C	40.70 - 42.20	40.70	100								XXXXXX
44C	42.20 - 43.70	42.20	100	NA				Fissured dark grey SILT with extremely closely spaced thin laminae of grey silty clay and light grey silt. Fissures are subhorizontal to 20deg closely spaced undulating smooth. (Lias Group) (BDS)	42.30	197.70	XXXXXX
45C	43.70 - 45.20	43.70	100								XXXXXX

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 12 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
46D	44.70 - 44.80			NA				Very stiff fissured dark grey clayey SILT with closely spaced thin laminae of light grey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS) 45.10 - 45.25m: Rare subangular and subrounded fine light grey siltstone gravel. Very stiff fissured grey clayey SILT with extremely closely spaced thin laminae of light grey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS)	44.70	195.30	
47C	45.20 - 46.70	45.20	97	NA			45.25		194.75		
48C	46.70 - 48.20	46.70	100								
49D	48.00 - 48.10										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		987	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
									CHECKED	
									CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 13 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
50C	48.20 - 49.70	48.20	100					Very stiff fissured grey clayey SILT with extremely closely spaced thin laminae of light grey silt. Fissures are randomly orientated extremely closely and very closely spaced. (Lias Group) (BDS)			
								49.20 - 49.35m: Locally very stiff clayey silt.			
51C	49.70 - 51.20	49.70	100								
52C	51.20 - 52.70	51.20	100	NA				Very stiff grey clayey SILT with extremely closely spaced thin laminae of light grey silt and dark grey silty clay. (Lias Group) (BDS)	51.20	188.80	
				NA				Grey SILT with extremely closely spaced thin laminae of light grey silt. (Lias Group) (BDS)	51.60	188.40	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 14 of 16

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
53C	52.70 - 54.20	52.70	99					Grey SILT with extremely closely spaced thin laminae of light grey silt. (Lias Group) (BDS)			
				NA				52.90 - 53.10m: Rare subangular and subrounded fine siltstone gravel.	53.50	186.50	
54C	54.20 - 55.70	54.20	100					Very stiff fissured light grey clayey SILT locally tending to silt. Fissures are subhorizontal to 20deg closely spaced undulating smooth. (Lias Group) (BDS)			
				NA				53.80 - 53.90m: Extremely closely spaced thin laminae of grey silt.	54.60	185.40	
55C	55.70 - 57.20	55.70	99					Very stiff grey clayey SILT with extremely closely spaced thin laminae of light grey silt. (Lias Group) (BDS)			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE		PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 15 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 March 2019

Easting 393441

Scale 1:25

End Date 02 April 2019

Northing 216054

Ground Level 240.00mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
56C	57.20 - 58.70	57.20	100					Very stiff grey clayey SILT with extremely closely spaced thinly laminae of light grey silt. (Lias Group) (BDS)			
57C	58.70 - 60.20	58.70	100					58.75m: Very closely spaced very thin beds of light grey silt. 59.80 - 60.10m: Rare angular and subangular fine and medium siltstone gravel.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)				BACKFILL TOP (m) BASE (m) MATERIAL				INSTRUMENTATION DEPTH (m) TYPE				SUB LOCATION: 987 	
BARREL DIAMETER DIAM (mm) BASE (m)				HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS				CONTRACT 35560 CHECKED CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 16 of 16

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:25

Start Date 27 March 2019 Easting 393441

End Date 02 April 2019 Northing 216054 Ground Level 240.00mOD Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Very stiff grey clayey SILT with extremely closely spaced thin laminae of light grey silt. (Lias Group) (BDS) 60.15m: Thin bed of very weak light grey siltstone. <small>Borehole Completed at 60.20m</small>	60.20	179.80	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 1 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 24 September 2019 Easting 392612

Depth 30.00 m

End Date 30 September 2019 Northing 215766 Ground Level 167.15mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10 - 0.20							Brown slightly sandy slightly gravelly SILT. Gravel is fine and medium subangular limestone. Frequent rootlets. (TOP)	0.25	166.90	
2ES	0.30 - 0.40										
1B	0.50 - 0.70							Brown slightly sandy gravelly SILT. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP)	0.70	166.45	
2D	0.50 - 0.70										
3ES	0.50 - 0.60										
3B	1.00 - 1.20							Firm light brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP)	1.20	165.95	
4ES	1.00 - 1.20	Nil				S 22					
4D	1.20 - 1.65										
5L	1.20 - 2.00										
6D	2.00 - 2.45	Nil						Medium dense becoming dense yellowish brown and greyish yellow slightly clayey locally clayey sandy angular and subangular fine to coarse limestone GRAVEL. (SLIP) (SLIP)			
7L	2.00 - 3.00					S 36					
8D	3.00 - 3.45	3.00						Firm light grey rarely mottled yellowish brown CLAY. (SLIP_LIAS) (SLIP) 3.40m: Subangular limestone cobble.	3.40	163.75	
9L	3.00 - 4.00					S 50					
10D	3.90 - 4.00	3.00						Stiff orangish brown locally mottled purplish brown silty CLAY. (SLIP_LIAS) (SLIP)	3.75	163.40	
11D	4.00 - 4.45					S 19					
12L	4.00 - 5.00										
13D	4.90 - 5.00	3.00						Medium dense light grey and orangish brown locally mottled purplish brown SILT. (SLIP_LIAS) (SLIP)	4.80	162.35	
14D	5.00 - 5.45					S 26					
15L	5.00 - 6.00										
16D	5.90 - 6.00	6.00						Stiff bluish grey clayey SILT with rare pockets (up to 50mm diam) of orangish brown fine sand. (SLIP_LIAS) (SLIP)	5.60	161.55	
17UT	6.00 - 6.45										
18L	6.00 - 7.00							Very stiff brownish grey locally mottled grey and orangish brown slightly sandy clayey SILT. (SLIP_LIAS) (SLIP)	6.20	160.95	
19D	6.45 - 6.50										
20D	6.90 - 7.00	7.00						Stiff bluish grey clayey SILT with rare pockets (up to 50mm diam) of orangish brown fine sand. (SLIP_LIAS) (SLIP)			
21D	7.00 - 7.45					S 32					
22L	7.00 - 7.60										
23D	7.60 - 8.05	7.00	72	NA				Very stiff brownish grey locally mottled grey and orangish brown slightly sandy clayey SILT. (SLIP_LIAS) (SLIP)			
24C	7.60 - 8.50					S 42					
25D	7.90 - 8.00										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	Groundwater not encountered prior to use of flush			
0.00	1.20	Inspection Pit	Hand tools	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)
1.20	7.60	Window Sampler	P60 Slope Climbing Rig	REMARKS			
7.60	30.00	Rotary Core	P60 Slope Climbing Rig				
CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	992	
168	10.00	0.00	0.50	11.70	Standpipe	AGS	
		0.50	9.50				
		9.50	12.00				
		12.00	30.00			CONTRACT	
BARREL DIAMETER		HOLE PROGRESS				REMARKS	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush	
128	7.60	24-09-2019 14:30	0.00	Nil	Dry	10.00-16.00m and 17.50-30.00m.	
146	30.00	24-09-2019 15:30	1.20	Nil	Dry		
		25-09-2019 09:30	1.20	Nil	Dry		
		25-09-2019 16:30	8.50	7.00	2.51		
		26-09-2019 08:10	8.50	7.00	2.76		
						35560	
						CHECKED	
						CT	

BOREHOLE LOG



DSRC205

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 24 September 2019 Easting 392612

Scale 1:50

End Date 30 September 2019 Northing 215766 Ground Level 167.15mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26D 27C	8.50 - 8.95 8.50 - 10.00	7.00	100				S 37	Very stiff light bluish grey mottled light brown and orangish brown clayey SILT with frequent pockets (up to 5mm) of yellowish brown silt. (SLIP_LIAS) (SLIP)	8.70	158.45	
28CS	9.25 - 9.50						9.50m: Slightly gravelly. Gravel is subangular and subrounded fine to coarse limestone.		9.70	157.45	
29D 30D 31C	9.90 - 10.00 10.00 - 10.45 10.00 - 11.50	7.00	87 17 17				S 35	Very stiff brownish grey slightly sandy slightly gravelly becoming gravelly clayey SILT. Gravel is angular to subrounded fine and medium limestone. (SLIP_LIAS) (SLIP)			
32C 33CS	11.50 - 13.00 11.50 - 11.80	7.00	100 13 13	150 NA			Brownish grey SILT with rare sand sized pockets (up to 1mm) of orangish brown silt. (SLIP_LIAS) (SLIP)		11.10 11.25	156.05 155.90	
34CS	12.30 - 12.60			NI			Very weak grey SILTSTONE with rare shell cast fossils (up to 20mm diam). (Lias Group) (DYS)	11.80	155.35		
35D 36C	12.90 - 13.00 13.00 - 14.50	7.00	100 13 13				C *51	11.30 - 11.50m: 60deg planar smooth fracture stained orangish brown and purplish brown.	12.60		154.55
37CS 38D 39C	14.10 - 14.30 14.30 - 14.40 14.50 - 16.00	7.00	100 100 13	200 NI 200				Stiff becoming very stiff thinly laminated grey locally mottled orangish brown CLAY. (Lias Group) (DYS)	14.50 14.70	152.65 152.45	
40C	16.00 - 17.50	-10.00		NI 20 50			C *100	Extremely weak fissile thinly and thickly laminated grey mottled orangish brown MUDSTONE. Fractures are 10deg to 20deg and 45deg to subvertical extremely closely spaced planar smooth frequently stained orangish brown. (Lias Group) (DYS)			
								Extremely weak thin and thickly laminated light grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal extremely closely and very closely spaced planar smooth stained orangish brown and purplish brown. (Lias Group) (DYS)			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							992
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			26-09-2019 16:30	17.50	10.00	6.90	
			27-09-2019 08:10	17.50	10.00	9.00	
			27-09-2019 15:30	25.00	10.00	20.15	
			30-09-2019 08:10	25.00	10.00	Dry	
			30-09-2019 16:30	30.00	10.00	Dry	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC205

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 24 September 2019 Easting 392612

Scale 1:50

End Date 30 September 2019 Northing 215766 Ground Level 167.15mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
41D	16.80 - 16.90		99					Very weak thinly laminated and very thinly bedded grey MUDSTONE. Fractures are subhorizontal and 70deg to subvertical very closely and closely spaced planar smooth and rough stained orangish brown and purplish brown rarely infilled (up to 5mm) with soft grey silty clay. (Lias Group) (DYS)	16.50	150.65	
			84								
			30								
				NI							
				75							
				210							
42C	17.50 - 19.00	10.00	91								
			86								
			41								
43D	18.30 - 18.40										
44C	19.00 - 20.50	10.00	98				C *107				
			63								
			52								
				NI							
				250							
				580							
45D	19.70 - 19.80							Extremely weak and very weak thinly and thickly laminated grey mottled orangish brown MUDSTONE locally disintegrated to claybound fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 10deg and 70deg to subvertical very closely to medium spaced planar smooth stained orangish brown (with up to 20mm penetration discolouration). (Lias Group) (DYS)			
46C	20.50 - 22.00		100								
			100								
			100								
47C	22.00 - 23.50	10.00	72				C *188	22.00 - 22.40m: Assessed zone of core loss.			
			49								
			27								
48C	23.50 - 25.00							Very weak to weak thinly laminated to very thinly bedded grey MUDSTONE. Fractures are subhorizontal and 40-50deg locally conjugating closely and medium spaced planar smooth stained orangish brown. (Lias Group) (DYS)			
			95								
			95								
			79								
49CS	24.00 - 24.40										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	992	

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
		01-10-2019 15:30	30.00	Nil	Dry			CHECKED	
								CT	

BOREHOLE LOG



DSRC205

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 24 September 2019 Easting 392612


Scale 1:50

End Date 30 September 2019 Northing 215766 Ground Level 167.15mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
50C	25.00 - 26.50	10.00	95 71 66				C *143	Very weak to weak thinly laminated to very thinly bedded grey MUDSTONE. Fractures are subhorizontal and 40-50deg locally conjugating closely and medium spaced planar smooth stained orangish brown. (Lias Group) (DYS) 27.10 - 27.70m: 80deg undulating smooth fracture stained orangish brown.			
51D	25.60 - 25.70										
52C 53CS	26.50 - 28.00 26.50 - 26.80		97 86 86								
54C	28.00 - 29.00	10.00	97 90 90				C *273				
55CS	28.40 - 28.65										
56C 57D	29.00 - 30.00 29.40 - 29.50		90 77 35								
		10.00					C *375	Borehole Completed at 30.00m	30.00	137.15	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 992		 CONTRACT 35560	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CHECKED CT	
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BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019

Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50							Grass over firm dark brown silty CLAY. Frequent rootlets. (MG) (MGR)	0.15	173.15	
2B 2ES	0.60 - 0.80							Soft orangish brown slightly gravelly silty CLAY. Gravel is subangular fine limestone and siltstone. Rare rootlets. (MG) (MGR)	0.55	172.75	
3B 3ES 4D 5L	1.00 - 1.20		Nil				S 6	Soft orangish brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. (SLIP) (SLIP)	1.35	171.95	
6D 7ES	1.70 - 1.80							Soft grey and orangish brown mottled reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine and medium bioclastic limestone. (SLIP) (SLIP)	2.10	171.20	
8D 9L	2.20 - 2.65	2.20					S 15	Firm brown mottled orangish brown slightly sandy gravelly silty CLAY with a medium subangular limestone cobble content. Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	2.55	170.75	
10D	2.70 - 2.80							Brown clayey gravelly fine to coarse SAND with a medium subangular bioclastic limestone cobble content. Frequent pockets of grey silt (up to 30mm) and orange sand (up to 15mm). Gravel is subangular and subrounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	3.35	169.95	
11D 12L	3.20 - 3.65	3.20					S 11	Medium dense brown clayey sandy subangular and subrounded fine to coarse bioclastic and rare oolitic limestone GRAVEL with a medium subangular bioclastic limestone cobble content. (SLIP) (SLIP)	4.45	168.85	
13D	3.90							Limited recovery of brown rarely mottled orange slightly sandy clayey subangular and subrounded fine to coarse bioclastic limestone GRAVEL with a low subangular bioclastic cobble content. Fines probably washed away. (SLIP) (SLIP)			
14D 15L	4.20 - 4.65	4.20					S 17				
16D	4.80 - 4.90										
17C	5.20 - 6.00	5.20	38	NA				4.45m: Medium dense.			
18C	6.00 - 7.50	6.00	33								
19D	6.30 - 6.40										
20C	7.50 - 9.00	7.50	27								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	5.20	Window Sampler	Comacchio 305					
5.20	40.50	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	9.00		0.00	0.50	Concrete	30.00	Inclinometer	
140	40.50		0.50	30.00	Grout			
			30.00	31.50	Bentonite			
			31.50	40.50	Gravel			
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
128	5.20		30-05-2019 13:20	0.00	Nil	Dry	Driller notes reduced flush returns 5.20-10.50m (approx 60% returns).	35560
146	40.50		30-05-2019 14:00	1.20	Nil	Dry		CHECKED
			31-05-2019 08:00	1.20	Nil	Dry		CT
			31-05-2019 16:45	10.50	10.50	3.00		
			03-06-2019 08:00	10.50	10.50	3.00		

BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 6

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019

Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	9.00 - 10.50	9.00	27								
22C	10.50 - 12.00	10.50	92						10.70	162.60	
23D	10.90 - 11.00						H 93	Stiff greenish brown mottled grey slightly sandy clayey SILT with frequent pockets (up to 60mm) of light orangish brown fine sand. (SLIP) (SLIP)	11.20	162.10	
24C	12.00 - 13.50	12.00	100				H 100	Stiff indistinctly fissured grey mottled brown slightly sandy slightly gravelly silty CLAY with rare pockets (up to 15mm) of orange fine sand. Gravel is subrounded fine to coarse sandstone. (SLIP) (SLIP) 11.20m: Boundary inclined 40deg, polished.			
25CS	12.00 - 12.40										
26D	12.70 - 12.80							12.50 - 12.70m: Brown mottled grey.			
27D	13.30 - 13.40							Very stiff greenish brown mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone. (SLIP) (SLIP)	12.95	160.35	
28C	13.50 - 15.00	13.50	64					13.70 - 13.85m: 60deg planar smooth fissure.			
29C	15.00 - 16.50	15.00	63					Very stiff fissured thinly and thickly laminated greenish brown and grey slightly sandy slightly gravelly silty CLAY with a low subrounded limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. Fissures are 60deg planar and undulating smooth. (SLIP_LIAS) (SLIP)	13.95	159.35	
30D	15.10 - 15.20							14.30 - 14.45m: 50deg undulating smooth fissure.			
31CS	15.45 - 15.85							Very stiff fissured dark grey mottled dark brown locally orange slightly sandy slightly gravelly silty CLAY with frequent pockets (up to 15mm) of light grey silt. Gravel is subangular and subrounded fine and medium limestone. Fissures are 70deg and subvertical undulating rough infilled (up to 1mm) with grey silt. (SLIP_LIAS) (SLIP)	15.95	157.35	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
		03-06-2019 17:00	22.50	22.50 1.00		CHECKED
		04-06-2019 08:00	22.50	22.50 3.00		CT
		04-06-2019 17:00	40.50	40.50 3.00		

BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 6

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019

Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
32C	16.50 - 18.00	16.50	100								
33D	17.10 - 17.20										
34CS	17.60 - 18.00										
35C	18.00 - 19.50	18.00	96								
36D	18.40 - 18.50							Very stiff fissured dark grey mottled brown slightly sandy silty CLAY. Frequent shell fragments (up to 3mm) and shell moulds and casts (up to 15mm). Rare belemnites (up to 15mm). Fissures are subhorizontal and 60deg closely spaced planar smooth. (SLIP_LIAS) (SLIP)	18.25	155.05	
37D	19.20 - 19.30							Very stiff fissured thinly laminated dark grey slightly sandy silty CLAY with frequent becoming rare shell fragments (up to 3mm). Fissures are 40-60deg very closely spaced planar and undulating smooth. (SLIP_LIAS) (WHM)	18.85	154.45	
38C	19.50 - 21.00	19.50	99					19.05 - 19.40m: 50deg planar smooth fissure.			
39CS	20.00 - 20.40										
40D	20.60 - 20.70							20.40m: Subhorizontal undulating smooth fissure. 20.85m: Grey rounded concretion.			
41C	21.00 - 22.50	21.00	100					21.25 - 21.60m: 60deg undulating smooth fissure. 21.30m: Rounded limestone cobble. 21.40 - 21.50m: Belemnite (15x35mm).			
42D	21.80 - 21.90							Very stiff dark grey mottled orangish brown slightly sandy slightly gravelly silty CLAY with rare shell fragments (up to 4mm). Gravel is subangular and subrounded fine and medium limestone. (SLIP_LIAS) (WHM)	21.50	151.80	
43D	22.20 - 22.30							21.50m: Boundary inclined 20deg.			
44C	22.50 - 24.00	22.50	100					Very stiff fissured thinly laminated dark grey rarely mottled dark brown slightly sandy silty CLAY with rare shell fragments (up to 2mm). Locally tending to extremely weak mudstone. Laminae inclined 30deg. Fissures are subhorizontal to 20deg planar and undulating smooth. (SLIP_LIAS) (WHM)	22.00	151.30	
								22.40m: Ammonite shell cast (25x45mm). 22.90 - 23.00m: Grey rounded concretion with radiating calcite veins.			
45D	23.70 - 23.80							Very stiff thinly laminated dark grey slightly sandy slightly gravelly silty CLAY with rare pockets (up to 4mm) of orange sand. Gravel is subangular and subrounded sandstone and limestone. (SLIP_LIAS) (WHM)	23.35	149.95	
46C	24.00 - 25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1077	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 6

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019

Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47D	24.70 - 24.80		89					Very stiff locally stiff greenish brown mottled grey, brown and rarely orangish brown slightly sandy silty CLAY with rare lenses (up to 10mm) of light grey silt. (Lias Group) (WHM) 24.35 - 24.60m: Gravelly. Gravel is rounded fine to coarse limestone.	24.15	149.15	
48CS	24.95 - 25.35										
49C	25.50 - 27.00	25.50	100 19 8					Very stiff thinly laminated dark grey CLAY with frequent pyrite nodules (up to 20mm). Fissures are subhorizontal to 20deg and 70deg to subvertical planar and undulating rough stained orange. (Lias Group) (WHM) Weak grey LIMESTONE. Fractures are subvertical undulating rough with orange penetrative staining (up to 25mm) and purple mineralisation (up to 1mm) intersecting 40deg very closely spaced undulating rough fractures with orange staining. (Lias Group) (DYS) Weak dark grey MUDSTONE. Fractures are subhorizontal closely spaced undulating rough stained orange and red. (Lias Group) (DYS) Extremely weak thinly laminated grey MUDSTONE with rare orange staining (up to 40mm). Rare shell fragments (up to 4mm). Bedding fractures are subhorizontal very closely and closely spaced stepped rough stained orange. (Lias Group) (DYS) 27.50 - 27.60m: Weak grey limestone with abundant shell fragments (up to 5mm). Fractures are randomly orientated very closely spaced undulating rough with orange penetrative staining (up to 5mm). 28.60 - 28.75m: 60deg undulating rough fracture stained orange. 30.00 - 30.15m: 50deg undulating rough stained orange. 30.85 - 30.95m: Frequent shell fragments (up to 3mm). Weak light grey and dark grey LIMESTONE with frequent shell fragments (up to 5mm). Fracture is 30deg undulating rough with orange staining and infill (up to 10mm) with silt. (Lias Group) (DYS) Very weak dark grey mottled greenish brown and orange SILTSTONE. Fractures are subhorizontal closely spaced undulating smooth infilled (up to 2mm) with grey silt. (Lias Group) (DYS) 31.90 - 32.00m: Light grey with orange staining siltstone nodule (45x55mm).	26.15	147.15	
50D	26.50 - 26.60			80 90 120					26.55	146.75	
51C	27.00 - 28.50	27.00	100 85 53	NI 50 250					26.80	146.50	
52C	28.50 - 30.00	28.50	100 95 23					27.10	146.20		
53C	30.00 - 31.50	30.00	100 91 83								
54C	31.50 - 33.00	31.50	100 94 53	70 150 200				31.15	142.15		
								31.50	141.80		
									32.00	141.30	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
							CHECKED
							CT

BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 6

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019


Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend		
55C	33.00 - 34.50	33.00	100 99 76	NI 60 220				Very weak thickly laminated dark grey SILTSTONE with frequent subhorizontal orange staining (up to 6mm). Bedding fractures are subhorizontal very closely and closely spaced undulating rough with rare orange staining. (Lias Group) (DYS)					
				70 80 200				33.25 - 33.30m: Light grey with orange staining siltstone nodule (25x60mm).				33.40	139.90
				50 100 200				Very weak dark grey MUDSTONE. Fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS)				34.00	139.30
56C	34.50 - 36.00	34.50	89 79 37	NI 110 200				Very weak greenish grey and dark grey SILTSTONE with rare shell fragments (up to 3mm). Fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS)					
				NI 110 200				34.10 - 34.20m: Light grey siltstone nodule (60x65mm).				34.50	138.80
								Very weak thinly laminated dark grey SILTSTONE. Bedding fractures are subhorizontal closely spaced undulating rough. (Lias Group) (DYS)					
57C	36.00 - 37.50	36.00	100 87 67	NI 84 440				Very weak and weak dark grey SILTSTONE with rare orange staining (up to 50mm). Fractures are subhorizontal closely and medium spaced undulating rough infilled (up to 2mm) of grey silt. (Lias Group) (DYS)					
58CS	36.45 - 36.90												
59C	37.50 - 39.00	37.00	92 86 71	NI 300 460				Weak dark grey SILTSTONE. Bedding fractures are subhorizontal very closely and closely spaced undulating rough. (Lias Group) (DYS)					
60CS	38.10 - 38.40							37.95 - 38.00m: 20deg incipient fracture with orange penetrative staining (up to 2mm).					
61C	39.00 - 40.50	39.00	99 95 70					Very weak thinly laminated dark grey MUDSTONE. Bedding fractures are subhorizontal to 20deg closely spaced stained orange infilled (up to 4mm) with grey silt. (Lias Group) (DYS)					

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1077 			
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC207

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 6

Start Date 30 May 2019

Easting 392681

Scale 1:50

End Date 04 June 2019

Northing 215603

Ground Level 173.30mOD

Depth 40.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NI 100 150				Borehole Completed at 40.50m	40.50	132.80	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
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CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
---	--	--	--	--	--	--	--	--	----------------------------------	--	--

BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS		CONTRACT 35560	
								CHECKED CT	

BOREHOLE LOG



DSRC218

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 17 September 2019 Easting 394126

Depth 25.00 m

End Date 20 September 2019 Northing 214739 Ground Level 285.65mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3C	0.10 - 0.30 0.10 - 0.30 0.30 - 0.50 0.50 - 1.50	0.50	100 26 11	NI			H 73	Grass over firm and stiff dark brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse limestone. Frequent roots (up to 5mm diam). (TOP)	0.30 0.50	285.35 285.15	
4CS 5C	1.39 - 1.50 1.50 - 3.00	1.50	93 53 15	NI				Weak highly fractured cream and light yellow LIMESTONE excavated as subangular fine to coarse clayey sandy subangular fine to coarse gravel. (GOG) (HMB) Medium strong very thinly bedded (20deg to 30deg) light brown oolitic LIMESTONE with medium spaced very thin beds of soft orangish brown slightly sandy clay. Fractures are 20deg to 30deg and 70deg to subvertical extremely closely and closely spaced planar rough stained orangish brown infilled (up to 5mm) with brown clay. (GOG) (HMB) 1.30 - 1.50m: Very stiff orangish brown slightly sandy clay.	1.50	284.15	
6CS	2.26 - 2.39							Medium strong thinly bedded light grey LIMESTONE locally sandy with closely spaced thick laminae of firm orangish brown clay. Bedding fractures are 5deg to 10deg very closely and closely spaced planar rough stained orangish brown. (GOG) (HMB)	2.80	282.85	
7C 7CS	3.00 - 4.50 3.00 - 4.50	3.00	92 9 0	NI	3.00			1.75 - 2.00m: Subvertical undulating rough fracture with orange and brown staining. 2.20 - 2.26m: Weak thinly laminated greyish brown fine and medium calcareous sandstone. 2.40 - 2.60m: Firm thinly laminated light brown clay with frequent thin laminae of extremely weak light brown calcareous sandstone.			
8C	4.50 - 6.00	4.50	100 49 21	NI				Extremely weak medium bedded dark grey MUDSTONE with medium spaced very thin beds of weak dark grey and grey limestone. Fractures are subhorizontal to 20° and randomly orientated very closely spaced planar smooth. (FEF) (FE) 3.30 - 3.70m: Fractures stained greyish brown (penetrating 5mm).	4.50	281.15	
9CS	5.07 - 5.24							Extremely weak to very weak thinly bedded dark grey calcareous SILTSTONE with abundant shell fossils (10mm). Bedding fractures are subhorizontal very closely and closely spaced planar rough. (FEF) (FE)			
10CS 11C	5.80 - 5.94 6.00 - 7.50	6.00	100 18 7	NI				4.50 - 4.80m: Subvertical planar rough fracture. 5.30 - 5.70m: Tending to extremely weak dark grey shelly mudstone.	6.15	279.50	
12CS	6.67 - 6.80							Very weak thickly laminated dark grey SILTSTONE. Locally disintegrated to claybound fine to coarse gravel sized siltstone lithorelicts. Rare thin laminae of grey fine sand. Fractures are subhorizontal to 10deg and randomly orientated very closely and closely spaced planar rough. (FEF) (FE)			
13C	7.50 - 9.00	7.50	100 58 47				260	7.05 - 7.10m: Frequent shell fossils replaced by calcite. 7.75 - 8.30m: Weak. Fractures are medium spaced.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				SUB LOCATION:	
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
0.00	0.50	Inspection Pit	Hand tools	3.00	1.50	0.60	20		
0.50	25.00	Rotary Core	Geotechnical Pioneer Rig						
CASING DEPTH			BACKFILL			INSTRUMENTATION		CONTRACT	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		
168	4.50		0.00	0.50	Concrete	15.00	Standpipe		
140	25.00		0.50	2.00	Bentonite				
			2.00	15.50	Gravel				
			15.50	25.00	Bentonite				
BARREL DIAMETER		HOLE PROGRESS				REMARKS			
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				
146	25.00	17-09-2019 08:30	0.00	Nil	Dry	Inspection pit terminated at 0.50m due to encountering hard strata. Driller notes reduced flush returns 3.00-4.50m (40% returned) and 18.00-19.50m (60% returned).			
		17-09-2019 16:30	3.00	3.00	0.89				
		18-09-2019 08:20	3.00	3.00	2.30				
		18-09-2019 16:45	15.00	15.00	3.20				
		19-09-2019 09:00	15.00	15.00	2.80				



CONTRACT

35560

CHECKED

CT

BOREHOLE LOG



DSRC218

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 17 September 2019 Easting 394126

Depth 25.00 m

End Date 20 September 2019 Northing 214739 Ground Level 285.65mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
14CS	8.04 - 8.30								8.30	277.35	XXXXXX XXXXXX XXXXXX
15C 16CS	9.00 - 10.50 9.05 - 9.32	9.00	97 81 67	NI 180 280				Medium strong to strong thinly bedded light grey and brownish grey LIMESTONE locally tending to calcareous fine and medium sandstone. With closely and medium spaced very thin beds of stiff fissured brown clay. Bedding fractures are 10deg to 20deg closely and medium spaced planar rough stained orange with up to 20mm penetrative discolouration. (FEF) (FE) 8.30 - 8.55m: Subvertical planar rough fracture stained orange (10mm). 9.55 - 9.70m: 70deg to 80deg undulating rough fracture.			
17C	10.50 - 12.00	10.50	100 22 9	NI 20 50				Extremely weak very thinly bedded dark grey MUDSTONE. Locally disintegrated to claybound angular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 10deg very closely spaced planar smooth. (FEF) (FE) 10.60 - 11.10m: With medium spaced very thin beds of very weak dark grey calcareous mudstone. 11.48 - 11.85m: Disintegrated to claybound mudstone lithorelicts.	10.40	275.25	
18CS 19C	11.86 - 12.00 12.00 - 13.50	12.00	99 51 19	NI 30 140				12.00 - 12.55m: With closely spaced very thin beds of medium strong grey limestone.			
20CS	12.62 - 12.79			NI 60 170				Very weak dark grey MUDSTONE. Fractures are 5deg to 10deg and 70deg to subvertical very closely and closely spaced planar smooth. (FEF) (FE)	12.55	273.10	
12C 21C 22CS	13.50 - 15.00 13.50 - 15.00 13.88 - 14.05	13.50	98 53 18					13.40 - 14.20m: With closely spaced thin beds of weak light grey limestone and calcareous siltstone.			
23C	15.00 - 16.50	15.00	100 10 0	NI				Extremely weak very thinly bedded dark grey MUDSTONE locally disintegrated to claybound angular fine to coarse gravel sized very stiff dark grey gravelly clay lithorelicts. Fractures are subhorizontal to 10deg and randomly orientated very closely spaced planar smooth. (FEF) (FE)	14.70	270.95	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
			19-09-2019 16:45	25.00	25.00	3.00				CHECKED		
									CT			

BOREHOLE LOG



DSRC218

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 17 September 2019 Easting 394126

Scale 1:50

End Date 20 September 2019 Northing 214739 Ground Level 285.65mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	16.50 - 18.00	16.50	100 81 41								
25CS	16.95 - 17.40			NI 180 450				Weak to medium strong thinly bedded dark grey calcareous SILTSTONE. Bedding fractures are 5deg to 10deg closely and medium spaced planar smooth. Rare vertical incipient fractures. (FEF) (FE) 17.50 - 17.65m: 60deg undulating rough fracture.	16.95	268.70	XXXXXX
26C	18.00 - 19.50	18.00	98 80 51								XXXXXX
27CS	18.90 - 19.05										XXXXXX
28C	19.50 - 21.00	19.50	97 53 11					19.50 - 19.90m: With medium spaced thin beds of medium strong grey limestone.			XXXXXX
29CS	19.80 - 20.00			NI 110 130				Weak dark grey MUDSTONE locally disintegrated to stiff gravelly clay. Gravel is subangular fine to coarse gravelly silty mudstone lithorelicts. Fractures are 5deg to 10deg and 50deg to 60deg closely spaced planar smooth. Frequent subvertical incipient fractures. (FEF) (FE)	19.90	265.75	XXXXXX
30C	21.00 - 22.50	21.00	100 49 31								
31CS	22.25 - 22.50			70 160 370				22.25 - 25.00m: Fractures are mainly subhorizontal to 10deg closely spaced planar smooth.			XXXXXX
32C	22.50 - 24.00	22.50	91 85 71								
33C	24.00 - 25.00	24.00									XXXXXX

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560			
									CHECKED			
									CT			

BOREHOLE LOG



DSRC218

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 17 September 2019 Easting 394126

End Date 20 September 2019 Northing 214739 Ground Level 285.65mOD Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
34CS	24.75 - 25.00		100 90 90					Borehole Completed at 25.00m	25.00	260.65	

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118 	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m) TYPE		
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT 35560 CHECKED CT
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		

BOREHOLE LOG



DSRC220

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 24 September 2019 Easting 394379

Scale 1:50

End Date 26 September 2019 Northing 214501 Ground Level 278.85mOD

Depth 31.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3ES 3B	0.00 - 0.20 0.10 - 0.20 0.20 - 0.60 0.30 - 0.40 0.50 - 0.60 0.60 - 1.00						H 29 H 40	Soft dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	278.65	
								Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine limestone. (HDD) (HEAD)	0.60	278.25	
4D 5L	1.00 - 1.45 1.00 - 1.50	Nil					S 47	Light orangish brown slightly sandy very clayey subangular fine to coarse limestone GRAVEL. (HDD) (HEAD)	1.00	277.85	
							C 38	Dense light yellowish brown and light brownish grey slightly sandy very clayey angular fine to coarse bioclastic limestone GRAVEL. (HDD) (HEAD) NO RECOVERY.	1.50	277.35	
6C 7CS	2.00 - 3.50 2.30 - 2.35	2.00	100 75 9	NI 60 130				Medium strong light grey and light yellowish brown argillaceous LIMESTONE. Fractures are subhorizontal to 20deg extremely closely to closely spaced undulating rough, surfaces weakened (up to 40mm) and recovered as soft light yellowish brown gravelly silty clay. (FEF) (FE) 2.40 - 2.55m: 80deg undulating rough fracture.	2.00	276.85	
				NI 20 60				Extremely weak and very weak thinly and thickly laminated dark grey rarely dark brownish grey calcareous MUDSTONE locally disintegrated to stiff dark grey gravelly silty clay. Fractures are subhorizontal to 10deg locally randomly orientated very closely and closely spaced planar and undulating rough rarely infilled (up to 20mm) with dark grey silty clay. (FEF) (FE)	2.55	276.30	
8C 9CS	3.50 - 5.00 4.00 - 4.10	2.00	100 64 28	NI 30 140							
10C 11CS	5.00 - 6.50 5.40 - 5.55	2.00	100 66 9				C *184	5.30 - 6.00m: Closely spaced thin beds of weak dark grey fossiliferous limestone.			
12C 13CS	6.50 - 8.00 7.20 - 7.30	2.00	100 93 0								
14C	8.00 - 9.50	2.00									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.00	Inspection Pit	Hand tools	5.60	2.00	5.60	20	
1.00	1.50	Window Sampler	Geotechnical P60 Rig					
1.50	31.30	Rotary Core	Geotechnical P60 Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	2.00		0.00	1.00	Concrete	13.20	Standpipe	1118
			1.00	3.00	Bentonite			
			3.00	13.50	Gravel			
			13.50	21.80	Bentonite			
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
113	1.50	24-09-2019 09:00	0.00	Nil	Dry	Borehole advanced by reaming casing (168mm Odex) 1.50-2.00m.		35560
116	31.30	24-09-2019 16:30	8.00	2.00	5.60	Inspection pit terminated at 1.00m due to encountering hard strata.		CHECKED
		25-09-2019 08:15	8.00	2.00	2.40	Driller notes loss of flush below 23.90m.		CT
		25-09-2019 16:15	23.40	2.00	9.40			
		26-09-2019 08:15	23.40	2.00	2.70			

BOREHOLE LOG



DSRC220

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 24 September 2019 Easting 394379

Scale 1:50

End Date 26 September 2019 Northing 214501 Ground Level 278.85mOD

Depth 31.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
15CS	8.25 - 8.50		96 93 75	NI 160 250				Weak to medium strong light grey and light bluish grey argillaceous LIMESTONE with medium spaced thin beds of dark grey calcareous mudstone. Fractures are subhorizontal to 15deg rarely 80deg to subvertical closely and medium spaced undulating rough stained orangish brown rarely infilled (up to 10mm) with dark grey silty clay. (FEF) (FE)	8.20	270.65	
16C	9.50 - 11.10	2.00	94 86 59								
17CS	10.50 - 10.65							10.50m: PLI suggests very weak to weak.			
18C	11.10 - 12.70	2.00	94 86 27	NI 70 150				Very weak thinly and thickly laminated dark grey calcareous MUDSTONE. Fractures are subhorizontal to 10deg closely spaced planar and undulating smooth rarely infilled (up to 5mm) with dark grey silty clay. (FEF) (FE)	11.35	267.50	
19CS	12.00 - 12.15										
20C	12.70 - 14.30	2.00	94 84 26								
21CS	14.10 - 14.30										
22C	14.30 - 15.80	2.00	100 97 62								
23CS	14.30 - 14.50										
24C	15.80 - 17.40	2.00	94	NI 210 350				Very weak and weak thinly laminated dark grey calcareous MUDSTONE with medium spaced thin beds of very weak and weak dark grey siltstone. Fractures are subhorizontal to 15deg closely and medium spaced planar and undulating smooth infilled (up to 3mm) with dark grey silty clay. (FEF) (FE)	14.90	263.95	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH				BACKFILL		INSTRUMENTATION	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
			21.80	31.30	Gravel		
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		26-09-2019 11:45	31.30	2.00	27.70		
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC220

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 24 September 2019 Easting 394379

End Date 26 September 2019 Northing 214501 Ground Level 278.85mOD Depth 31.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25CS	16.65 - 17.00		92 71								
26C	17.40 - 18.90	2.00	100 99 91								
27CS	17.90 - 18.15										
28C	18.90 - 20.40	2.00	100 95 66								
29CS	19.50 - 19.70										
30C	20.40 - 21.90	2.00	100 93 68						20.55	258.30	
31CS	20.75 - 21.05			NI 370 500				Very weak to weak dark grey and dark bluish grey argillaceous LIMESTONE. Fractures are subhorizontal to 10deg medium spaced planar rough stained dark yellowish brown and orangish brown infilled (up to 15mm) with dark bluish grey silty clay. (FEF) (FE) 20.55 - 20.80m: 80deg planar rough fracture.			
32C	21.90 - 23.40	2.00	100 99 91						21.95	256.90	
33CS	22.35 - 22.80			NI 260 450				Medium strong light yellowish brown peloidal and oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough rarely stained dark yellowish brown. Frequent shell fragments and calcite infilled burrows. (IOG) (SALS) 23.40m: PLI suggests strong.			
34C	23.40 - 25.00	2.00	94 93 76						23.55	255.30	
35CS	23.40 - 23.70			NI 290 650				Weak to medium strong light yellowish brown fossiliferous oolitic LIMESTONE with medium and widely spaced thin to thick beds of dark grey oolitic limestone. Fractures are subhorizontal to 10deg rarely 20deg widely spaced undulating rough rarely stained orangish brown, surfaces weakened (20mm). Frequent calcite infilled shell moulds (up to 20mm) and calcite veins. (IOG) (SALS)			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560		
									CHECKED		
									CT		

BOREHOLE LOG



DSRC220

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 24 September 2019 Easting 394379

Scale 1:50

End Date 26 September 2019 Northing 214501 Ground Level 278.85mOD

Depth 31.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
36C	25.00 - 26.60	2.00	94 93 81					Weak to medium strong light yellowish brown fossiliferous oolitic LIMESTONE with medium and widely spaced thin to thick beds of dark grey oolitic limestone. Fractures are subhorizontal to 10deg rarely 20deg widely spaced undulating rough rarely stained orangish brown, surfaces weakened (20mm). Frequent calcite infilled shell moulds (up to 20mm) and calcite veins. (IOG) (SALS)			
37CS	25.65 - 26.00										
38C 39CS	26.60 - 28.20 26.60 - 27.05	2.00	94 93 72								
40C	28.20 - 29.80	2.00	94 93 89								
41CS	28.80 - 29.20							28.50 - 29.75m: Grey.			
42C 43CS	29.80 - 31.30 29.80 - 30.25	2.00	100 99 98	300 550 700				Weak to medium strong thinly bedded light yellow peloidal and oolitic LIMESTONE. Fractures are subhorizontal to 15deg medium and widely spaced undulating rough. Frequent thin beds of shell fragments and frequent calcite filled shells (up to 40mm). (IOG) (SALS) 30.30 - 30.45m: Thin bed of light grey fossiliferous oolitic limestone.	29.75	249.10	
									31.30	247.55	
									Borehole Completed at 31.30m		

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.30 - 0.50 0.30 - 0.50							Grass over firm brown clayey SILT. Frequent rootlets. (MG) (MGR)	0.10	226.75	
2B 2ES	0.70 - 0.90 0.70 - 0.90							Brown clayey gravelly fine and medium SAND. Gravel is subangular fine to coarse limestone and calcite. (MG) (MGR)	0.60	226.25	
3B 3ES 4D 5L	1.00 - 1.20 1.00 - 1.20 1.20 - 1.65 1.20 - 2.20	1.20					S 6	Loose light yellowish brown slightly silty sandy angular to subrounded fine to coarse bioclastic and oolitic limestone GRAVEL with a medium bioclastic and oolitic limestone cobble content. Rare rootlets. (SLIP) (SLIP)			
4ES 6D 7D 8L	2.00 - 2.20 2.00 - 2.20 2.20 - 2.65 2.20 - 3.20	2.20					S 12	Medium dense light brown silty sandy angular to subrounded fine to coarse bioclastic and oolitic limestone GRAVEL with a low subangular bioclastic and oolitic limestone cobble content. (SLIP) (SLIP)	2.30	224.55	
9D	2.80 - 3.00										
10D 11L	3.20 - 3.65 3.20 - 4.20	2.20 3.20					S 13				
12D 13D 14L	4.00 - 4.20 4.20 - 4.65 4.20 - 5.20	4.20					S 23	Stiff orangish brown rarely mottled light grey sandy clayey SILT. (SLIP_LIAS) (SLIP)	3.50	223.35	
15D 16L	5.20 - 5.65 5.20 - 6.20	4.20 5.20					S 20	Stiff orangish brown mottled light grey and orange sandy clayey SILT with abundant pockets (up to 30mm) of light grey silt. (SLIP_LIAS) (SLIP)	5.00	221.85	
17D 18L	6.20 - 6.65 6.20 - 7.20	6.20					S 26	Stiff orangish brown mottled brown, orange and rarely light grey sandy clayey SILT. (SLIP_LIAS) (SLIP) 6.00 - 6.10m: Abundant pockets (up to 50mm) of orangish brown fine and medium sand.	5.55	221.30	
19D	6.90 - 7.10										
20D 21L	7.20 - 7.65 7.20 - 8.50	7.20					S 20	Stiff orangish brown mottled brown and light grey sandy clayey SILT. (SLIP_LIAS) (SLIP) 7.70 - 7.95m: Light grey mottled orangish brown.	7.45	219.40	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	8.50	Window Sampler	Comacchio 305					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
168	22.00	0.00	0.50	Concrete	70.00	Standpipe	
140	80.50	0.50	5.00	Grout			
		5.00	38.00	Gravel			
		38.00	48.00	Grout			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes loss of flush returns 50.50-56.50m. Polymer added to waterflush 50.50-62.50m.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	8.50	07-05-2019 08:30		Nil	Dry		CHECKED
146	80.50	07-05-2019 17:00	7.20	7.20	2.00		CT
		08-05-2019 08:30	7.20	7.20	5.00		
		08-05-2019 17:00	26.50	26.50	2.00		
		09-05-2019 08:30	26.50	26.50	2.00		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22D 23C 24D	8.50 - 8.95 8.50 - 10.00 8.80 - 8.90	8.50	100	NA			S 25	Stiff orangish brown mottled brown and light grey sandy clayey SILT. (SLIP_LIAS) (SLIP) 8.00 - 8.10m: Orangish brown. 8.70 - 8.80m: Frequent orange mottling. 8.90 - 9.00m: Light grey mottled orangish brown. 9.05 - 9.25m: Light grey mottled orangish brown.	9.25	217.60	
25D	9.60 - 9.80						Stiff thinly and thickly laminated light grey mottled orangish brown sandy clayey SILT with very closely spaced thick laminae of orange siltstone. Laminae inclined 30deg. (SLIP_LIAS) (SLIP)	9.90	216.95		
26C 27D	10.00 - 11.50 10.10 - 10.20	10.00	100				9.55m: 30deg planar smooth fissure with 2mm silt infill. Stiff orangish brown rarely mottled light grey and brown slightly sandy slightly gravelly clayey SILT with rare shell fragments (up to 2mm). Gravel is subrounded fine to coarse siltstone lithorelicts. (SLIP_LIAS) (SLIP) 10.10m: Subrounded limestone clast (20mm).	10.20	216.65		
28D	11.00 - 11.10						Stiff light grey mottled orangish brown slightly sandy clayey SILT with rare pockets (up to 40mm) of dark grey clay. (SLIP_LIAS) (SLIP)				
29C	11.50 - 13.00	11.50	100				10.20 - 10.40m: Thinly bedded with orange siltstone.	11.55	215.30		
30D	12.00 - 12.10						Very stiff orangish brown locally mottled light grey slightly sandy clayey SILT. (SLIP_LIAS) (SLIP) 12.05 - 12.20m: 60deg relict fracture with 2mm red penetrative staining.				
31C 32D	13.00 - 14.50 13.10 - 13.20	13.00	100				Stiff light grey mottled orangish brown slightly sandy clayey SILT. (SLIP_LIAS) (SLIP) 13.40 - 13.50m: Orangish brown mottled light grey.	12.90	213.95		
33D	14.10 - 14.20						Very stiff orange and grey slightly sandy clayey SILT with frequent thin laminae of light grey silt. (SLIP_LIAS) (SLIP)				
34C	14.50 - 16.00	14.50	100								
35D	15.60 - 15.70						15.25 - 15.35m: Extremely weak orange sandstone.	15.40	211.45		
36C	16.00 - 17.50	16.00					Very stiff brownish grey mottled grey and orangish brown slightly sandy clayey SILT with frequent pockets (up to 10mm) of light grey silt. (SLIP_LIAS) (SLIP)				

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE		
TOP (m)	BASE (m)	TYPE	Comacchio 305		Groundwater not encountered prior to use of flush		
8.50	80.50	Rotary Core			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077
		48.00	49.00	Bentonite			
		49.00	70.50	Gravel			
		70.50	80.50	Bentonite			

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
		09-05-2019 17:00	43.00	43.00		2.00	CHECKED CT
		10-05-2019 08:30	43.00	43.00		4.00	
		10-05-2019 12:30	50.50	50.50		4.00	
		13-05-2019 11:45	50.50	50.50	4.00		
		13-05-2019 12:45	53.50	53.50	2.00		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			93						16.30	210.55	
37D	17.00 - 17.10							Very stiff brownish grey mottled grey and orangish brown slightly sandy clayey SILT with frequent pockets (up to 10mm) of light grey silt. (SLIP_LIAS) (SLIP) 16.20 - 16.25m: Subangular siltstone cobble.			
38C	17.50 - 19.00	17.50	100					Very stiff bluish grey locally stained dark orangish brown slightly sandy silty CLAY with frequent pockets (up to 10mm) of light grey silt. (SLIP_LIAS) (SLIP) 16.35 - 16.40m: 50deg planar rough fissure. 17.30 - 17.40m: 60deg planar rough fissure stained dark orangish brown.			
39D	18.00 - 18.10										
40CS	18.50 - 19.00							18.20 - 18.35m: 80deg planar rough fissure stained dark orangish brown. 18.45 - 18.65m: Fissures are 40deg and subvertical planar rough stained orangish brown.	18.70	208.15	
41C 42D	19.00 - 20.50 19.10 - 19.20	19.00	100 82 82	NI 180 310				Very stiff dark grey CLAY. (SLIP_LIAS) (SLIP) 18.80 - 18.90m: Frequent subround pyrite nodules (up to 20mm). 19.25 - 19.35m: Subrounded limestone cobble.	19.35	207.50	
43C	20.50 - 22.00	20.50	100 87 87					Extremely weak thinly and thickly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding fractures are subhorizontal to 15deg closely spaced rarely medium spaced planar smooth. (Lias Group) (WHM) 20.05 - 20.25m: 80deg to subvertical planar smooth fracture. 20.75 - 20.85m: 80deg to subvertical stepped smooth fracture. 21.05 - 21.10m: Frequent pyrite nodules (up to 8mm).			
44C 45CS	22.00 - 23.50 22.20 - 22.45	22.00	100 68 52					22.25 - 22.45m: 70deg undulating smooth fracture. 22.45 - 22.55m: Subvertical stepped rough relict fracture. 22.55 - 22.60m: Light brown subrounded nodule (10mm)			
46C	23.50 - 25.00	23.50	88 73 71					23.55m: Subhorizontal undulating smooth fracture infilled with brownish grey silt (up to 3mm).			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
BARREL DIAMETER			HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
			14-05-2019 08:30	53.50	53.50	6.00		
			14-05-2019 17:00	62.50	62.50	4.00		
			15-05-2019 08:30	62.50	62.50	6.00		
			15-05-2019 17:00	74.50	74.50	6.00		
			16-05-2019 09:00	74.50	74.50	6.00		

CONTRACT

35560

CHECKED

CT



BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 07 May 2019

Easting 392857

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47C	25.00 - 26.50	25.00	100 33 27					Extremely weak thinly and thickly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding fractures are subhorizontal to 15deg closely spaced rarely medium spaced planar smooth. (Lias Group) (WHM) 25.00 - 25.20m: Rare pockets (up to 70mm) of grey silt. 25.27 - 25.38m: 75deg planar smooth fracture. 25.55 - 26.40m: 50deg planar smooth fracture.	25.00		
48C	26.50 - 28.00	26.50	96 79 53	NI 96 150				Weak dark grey MUDSTONE. Fractures are subhorizontal to 30deg closely spaced planar smooth. (Lias Group) (WHM) 26.05 - 26.50m: 80deg to subvertical planar smooth fracture. 26.20 - 26.30m: 50deg planar smooth fracture.	26.00	200.85	
49CS	27.00 - 27.45			NI 150 450				Weak thinly laminated dark grey MUDSTONE locally disintegrated to very stiff clay. Bedding fractures are subhorizontal to 20deg closely to medium spaced planar smooth. (Lias Group) (WHM) 26.67m: Ammonite shell fragment. 26.70 - 26.90m: 60deg incipient planar smooth fracture.	26.60	200.25	
50C	28.00 - 29.50	28.00	100 20 16	NI 40 180				Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff silty clay. Fractures are subhorizontal, 40-60deg and subvertical very closely rarely closely spaced planar and undulating smooth. (Lias Group) (WHM) 28.40 - 28.50m: 60deg planar smooth fracture. 28.80 - 28.85m: 60deg planar smooth fracture.	27.80	199.05	
51C	29.50 - 31.00	29.50	100 24 15	NI 60 220				Extremely weak thinly laminated dark grey MUDSTONE locally tending to very stiff silty clay. Frequent lenses (up to 5x60mm) of limestone. Fractures are randomly orientated very closely and closely spaced planar and undulating smooth. (Lias Group) (WHM) 29.60 - 30.00m: Randomly orientated rarely medium spaced incipient fractures. 30.40 - 30.45m: Frequent pyrite nodules (up to 5mm). 30.85 - 30.90m: 70deg planar smooth fracture.	29.55	197.30	
52C	31.00 - 32.50	31.00	100 46 28								
53CS	31.45 - 31.85							31.70 - 32.00m: Fractures are closely spaced.	32.00	194.85	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 16-05-2019 12:00 80.50 80.50 6.00			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

Sheet 5 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
54C	32.50 - 34.00	32.50	100	NA				Very stiff fissured thinly laminated dark grey silty CLAY. Fissures are subhorizontal and 70deg very closely to medium spaced planar smooth locally polished. (Lias Group) (WHM)			
55C	34.00 - 35.50	34.00	100								
56C	35.50 - 37.00	35.50	100 100 89	NI 120 400				Very stiff fissured thinly laminated dark grey locally light brownish grey silty CLAY locally tending to extremely weak mudstone. Frequent lenses (up to 10mm) of limestone. Fissures are subhorizontal very closely and closely spaced planar smooth locally polished. (Lias Group) (WHM) Very stiff fissured thinly laminated dark grey clayey SILT locally tending to very weak mudstone. Fissures are subhorizontal extremely closely spaced planar smooth locally polished. (Lias Group) (WHM)	34.60 34.90	192.25 191.95	
57CS	36.45 - 36.75							Very weak thinly laminated dark grey MUDSTONE with rare becoming frequent thin laminae and lenses (up to 5x12mm) of limestone. Fracture set 1: Bedding fractures are subhorizontal closely spaced planar smooth. Fracture set 2: 40-50deg medium spaced planar smooth. (Lias Group) (WHM)			
58C	37.00 - 38.50	37.00	100 93 93								
59CS	37.65 - 38.05										
60C	38.50 - 40.00	38.50	100 100 100								
61C	40.00 - 41.50	40.00		NI				Very weak thinly laminated grey and dark grey MUDSTONE with rare lenses (up to 8mm) of limestone. Fracture set 1: Bedding fractures are subhorizontal to 10deg very closely spaced planar smooth. Fracture set 2: 70-80deg very closely and closely spaced planar smooth locally undulating rough. (Lias Group) (WHM)	39.80	187.05	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE		PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS	
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)		REMARKS	
				SUB LOCATION: 1077	
				AGS	
				CONTRACT 35560	
				CHECKED CT	

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
62C	41.50 - 43.00	41.50	100 70 0	40 80				Very weak locally weak thinly laminated dark grey MUDSTONE. Fracture set 1: Bedding fractures are subhorizontal closely and medium spaced planar smooth. Fracture set 2: 70deg medium spaced planar smooth. (Lias Group) (WHM)	40.90	185.95	
			NI 120 450								
63C	43.00 - 44.50	43.00	100 83 67					43.05 - 43.15m: Strong light grey limestone. 43.30 - 43.80m: Very stiff dark grey clay.			
64C 65CS	44.50 - 46.00 44.55 - 45.00	44.50	93 58 52								
66C	46.00 - 47.50	46.00	100 100 86					Extremely weak to weak thinly laminated dark grey MUDSTONE. Fractures are 60deg mainly medium spaced undulating rough. (Lias Group) (WHM) 45.85 - 45.95m: Frequent limestone nodules (up to 20mm). 46.50 - 46.60m: Frequent limestone nodules (up to 30mm). Extremely weak to very weak thinly laminated dark grey MUDSTONE with frequent limestone nodules (up to 40mm). Bedding fractures are subhorizontal medium spaced planar smooth. (Lias Group) (WHM) 47.40 - 47.50m: 40deg planar smooth fracture.	45.50	181.35	
			NI 240 250								
67C	47.50 - 49.00	47.50	96 92 71				Weak dark grey MUDSTONE with frequent ammonite moulds (up to 45mm). Fractures are subhorizontal mainly closely spaced undulating rough with rare light grey silt infill (up to 2mm). (Lias Group) (WHM)	46.80	180.05		
			NI 220 320								
			100 95 69						47.70	179.15	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1077

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	35560
							CHECKED
							CT

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

Sheet 7 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
68C	49.00 - 50.50	49.00	99 84 65	NI 70 110				Weak dark grey MUDSTONE with frequent ammonite moulds (up to 45mm). Fractures are subhorizontal mainly closely spaced undulating rough with rare light grey silt infill (up to 2mm). (Lias Group) (WHM) 48.50 - 48.55m: 10deg undulating rough fracture.	49.10	177.75	
69C	50.50 - 52.00	50.50	100 87 76	NI 240 310				Extremely weak to weak thickly and thinly laminated dark grey MUDSTONE with rare limestone nodules (up to 40mm). Fractures are subhorizontal to 20deg very closely and closely spaced undulating rough. (Lias Group) (WHM) 49.10 - 49.40m: Randomly orientated extremely closely spaced incipient fractures. 49.70 - 49.75m: Subvertical undulating rough fracture. Very weak locally extremely weak dark grey MUDSTONE with frequent limestone nodules (up to 60mm). Fracture set 1: Subhorizontal medium spaced planar smooth, fracture set 2: 60deg medium spaced undulating rough. (Lias Group) (WHM) 49.75m: Subhorizontal undulating rough fracture infilled (2mm) with light grey silt and rare fine sand sized pyrite.	49.75	177.10	
70C	52.00 - 53.50	52.00	100 74 54					52.10 - 52.60m: 60deg very closely spaced incipient fractures.			
71CS	52.90 - 53.50			NI 550 600				Very weak dark grey MUDSTONE with rare limestone nodules (up to 40mm). Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (WHM)	52.85	174.00	
72C	53.50 - 55.00	53.50	100 97 97					54.40 - 54.65m: Frequently thick laminae of limestone.			
73C	55.00 - 56.50	55.00	100 100 100	180 380 440				Very weak dark grey MUDSTONE with frequent lenses (up to 20mm) of limestone. Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (WHM) 55.40 - 55.80m: Very thinly bedded.	55.15	171.70	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

Sheet 8 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 07 May 2019

Easting 392857

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
74CS	56.10 - 56.50							Very weak dark grey MUDSTONE with frequent lenses (up to 20mm) of limestone. Fractures are subhorizontal medium spaced undulating rough. (Lias Group) (WHM) 56.20 - 56.55m: Randomly orientated extremely closely spaced incipient fractures.			
75C	56.50 - 58.00	56.50	100 100 85								
76C	58.00 - 59.50	58.00	100 99 58	NI 130 160				Very weak dark grey MUDSTONE. Fractures are subhorizontal to 20deg very closely and closely spaced planar rough. Frequent randomly orientated extremely closely spaced incipient fractures. (Lias Group) (WHM) Very weak locally weak dark grey MUDSTONE with rare light brown limestone nodules (up to 15mm). Frequent ammonite casts (up to 40mm) infilled with grey silt. Fractures are subhorizontal very closely and closely spaced planar rough. (Lias Group) (WHM) 58.10 - 58.25m: Abundant limestone nodules (up to 30mm). 58.55 - 58.80m: 70deg to subvertical undulating rough fracture.	57.55	169.30	
									58.05	168.80	
77C 78CS	59.50 - 61.00 59.55 - 60.00	59.50	95 95 88	NI 300 450				Weak dark grey MUDSTONE with rare belemnites (up to 35mm) replaced by calcite, rare ammonite moulds (up to 60mm) and limestone nodules (up to 15mm). Fractures are subhorizontal closely and medium spaced undulating rough. (Lias Group) (WHM) 60.20 - 60.30m: Subvertical planar smooth fracture. 60.60m: Limestone nodule (30mm).	59.50	167.35	
79C	61.00 - 62.50	61.00	100 100 100	390 450 950				Weak dark grey and grey MUDSTONE with rare ammonite moulds (up to 60mm), limestone nodules (up to 10mm) and sand filled burrows (up to 25mm). Fractures are subhorizontal to 10deg medium and widely spaced undulating rough. (Lias Group) (WHM) 61.85m: 70mm ammonite mould.	60.90	165.95	
80C 81CS	62.50 - 64.00 62.50 - 62.95	62.50	100 100 100	390 410 740				Weak dark grey MUDSTONE with closely and medium spaced very thin beds of grey limestone. Bedding fractures are subhorizontal medium and widely spaced planar smooth. (Lias Group) (WHM)	63.05	163.80	
82C	64.00 - 65.50	64.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
83CS	65.10 - 65.50		100 100 100					Weak dark grey MUDSTONE with closely and medium spaced very thin beds of grey limestone. Bedding fractures are subhorizontal medium and widely spaced planar smooth. (Lias Group) (WHM)			
84C	65.50 - 67.00	65.50	100 63 43	NI 80 220			65.45 - 65.55m: 50deg undulating rough fracture. Weak thickly laminated and very thinly bedded dark brown and dark grey MUDSTONE with frequent ammonite moulds (up to 85mm) and rare brachiopod moulds (up to 20mm). Bedding fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (WHM) 65.65 - 66.30m: 70deg planar rough fracture.	65.65	161.20		
85C	67.00 - 68.50	67.00	100 89 82				67.05 - 67.45m: Subvertical planar rough fracture intersecting a 60deg stepped rough fracture.	67.70	159.15		
86C	68.50 - 70.00	68.50	100 100 100	1600			Weak dark grey MUDSTONE with frequent ammonite moulds (up to 45mm). Fractures are subhorizontal closely and medium spaced undulating rough locally infilled (up to 2mm) with light grey silt. (Lias Group) (WHM) Very strong dark grey and grey LIMESTONE with frequent pockets (up to 25mm) of coarse sand sized pyrite and frequent belemnites (up to 40mm) replaced by calcite. Natural fractures not observed. (Lias Group) (MRB) 68.45 - 68.55m: Dark brown.	68.45	158.40		
87CS	69.40 - 69.85										
88C	70.00 - 71.50	70.00	100 100 75	NI 220 400			Weak thickly laminated dark grey and grey MUDSTONE with rare lenses (up to 40mm) and thick laminae of limestone. Bedding fractures are subhorizontal medium spaced undulating rough. (Lias Group) (DYS)	70.05	156.80		
89C	71.50 - 73.00	71.50	100 95 63	NI 85 240			Weak thinly laminated dark grey and grey MUDSTONE. Fractures are subhorizontal to 10deg closely and medium spaced planar rough. (Lias Group) (DYS)	71.00	155.85		

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
90C	73.00 - 74.50	73.00	97 97 48	NI 60 380				Weak thinly laminated dark grey and grey MUDSTONE. Fractures are subhorizontal to 10deg closely and medium spaced planar rough. (Lias Group) (DYS) 72.05 - 72.65m: 60deg undulating rough fracture. 72.45 - 72.65m: 60deg stepped incipient fracture.	72.90	153.95	
91C	74.50 - 76.00	74.50	100 90 84					Weak dark grey MUDSTONE with rare lenses of limestone (up to 90mm). Fractures are subhorizontal closely and medium spaced undulating rough. (Lias Group) (DYS)			
92C	76.00 - 77.50	76.00	100 99 89	NI 600 700				Strong light grey burrow mottled grey LIMESTONE. Natural fractures not observed. (Lias Group) (DYS) 75.80 - 75.90m: Extremely weak dark grey siltstone.	75.30	151.55	
93CS	77.05 - 77.50							Very weak dark grey SILTSTONE with rare shell fragments (up to 2mm). Fractures are subhorizontal widely spaced undulating rough. (Lias Group) (DYS)	76.15	150.70	
94C	77.50 - 79.00	77.50	93 71 55					78.45 - 78.90m: 70deg planar rough fracture intersecting a 40deg planar rough fracture.			
95C	79.00 - 80.50	79.00	100 100 100								
96CS	80.00 - 80.40								80.00	146.85	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1077 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC224

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 11

Start Date 07 May 2019

Easting 392857

Scale 1:50

End Date 16 May 2019

Northing 215346

Ground Level 226.85mOD

Depth 80.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				500				Weak dark grey MUDSTONE. Natural fractures not observed. (Lias Group) (DYS)	80.50	146.35	
								Borehole Completed at 80.50m			

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1077
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED CT	

BOREHOLE LOG



DSRC229

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 19 March 2020

Easting 392896

Scale 1:50

End Date 24 March 2020

Northing 215874

Ground Level 200.45mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.05 - 0.10							Very soft dark brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. Frequent roots and rootlets. (TOP)	0.10	200.35	
2B 2ES	0.25 - 0.30								0.45	200.00	
3B 3ES	0.45 - 0.50							Very soft dark brown and orange gravelly CLAY with a low limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	0.95	199.50	
4D 4ES	0.45 - 0.50								1.20	199.25	
5B 6D	0.95 - 1.00	Nil					S 15	Soft to firm orangish brown slightly sandy silty CLAY. (SLIP) (SLIP)			
7D 8L	1.20 - 1.65							Very soft light brown sandy silty CLAY with frequent fine to coarse gravel sized siltstone lithorelicts. (SLIP) (SLIP)			
9D	1.90 - 2.00							Firm to stiff light brown and brownish grey locally stained orangish brown slightly sandy clayey SILT. (SLIP_LIAS) (SLIP)			
10D 11L	2.20 - 2.65	Nil					S 21				
12D 13LS	2.80 - 2.90										
14D 15L	3.20 - 3.65	3.20					S 9	3.20m: SPT suggests firm.			
16L	3.70 - 4.20	3.70									
17D 18L	4.20 - 4.65	4.20					S 9	Firm becoming stiff light brown slightly sandy clayey SILT. (SLIP_LIAS) (SLIP)	4.05	196.40	
19D	4.90 - 5.00										
20UT 23L	5.20 - 5.63	5.20									
21D 22D	5.60 - 5.70										
24D	5.90 - 6.00										
25D 26L	6.20 - 6.65	5.20					S 28				
	6.20 - 7.20	7.20							6.50	193.95	
27D	6.90 - 7.00							Stiff light brown locally orangish brown slightly sandy clayey SILT with frequent pockets (up to 120mm) of grey slightly gravelly clayey silt. Gravel is siltstone lithorelicts. (SLIP_LIAS) (SLIP)			
28D 29L	7.20 - 7.65	7.20					S 26				
	7.20 - 8.00										
30D	8.00 - 8.45	7.20					S 29				

Continued Next Page

HOLE CONSTRUCTION			PLANT USED				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	Hand tools				Groundwater not encountered prior to use of flush				
0.00	1.20	Inspection Pit	Geotechnical Pioneer Rig				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
1.20	8.00	Window Sampler	Geotechnical Pioneer Rig								
8.00	25.00	Rotary Core									

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL		DEPTH (m)	TYPE	1084
168	8.20	0.00	0.30	Concrete		8.50	Standpipe	
		0.30	1.50	Bentonite				
		1.50	8.50	Gravel				
		8.50	25.00	Bentonite				

BARREL DIAMETER		HOLE PROGRESS					REMARKS
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
128	8.00	19-03-2020 08:10	0.00	Nil	Dry		
146	25.00	19-03-2020 16:30	6.20	6.20	3.20		
		20-03-2020 08:40	6.20	6.20	3.10		
		20-03-2020 15:30	15.20	8.20	3.10		
		23-03-2020 09:00	15.20	8.20	4.20		

AGS
CONTRACT
35560
CHECKED
CT

BOREHOLE LOG



DSRC229

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 19 March 2020 Easting 392896

Depth 25.00 m

End Date 24 March 2020 Northing 215874 Ground Level 200.45mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31C	8.00 - 9.20	8.00		NA				Very stiff grey locally stained orangish brown slightly gravelly slightly micaceous silty CLAY with frequent lenses (up to 30mm) of light grey silt. Gravel is subangular fine to coarse lithorelicts of mudstone and sandstone. Fissures are 50deg to 60deg medium and widely spaced undulating rough locally stained orangish brown with up 20mm penetrative discolouration. (SLIP_LIAS) (SLIP)	8.10	192.35	
32D	8.90 - 9.00										
33D 34C	9.20 - 9.65 9.20 - 10.70	8.20	100				S 40				
35CS	10.40 - 10.70										
36D 37C	10.70 - 11.50 10.70 - 12.20	8.20	80				S 21				
38D	11.40 - 11.50										
39D 40C	12.20 - 12.65 12.20 - 13.70	8.20	100				S 23				
41D 42C	13.70 - 14.15 13.70 - 15.20	8.20	100				S 23				
43CS	14.50 - 14.90										
44D 45C	15.20 - 15.65 15.20 - 16.70	8.20	100 0 0				S 17		15.35 - 15.60m: Light brown and grey locally stained orangish brown clayey silt, locally tending to extremely weak siltstone.		

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH				BACKFILL		INSTRUMENTATION	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER				HOLE PROGRESS			REMARKS
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		23-03-2020 16:30	22.70	8.20	5.40		
		24-03-2020 09:00	22.70	8.20	7.10		
		24-03-2020 11:45	25.00	8.20	8.40		
CONTRACT							35560
CHECKED							CT



BOREHOLE LOG



DSRC229

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 19 March 2020

Easting 392896

Scale 1:50

End Date 24 March 2020

Northing 215874

Ground Level 200.45mOD

Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
46D 47C	16.70 - 17.15	8.20	97	NI			S 30	Extremely weak grey locally stained orangish brown SILTSTONE, locally disintegrated to stiff grey and orangish brown gravelly clayey silt. Gravel is angular and subangular fine to coarse siltstone. (Lias Group) (WHM)	16.05	184.40	XXXXXX
	16.70 - 18.20			NA				Very stiff grey locally stained orangish brown gravelly silty CLAY with frequent lenses (up to 30mm) of light grey silt and rare iron pyrite nodules (up to 60mm). Gravel is angular and subangular fine to coarse siltstone and mudstone lithorelicts. Fissures are 50deg to 60deg medium spaced planar rough. (Lias Group) (WHM) 16.50 - 16.53m: Very weak grey and orangish brown siltstone.	16.50	183.95	XXXXXX
48D 49CS	17.30 - 17.40 17.50 - 17.77										
50D 51C	18.20 - 18.65 18.20 - 19.70	8.20	90				S 56				
52D 53C	19.70 - 20.15 19.70 - 21.20	8.20	100				S 63				
54CS	20.45 - 20.85							20.10 - 20.15m: 40deg very thin bed of weak light grey mudstone. 20.15 - 25.00m: Locally tending to extremely weak siltstone.			
55D 56C	21.20 - 21.65 21.20 - 22.70	8.20	77				S 83				
57C	22.70 - 24.20	8.20	100 0 0				C 59				
58CS	23.81 - 24.20							23.70 - 23.90m: Very weak grey siltstone. 23.80 - 23.95m: Frequent shell fragments (up to 60mm) and rare ammonites (up to 20mm).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1084 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC229

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 19 March 2020 Easting 392896

End Date 24 March 2020 Northing 215874 Ground Level 200.45mOD Depth 25.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
59C	24.20 - 25.00	8.20	94				C *158				
60CS	24.60 - 25.00	8.20					C *300	Borehole Completed at 25.00m	25.00	175.45	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 1084
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



DSRC301

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10 - 0.20							Grass over brown slightly sandy slightly gravelly SILT.			
2ES	0.30 - 0.40							Gravel is subangular and subrounded fine and medium limestone. Frequent rootlets. (TOP)	0.35	233.85	
1B	0.50 - 0.70							Soft light brown slightly sandy gravelly CLAY with low limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (HDD) (HEAD)	0.80	233.40	
3ES	0.50 - 0.60										
2B	1.00 - 1.20							Firm becoming stiff light brown slightly sandy gravelly silty CLAY with low subangular limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (HDD) (HEAD)	1.55	232.65	
4ES	1.00 - 1.10	Nil									
3L	1.20 - 1.50										
4C	1.50 - 2.20	1.50	100 64 14	NI 40 100			C *61	Weak light grey and light yellowish brown bioclastic LIMESTONE locally disintegrated to clayey subangular fine to coarse gravel. Medium spaced very thin beds of firm orange clay. Fractures are subhorizontal to 20deg very closely and closely spaced planar and undulating rough. (IOG) (BLPL)			
5C	2.20 - 3.20	1.50	97 27 0				C *130				
6C	3.20 - 4.20	1.50	100 51 34				C *167				
7CS	3.75 - 4.00								4.00	230.20	
8C	4.20 - 5.20	1.50	98 21 0	NA			C 67	Very dense light brown slightly sandy clayey subangular and subrounded fine and medium limestone GRAVEL. (IOG) (BLPL) 4.40 - 4.45m: Thin bed of limestone.	4.70	229.50	
9C	5.20 - 6.70	5.20	96 53 8	NI 60 120			C *222	Weak thinly bedded light grey and light yellowish brown locally peloidal bioclastic LIMESTONE locally disintegrated to clayey subangular fine to coarse gravel. Fractures are subhorizontal to 20deg rarely subvertical closely spaced planar and undulating rough. Localised orange staining. (IOG) (BLPL)			
10C	6.70 - 8.20	5.20	97 50 29	NA				(Firm) light brown slightly sandy slightly gravelly CLAY with low limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (IOG) (BLPL)	7.05	227.15	
11CS	7.70 - 7.88			NI 120 410				Weak to medium strong thinly and medium bedded light yellowish brown oolitic and bioclastic LIMESTONE locally disintegrated to slightly sandy gravelly clay. Frequent irregular voids (up to 80mm) stained orange. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough surfaces weakened. (IOG) (BLPL)	7.40	226.80	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.50	Inspection Pit	Hand tools				Groundwater not encountered prior to use of flush	
1.20	1.50	Window Sampler	Comacchio 305					
1.50	105.05	Rotary Core	Comacchio 305					
CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106	
168	46.20	0.00	0.50	Concrete	29.00	Standpipe		
140	105.05	0.50	7.40	Bentonite				
		7.40	10.50	Sand				
		10.50	29.50	Gravel				
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Dynamic sampling undertaken to recover dropped core 35.70-37.20m (0.70m recovered), 40.20-41.70m (1.50m recovered) and 43.20-44.70m (1.48m recovered). Driller notes reduced flush returns		35560
128	1.50	09-09-2019 09:00	0.00	Nil	Dry			CHECKED
146	33.40	09-09-2019 17:00	3.20	1.50	2.10			CT
116	62.70	10-09-2019 09:00	3.20	1.50	2.50			
146	105.05	10-09-2019 14:20	11.25	5.20	6.50			
		11-09-2019 08:30	11.25	5.20	10.80			

BOREHOLE LOG



DSRC301

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
12C	8.20 - 9.70	5.20	100 56 41				C *103	Weak to medium strong thinly and medium bedded light yellowish brown oolitic and bioclastic LIMESTONE locally disintegrated to slightly sandy gravelly clay. Frequent irregular voids (up to 80mm) stained orange. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough surfaces weakened. (IOG) (BLPL) 9.00 - 9.10m: Subvertical undulating rough fracture with light brown clay infill.			
13C	9.70 - 11.20	5.20	97 68 58								
14CS	10.35 - 10.75										
15C	11.20 - 12.70	5.20	100 91 88	NI 300 740			C *667	Weak to medium strong medium bedded light yellowish brown oolitic and bioclastic LIMESTONE with medium spaced very thin beds of stiff orangish brown clay and extremely weak orangish brown calcareous mudstone. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough. (IOG) (BLPL)	11.30	222.90	
16C	12.70 - 14.20	5.20	96 94 83								
17CS	12.85 - 13.25										
18C	14.20 - 15.70	5.20	99 89 55				C **	14.50 - 14.55m: Thin bed of light orangish brown sandy clay. 14.55 - 14.90m: Subvertical undulating rough fracture infilled with light brown clay. 15.05 - 15.10m: 60deg undulating rough fracture stained light orangish grey.			
19CS	15.20 - 15.50										
20C	15.70 - 16.20	5.20	100 100								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH				BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106
			29.50	105.05	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	9.70-11.20m (40% returned), 33.40-38.70m (0-60% returned) and 46.20-58.20m (20-60% returned). Driller notes loss of flush 11.20-33.40m, 38.70-46.20m and 58.20-105.05m.	35560	
		11-09-2019 17:00	22.30	5.20	20.60		CHECKED	
		12-09-2019 08:00	22.30	5.20	21.20		CT	
		12-09-2019 17:00	32.50	5.20	24.80			
		13-09-2019 08:30	32.50	5.20	25.80			
		13-09-2019 16:30	33.40	21.70	21.00			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	16.20 - 17.70	5.20	100	NI 300 800			C *111	Weak to medium strong medium bedded light yellowish brown oolitic and bioclastic LIMESTONE with medium spaced very thin beds of stiff orangish brown clay and extremely weak orangish brown calcareous mudstone. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough. (IOG) (BLPL) 16.00 - 16.10m: Grey limestone inclusion surrounded (2mm) by calcite.	16.40	217.80	
			93								
			77								
			76								
22C 23CS	17.70 - 19.20 17.80 - 18.15	5.20	100				Weak white and light yellowish brown bioclastic LIMESTONE with frequent irregular voids (up to 50mm) stained orange and partially infilled with orange slightly sandy clay. Rare shell fossils (up to 70mm). Fractures are subhorizontal to 20deg closely and medium rarely widely spaced undulating rough stained light orangish brown. (IOG) (BLPL) 16.95 - 17.10m: Bluish grey. 18.55 - 18.75m: 70deg planar rough fracture with dark reddish brown staining.				
			95								
24C	19.20 - 20.70	5.20	100				C *115				
			53								
25C	20.70 - 22.20	5.20	100	250 500 510				Medium strong grey mottled orange bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced planar rough stained orange. Localised voids on one side of core with associated orange staining. (IOG) (BLPL) 21.35 - 21.60m: 80deg calcite vein (5mm)	20.80	213.40	
			100								
26CS	21.80 - 22.20	5.20	100								
			99								
27C	22.20 - 23.70	5.20	100	NI 220 300			C **	22.20m: Brachiopod shell fragment (20mm). Extremely weak and very weak dark grey MUDSTONE. Fractures are subhorizontal to 15deg medium spaced planar and undulating rough. (Lias Group) (BDS) 22.50m: 50mm bed of fractured grey limestone.	22.40	211.80	
			100								
28C 29CS	23.70 - 25.20 23.70 - 24.00	5.20	100	500				Strong grey mottled orange bioclastic LIMESTONE with rare shell fossils replaced by calcite. No natural fractures observed. (Lias Group) (BDS)	23.70	210.50	
			33								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106	

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
		16-09-2019 09:00	33.40	21.50	26.00			CHECKED	
		16-09-2019 17:00	33.40	33.40	4.00			CT	
		17-09-2019 08:30	33.40	33.40	4.00				
		17-09-2019 14:30	38.70	37.20	29.10				
		18-09-2019 09:30	38.70	38.70	16.80				

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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
30C	25.20 - 26.70	5.20	100	NA		C 11		Medium dense (?) becoming very dense with depth orangish brown locally mottled grey slightly sandy SILT. (Lias Group) (BDS)	24.20	210.00	[Pattern]
31C	26.70 - 28.20	5.20	100								[Pattern]
32CS	27.93 - 28.20										[Pattern]
33C	28.20 - 29.70	5.20	100			C 92					[Pattern]
34C	29.70 - 31.20	5.20	93	NA				Very stiff thinly laminated dark grey micaceous slightly sandy clayey SILT. Locally stained reddish brown. (Lias Group) (BDS)	29.45	204.75	[Pattern]
35CS	30.50 - 30.80										[Pattern]
36C	31.20 - 32.70	5.20	100	NA		C 59		Very stiff thinly laminated very closely fissured dark grey micaceous slightly sandy clayey SILT. (Lias Group) (BDS) 31.20 - 31.90m: Mottled greyish brown.	31.20	203.00	[Pattern]

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION: 1106
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT 35560
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		18-09-2019 17:30	46.35	38.70	25.00		
		19-09-2019 08:30	46.35	38.70	25.70		
		19-09-2019 18:00	52.20	46.20	15.30		
		20-09-2019 09:00	52.20	46.20	29.30	CHECKED CT	
		20-09-2019 17:30	58.20	46.20	19.70		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 5 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37C	32.70 - 33.40	5.20	100					Very stiff thinly laminated very closely fissured dark grey micaceous slightly sandy clayey SILT. (Lias Group) (BDS)			
38CS	33.15 - 33.40										
39C	33.40 - 34.20	33.40	75								
40C	34.20 - 35.70	33.40	88				C 72				
41CS	35.05 - 35.25										
42C	35.70 - 37.20	33.40	50						35.70 - 37.20m: Limited recovery.		
43C	37.20 - 38.70	37.20	75				C 41				
44CS	37.95 - 38.30										
45C	38.70 - 40.20	38.70	100 95 95	NI 310 600					Extremely weak to very weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 39.10 - 39.15m: Calcareous fine sandstone.	38.70	195.50

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			23-09-2019 09:00	58.20	46.20	29.50	
			23-09-2019 15:00	62.70	46.20	21.30	
			11-10-2019 08:30	62.70	46.20	26.70	
			11-10-2019 09:30	64.20	31.30	20.70	
			14-10-2019 08:45	64.20	31.30	34.70	
							CONTRACT
							35560
							CHECKED
							CT

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Sheet 6 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
46C	40.20 - 41.70	38.70	100 100 100				C *200	Extremely weak to very weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 40.15m: Belemnite fossil (20mm diam) replaced by calcite.			
47CS	41.30 - 41.70										
48C	41.70 - 43.20	38.70	97 85 85								
49C	43.20 - 44.70	38.70	97 85 85				C *222				
50CS	43.60 - 43.95										
51C	44.70 - 46.20	38.70	100 100 100								
52CS	45.40 - 45.80										
53C	46.20 - 47.70	38.70 46.20	76 64 64	NI	300 600		C *429	Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM)	46.20	188.00	
54C	47.70 - 49.20	46.20	73 73								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1106			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS				REMARKS		CONTRACT	
		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
		14-10-2019 16:30	69.30	31.90	22.60			CHECKED CT	
		15-10-2019 09:15	69.30	31.90	31.20				
		15-10-2019 16:30	75.30	31.90	Dry				
		16-10-2019 06:30	75.30	Nil	Dry				
		16-10-2019 18:00	75.30	49.70	32.40				

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CLIENT HIGHWAYS ENGLAND

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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
55CS	48.50 - 48.75		73					Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM)			
56C	49.20 - 50.70	46.20	100 80 80				C *375				
57C	50.70 - 52.20	46.20	100 100 100								
58CS	51.30 - 51.55							51.55 - 51.75m: 80deg planar smooth fracture.			
59C	52.20 - 53.70	46.20	98 93 93				C *316				
60CS	52.65 - 52.85							52.50m: Bivalve shell fragments (up to 30mm)			
61C	53.70 - 55.20	46.20	100 100 100								
62C	55.20 - 56.70	46.20	29 0 0				C *273	55.20 - 56.70m: Limited recovery. Drilling disturbed.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1106
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT 35560 CHECKED CT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)			WATER (m)
		17-10-2019 09:00	75.30	49.70			34.70
		17-10-2019 16:30	79.80	49.70			33.00
		18-10-2019 08:30	79.80	49.70			37.40
		18-10-2019 15:00	84.30	49.70	36.60		
		21-10-2019 09:20	84.30	49.70	22.67		

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CLIENT HIGHWAYS ENGLAND

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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
63C	56.70 - 58.20	46.20	100 100 90					Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM)			
64CS	57.65 - 57.90										
65C	58.20 - 59.70	46.20	84 77 77				C *667	58.05 - 58.20m: Subvertical undulating rough fracture with calcite veins (2mm).			
66CS	59.10 - 59.35										
67C	59.70 - 61.20	46.20	100 100 83					60.50m: Belemnite fossil (15mm diam).			
68C	61.20 - 62.70	46.20	100 91 91				C *333	60.95m: Belemnite fossil (15mm diam). 61.20 - 62.70m: Rare greenish grey bioturbation (5mm spots). 61.30m: Bivalve fragment (30mm). 61.55 - 61.60m: Siltstone nodule (50mm). 61.80 - 62.00m: 60deg planar rough fracture.			
69CS	62.10 - 62.30										
70C	62.70 - 64.20	62.70	66 59 15								
71CS	63.60 - 63.80										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		21-10-2019 15:50	88.80	88.80	18.52		
		22-10-2019 08:40	88.80	88.80	24.51		
		22-10-2019 17:00	95.45	95.45	20.38		
		23-10-2019 08:10	95.45	95.45	26.63		CHECKED
		23-10-2019 17:25	99.30	99.30	22.44		CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
72C	64.20 - 65.70	64.20	100 100 59				C *429	Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 64.80 - 65.10m: Subvertical planar rough fracture.			
73C 74CS	65.70 - 66.30 65.82 - 65.99	65.70	100 93 48								
75C	66.30 - 67.80	66.30	98 89 57				C *375	67.30 - 67.55m: 70deg planar rough fracture.			
76C	67.80 - 69.30	67.80	93 93 93					67.80 - 68.20m: Subvertical planar smooth fracture.			
77CS	68.97 - 69.18										
78C	69.30 - 70.80	69.30	100 83 65				C *545	69.30 - 75.30m: Rarely mottled greenish grey (bioturbation) and white shell fragments (up to 5mm). 70.30m: Coarse gravel sized limestone nodule.			
79C 80CS	70.80 - 72.30 71.05 - 71.26	70.80	100 100 96					71.25 - 71.65m: Subvertical planar smooth fracture. 71.65 - 71.75m: 50deg planar smooth fracture.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		24-10-2019 08:20	99.30	99.30	27.08		CHECKED
		24-10-2019 16:00	105.05	105.05	22.24		CT

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CLIENT HIGHWAYS ENGLAND

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SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
81C	72.30 - 73.80	72.30	93 74 74				C *462	Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM)			
82C	73.80 - 75.30	73.80	100 97 80								
83CS	74.85 - 75.05										
84C	75.30 - 76.80	75.30	91 77 49				C *429	75.30 - 78.30m: Rare shell fragments (<5mm).			
85C	76.80 - 78.30	76.80	100 100 65								
86CS	78.12 - 78.30										
87C	78.30 - 79.80	78.30	100 86 80				C *545	79.30 - 79.45m: Subvertical planar smooth fracture. 79.45 - 79.80m: Rare lenses (up to 20mm) light grey silt.			
88CS	78.82 - 79.13										
89C	79.80 - 81.30	79.80	100					79.80 - 82.80m: Rare shell fragments (up to 5mm).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1106	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
90CS	80.72 - 80.90		100 94					Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 80.55 - 80.75m: Subvertical planar smooth fracture. 82.15 - 82.45m: Rare thin laminae and lenses of extremely weak light grey and light brown siltstone. 82.50 - 82.60m: Subvertical undulating smooth fracture.			
91C	81.30 - 82.80	81.30	100 98 77			↓ C *667					
92C 93CS	82.80 - 84.30 82.87 - 83.07	82.80	77 71 47								
94C	84.30 - 85.80	84.30	100 95 79	NI 200 720		↓ C *857			84.30	149.90	
95C	85.80 - 87.30	85.80	100 91 83					Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced, rarely widely spaced, planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 85.45 - 85.65m: 40-50deg very closely spaced undulating smooth fractures. 86.75 - 86.85m: 40deg planar smooth fracture. 87.05m: Very thin bed (20mm) of yellowish grey pyritic sand.			
96CS	86.55 - 86.75										
97C	87.30 - 88.80	87.30	100 89 77			↓ C *500					

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC301

CLIENT HIGHWAYS ENGLAND

Sheet 12 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 09 September 2019 Easting 393185

Depth 105.05 m

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
98CS	88.15 - 88.40							Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced, rarely widely spaced, planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM) 88.65 - 88.70m: 30deg planar smooth fracture. 92.45m: Ammonite (40mm). 92.85 - 92.90m: 20deg planar smooth fracture. 94.00 - 94.10m: 80deg planar smooth fracture.				
99C	88.80 - 90.30	88.80	100 100 100									
100C	90.30 - 91.80	90.30	100 90			↓ C *667						
101C S	90.65 - 90.89		86									
102C	91.80 - 93.30	91.80	100 100 91									
103C	93.30 - 94.80	93.30	100 97 83			↓ C *600						
104C	94.80 - 96.30	94.80	94 94									
105C S	95.15 - 95.40		75									
Continued Next Page												

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
							CHECKED	
							CT	

BOREHOLE LOG



DSRC301

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 14

Start Date 09 September 2019 Easting 393185

Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
106C	96.30 - 97.80	96.30	96 85 68	NI 150 600			C *600	Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced, rarely widely spaced, planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (WHM)			
107C	97.80 - 99.30	97.80	100 100 69								
108C S	98.18 - 98.45										
109C	99.30 - 100.80	99.30	83 81 56				C *545	98.85 - 99.10m: 60-70deg very closely spaced undulating smooth fractures. 99.55 - 100.60m: Subvertical planar smooth fracture.			
110C	100.80 - 102.30	100.80	100 100 80								
111C S	100.80 - 101.01										
112C	102.30 - 103.80	102.30	97 97 58				C *600	102.75 - 102.90m: 60deg planar smooth fracture.			
113C S	102.97 - 103.24										
114C	103.80 - 105.05	103.80	100								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC301

CLIENT HIGHWAYS ENGLAND

Sheet 14 of 14

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 September 2019 Easting 393185


Scale 1:50

End Date 24 October 2019 Northing 215962 Ground Level 234.20mOD

Depth 105.05 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			97 85					Very weak to weak thinly laminated dark grey silty MUDSTONE locally tending to siltstone. With frequent thin laminae and lenses of light grey silt and fine sand. Fractures are subhorizontal to 10deg closely and medium spaced, rarely widely spaced, planar smooth. Frequent subvertical and randomly orientated incipient fractures. (Lias Group) (VHM) 104.50 - 104.65m: Subvertical undulating rough fracture with gravelly clay infill. 104.70 - 104.85m: 60deg planar smooth fracture. Borehole Completed at 105.05m	105.05	129.15	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1106		 CONTRACT 35560	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CHECKED CT	
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BOREHOLE LOG



DSRC302

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 05 March 2019

Easting 393329

Scale 1:50

End Date 06 March 2019

Northing 216018

Ground Level 234.50mOD

Depth 35.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 3ES 5B 6D 4ES 7B 8D 10L 9D	0.10 - 0.30 0.10 - 0.30 0.10 - 0.30 0.30 - 0.50 0.30 - 0.50 0.30 - 0.50 0.60 - 0.90 0.60 - 0.90 0.60 - 0.90 0.90 - 1.20 0.90 - 1.20 0.90 - 1.20 1.20 - 2.20 1.20 - 1.65							Grass over dark brown slightly sandy SILT with frequent rootlets and rare snail shells (up to 15mm diameter). (MG) (MGR)	0.30	234.20	
								Light brown mottled yellowish brown clayey sandy angular to subrounded fine to coarse light brownish yellow oolitic limestone GRAVEL with a low angular to subrounded light yellowish brown oolitic limestone cobble content and rare rootlets. (IOG) (BLPL)	0.50	234.00	
							S 37	Light brownish yellow clayey very sandy angular to subrounded fine to coarse oolitic limestone GRAVEL. (IOG) (BLPL)	1.70	232.80	
								Extremely weak highly fractured light yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 10mm). Fractures are randomly orientated extremely closely and very closely spaced undulating rough. (IOG) (BLPL)			
11D 12C	2.20 - 2.60 2.20 - 3.70		97 13 7	NI			S 50	Very weak highly fractured light brown oolitic LIMESTONE. Fractures are randomly orientated extremely closely to closely spaced undulating rough infilled (up to 20mm) with brown and dark brown clay. (IOG) (BLPL)	2.60	231.90	
				NI				Weak light brown bioclastic LIMESTONE. Fractures are subhorizontal very closely and closely spaced undulating rough infilled (up to 10mm) with dark brown clay or stained dark orangish brown. (IOG) (BLPL)	3.40	231.10	
13C	3.70 - 5.20		95 56 15	NI 90 200				3.45 - 3.55m: 45deg stepped rough fracture infilled (50mm) with brown clay. 3.65 - 4.05m: 60deg undulating rough fracture infilled (35mm) with orangish brown sandy clay. 4.20 - 4.30m: Orangish brown clayey gravelly coarse sand. Gravel is angular to subrounded fine to coarse limestone. 4.50 - 4.70m: Fractures are randomly orientated extremely closely and very closely spaced infilled (2mm) with light brown clay. 4.55 - 4.70m: 80deg vein of white calcite (10mm thick). 5.00 - 5.10m: 80deg vein of white calcite (10mm thick). 5.15 - 5.20m: Disintegrated to sandy gravel.	5.20	229.30	
14C	5.20 - 6.70		89 52 22	NI 50 60				Very weak light brown stained orangish brown bioclastic LIMESTONE with rare voids (up to 5mm). Fractures are subhorizontal and subvertical very closely spaced undulating rough infilled (up to 20mm) with brown clay. (IOG) (BLPL)	5.70	228.80	
				NI 90 200				Weak light yellowish brown bioclastic LIMESTONE with frequent calcite veins (up to 2mm thick). Fractures are subhorizontal very closely and closely spaced undulating rough stained dark orangish brown. (IOG) (BLPL)	6.70	227.80	
15C	6.70 - 8.20		69 41 23	NI 80 150				6.45 - 6.55m: Firm orangish brown and grey clay. Medium strong light yellowish brown stained orangish brown bioclastic LIMESTONE with frequent voids (up to 20mm) and calcite veins (2mm thick). Fractures are subhorizontal to 20deg closely spaced stained dark orangish brown. (IOG) (BLPL)			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	2.20	Windowless Sampler	Comacchio 305					
2.20	35.20	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	987
168	2.20		0.00	0.50	Concrete	26.00	Standpipe	
140	35.20		0.50	13.00	Grout			
			13.00	15.00	Bentonite			
			15.00	26.50	Gravel			
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
128	2.20		05-03-2019 09:45	0.00	Nil	Dry	On 07/03/19, downhole geophysical survey carried out. Borehole collapsed 35.20-30.00m. Driller notes reduced flush returns	CHECKED
146	35.20		05-03-2019 16:50	24.70	24.70	22.99	5.20-6.70m (50% returned) and loss of flush returns 6.70-35.20m.	CT
			06-03-2019 10:15	24.70	24.70	Dry		
			06-03-2019 13:40	35.20	35.20	25.68		

BOREHOLE LOG



DSRC302

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 5

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 05 March 2019

Easting 393329

Scale 1:50

End Date 06 March 2019

Northing 216018

Ground Level 234.50mOD

Depth 35.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C	8.20 - 9.70	8.20	63 22 0	NI 60 90				orangish brown. osely spaced infilled (2mm) with brown clay. Medium strong highly fractured bioclastic LIMESTONE with frequent voids (up to 40mm) and calcite inclusions (up to 60mm). Fractures are randomly orientated very closely and closely spaced undulating rough infilled (up to 50mm) with brown clay. (IOG) (BLPL) 8.40 - 8.60m: 70deg vein of light grey and white calcite (up to 80mm thick). 8.90m: 50deg undulating rough fracture infilled (2mm) with light brown sandy clay. 9.05 - 9.10m: Weak brown angular to rounded fine and medium gravel sized conglomerate. 9.10 - 9.70m: Assessed zone of core loss.	8.20	226.30	
				NR							
17C	9.70 - 11.20	9.70	100 70 55	150 200 250				Strong light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL) Medium strong light yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal, 45deg and subvertical locally intersecting closely and medium spaced undulating rough infilled (up to 20mm) with brown clay or stained dark orangish brown. (IOG) (BLPL) 11.00m: Subhorizontal to 20deg fracture infilled (3mm) with dark brown clayey fine to coarse sand. 11.10m: 45deg stepped rough fracture. 11.40 - 11.50m: Firm brown slightly sandy clay. 11.40 - 12.40m: Frequent pisoids (up to 8mm diameter). 11.50 - 11.60m: Weak light yellowish brown oolitic limestone. 11.60 - 11.70m: Stiff brown clay. 12.20 - 12.25m: Frequent brachiopods (up to 20mm). 12.40 - 12.50m: Rare fossils (up to 20mm). 12.95 - 13.45m: 70deg stepped rough fracture stained orangish brown.	9.70	224.80	
				NI 90 300					10.55	223.95	
18C	11.20 - 12.70	11.20	93 58 43					Medium strong light yellowish brown stained orangish brown bioclastic LIMESTONE with frequent voids (up to 4mm). Fractures are subhorizontal to 20deg locally 45deg closely and medium spaced stained orangish brown undulating rough. (IOG) (BLPL) 13.30 - 14.20m: Abundant pisoids (up to 12mm). 13.65 - 13.75m: Subvertical undulating incipient fracture. 13.80 - 14.00m: Highly fractured, randomly orientated extremely closely spaced infilled with pea grit (up to 30mm). 14.20 - 14.70m: Assessed zone of core loss. 14.20 - 15.60m: Abundant pea grit (up to 30mm).			
19CS	11.75 - 12.05										
20C	12.70 - 14.20	12.70	81 37 25	NI 90 200				15.80 - 16.55m: 70deg vein of light grey and white calcite (up to 20mm).	13.00	221.50	
21C	14.20 - 15.70	14.20	68 33 0								
22C	15.70 - 17.20	15.70	97 61								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL 26.50 30.00 Bentonite 30.00 35.20 Arisings			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC302

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 5

Start Date 05 March 2019

Easting 393329

Scale 1:50

End Date 06 March 2019

Northing 216018

Ground Level 234.50mOD

Depth 35.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
23C	17.20 - 18.70	17.20	36					Medium strong light yellowish brown bioclastic LIMESTONE with frequent 60deg veins of light grey and white calcite (up to 10mm thick). Fractures are subhorizontal, 45deg and subvertical intersecting closely and medium spaced undulating rough infilled (up to 30mm) with brown clay. (IOG) (BLPL) 16.40 - 16.75m: Subvertical undulating rough fracture infilled (5mm) with orangish brown slightly gravelly clay. Gravel is subrounded fine to coarse shelly limestone gravel. 16.55 - 17.60m: Subvertical planar rough fracture with orangish brown staining and infilled (10mm) with orangish brown slightly sandy clay. 16.80 - 17.00m: 70deg planar rough fracture infilled (2mm) with orangish brown slightly sandy clay.	16.20	218.30	
			100 77 62	NI 90 210	17.30	217.20					
24C	18.70 - 20.20	18.70	100 67 56					Strong light yellowish brown bioclastic LIMESTONE with rare voids (up to 10mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough. (IOG) (BLPL) 17.30 - 18.00m: Subvertical planar rough fracture stained dark brown. 18.75 - 18.85m: Subhorizontal undulating rough fracture infilled with light brown clayey sand. 19.40m: Subvertical to vertical undulating incipient fracture.	19.70	214.80	
			96 71 45	NI 100 180	20.20						
25C	20.20 - 21.70	20.20	96 71 45					Strong light yellowish brown bioclastic LIMESTONE with frequent rounded elongate voids (up to 15mm). Fractures are subhorizontal to 40deg very closely and closely spaced undulating rough stained orangish brown or infilled (up to 10mm) with soft brown clay. (IOG) (BLPL) 19.70 - 20.05m: Fractures intersecting. 20.30 - 20.40m: Subvertical planar rough fracture stained orangish brown. 20.40 - 20.70m: 45deg-50deg closely spaced undulating rough fractures stained orangish brown and infilled (2mm) with brown clay. 21.30 - 21.60m: Rare brachiopods (up to 40mm diameter).	21.90	212.60	
			96 79 56	110 220 385	21.70						
26C	21.70 - 23.20	21.70	96 79 56					Weak and medium strong light brown and yellowish brown shelly LIMESTONE with frequent rounded elongate voids (up to 15mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL) 21.90 - 22.00m: Vertical planar rough fracture stained orangish brown. 22.35 - 22.50m: Light and dark grey.	22.85	211.65	
			63 43 7	NI 30 60	23.20						
27CS	22.05 - 22.40							Medium strong light yellowish brown bioclastic LIMESTONE with frequent rounded elongate voids (up to 15mm). Fractures are subhorizontal to 20deg very closely spaced infilled (up to 40mm) with stiff brown clay. (IOG) (BLPL) 23.20 - 23.75m: Assessed zone of core loss.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC302

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 5

Start Date 05 March 2019

Easting 393329

Scale 1:50

End Date 06 March 2019

Northing 216018

Ground Level 234.50mOD

Depth 35.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29C	24.70 - 26.20	24.70	50 3 0	NR				Medium strong light yellowish brown bioclastic LIMESTONE with frequent rounded elongate voids (up to 15mm). Fractures are subhorizontal to 20deg very closely spaced infilled (up to 40mm) with stiff brown clay. (IOG) (BLPL) 24.05 - 24.20m: Subvertical planar rough fracture stained light orangish brown. 24.45 - 24.55m: Subvertical planar rough fracture stained orange. 24.55 - 24.65m: Firm orangish brown slightly gravelly slightly sandy clay. Gravel is subrounded fine and medium light brown shelly limestone. Assessed zone of core loss.	24.70	209.80	
30C	26.20 - 27.70	26.20	100 5 0	NI				Medium strong highly fractured light brown and brown bioclastic LIMESTONE locally disintegrated to clayey subangular fine to coarse lithorelicts of limestone. Fractures are randomly orientated extremely closely and very closely spaced undulating smooth. (IOG) (BLPL) 26.55 - 26.65m: Subvertical planar rough fracture infilled (2mm) with light orangish brown clay.	25.45	209.05	
31C	27.70 - 29.20	27.70	100 73 67	NA				Stiff becoming very stiff thinly laminated dark grey silty CLAY with extremely closely spaced very thin lenses of light grey silt. (Lias Group) (BDS) 27.00 - 27.05m: Light grey silt.	26.75	207.75	
32CS	28.20 - 28.70							Very weak to weak dark grey SILTSTONE. Fractures are subhorizontal to 20deg medium spaced undulating smooth. (Lias Group) (BDS) 28.20 - 28.65m: Weak dark grey siltstone. 28.40 - 28.45m: Abundant shell fragments (up to 15mm).	27.75	206.75	
33C 37D	29.20 - 30.70 29.30 - 29.40	29.20	100 42 28	NA				Fissured slightly sandy grey SILT with extremely closely spaced thin laminae of light grey silt. Fissures are subhorizontal to 20deg closely spaced undulating smooth. (Lias Group) (BDS) 29.20 - 29.35m: Very stiff grey silty clay. 29.70 - 29.75m: Silty clay. 29.85 - 30.20m: Very weak siltstone.	28.85	205.65	
34C	30.70 - 32.20	30.70	87								
38D	31.90 - 32.00										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 11

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.05 - 0.30							Grass over very soft dark brown slightly sandy clayey SILT with frequent rootlets. (TOP)	0.30	235.95	
2ES 3B 4D	0.30 - 0.50							Light orangish brown clayey very sandy subangular to subrounded fine to coarse oolitic limestone GRAVEL with a low subangular cobble content. (IOG) (BLPL)			
3ES 5B	0.60 - 0.90										
4ES 6B 7D 8D 9L	1.00 - 1.20						S 32	1.20m: Dense.			
10D 11C	2.00 - 2.18 2.00 - 3.50	2.00 2.00	100 55 0	NI 30 70			S *273	Weak light yellowish grey oolitic LIMESTONE. Fractures are subhorizontal to 20deg very closely and closely spaced undulating smooth stained brownish orange strength reduced to extremely weak (up to 20mm) either side of fracture surface. (IOG) (BLPL) 2.35 - 2.50m: Subvertical undulating rough fracture stained dark brownish orange. 2.70 - 2.75m: 30deg undulating smooth fracture stained light brownish orange. 2.80 - 3.20m: Subvertical undulating rough fractures stained dark brownish orange.	1.80	234.45	
12C	3.50 - 5.00	3.50	100 70 23	NI 40 130				Medium strong light greyish yellow shelly LIMESTONE with frequent ooids (up to 2mm) and rare elongate rounded voids (up to 50mm) stained brownish orange. Fractures are subhorizontal very closely and closely spaced undulating rough strength reduced to very weak (up to 20mm) either side of fracture surface. (IOG) (BLPL) 3.80 - 3.85m: Fractures infilled (5mm) with orangish brown clay.	3.60	232.65	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	2.00	Windowless Sampler	Comacchio 305					
2.00	41.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	987
168	2.00		0.00	0.30	Arisings			
140	41.00		0.30	39.65	Bentonite			
			39.65	41.00	Arisings			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	On completion, borehole sidewalls collapsed 41.00-39.65m. Driller notes reduced flush returns (20%) 2.00-3.50m and loss of flush returns 3.50-41.00m. Down hole geophysical survey undertaken		35560
128	2.00	08-03-2019 10:20	0.00	Nil	Dry			
146	41.00	08-03-2019 16:50	17.00	17.00	Dry			
		11-03-2019 09:00	17.00	17.00	Dry			
		11-03-2019 16:30	30.50	30.50	27.73			
		12-03-2019 09:15	30.50	30.50	29.20		CHECKED	
							CT	

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 11

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13C	5.00 - 6.50	5.00	100	NI				Medium strong light greyish yellow shelly LIMESTONE with frequent ooids (up to 2mm) and rare elongate rounded voids (up to 50mm) stained brownish orange. Fractures are subhorizontal very closely and closely spaced undulating rough strength reduced to very weak (up to 20mm) either side of fracture surface. (IOG) (BLPL) 4.10 - 4.20m: Extremely weak highly fractured limestone recovered as claybound angular fine to coarse gravel. 4.15 - 4.20m: 50deg planar rough fracture stained brownish orange. 4.80 - 5.00m: Extremely weak highly fractured limestone.	5.00	231.25	
			63 47	120 180				Strong light greyish yellow oolitic LIMESTONE with closely spaced thin beds of shelly limestone. Fractures are subhorizontal to 20deg and 70deg to subvertical closely spaced undulating rough stained orangish brown strength reduced to very weak (up to 15mm) either side of fracture surface. (IOG) (BLPL) 5.30 - 5.35m: Subhorizontal extremely closely spaced undulating smooth fractures. 5.42m: Subhorizontal planar incipient fracture. 5.70 - 5.80m: 40deg vein of white and grey calcite (15mm thick). 6.00 - 6.05m: 30deg vein of white calcite (10mm thick).	6.20	230.05	
14C	6.50 - 8.00	6.50	100	NI				Weak and medium strong light yellowish grey oolitic LIMESTONE. Fractures are subhorizontal and subvertical closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL) 6.20 - 6.40m: 70deg undulating rough fracture. 6.70 - 7.00m: Very weak highly fractured limestone recovered as angular and subangular gravel. 6.95 - 7.15m: Subvertical and 60deg planar rough fractures stained orangish brown. 7.15 - 7.18m: Abundant shell fragments (up to 3mm). 7.20m: Subhorizontal band (20mm) of light brownish orange staining. 7.25 - 7.40m: 20deg undulating rough fracture stained orangish brown. 7.40 - 7.50m: 50deg white calcite vein (6mm thick).	7.60	228.65	
			53 39	140 290				Very weak to weak light brown bioclastic LIMESTONE. Fractures are subhorizontal very closely and closely spaced undulating rough stained dark orangish brown. (IOG) (BLPL) 7.65 - 7.70m: Abundant shell fragments (up to 3mm). 7.80 - 7.90m: Extremely weak highly fractured limestone recovered as claybound angular and subangular fine to coarse gravel.			
15C	8.00 - 9.50	8.00									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	DEPTH (m)	TYPE	987
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	13/03/19 prior to backfilling borehole.	
		12-03-2019 14:15	41.00	41.00	29.18		
		13-03-2019 10:00	41.00	41.00	29.12		
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42CS	8.45 - 8.75		93 51 28					Very weak to weak light brown bioclastic LIMESTONE. Fractures are subhorizontal very closely and closely spaced undulating rough stained dark orangish brown. (IOG) (BLPL) 8.25 - 8.50m: Extremely weak highly fractured limestone recovered as clayey angular to subrounded fine to coarse gravel. 8.50 - 8.80m: Fractures are medium spaced.			
			300								
16C	9.50 - 11.00	9.50	NI 60 100					9.20 - 9.40m: Extremely weak highly fractured limestone recovered as claybound angular to subrounded fine to coarse gravel. Weak light yellowish grey bioclastic LIMESTONE very closely and closely interbedded with very thin and thin beds of very weak highly fractured brown and light yellowish brown clayey limestone. Fractures are randomly orientated extremely closely and very closely spaced undulating rough stained dark orangish brown. (IOG) (BLPL) 9.55m: Subhorizontal white calcite vein (20mm thick). 10.15 - 10.30m: Extremely weak highly fractured limestone recovered as angular clay bound subangular and subrounded fine to coarse gravel.	9.40	226.85	
			100 58 13	NI 50							
17C	11.00 - 12.50	11.00	NI 75 190					Weak brown clayey LIMESTONE with abundant voids (up to 10mm). Fractures are subhorizontal very closely spaced undulating rough. (IOG) (BLPL) 10.62 - 10.65m: Subhorizontal planar rough fracture infilled with dark yellowish brown clay. 10.65 - 10.70m: Abundant shell fragments (up to 10mm).	10.50	225.75	
			97 72 27	NI 50 140							
								Very weak highly fractured brown LIMESTONE with abundant voids (up to 5mm) with closely spaced thin zones of extremely weak highly fractured limestone recovered as claybound angular fine to coarse gravel. Fractures are randomly orientated very closely and closely spaced undulating rough strength reduced to extremely weak (20mm) either side of fracture surface. (IOG) (BLPL)	11.40	224.85	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18C	12.50 - 14.00	12.50	100 76 34	NI 90 230				Weak light yellowish grey shelly LIMESTONE with medium spaced thin beds of firm to stiff orangish brown slightly sandy clay. Fractures are subhorizontal closely and medium spaced planar rough infilled (5mm) with brown clay, strength reduced to extremely weak (up to 20mm) either side of fracture surface. (IOG) (BLPL) 12.10m: Subhorizontal undulating incipient fracture. 12.15 - 12.20m: Elongate void (50mm) stained orangish brown.	12.10	224.15	
								13.00 - 13.10m: Abundant shell fragments (up to 30mm). 13.25 - 13.45m: Very weak highly fractured limestone. 50deg dark grey calcite vein (30mm thick).			
19C	14.00 - 15.50	14.00	100 67 53					14.80 - 14.82m: Elongate voids (up to 10mm) stained orangish brown.			
20C	15.50 - 17.00	15.50	93 71 37	NI 45 110				Weak light yellowish grey oolitic LIMESTONE with abundant pisoids (up to 15mm). Fractures are subhorizontal very closely and closely spaced undulating rough stained light yellowish brown strength reduced to extremely weak (up to 30mm) either side of fracture surface. (IOG) (BLPL) 15.75m: Subhorizontal undulating rough fracture infilled (2mm) with light orangish brown clay.	15.40	220.85	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 987
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 5 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	17.00 - 18.50	17.00	100 60 49					Weak light yellowish grey oolitic LIMESTONE with abundant pisoids (up to 15mm). Fractures are subhorizontal very closely and closely spaced undulating rough stained light yellowish brown strength reduced to extremely weak (up to 30mm) either side of fracture surface. (IOG) (BLPL) 16.00 - 16.40m: 70deg to subvertical undulating rough fracture. 16.50 - 16.60m: Firm brown slightly sandy clay.	16.60	219.65	
								Medium strong light yellowish grey oolitic LIMESTONE with rare pisoids and shell fragments (up to 20mm). Fractures are subhorizontal closely and medium spaced undulating rough stained dark yellow strength reduced to very weak (up to 20mm) either side of fracture surface. (IOG) (BLPL)	17.50	218.75	
22C	18.50 - 20.00	18.50	79 43 31					Weak light yellowish grey bioclastic LIMESTONE with abundant pea grit (up to 15mm) and voids (up to 10mm). Fractures are subhorizontal very closely and closely spaced undulating smooth stained dark yellow strength reduced to very weak (up to 20mm) either side of fracture surface. (IOG) (BLPL)	18.90	217.35	
								Very weak to weak light yellowish grey bioclastic LIMESTONE with frequent rounded voids (up to 70mm) stained orangish brown and abundant pisoids. Closely and medium spaced zones of extremely weak highly fractured limestone recovered as claybound angular fine to coarse gravel. Fractures are subhorizontal closely and medium spaced undulating smooth stained dark orangish brown. (IOG) (BLPL) 19.10 - 19.20m: 70deg to subvertical white calcite vein (up to 5mm thick).			
23C	20.00 - 21.50	20.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 6 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43CS	21.15 - 21.45		96 73 45					Very weak to weak light yellowish grey bioclastic LIMESTONE with frequent rounded voids (up to 70mm) stained orangish brown and abundant pisoids. Closely and medium spaced zones of extremely weak highly fractured limestone recovered as claybound angular fine to coarse gravel. Fractures are subhorizontal closely and medium spaced undulating smooth stained dark orangish brown. (IOG) (BLPL)			
								20.75 - 20.80m: Shell fragments (50mm) replaced with white calcite.			
								21.20 - 21.30m: Subvertical (50mm) infilled with brownish orange clay.			
24C	21.50 - 23.00	21.50	88 50 45					21.40 - 21.50m: 70deg to subhorizontal veins of white calcite (up to 10mm thick).			
								22.20 - 22.45m: 80deg undulating rough fracture stained orangish brown.			
25C	23.00 - 24.50	23.00	100 41 25	NI 55 130				Medium strong light yellowish grey LIMESTONE with abundant pisoids (up to 12mm) and frequent rounded voids (up to 60mm) stained light yellowish brown. Closely spaced thin zones of extremely weak highly fractured limestone recovered as angular gravel. Fractures are subhorizontal very closely and closely spaced undulating rough stained greyish brown. (IOG) (BLPL)	22.70	213.55	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 7 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26C	24.50 - 26.00	24.50	100 59 53	NI 120 200				Medium strong light yellowish grey LIMESTONE with abundant pisoids (up to 12mm) and frequent rounded voids (up to 60mm) stained light yellowish brown. Closely spaced thin zones of extremely weak highly fractured limestone recovered as angular gravel. Fractures are subhorizontal very closely and closely spaced undulating rough stained greyish brown. (IOG) (BLPL)	24.25	212.00	
								24.00 - 24.10m: Subvertical to 60deg undulating rough fracture stained orangish brown. Weak and medium strong orangish brown bioclastic LIMESTONE with abundant ooids (up to 20mm). Fractures are subhorizontal closely undulating rough strength reduced to extremely weak (up to 100mm) either side of fracture surface. (IOG) (BLPL) 24.25 - 24.40m: 80deg vein of white calcite (40mm thick). 24.50 - 24.75m: 80deg to subvertical vein of white mottled grey calcite (30mm thick). 25.00 - 25.70m: Subvertical undulating rough fracture.			
27C	26.00 - 27.50	26.00	100 65 56	NI 170 280				26.10 - 26.75m: Subvertical undulating rough fracture stained orangish brown. 26.30 - 26.35m: Dark brownish red staining.	26.75	209.50	
								Medium strong light yellowish brown shelly LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating smooth stained orangish brown. (IOG) (BLPL) 27.45 - 27.50m: 70deg undulating rough fracture stained dark orangish brown.			
28C	27.50 - 29.00	27.50	80 43 20	NI 40 70				Weak brownish grey becoming dark grey shelly LIMESTONE. Fractures are subhorizontal to 20deg very closely and closely spaced undulating rough infilled (up to 10mm) with yellowish brown clayey fine and medium sand. (IOG) (BLPL) 27.90 - 27.95m: 60deg planar rough fracture infilled with orangish brown fine and medium sand.	27.50	208.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 8 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NI 110				Weak highly fractured orangish brown shelly LIMESTONE. Fractures are randomly orientated very closely and closely spaced undulating rough stained orangish brown infilled (up to 20mm thick) with brown clay strength reduced to very weak (up to 20mm) either side of fracture surface. (IOG) (BLPL)	28.10	208.15	
29C	29.00 - 30.50	29.00	79 51 13					29.00 - 29.10m: 80deg white calcite vein (25mm thick). 29.25 - 29.30m: Dark bluish grey staining. 30.10 - 30.20m: 50deg undulating rough fracture stained orangish brown.			
30C	30.50 - 32.00	30.50	100 27 27	400				Weak dark orangish brown becoming dark grey shelly LIMESTONE. (IOG) (BLPL) 30.50 - 30.60m: Subvertical white calcite vein (up to 3mm thick). 30.50 - 31.00m: Orange and red staining. 30.75 - 30.80m: Rounded void (up to 5mm) stained orangish brown. 30.80 - 30.95m: 70deg white calcite vein (up to 4mm). Very stiff dark grey silty CLAY with closely spaced thin laminae of light grey silty clay. (Lias Group) (BDS)	30.50	205.75	
				NA					30.95	205.30	
31C	32.00 - 33.50	32.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 9 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 March 2019

Easting 393383

Scale 1:25

End Date 13 March 2019

Northing 216045

Ground Level 236.25mOD

Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 33 27								
				70 110 190				Very weak grey calcareous SILTSTONE. Fractures are subhorizontal closely spaced undulating smooth. (Lias Group) (BDS)	32.80	203.45	
32D	33.35 - 33.45			NA				Fissured dark grey slightly sandy SILT. Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (Lias Group) (BDS)	33.30	202.95	
33C	33.50 - 35.00	33.50	99 20 20								
				300				Very weak and weak grey SILTSTONE. Natural fractures not observed. (Lias Group) (BDS)	34.20	202.05	
				NA				Very stiff fissured dark grey clayey SILT with very closely spaced thick laminae and thin beds of grey silt. Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (Lias Group) (BDS)	34.50	201.75	
34C	35.00 - 36.50	35.00	90								
35D	35.40 - 35.50										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 10 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:25

Start Date 08 March 2019 Easting 393383

End Date 13 March 2019 Northing 216045 Ground Level 236.25mOD Depth 41.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
36D	36.30 - 36.40										
37C	36.50 - 38.00	36.50	99								
38C	38.00 - 39.50	38.00	100								
39D	38.70 - 38.80										
40D	39.20 - 39.30										
41C	39.50 - 41.00	39.50	100					Very stiff fissured dark grey silty CLAY. Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (Lias Group) (BDS)	39.50	196.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC303

CLIENT HIGHWAYS ENGLAND

Sheet 11 of 11

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:25

Start Date 08 March 2019 Easting 393383

Depth 41.00 m

End Date 13 March 2019 Northing 216045 Ground Level 236.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								Very stiff fissured dark grey silty CLAY. Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (Lias Group) (BDS)			
								40.60m: Subhorizontal planar rough fissure.			
								Borehole Completed at 41.00m	41.00	195.25	

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 987
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



DSRC310

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 29 April 2020

Easting 394101

Scale 1:50

End Date 01 May 2020

Northing 215211

Ground Level 250.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 2D 1ES	0.00 - 0.20 0.00 - 0.20 0.10							Grass over soft brown slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. Frequent rootlets. (TOP)	0.20	250.70	
3B 4D 2ES 3ES	0.25 - 0.50 0.25 - 0.50 0.30 0.50							Firm light reddish brown slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP)	0.65	250.25	
5B 6D 4ES 7B 8D 9L	0.65 - 0.90 0.65 - 0.90 1.00 1.00 - 1.20 1.20 - 1.65 1.20 - 2.00	Nil				S 13		Firm light reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	1.30	249.60	
10C	2.00 - 3.20	Nil	58 13 0	NI		C 64		Weak highly fractured (probably very thinly and thinly bedded) light brown oolitic LIMESTONE recovered non intact as coarse gravel and cobble sized fragments. (SLIP) (SLIP)	1.85	249.05	
11C 12CS	3.20 - 4.70 3.46 - 3.57	3.20	73 31 11	NI 50 320				Weak to medium strong thinly bedded white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough, surfaces weakened (up to 20mm from fracture surface). (IOG) (SALS)	3.20	247.70	
13C	4.70 - 6.20	4.70	97 76 38	NI 100 210				4.50 - 5.25m: Subvertical undulating rough fracture infilled (up to 30mm) with calcite.	5.10	245.80	
14C	6.20 - 7.70	6.20	100 98 81					6.20 - 6.30m: Thin bed of light brown slightly sandy clay. 7.70 - 7.80m: Thin bed of very weak light brown calcareous fine sandstone.			
15CS 16C	7.47 - 7.68 7.70 - 9.20	7.70	100 97	NI				Weak thinly bedded light grey and brown (bioturbated) bioclastic LIMESTONE with frequent irregular thin laminae of brown slightly sandy clay. Fractures are subhorizontal to 20deg and 50-70deg closely and medium spaced undulating rough with orangish brown staining (penetrating up to 20mm). (IOG) (ASLS)	7.80	243.10	

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE		Hand tools	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS			
0.00	1.20	Inspection Pit		Geotechnical Pioneer Rig								
1.20	2.20	Window Sampler		Geotechnical Pioneer Rig								
2.20	30.20	Rotary Core										
CASING DEPTH				BACKFILL				INSTRUMENTATION				
DIAM (mm)	BASE (m)			TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		SUB LOCATION:		
168	3.00			0.00	0.50	Concrete	30.00	Standpipe		1158		
140	30.20			0.50	2.00	Bentonite						
				2.00	30.20	Gravel						
BARREL DIAMETER				HOLE PROGRESS				REMARKS				
DIAM (mm)	BASE (m)			DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					
128	2.20			29-04-2020 08:00	0.00	Nil	Dry					
146	30.20			29-04-2020 17:00	1.20	Nil	Dry					
				30-04-2020 08:55	1.20	Nil	Dry					
				30-04-2020 16:25	16.70	16.70	11.80					
				01-05-2020 08:30	16.70	16.70	14.50					
									Driller notes loss of flush below 5.30m. When installing standpipe, 35 bags of gravel used to backfill 30.20-23.00m, and a further 28 bags to backfill 23.00-6.00m. Suspected void or open fractures. No reduction			

CONTRACT

35560

CHECKED

CT

BOREHOLE LOG



DSRC310

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 29 April 2020

Easting 394101

Scale 1:50

End Date 01 May 2020

Northing 215211

Ground Level 250.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17C 18CS	9.20 - 10.70 9.20 - 9.38	9.20	57 98 83 53	100 NI 95 290				Weak thinly bedded light grey and brown (bioturbated) bioclastic LIMESTONE with frequent irregular thin laminae of brown slightly sandy clay. Fractures are subhorizontal to 20deg and 50-70deg closely and medium spaced undulating rough with orangish brown staining (penetrating up to 20mm). (IOG) (ASLS) 8.50 - 8.70m: Subvertical undulating rough fracture with clay infill.	9.20	241.70	
19C	10.70 - 12.20	10.70	100 80 57					Weak to medium strong thinly bedded white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough. (IOG) (BLPL) 9.20m: PLI suggests strong. 9.60 - 11.90m: Subvertical undulating rough fracture with light orangish brown staining (penetrating up to 50mm).			
20C 21CS	12.20 - 13.70 12.48 - 12.75	12.20	100 85 69					12.75 - 12.85m: 50-60deg planar rough fracture. 13.00 - 13.10m: 50-60deg planar rough fracture with calcite infill (up to 10mm).			
22C	13.70 - 15.20	13.70	100 87 55					13.75 - 14.30m: Subvertical undulating rough fracture. 14.60 - 15.10m: Subvertical undulating rough fracture with orangish brown staining. 15.10 - 15.20m: Thin bed of slightly sandy clay.			
23C 24CS	15.20 - 16.70 15.25 - 15.61	15.20	97 95 91	40 250 640				Weak to medium strong medium bedded white and light yellowish brown ooidal and bioclastic LIMESTONE with frequent calcite veins (up to 10mm thick). Fractures are subhorizontal to 10deg medium rarely widely spaced undulating rough. (IOG) (BLPL) 15.75 - 15.95m: 50deg planar rough fracture with orangish brown staining.	15.20	235.70	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158

BARREL DIAMETER		HOLE PROGRESS				REMARKS in torque or rapid penetration observed during drilling.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		01-05-2020 13:00	30.20	30.20	Dry		CHECKED
		04-05-2020 10:15	30.20	30.20	Dry		CT

BOREHOLE LOG



DSRC310

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 29 April 2020

Easting 394101

Scale 1:50

End Date 01 May 2020

Northing 215211

Ground Level 250.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25C	16.70 - 18.20	16.70	100 100 94					Weak to medium strong medium bedded white and light yellowish brown ooidal and bioclastic LIMESTONE with frequent calcite veins (up to 10mm thick). Fractures are subhorizontal to 10deg medium rarely widely spaced undulating rough. (IOG) (BLPL) 16.15m: Thin bed (20mm) of orangish brown slightly sandy clay.			
26C	18.20 - 19.70	18.20	100 98 98								
27CS	19.42 - 19.70										
28C	19.70 - 21.20	19.70	100 100 81	NI 350 970							
29C	21.20 - 22.70	21.20	100 100 88					20.80 - 21.10m: 70-80deg undulating rough fracture with orangish brown staining and infilled (up to 30mm) with calcite.			
30CS	21.81 - 22.14										
31C	22.70 - 24.20	22.70	100 97 83					22.55 - 24.40m: Subvertical undulating rough fracture with orangish brown staining. 23.40m: 30mm rounded void.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC310

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 29 April 2020

Easting 394101

Scale 1:50

End Date 01 May 2020

Northing 215211

Ground Level 250.90mOD

Depth 30.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
32C	24.20 - 25.70	24.20	95 95 92					Weak to medium strong medium bedded white and light yellowish brown ooidal and bioclastic LIMESTONE with frequent calcite veins (up to 10mm thick). Fractures are subhorizontal to 10deg medium rarely widely spaced undulating rough. (IOG) (BLPL) 24.80 - 24.90m: 40-50deg undulating rough fracture with orangish brown staining.			
33CS	25.37 - 25.70										
34C	25.70 - 27.20	25.70	81 51 41					25.95 - 26.75m: Subvertical undulating rough fracture with orangish brown staining. Drilling induced fragmentation of core.			
35C	27.20 - 28.70	27.20	98								
36CS	27.40 - 27.77		98 93					28.20 - 28.30m: 50deg planar rough fracture with light orangish brown staining.			
37C	28.70 - 30.20	28.70	95 95 87					29.70 - 30.05m: Subvertical undulating rough fracture with orangish brown staining.			
									30.20	220.70	
									Borehole Completed at 30.20m		

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
						1158

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
							CHECKED
						CT	

BOREHOLE LOG



DSRC311

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 5

Start Date 22 April 2020

Easting 394016

Scale 1:50

End Date 28 April 2020

Northing 215259

Ground Level 255.20mOD

Depth 40.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.05 - 0.20							Grass over soft brown silty CLAY. Frequent rootlets. (TOP)	0.25	254.95	
2D	0.05 - 0.20							Firm light brown slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone and rare sandstone. (SLIP) (SLIP)	0.45	254.75	
1ES	0.10										
2ES	0.30							Firm light brown CLAY. (SLIP) (SLIP)	0.90	254.30	
3B	0.35 - 0.45										
4D	0.35 - 0.45							Firm light brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone and rare sandstone. (SLIP) (SLIP)			
3ES	0.50										
5B	0.50 - 0.80							Firm light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subrounded limestone. (SLIP) (SLIP)	1.95	253.25	
6D	0.50 - 0.80										
7B	0.95 - 1.20	Nil					S 9	Weak highly fractured possibly very thinly bedded light yellowish brown ooidal and bioclastic LIMESTONE recovered non intact as coarse gravel and cobble sized fragments. (SLIP) (SLIP)	2.15	253.05	
8D	0.95 - 1.20										
4ES	1.00							Very weak to weak white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough surfaces locally weakened (up to 20mm) from fracture surface. (IOG) (SALS) 3.40 - 5.00m: With medium spaced very thin beds of light brown slightly sandy clay/mudstone.	2.80	252.40	
10L	1.20 - 2.20	Nil		NI			S 77				
9D	1.20 - 1.65							5.25 - 5.60m: Mottled grey. Locally peloidal.			
11D	1.60 - 1.80										
12D	2.20 - 2.65	Nil	94	NI				6.20 - 9.00m: With frequent irregular thin laminae of light brown slightly sandy clay/mudstone.			
13C	2.20 - 3.00	2.20	31 13								
14C	3.00 - 4.50	3.00	100 95 60	NI	100 370						
15C	4.50 - 6.00	4.50	100 90 68								
16CS	5.20 - 5.46										
17C	6.00 - 7.50	6.00	100 100 93								
18CS	6.34 - 6.69										
19C	7.50 - 9.00	7.50	100 91 73								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	2.20	Window Sampler	Geotechnical Pioneer Rig					
2.20	40.00	Rotary Core	Geotechnical Pioneer Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158
168	4.00		0.00	0.30	Concrete	39.50	Standpipe	
140	40.00		0.30	11.50	Bentonite			
			11.50	40.00	Gravel			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes loss of flush below 7.50m.		35560
128	2.20	22-04-2020 15:05	0.00	Nil	Dry			CHECKED
146	40.00	22-04-2020 15:55	1.20	Nil	Dry			CT
		23-04-2020 08:30	1.20	Nil	Dry			
		23-04-2020 17:05	10.50	10.50	9.10			
		24-04-2020 08:05	10.50	10.50	10.10			

BOREHOLE LOG



DSRC311

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 5

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 22 April 2020

Easting 394016

Scale 1:50

End Date 28 April 2020

Northing 215259

Ground Level 255.20mOD

Depth 40.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
20C	9.00 - 10.50	9.00	97 85 56	NI 50 100				Very weak to weak white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough surfaces locally weakened (up to 20mm) from fracture surface. (IOG) (SALS) 8.25 - 8.45m: 70deg planar rough fracture. 8.45 - 8.65m: 60deg planar rough fracture. 9.00 - 9.50m: Very thinly bedded. Frequent irregular voids. 9.50 - 11.25m: With frequent irregular thin laminae of light brown sandy clay/mudstone.			
21C	10.50 - 12.00	10.50	100	100				10.70 - 11.35m: PLI suggests medium strong to strong.			
22CS	10.73 - 11.02		92					11.02 - 11.37m: Subvertical undulating rough fracture.			
								11.35 - 11.85m: Very weak to weak light orangish brown and light grey sandy LIMESTONE. (IOG) (SALS) 11.75 - 11.85m: 55deg planar rough fracture.	11.35	243.85	
23C	12.00 - 13.50	12.00	97 77 57	NI 120 150				Weak very thinly and thinly bedded light grey and light brown (bioturbated) LIMESTONE with frequent irregular thin laminae of light brown slightly sandy clay/mudstone. Frequent irregular voids (up to 30mm). Fractures are subhorizontal to 30deg closely spaced undulating rough surfaces locally weakened (up to 25mm) from fracture surface. (IOG) (ASLS) 12.15 - 12.25m: Subvertical undulating rough fracture. 12.35 - 12.80m: Subvertical undulating rough fracture. 12.80 - 13.30m: Frequent shell fossils replaced by calcite. 13.25 - 13.35m: (Soft) light orangish brown slightly sandy slightly gravelly clay.	11.85	243.35	
24C	13.50 - 15.00	13.50	97 97 93	100 220 870				Weak white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 10deg closely and medium spaced undulating rough locally stained orangish brown (penetrating up to 30mm). (IOG) (BLPL)	13.40	241.80	
25CS	14.48 - 14.75										
26C	15.00 - 16.50	15.00	100 100 83					15.90 - 16.70m: Subvertical undulating rough fracture locally stained orangish brown.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1158
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			24-04-2020 15:35	25.50	25.50	24.40	
			27-04-2020 08:50	25.50	25.50	25.20	
			27-04-2020 15:00	39.00	39.00	38.70	
			28-04-2020 08:30	39.00	39.00	Dry	
			28-04-2020 09:05	40.00	40.00	39.95	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC311

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 5

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 22 April 2020

Easting 394016

Scale 1:50

End Date 28 April 2020

Northing 215259

Ground Level 255.20mOD

Depth 40.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.50 - 18.00	16.50	100 95 70					Weak white and light yellowish brown ooidal and bioclastic LIMESTONE. Fractures are subhorizontal to 10deg closely and medium spaced undulating rough locally stained orangish brown (penetrating up to 30mm). (IOG) (BLPL)			
28CS	17.54 - 17.80							17.25 - 17.35m: (Soft) light orangish brown slightly sandy clay.			
29C	18.00 - 19.50	18.00	100 97 97					18.25 - 18.50m: Subvertical undulating rough fracture with calcite veining (up to 15mm). 18.50 - 20.15m: Ooidal and bioclastic.			
30C	19.50 - 21.00	19.50	100 93					20.15 - 20.30m: (Soft) light orangish brown slightly sandy slightly gravelly clay.			
31CS	19.83 - 20.14		81					20.65 - 20.70m: (Soft) light orangish brown slightly sandy slightly gravelly clay.			
32C	21.00 - 22.00	21.00	80 55 40					21.10m: 50deg planar rough fracture.			
33C	22.00 - 22.50	22.00	100 100 60					22.55 - 22.75m: Intersecting 30deg and 45deg undulating rough fractures stained orangish brown.			
34C	22.50 - 24.00	22.50	99 99								
35CS	22.79 - 23.05		78								
36C	24.00 - 25.50	24.00			300 450 580			Weak to medium strong medium to thickly bedded white and light yellowish brown ooidal LIMESTONE with frequent fossils (bivalves with rarely belemnites). Fractures are subhorizontal to 20deg medium and widely spaced undulating rough locally stained orangish brown. (IOG) (BLPL)	23.55	231.65	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE		PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS	
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)		REMARKS	
				SUB LOCATION: 1158	
				AGS	
				CONTRACT	
				35560	
				CHECKED	
				CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 4 of 5

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 22 April 2020

Easting 394016

Scale 1:50

End Date 28 April 2020

Northing 215259

Ground Level 255.20mOD

Depth 40.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 100 100					Weak to medium strong medium to thickly bedded white and light yellowish brown ooidal LIMESTONE with frequent fossils (bivalves with rarely belemnites). Fractures are subhorizontal to 20deg medium and widely spaced undulating rough locally stained orangish brown. (LOG) (BLPL)			
37C	25.50 - 27.00	25.50	100 100 83					25.50 - 25.85m: Subvertical undulating rough fracture.			
38CS	26.30 - 26.59			350 750 1120				26.30 - 40.00m: Fractures are mainly widely spaced.			
39C	27.00 - 28.50	27.00	100 100 100								
40C	28.50 - 30.00	28.50	100 100 98								
41CS	29.58 - 29.81										
42C	30.00 - 31.50	30.00	95 91 87					29.85 - 30.30m: Subvertical planar rough fracture locally stained orangish brown.			
43C	31.50 - 33.00	31.50	100 100 100								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC311

CLIENT HIGHWAYS ENGLAND

Sheet 5 of 5

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 22 April 2020

Easting 394016

End Date 28 April 2020

Northing 215259

Ground Level 255.20mOD

Depth 40.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend		
44CS	32.70 - 33.05							Weak to medium strong medium to thickly bedded white and light yellowish brown ooidal LIMESTONE with frequent fossils (bivalves with rarely belemnites). Fractures are subhorizontal to 20deg medium and widely spaced undulating rough locally stained orangish brown. (LOG) (BLPL)					
45C	33.00 - 34.50	33.00	100 100 100										
46C	34.50 - 36.00	34.50	96 96 87										
47CS	34.88 - 35.14												
48C	36.00 - 37.50	36.00	100 87 70										
49C	37.50 - 39.00	37.50	98 98 98										
50CS	38.38 - 38.63												
51C	39.00 - 40.00	39.00	100 100 88										
									40.00	215.20			
									Borehole Completed at 40.00m				

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1158			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 1 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 18 May 2020

Easting 393780

Scale 1:50

End Date 22 May 2020

Northing 215301

Ground Level 282.15mOD

Depth 25.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00 - 0.25							Grass over soft dark brown slightly gravelly CLAY. Gravel is angular and subangular fine and medium limestone. Frequent rootlets. (TOP) Soft light orangish brown gravelly CLAY with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (HDD) Soft light brown mottled orangish brown slightly gravelly sandy CLAY. Gravel is angular and subangular fine to coarse limestone. (HDD) Light greyish brown sandy angular and subangular fine to coarse limestone GRAVEL. (GOG) (WHL) Extremely weak light greyish brown bioclastic LIMESTONE with abundant fossils. Fractures are subhorizontal closely spaced undulating rough stained orangish brown with a veneer of clay. (GOG) (WHL) Weak light greyish brown bioclastic and ooidal LIMESTONE. Rare shell debris (up to 15mm). Fractures are subhorizontal to 10deg closely spaced undulating rough stained orangish brown. (GOG) (WHL) (Soft) brown mottled orangish brown sandy CLAY with extremely weak brownish grey limestone. Frequent fragments of black organic material (up to 5mm). (GOG) (WHL) Weak light greyish brown bioclastic LIMESTONE with medium spaced thin beds of extremely weak brown calcareous siltstone. Frequent bivalve fossils (up to 25mm) and frequent calcite veining (up to 3mm thick). Fractures are subhorizontal to 10deg closely spaced undulating rough. (GOG) (WHL) 3.90 - 4.00m: Subvertical fracture undulating rough stained orangish brown. Strong light yellowish brown speckled black crystalline LIMESTONE. Rare calcite veining (up to 20mm). Frequent shell debris (up to 5mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough rarely stained orangish brown. (GOG) (WHL) 7.25 - 7.50m: Subvertical fracture undulating rough.	0.25	281.90	
1ES	0.10 - 0.20						0.70		281.45		
2D	0.10 - 0.20						1.05		281.10		
2ES	0.25 - 0.35						1.50		280.65		
3B	0.25 - 0.75						1.70		280.45		
4D	0.25 - 0.35						2.45		279.70		
3ES	0.70 - 0.80						2.75		279.40		
5B	0.70 - 1.05						5.20		276.95		
6D	0.70 - 0.80	Nil									
7D	1.05 - 1.34										
8L	1.05 - 1.50										
9D	1.40 - 1.50	1.50	100	NI							
10C	1.50 - 1.70										
11C	1.70 - 3.20		85 57 47	NI 100 130							
12CS	3.00 - 3.20			NA							
13C	3.20 - 4.70										
14CS	4.53 - 4.70			NI							
15C	4.70 - 6.20			90 90 200							
16CS	5.75 - 6.00										
17C	6.20 - 7.70										
18C	7.70 - 9.20			90 83 60							

Continued Next Page

HOLE CONSTRUCTION TOP (m) 0.00 BASE (m) 1.05 TYPE Inspection Pit 1.05 1.50 Window Sampler 1.50 25.10 Rotary Core			PLANT USED Hand tools Geotechnical Pioneer Rig Geotechnical Pioneer Rig			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) 168 BASE (m) 3.00 140 25.10		BACKFILL TOP (m) 0.00 BASE (m) 0.50 MATERIAL Concrete 0.50 1.00 Bentonite 1.00 14.50 Gravel 14.50 25.10 Bentonite		INSTRUMENTATION DEPTH (m) 14.00 TYPE Standpipe		SUB LOCATION: 1143		
BARREL DIAMETER DIAM (mm) 128 BASE (m) 1.50 146 25.10		HOLE PROGRESS DATE TIME 18-05-2020 12:30 DEPTH (m) 0.00 CASING (m) Nil WATER (m) Dry 18-05-2020 16:35 3.20 Nil 3.05 19-05-2020 08:50 3.20 3.20 Dry 19-05-2020 14:50 12.20 12.20 11.50 20-05-2020 08:30 12.20 12.20 Dry		REMARKS Down-hole geophysical survey undertaken 22/05/2020 prior to backfilling borehole. Results presented separately.		CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC312

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 18 May 2020

Easting 393780

Scale 1:50

End Date 22 May 2020

Northing 215301

Ground Level 282.15mOD

Depth 25.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
19CS	8.90 - 9.10		58					Strong light yellowish brown speckled black crystalline LIMESTONE. Rare calcite veining (up to 20mm). Frequent shell debris (up to 5mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough rarely stained orangish brown. (GOG) (WHL) 8.10 - 8.20m: 40deg undulating rough fracture. 8.80 - 8.85m: Very thin bed (30mm) of (stiff) brown mottled light grey sandy clay.	9.20	272.95	
20C	9.20 - 10.70	9.20	93 90 68	NI 150 420				Weak light greyish brown bioclastic and ooidal LIMESTONE. Abundant shell debris (up to 5mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough rarely stained orangish brown. (GOG) (HMB) 10.10 - 10.30m: Two parallel 60deg to 70deg fractures closely spaced undulating rough.	10.70	271.45	
21CS	9.85 - 10.10										
22C	10.70 - 12.20	10.70	100 97 78	NI 100 260				Weak light greyish brown bioclastic locally crystalline LIMESTONE with frequent calcite veining (up to 8mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough rarely stained orangish brown. (GOG) (HMB) 11.05 - 11.25m: 60deg calcite vein (8mm thick).			
23C	12.20 - 13.70	12.20	90 79 50								
24CS	13.40 - 13.60										
25C	13.70 - 15.20	13.70	100 66 33	NI 50 160				Weak light grey crystalline LIMESTONE. Fractures are subhorizontal to 10deg closely spaced undulating and planar rough stained orangish brown. (GOG) (HMB) 14.20 - 14.50m: Extremely weak brown slightly sandy calcareous mudstone.	13.55	268.60	
								Extremely weak dark grey and grey MUDSTONE. Fractures are subhorizontal to 10deg undulating smooth rarely stained orangish brown. Abundant incipient fractures subvertical and 20-40deg extremely closely spaced stepped and undulating smooth. (FEF) (FE) 15.15 - 15.20m: Thin bed of weak dark grey siltstone.	14.55	267.60	
26C	15.20 - 16.70	15.20	100 23 0	NI 40 80				Extremely weak grey and dark grey MUDSTONE locally disintegrated to slightly gravelly clay. Fractures are subhorizontal to 10deg closely spaced undulating smooth. Frequent incipient fractures subvertical and 30-40deg undulating smooth. (FEF) (FE) 15.95 - 16.00m: Thin bed of weak dark grey siltstone.	15.20	266.95	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1143

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		20-05-2020 16:40	22.70	22.70	7.50		CHECKED
		21-05-2020 08:30	22.70	22.70	11.65		
		21-05-2020 13:20	25.10	25.10	8.40		
		22-05-2020 08:50	25.10	25.10	9.05	CT	

BOREHOLE LOG



DSRC312

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 18 May 2020

Easting 393780

Scale 1:50

End Date 22 May 2020

Northing 215301

Ground Level 282.15mOD

Depth 25.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.70 - 18.20	16.70	100						16.80	265.35	
28CS	17.10 - 17.40		83 69	NI 140 320				Weak light grey MUDSTONE. Frequent bivalve fossils (up to 10mm). Fractures are subhorizontal and 20deg closely and medium spaced undulating rough. (FEF) (FE) 17.40 - 17.60m: Locally disintegrated to dark grey clayey gravel.			
29C	18.20 - 19.70	18.20	97 83 45	NI 40 100				Extremely weak grey MUDSTONE. Fractures are 10-30deg and 50-60deg closely spaced planar and undulating smooth. Frequent undulating smooth incipient fractures. (FEF) (FE)	18.20	263.95	
30C	19.70 - 21.20	19.70	100 33 30	NI				19.70 - 20.50m: Disintegrated to (soft) dark grey slightly sandy slightly gravelly clay. Gravel is subangular fine to coarse gravel sized mudstone lithorelicts.			
31C	21.20 - 22.70	21.20	100 41 7	NI				21.25 - 21.90m: Disintegrated to (soft) dark grey slightly sandy slightly gravelly clay. Gravel is subangular fine to coarse gravel sized mudstone lithorelicts.	21.90	260.25	
32C	22.70 - 24.20	22.70	97 43 28	NA				Very weak light grey SILTSTONE very thinly interbedded with extremely weak grey mudstone. Fractures are subhorizontal and 10deg very closely spaced undulating smooth rarely stained orangish brown. Rare incipient fractures subhorizontal and 30deg to 50deg undulating smooth. (FEF) (FE) (Recovered as soft) dark grey slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse gravel sized siltstone lithorelicts. (FEF) (FE) Medium strong light grey SILTSTONE. Frequent calcite veining (up to 5mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (FEF) (FE) 23.55 - 23.65m: Extremely weak.	22.70	259.45	XXXXXX
33CS	23.90 - 24.20		50 200 320						23.55	258.60	XXXXXX

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS						CONTRACT 35560 CHECKED CT

BOREHOLE LOG



DSRC312

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 18 May 2020

Easting 393780

Scale 1:50

End Date 22 May 2020

Northing 215301

Ground Level 282.15mOD

Depth 25.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
34C 35CS	24.20 - 25.10 24.35 - 24.70	24.20	100 45 42					Medium strong light grey SILTSTONE. Frequent calcite veining (up to 5mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (FEF) (FE) 25.00 - 25.10m: Disintegrated to (soft) dark grey slightly sandy slightly gravelly clay. Gravel is subangular fine to coarse gravel sized siltstone lithorelicts. <small>Borehole Completed at 25.10m</small>	25.10	257.05	xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx
HOLE CONSTRUCTION TOP (m) BASE (m) TYPE PLANT USED					WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS						
CASING DEPTH DIAM (mm) BASE (m)				BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 	
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS			CONTRACT 35560	
						CHECKED CT					

BOREHOLE LOG



DSRC314

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 16 September 2019 Easting 393256

Scale 1:50

End Date 19 September 2019 Northing 215193 Ground Level 293.10mOD

Depth 15.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1C	0.30 - 1.80	0.30	80 6 0	NI				Brown CLAY with yellow limestone cobbles (Driller's description). (TOP) Strong thinly bedded highly fractured light yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 5mm). Recovered as gravel and cobble sized fragments. (IOG) (ASLS)	0.30	292.80	
2C	1.80 - 3.00	1.80	90 63 27	20 60 120				1.70 - 1.80m: Weak light brown mudstone.	2.05	291.05	
3CS	2.46 - 2.59							Medium strong very thinly and thinly bedded light yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 5mm). Fractures are 5deg to 30deg very closely and closely spaced planar rough rarely infilled (up to 1mm) with yellowish brown silt. (IOG) (BLPL)			
4CS	2.73 - 2.83										
5C	3.00 - 4.50	3.00	100 93 81	70 120 180					3.30	289.80	
6CS	4.07 - 4.23							Medium strong thinly bedded light yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 5mm). Fractures are 5deg and rarely 30deg closely and rarely medium spaced planar rough. (IOG) (BLPL)			
7C	4.50 - 6.00	4.50	100 73 53	NI 40 110 230			4.55 - 4.85m: Very closely fractured.				
8CS	5.61 - 5.83							5.60m: 30deg planar rough fracture.			
9C	6.00 - 7.50	6.00	99					6.20 - 6.60m: 80deg undulating rough fracture.			
10CS	6.15 - 6.43		95 64								
11C	7.50 - 9.00	7.50	99 88 85								

Continued Next Page

HOLE CONSTRUCTION TOP (m) 0.00 BASE (m) 0.30 TYPE Inspection Pit 0.30 15.00 Rotary Core			PLANT USED Comacchio GEO 602 Comacchio GEO 602			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) 168 BASE (m) 1.50 140 15.00		BACKFILL TOP (m) 0.00 BASE (m) 0.50 MATERIAL Concrete 0.50 2.00 Bentonite 2.00 15.00 Gravel			INSTRUMENTATION DEPTH (m) 15.00 TYPE Standpipe		SUB LOCATION: 1118	
BARREL DIAMETER DIAM (mm) 146 BASE (m) 15.00		HOLE PROGRESS DATE TIME 16-09-2019 15:15 DEPTH (m) 0.00 CASING (m) Nil WATER (m) Dry 17-09-2019 08:45 0.30 Nil Dry 17-09-2019 16:30 12.00 12.00 Dry 18-09-2019 08:30 12.00 12.00 Dry 18-09-2019 10:00 15.00 15.00 Dry			REMARKS Driller notes reduced flush returns 1.80-3.00m (50% returned) and loss of flush 3.00-15.00m. Down-hole geophysical survey undertaken on completion.		CONTRACT 35560 CHECKED CT	

BOREHOLE LOG



DSRC314

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 2

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 16 September 2019 Easting 393256

Scale 1:50

End Date 19 September 2019 Northing 215193 Ground Level 293.10mOD

Depth 15.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
12CS	8.10 - 8.35								8.50	284.60	
				50 130 290				Medium strong thinly and medium bedded light yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 5mm). Fractures are subhorizontal to 5deg rarely subvertical closely and rarely medium spaced undulating rough. (IOG) (BLPL)			
13C	9.00 - 10.50	9.00	100 93 87					9.40 - 9.70m: 80deg undulating rough fracture locally stained orangish brown.			
14CS	9.87 - 10.05										
15C	10.50 - 12.00	10.50	74 70 68					11.00 - 11.25m: 90deg planar smooth fracture stained orangish brown.			
16CS	10.64 - 10.90										
17C	12.00 - 13.50	12.00	100 80 73					12.40 - 13.10m: Fractures probably subhorizontal and subvertical planar rough frequently stained yellowish brown. Recovered non intact.			
18CS	12.06 - 12.38			NI							
				430							
19C	13.50 - 15.00	13.50	86 64 53	NI 50 280				13.98m: PLI suggests weak.			
20CS	13.98 - 14.29			NI				14.45 - 15.00m: Fractures probably subhorizontal and subvertical planar rough and undulating rough frequently stained yellowish brown. Recovered non intact.	15.00	278.10	
								Borehole Completed at 15.00m			

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 1118
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 19-09-2019 08:00 15.00 15.00 Dry	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES	0.00 - 0.20 0.10							Very stiff dark brown slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is subangular fine to coarse limestone. (TOP) Stiff brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP) Firm orangish brown slightly gravelly CLAY. Gravel is subangular fine limestone. (SLIP) (SLIP)	0.20	246.70	
2B 2ES	0.20 - 0.40 0.30						0.40		246.50		
3B 3ES	0.40 - 0.80 0.50										
4B 4ES	0.80 - 1.20 1.00										
5L 6CS	1.20 - 2.20 1.35 - 1.45	Nil				C 10			1.70	245.20	
7L	2.20 - 3.00	Nil				C 29			2.55	244.35	
8CS	2.70 - 2.80						Firm light brown slightly sandy CLAY. (SLIP) (SLIP)	2.90	244.00		
9C	3.00 - 4.40	Nil	99 89 68	50 230 450		C *600	Medium strong white to light brown oolitic LIMESTONE with frequent shell fossils. Fractures are subhorizontal to 10deg medium spaced undulating rough with rare light brown staining. (IOG) (ASLS) 3.00 - 4.40m: Bivalve fragments (up to 60mm) 3.55 - 3.70m: 60deg planar conjugating fractures. 3.70 - 4.40m: Closely spaced thin beds of light brown gravelly clay. Gravel is subangular fine to coarse limestone. 4.22m: PLI suggests very weak.	4.40	242.50		
10CS 11C	4.22 - 4.42 4.40 - 5.80	4.40	100 100 89	130 400 750			Weak to medium strong white and light brown oolitic LIMESTONE with rare thin beds of calcareous mudstone. Fractures are subhorizontal to 10deg closely to widely spaced undulating rough with rare light brown staining. Rare shell fragments and peloids. (IOG) (BLPL) 4.40 - 4.60m: Subvertical undulating rough fracture stained orange. 5.50 - 5.55m: Subvertical undulating rough fracture. 5.65 - 5.80m: Subvertical undulating rough fracture.				
12CS	5.10 - 5.44						6.50m: Small pocket (40mm) gravelly clay.				
13C 14CS	5.80 - 7.30 5.80 - 6.21	5.80	100 100 90				6.90 - 7.00m: 80deg planar rough fracture.				
15CS 16C	7.05 - 7.23 7.30 - 8.40	7.30	98 88 86				7.40 - 8.15m: Subvertical undulating rough fracture with calcite precipitation (up to 60mm thick).				

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	3.00	Window Sampler	Comacchio GEO 405					
3.00	90.65	Rotary Core	Comacchio GEO 405					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	3.00		0.00	0.50	Concrete	52.70	Standpipe	
140	90.65		0.50	4.40	Bentonite			
			4.40	53.70	Gravel			
			53.70	90.65	Bentonite			
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
102	3.00		23-09-2019 08:00	0.00	Nil	Dry		CHECKED
146	90.65		23-09-2019 16:30	1.20	Nil	Dry		CT
			30-09-2019 10:30	1.20	Nil	Dry		
			30-09-2019 16:20	13.90	12.40	13.30		
			01-10-2019 08:30	13.90	12.40	10.30		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17C	8.40 - 9.40	8.40	94					Weak to medium strong white and light brown oolitic LIMESTONE with rare thin beds of calcareous mudstone. Fractures are subhorizontal to 10deg closely to widely spaced undulating rough with rare light brown staining. Rare shell fragments and peloids. (IOG) (BLPL) 8.40 - 8.65m: 70deg undulating rough fracture. 8.95 - 8.98m: Thin bed of light brown gravelly clay. 9.10 - 9.15m: Thin bed of light brown gravelly clay.			
18CS	8.65 - 8.78		94 77								
19C	9.40 - 10.90	9.40	99 99 87					9.40 - 9.75m: 80deg to subvertical planar rough fracture with reddish brown staining. 9.95 - 10.15m: 70deg undulating rough fracture. 10.15 - 10.40m: Cross bedding. UCS and PLI suggests weak. 10.45 - 10.55m: Grey limestone. 10.60 - 10.65m: Thin bed of friable orange clayey silt.			
20CS	10.15 - 10.42										
21C	10.90 - 12.40	10.90	100 87 81	520				Medium strong grey bioclastic locally argillaceous LIMESTONE. Fractures are 10-20deg medium and widely spaced undulating rough locally infilled with clay. (IOG) (BLPL) 12.10 - 12.30m: Light brown. Disintegrated to gravelly clay.	10.95	235.95	
22CS	11.53 - 11.85			700							
23C	12.40 - 13.90	12.40	100 100 93	NI 120 850 2000				Medium strong locally weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal medium and widely spaced undulating rough. (IOG) (BLPL) 12.65 - 12.80m: Weak orangish brown bioclastic mudstone. 13.15 - 13.35m: 50-60deg undulating rough fracture with light brown staining. 13.40 - 14.00m: Subvertical undulating rough fracture with light brown staining.	12.30	234.60	
24C	13.90 - 15.40	13.90	99 99 85					14.00 - 14.80m: Subvertical undulating rough fracture with reddish brown staining. 14.70 - 15.10m: Subvertical undulating rough fracture with light brown staining. 15.15 - 15.30m: 50deg planar rough fracture stained brown.			
25C	15.40 - 16.90	15.40	100 100 95								
26CS	15.82 - 16.10										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1118
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		01-10-2019 16:30	44.70	43.20	Dry		
		02-10-2019 08:30	44.70	43.20	Dry		
		02-10-2019 16:50	63.20	61.70	57.30		
		03-10-2019 08:30	63.20	61.70	49.70		
		03-10-2019 16:30	90.65	89.45	50.00		
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 23 September 2019 Easting 394194

End Date 03 October 2019

Northing 215201

Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.90 - 18.40	16.90	100 100 99					Medium strong locally weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal medium and widely spaced undulating rough. (IOG) (BLPL) 16.20 - 16.80m: Subvertical undulating rough fracture with reddish brown staining. 17.05 - 17.30m: 50deg planar rough fracture. 17.20 - 17.80m: Subvertical undulating rough fracture with reddish brown staining.			
28C	18.40 - 19.90	18.40	100 100 100								
29CS	19.04 - 19.32										
30C	19.90 - 21.40	19.90	100 100 95					19.25 - 19.40m: 50deg planar rough fracture.			
31CS	20.90 - 21.20										
32C	21.40 - 22.90	21.40	100 100 97					21.70 - 21.85m: 60-70deg undulating rough fracture.			
33C	22.90 - 24.40	22.90	100 100 94								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
34C 35CS	24.40 - 25.90 24.40 - 24.82	24.40	100 100 100					Medium strong locally weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal medium and widely spaced undulating rough. (IOG) (BLPL)			
								25.45 - 25.70m: 70deg undulating rough fracture.			
36C	25.90 - 27.40	25.90	97 96 87								
37C	27.40 - 28.90	27.40	99 97 87	30 250 420				Weak white and light yellowish brown bioclastic ooidal shelly LIMESTONE with rare voids (up to 20mm). Fractures are 5-20deg medium spaced undulating rough locally infilled with light brown gravelly clay. (IOG) (BLPL)	27.50	219.40	
38CS	28.43 - 28.82										
39C	28.90 - 30.40	28.90	100 100 97					29.70 - 30.25m: Frequent voids up to 30mm (bioturbated).			
40C	30.40 - 31.90	30.40	100 100 100					30.65 - 31.05m: Frequent voids up to 50mm (bioturbated).			
41CS	31.42 - 31.81							Weak white and light yellowish brown bioclastic and oolitic LIMESTONE with abundant voids (up to 50mm) (highly bioturbated). Voids infilled with brown sandy clay and calcite crystals. Fractures are probably subhorizontal very closely and closely spaced undulating rough locally infilled with light brown gravelly clay. (IOG) (BLPL)			
42C	31.90 - 32.70	31.90							31.90	215.00	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 5 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43C	32.70 - 34.20	32.70	100 38 13	NI				Weak white and light yellowish brown bioclastic and oolitic LIMESTONE with abundant voids (up to 50mm) (highly bioturbated). Voids infilled with brown sandy clay and calcite crystals. Fractures are probably subhorizontal very closely and closely spaced undulating rough locally infilled with light brown gravelly clay. (IOG) (BLPL) 32.75 - 32.90m: Rare voids. 33.00 - 33.20m: Rare voids.			
44CS	33.65 - 33.98		97 33 23								
45C	34.20 - 35.70	34.20	100 99 91	100 400 620				Weak white and light yellowish brown bioclastic and oolitic LIMESTONE with rare very thin beds of calcareous mudstone. Fractures are subhorizontal to 10deg closely to widely spaced undulating rough locally infilled with light brown gravelly clay. (IOG) (BLPL) 34.40 - 34.55m: 50deg planar rough fracture. 35.05 - 36.00m: Subvertical undulating rough fracture with light brown staining.	34.20	212.70	
46C	35.70 - 37.20	35.70	100 97 88								
47CS	36.80 - 37.20										
48C	37.20 - 38.70	37.20	100 79 68								
49C	38.70 - 40.20	38.70	100 86 70					Very weak white and light yellowish brown bioclastic and oolitic LIMESTONE (highly bioturbated). Fractures are subhorizontal closely spaced undulating rough locally infilled with light brown gravelly clay. (IOG) (BLPL)	38.30	208.60	
50CS	39.45 - 39.76			NI				Medium strong highly fractured and voided light yellowish brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg and subvertical very closely and closely spaced undulating rough infilled with brown clay. (IOG) (BLPL)	39.75	207.15	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 6 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
51C	40.20 - 41.70	40.20	92	50				Weak white and light yellowish brown oolitic and bioclastic LIMESTONE locally disintegrated to clayey gravel. Frequent voids (up to 50mm). Fractures are subhorizontal closely and medium spaced undulating rough locally infilled with light brown clay. Surfaces weakened. (IOG) (BLPL)	40.30	206.60	
			73 51	90 NI 160 300							
52C 53CS	41.70 - 43.20 41.70 - 42.11	41.70	100 99 99	300 420 535				41.70 - 43.50m: Fractures are medium spaced.			
54C	43.20 - 44.70	43.20	100 97 97	350				Strong grey oolitic and bioclastic LIMESTONE. (IOG) (BLPL)	43.50	203.40	
			110 170 430								
55CS	44.10 - 44.34							Weak white and light brown peloidal, oolitic and bioclastic LIMESTONE locally bioturbated. Fractures are subhorizontal closely and medium spaced undulating rough locally infilled with light brown clay. Surfaces weakened. Rare very thin beds of light brown calcareous mudstone. (IOG) (BLPL)			
56C	44.70 - 46.20	44.70	97 97 91					44.45m: Bivalve (50mm). 44.70 - 44.90m: Frequent voids up to 20mm (bioturbated).	43.85	203.05	
57C	46.20 - 47.70	46.20	100 99 99					46.10 - 46.20m: Frequent voids up to 20mm (bioturbated).			
58CS	46.92 - 47.23										
59C	47.70 - 49.20	47.70	99 98					47.45 - 47.50m: Frequent voids up to 20mm (bioturbated). 47.70 - 47.80m: Frequent voids up to 20mm (bioturbated).			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 7 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
60C	49.20 - 50.70	49.20	93			[Pattern]		Weak white and light brown peloidal, oolitic and bioclastic LIMESTONE locally bioturbated. Fractures are subhorizontal closely and medium spaced undulating rough locally infilled with light brown clay. Surfaces weakened. Rare very thin beds of light brown calcareous mudstone. (IOG) (BLPL) 48.35 - 48.45m: Frequent voids up to 20mm (bioturbated). Medium strong grey bioclastic LIMESTONE. (IOG) (BLPL) 48.50 - 48.75m: 80deg contact. 48.80m: Bivalve (20mm) 48.85m: 10deg incipient fracture with black mineralisation.	48.50	198.40	[Pattern]
			100 97 97	800	49.35		197.55				
61CS	49.65 - 50.00							Weak white and light brown oolitic and bioclastic LIMESTONE with frequent voids (up to 60mm) stained orange. (IOG) (BLPL) 50.15m: 50mm bed of extremely weak light brown mudstone. 50.20 - 50.80m: Fractures are 10-20deg and subvertical closely spaced planar rough.			
62C	50.70 - 52.20	50.70	60 100 120					Medium strong grey oolitic and bioclastic LIMESTONE. Fractures are 10deg to 20deg rarely vertical closely to medium spaced undulating rough stained orangish brown with up to 20mm penetrative discolouration. (IOG) (BLPL) 50.85 - 51.00m: Frequent voids up to 60mm (bioturbated). 51.05 - 51.65m: Subvertical undulating rough fracture with orangish brown penetrative discolouration. 51.65 - 52.40m: Frequent voids up to 20mm (bioturbated) and brown staining.	50.80	196.10	[Pattern]
63C	52.20 - 53.70	52.20	89 87 85	120 180 550				53.20 - 53.60m: Subvertical undulating rough fracture. Very weak thinly laminated dark grey MUDSTONE locally tending to weak calcareous siltstone. Frequent thin and thick laminae of grey silt. Fractures are subhorizontal to 20deg medium spaced planar smooth. Frequent randomly orientated incipient fractures. (Lias Group) (BDS)			
64CS	52.47 - 52.78		100 98 98	1050					53.40	193.50	[Pattern]
65C	53.70 - 55.20	53.70	20 250 550								
66C	55.20 - 56.70	55.20	100 100 100								
67CS	55.71 - 56.02		100 100 89								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
				53.00	3.00	49.90	20	
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 8 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 23 September 2019 Easting 394194

End Date 03 October 2019

Northing 215201

Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
68C 69CS	56.70 - 57.20 56.83 - 57.13	56.70	98 98 80					Very weak thinly laminated dark grey MUDSTONE locally tending to weak calcareous siltstone. Frequent thin and thick laminae of grey silt. Fractures are subhorizontal to 20deg medium spaced planar smooth. Frequent randomly orientated incipient fractures. (Lias Group) (BDS) 57.80m: Belemnite fossil. 60.90 - 61.05m: 70deg planar rough fracture. 61.40 - 61.70m: 80deg planar rough fracture. 62.15m: Siltstone nodule (40mm).				
70C	57.20 - 58.70	57.20	100 100 89									
71CS	58.30 - 58.50											
72C	58.70 - 60.20	58.70	99 99 93									
73C	60.20 - 61.70	60.20	100 97 79									
74C	61.70 - 63.20	61.70	100 95 85									
75CS	62.83 - 63.13											
76C	63.20 - 64.70	63.20	100 100 91									
Continued Next Page												

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 9 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 23 September 2019 Easting 394194

Scale 1:50

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
77C	64.70 - 66.20	64.70	100 100 97					Very weak thinly laminated dark grey MUDSTONE locally tending to weak calcareous siltstone. Frequent thin and thick laminae of grey silt. Fractures are subhorizontal to 20deg medium spaced planar smooth. Frequent randomly orientated incipient fractures. (Lias Group) (BDS) 64.10m: Siltstone nodule (30mm). 64.70 - 65.00m: Thin bed of calcareous siltstone.			
78CS	65.70 - 66.00										
79C	66.20 - 67.70	66.20	100 100 75								
80C	67.70 - 69.20	67.70	100 100 94					68.16 - 68.31m: Thin bed of calcareous siltstone.			
81CS	68.80 - 69.10										
82C	69.20 - 70.70	69.20	100 100 92					69.30 - 69.35m: Extremely weak grey calcareous siltstone.			
83C	70.70 - 72.20	70.70	100 100 91					71.20 - 71.50m: Closely spaced very thin and thin beds of weak grey calcareous siltstone.			
84CS	70.95 - 71.20										

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 			
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 10 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 23 September 2019 Easting 394194

End Date 03 October 2019

Northing 215201

Ground Level 246.90mOD

Depth 90.65 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
85C	72.20 - 73.70	72.20	100 99 81					Very weak thinly laminated dark grey MUDSTONE locally tending to weak calcareous siltstone. Frequent thin and thick laminae of grey silt. Fractures are subhorizontal to 20deg medium spaced planar smooth. Frequent randomly orientated incipient fractures. (Lias Group) (BDS) 72.20 - 72.40m: 50deg planar rough fracture.			
86C	73.70 - 75.20	73.70	100 100 85					73.45 - 73.76m: Medium strong grey bioclastic limestone.			
87CS	74.45 - 74.85										
88C	75.20 - 76.70	75.20	100 100 96								
89C	76.70 - 78.20	76.70	100 100 99								
90CS	77.70 - 77.90										
91C	78.20 - 79.70	78.20	100 100 86								
92C	79.70 - 81.20	79.70	100 100					79.90 - 80.55m: Weak grey calcareous siltstone.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315

CLIENT HIGHWAYS ENGLAND

Sheet 11 of 12

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 23 September 2019 Easting 394194

Depth 90.65 m

End Date 03 October 2019 Northing 215201 Ground Level 246.90mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
93CS	80.55 - 80.90		85					Very weak thinly laminated dark grey MUDSTONE locally tending to weak calcareous siltstone. Frequent thin and thick laminae of grey silt. Fractures are subhorizontal to 20deg medium spaced planar smooth. Frequent randomly orientated incipient fractures. (Lias Group) (BDS)			
94C	81.20 - 82.70	81.20	100 100 100	100 1000 2000			81.10 - 81.15m: Weak grey calcareous siltstone.		81.15	165.75	XXXXXX
95CS	81.82 - 82.20							Weak thickly bedded dark grey SILTSTONE with rare thin laminae of grey silt. Fractures are subhorizontal widely spaced planar smooth. (Lias Group) (BDS)			XXXXXX
96C	82.70 - 84.20	82.70	100 100 88								XXXXXX
97C	84.20 - 85.70	84.20	100 100 80							XXXXXX	
98CS	85.43 - 85.69							85.95 - 87.55m: Subvertical planar rough incipient fracture.			XXXXXX
99C	85.70 - 87.20	85.70	100 100 100								XXXXXX
100C	87.20 - 88.70	87.20	100 100 95							XXXXXX	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								TOPSOIL (Driller's description). (TOP)	0.30	246.70	
								Limestone GRAVEL (Driller's description).			
								LIMESTONE (Driller's description).	3.20	243.80	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	3.00	Windowless Sampler	Geotechnical Pioneer Rig					
3.20	54.50	Rotary Core	Geotechnical Pioneer Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	3.20		0.00	0.50	Concrete	52.90	Standpipe	
140	46.70		0.50	4.40	Bentonite			
			4.40	53.40	Gravel			
			53.40	54.50	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Samples and core not retained. Driller notes loss of flush throughout. Borehole drilled to provide a replacement water monitoring standpipe for DSRC315, which was no longer operational. See log of	35560	
128	3.00	29-05-2020 10:30	0.00	Nil	Dry		CHECKED	
146	46.70	29-05-2020 15:20	15.20	13.70	1.10		CT	
116	54.50	01-06-2020 08:40	15.20	13.70	14.75			
		01-06-2020 16:15	36.20	34.70	32.00			
		02-06-2020 08:30	36.20	34.70	35.40			

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								LIMESTONE (Driller's description).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL				INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS				REMARKS				CONTRACT 35560	
		DATE TIME DEPTH (m) CASING (m) WATER (m) 02-06-2020 14:10 42.30 40.80 41.40 03-06-2020 10:00 42.30 40.80 43.20 03-06-2020 13:00 48.50 47.00 47.10 04-06-2020 08:00 48.50 47.00 48.40 04-06-2020 12:00 54.50 53.00 48.40				borehole DSRC315 for detailed descriptions of the strata encountered.				CHECKED CT	

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								LIMESTONE (Driller's description).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560
							CHECKED CT	

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								LIMESTONE (Driller's description).			
								30.20 - 34.70m: Driller notes fractured.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRC315A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 7

Start Date 29 May 2020

Easting 394194

Scale 1:50

End Date 04 June 2020

Northing 215200

Ground Level 247.00mOD

Depth 54.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
									53.40	193.60	
								MUDSTONE (Driller's description).			
									54.50	192.50	
								Borehole Completed at 54.50m			

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC317

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 02 October 2019

Easting 394718

Scale 1:50

End Date 04 October 2019

Northing 214127

Ground Level 274.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2C 3B	0.00 - 0.25 0.10 - 0.20 0.30 - 1.20 0.30 - 0.35		100 13 0	NI 10 30				Grass over soft and firm brown and dark brown gravelly silty CLAY. Gravel is subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.25	274.65	
4C	1.20 - 2.70	1.20	100 81 12	NI 55 180			Very weak and weak highly fractured light yellowish brown and dark yellowish brown argillaceous LIMESTONE. Fractures are randomly orientated extremely closely and very closely spaced planar and undulating rough with a veneer of dark yellowish brown sandy silt. (GOG) (HMB)	1.30	273.60		
5CS 6C	2.50 - 2.70 2.70 - 4.20	1.20	100 91 49	NI 110 210			Very weak and weak light and dark yellowish brown oolitic LIMESTONE locally disintegrated to dark orangish brown and light yellowish brown gravelly sandy clayey silt. Fractures are subhorizontal to 10deg and 70-80deg very closely and closely spaced undulating rough stained orangish brown and dark grey infilled (up to 40mm) with light brown and orangish brown clayey silt. Fracture surfaces weakened. Frequent calcite infilled burrows. (GOG) (HMB) 2.50m: PLI suggests weak to medium strong.	2.85	272.05		
7CS	3.80 - 4.00						Weak light yellowish brown and light yellowish grey bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely spaced planar and undulating rough stained orangish brown rarely infilled (up to 15mm) with orangish brown sandy clayey silt. Frequent thick laminae of shell fragments (up to 10mm). (GOG) (HMB)				
8C	4.20 - 5.70	1.20	100 93 83	80 150 360			Extremely weak and very weak thinly laminated dark grey MUDSTONE with thin beds of weak dark grey calcareous siltstone. Bedding fractures are subhorizontal to 5deg closely and medium spaced planar smooth infilled (up to 5mm) with dark grey silty clay. (FEF) (FE)	4.35	270.55		
9CS	4.95 - 5.10						5.90 - 5.95m: Medium strong grey limestone.				
10C	5.70 - 7.00	5.70	100 82 49				Very weak and weak dark grey and dark bluish grey bioclastic LIMESTONE with medium spaced very thin beds of stiff dark grey silty clay. Bedding fractures are subhorizontal to 20deg closely and medium spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE)	6.50	268.40		
11CS	6.30 - 6.60			NI 170 250							
12C	7.00 - 8.50	5.70	100 92 43								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE		
TOP (m)	BASE (m)	TYPE	Hand tools			Groundwater not encountered prior to use of flush		
0.00	0.30	Inspection Pit	Geotechnical Pioneer Rig			DEPTH (m)	CASING (m)	ROSE TO (m)
0.30	30.00	Rotary Core				AFTER (min)	REMARKS	

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	8.80	0.00	0.50	Concrete	4.00	Standpipe	
		0.50	1.00	Bentonite			
		1.00	4.30	Gravel			
		4.30	30.00	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes loss of flush 0.30-5.70m (0% returned) and reduced flush returns 20.50-30.00m (50% returned).	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
146	30.00	02-10-2019 11:05	0.00	Nil	Dry		CHECKED
		02-10-2019 16:40	7.00	5.70	3.20		CT
		03-10-2019 08:25	7.00	5.70	3.40		
		03-10-2019 16:45	22.00	5.70	1.90		
		04-10-2019 08:25	22.00	5.70	1.90		

BOREHOLE LOG



DSRC317

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 02 October 2019

Easting 394718

Scale 1:50

End Date 04 October 2019

Northing 214127

Ground Level 274.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13CS	8.15 - 8.45							Very weak and weak dark grey and dark bluish grey bioclastic LIMESTONE with medium spaced very thin beds of stiff dark grey silty clay. Bedding fractures are subhorizontal to 20deg closely and medium spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE) 9.00 - 9.20m: Abundant dark grey shell fossils (up to 20mm).			
14C	8.50 - 10.00	5.70	100								
15CS	8.75 - 8.90		97								
				NI				Extremely weak and very weak dark grey MUDSTONE. Bedding fractures are subhorizontal to 10deg medium spaced planar smooth. (FEF) (FE) 9.40m: 40mm bed of shell debris.	9.20	265.70	
				210							
				550				10.20m: Tending to weak calcareous mudstone. 10.55 - 10.70m: Medium strong grey bioclastic limestone.			
16C	10.00 - 11.50	5.70	100								
			93								
				NI				Weak to medium strong dark grey and greyish brown calcareous fine SANDSTONE locally tending to siltstone. Frequent thin laminae of light grey silt. Fractures subhorizontal to 10deg are closely and medium spaced planar rough stained dark yellowish brown rarely infilled (up to 3mm) with dark grey and dark yellowish brown sandy silty clay. (FEF) (FE)	10.70	264.20	
				170							
17CS	11.20 - 11.45							Strong grey LIMESTONE with closely spaced thin beds of very weak dark grey mudstone. Fractures are subhorizontal to 10deg closely and medium spaced planar rough. (FEF) (FE) 12.30 - 12.35m: Extremely weak light brown calcareous fine and medium sandstone. Colouration penetrating 60mm either side of boundary.			
18C	11.50 - 13.00	5.70	93								
19CS	11.75 - 12.10		90								
				NI				Extremely weak and very weak thinly laminated dark grey MUDSTONE with medium and widely spaced very thin and thin beds of medium strong grey limestone. Fractures are subhorizontal to 10deg closely spaced planar smooth rarely infilled (up to 10mm) with dark grey silty clay. Frequent subvertical planar smooth incipient fractures. (FEF) (FE)	11.75	263.15	
				120							
				240				Weak to medium strong bluish grey argillaceous LIMESTONE with closely spaced thin beds of very weak dark grey mudstone. Bedding fractures are subhorizontal to 10deg closely spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE)			
20C	13.00 - 14.50	5.70	100								
			84								
				NI				Extremely weak and very weak thinly laminated dark grey MUDSTONE with medium and widely spaced very thin and thin beds of medium strong grey limestone. Fractures are subhorizontal to 10deg closely spaced planar smooth rarely infilled (up to 10mm) with dark grey silty clay. Frequent subvertical planar smooth incipient fractures. (FEF) (FE)	12.85	262.05	
				65							
				160				Weak to medium strong bluish grey argillaceous LIMESTONE with closely spaced thin beds of very weak dark grey mudstone. Bedding fractures are subhorizontal to 10deg closely spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE)			
21C	14.50 - 16.00	5.70	99								
			95								
				NI				Weak to medium strong bluish grey argillaceous LIMESTONE with closely spaced thin beds of very weak dark grey mudstone. Bedding fractures are subhorizontal to 10deg closely spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE)	15.10	259.80	
				150							
22CS	15.70 - 15.90							Weak to medium strong bluish grey argillaceous LIMESTONE with closely spaced thin beds of very weak dark grey mudstone. Bedding fractures are subhorizontal to 10deg closely spaced planar and undulating rough rarely infilled (up to 5mm) dark grey silty clay. (FEF) (FE)			
23C	16.00 - 17.50	5.70									
				NI							
				220							

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HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
CASING DEPTH				BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT 35560
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
		04-10-2019 15:00	30.00	8.80	1.60			CHECKED CT

BOREHOLE LOG



DSRC317

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 02 October 2019

Easting 394718

Scale 1:50

End Date 04 October 2019

Northing 214127

Ground Level 274.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	17.50 - 18.25	5.70	91 80 21					Extremely weak and very weak thinly laminated dark grey MUDSTONE. Bedding fractures are subhorizontal to 10deg closely spaced planar smooth rarely infilled (up to 5mm) with dark grey silty clay. (FEF) (FE)	16.45	258.45	
			NI 60 200								
25C	18.25 - 19.00	5.70	91 57 27								
26C	19.00 - 20.50	5.70	95 92 92					Weak bluish grey argillaceous LIMESTONE. Fractures are subhorizontal to 10deg medium spaced undulating rough rarely infilled (up to 3mm) with dark bluish grey sandy silty clay. Frequent calcite infilled shell fossils (up to 20mm). (FEF) (FE) 19.25 - 19.60m: Very weak. 19.90 - 20.40m: Very thinly interbedded with medium strong bluish grey bioclastic limestone and very weak dark grey siltstone.	18.60	256.30	
			40 300 440								
27CS	19.45 - 19.85		91 86 86								
28C 29CS	20.50 - 22.00 20.50 - 20.70	7.30	100 91 86	NI 160 350				Very weak thinly laminated dark grey calcareous MUDSTONE with frequent thin laminae of light grey silt. Locally disintegrated to stiff dark grey gravelly silty clay. Gravel is subangular fine to coarse mudstone lithorelicts. Fractures are subhorizontal to 10deg closely and medium spaced planar and undulating smooth rarely infilled (up to 10mm) with dark grey silty clay. Rare subvertical planar smooth incipient fractures. (FEF) (FE)	20.45	254.45	
30C	22.00 - 23.50	8.80	100 70 41								
31C	23.50 - 24.50	8.80	100 95 63					23.85 - 24.00m: Medium strong grey bioclastic limestone.	24.00	250.90	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560 CHECKED CT	
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BOREHOLE LOG



DSRC317

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 02 October 2019

Easting 394718

Scale 1:50

End Date 04 October 2019

Northing 214127

Ground Level 274.90mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
32CS	24.10 - 24.50			NI 195 420				Weak thinly laminated dark grey calcareous MUDSTONE with frequent thin laminae of light grey silt. Locally disintegrated to stiff dark grey gravelly silty clay. Gravel is subangular fine to coarse mudstone lithorelicts. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth rarely infilled (up to 5mm) with dark grey silty clay. Rare subvertical planar smooth incipient fractures. (FEF) (FE)			
33C	24.50 - 26.00	8.80	100 87 78								
34C	26.00 - 27.50	8.80	92 69 61								
35CS	27.20 - 27.45										
36C	27.50 - 28.50	8.80	84 68 50								
37C	28.50 - 30.00	8.80	100 88 75					28.70 - 29.20m: Subvertical planar smooth fracture.			
38CS	29.20 - 29.60										
									30.00	244.90	
									Borehole Completed at 30.00m		

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRC319

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3B 3ES	0.05 - 0.10 0.05 - 0.10 0.25 - 0.30 0.25 - 0.30 0.45 - 0.50 0.45 - 0.50							Vegetation over very soft dark brown slightly sandy gravelly CLAY. Gravel is angular to subrounded fine and medium limestone. Frequent rootlets and roots (up to 20mm diam). (TOP)	0.20	231.40	
4B 4ES 5D 6L	0.95 - 1.00 0.95 - 1.00 1.20 - 1.65 1.20 - 2.20	Nil				S 24		Very soft light brownish orange slightly sandy gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. Frequent rootlets. (HDD) (HEAD)	1.00	230.60	
7D 8L	2.20 - 2.65 2.20 - 3.20	Nil				S 16		Stiff orangish brown gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone and quartz. Rare rootlets. (HDD) (HEAD)			
10L 9D	3.20 - 4.20 3.20 - 3.65	Nil				S 34		Weak very thinly bedded light grey bioclastic LIMESTONE with very closely spaced very thin beds of stiff orangish brown slightly sandy clay. Bedding surfaces rough and irregular stained orange. Fractures are closely spaced undulating rough with frequent clay infill (up to 20mm). Rare large fossils (up to 15mm) with calcite infill. (IOG) (BLPL)	2.85	228.75	
11D	4.20 - 4.65	Nil				S 60					
12C	4.60 - 5.10	5.10	88 0 0	NI 80 160				Medium strong thinly bedded light grey and yellowish brown bioclastic LIMESTONE with closely and very closely spaced very thin beds of firm brown slightly sandy clay. Bedding fractures are subhorizontal to 20deg probably closely spaced, irregular. (IOG) (BLPL)	4.60	227.00	
13C	5.10 - 6.40	5.10	86 26 14					4.60 - 4.90m: Subvertical fracture undulating rough infilled with stiff brown slightly sandy slightly gravelly clay. Gravel is well rounded fine and medium limestone. 5.80 - 6.00m: Subvertical planar rough fracture.			
14C	6.40 - 6.90	6.40	100 0 0	NI				6.40 - 6.90m: Recovered non intact.			
15D 16C	6.90 - 7.50 6.90 - 7.70	6.90	90 18 18	NI		S 41		Very weak and weak light grey and light brown bioclastic LIMESTONE. Subvertical fracture undulating rough infilled (50mm) with stiff brown slightly sandy slightly gravelly clay. Gravel is well rounded fine and medium limestone. (IOG) (BLPL)	6.90	224.70	
17C	7.70 - 9.20	7.70	110 100 37	NI				Very weak and weak thinly bedded light grey and light brown bioclastic LIMESTONE with closely spaced very thin beds of firm yellowish brown slightly sandy clay. Recovered non intact. (IOG) (BLPL) 7.65 - 7.85m: Stiff orangish brown clay with calcite crystals (up to 30mm).	7.60	224.00	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	4.20	Window Sampler	Comacchio MC 405					
4.60	65.20	Rotary Core	Comacchio MC 405					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098
168	4.60		0.00	0.50	Concrete	20.50	Standpipe	
140	65.20		0.50	2.90	Bentonite			
			2.90	3.50	Sand			
			3.50	20.50	Gravel			
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560
102	3.20	03-03-2020 08:00	0.00	Nil	Dry	Borehole advanced by reaming casing (168mm) 4.20-4.60m. Driller notes joint/void 14.80-15.00m.		CHECKED
87	4.20	03-03-2020 12:00	1.20	Nil	Dry	Driller notes loss of flush returns 15.20-65.20m.		CT
168	4.60	04-03-2020 08:00	1.20	Nil	Dry			
146	65.20	04-03-2020 17:00	16.80	15.20	Dry			
		05-03-2020 08:00	16.80	15.20	Dry			

BOREHOLE LOG



DSRC319

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 9

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			33								
18C	9.20 - 10.70	9.20	100	NI				Medium strong yellowish grey bioclastic LIMESTONE with medium spaced thin laminae of calcareous mudstone. Frequent irregular voids (up to 50mm) stained orange, locally infilled with orange sandy clay. Fractures are 30-50deg closely and medium spaced irregular rough stained orangish brown with a veneer of brown clay. (IOG) (BLPL) 8.80 - 8.95m: Stiff brown clay. 9.40m: PLI suggests extremely weak to very weak.	8.40	223.20	
19CS	9.40 - 9.60		82 66	90 340							
20C	10.70 - 11.90	10.70	100	NI				10.20m: Subhorizontal planar rough fracture infilled (20mm) with soft brown clay. Medium strong yellowish grey bioclastic LIMESTONE with medium spaced thin laminae of calcareous mudstone. Fractures are 10-20deg medium spaced irregular rough stained orangish brown with a veneer of brown clay. (IOG) (BLPL)	10.25	221.35	
21CS	10.70 - 11.00		38 26	150 280 300							
22C	11.90 - 13.50	11.90	96	NI				Medium strong thinly bedded yellowish grey bioclastic LIMESTONE with medium spaced thin laminae of calcareous mudstone. Fractures are 20-30deg and subvertical (intersecting) very closely and closely spaced irregular rough stained orangish brown with a veneer of brown clay. (IOG) (BLPL)	11.05	220.55	
			66 58	70 130							
23CS	12.75 - 12.90			NI				12.50 - 12.55m: Subhorizontal planar rough fracture infilled (50mm) with firm brown clay with fine to coarse limestone gravel. Weak yellowish grey bioclastic LIMESTONE. Frequent irregular voids (up to 70mm) stained orange locally infilled with orange sandy clay. Fractures are 10-30deg and subvertical (intersecting) closely and medium spaced irregular rough stained orangish brown with a veneer of clay. (IOG) (BLPL)	12.55	219.05	
24C	13.50 - 15.20	13.50	88	250							
			75	400				14.35 - 14.40m: Subhorizontal planar rough fracture infilled (20mm) with orangish brown clay. 14.80 - 15.00m: Driller notes joint/void. Medium strong thinly bedded light grey and light brown bioclastic LIMESTONE with very closely and closely spaced very thin beds of calcareous mudstone. Frequent irregular voids (up to 30mm) infilled with orange sandy clay. Fractures are 10-20deg closely spaced irregular rough stained orangish brown with a veneer of clay. (IOG) (BLPL)			
25C	15.20 - 16.80	15.20	95								
26CS	15.45 - 15.85		78						15.85	215.75	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH				BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098
			20.50	65.20	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560
		05-03-2020 17:00	42.60	42.40	24.60			CHECKED
		06-03-2020 08:00	42.60	42.40	21.00			CT
		06-03-2020 15:00	57.30	55.80	22.37			
		09-03-2020 08:45	57.30	55.80	20.70			
		09-03-2020 16:30	65.20	65.20	20.60			

BOREHOLE LOG



DSRC319

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.80 - 18.30	16.80	98 90 90	100 170				Weak thinly bedded orangish yellow bioclastic LIMESTONE with closely spaced very thin beds of calcareous mudstone. Frequent irregular voids (up to 70mm) infilled with orange calcareous sandy clay. Medium bedded with medium strong grey bioclastic limestone. Fractures are 10deg closely to widely spaced undulating rough with a clay veneer. (IOG) (BLPL)	17.10	214.50	
28C	18.30 - 19.80	18.30	100 97 94								
29CS	19.10 - 19.50							19.10m: PLI suggests very weak.			
30C	19.80 - 21.20	19.80	100 97 97					Stiff dark grey CLAY. (Lias Group) (BDS) Extremely weak thinly laminated dark grey MUDSTONE with medium spaced thin beds of thinly laminated sandy siltstone. Bedding fractures are 10° closely spaced planar smooth. (Lias Group) (BDS)	20.50	211.10	
31D 32C	21.20 - 21.54 21.20 - 22.80	21.20	92 72 72			S *162				20.70	
33CS	21.80 - 22.20		600					Weak dark grey fine bioclastic SANDSTONE. Rare pyrite nodules (up to 50mm). (Lias Group) (BDS)	21.80	209.80	
34C	22.80 - 24.30	22.80	600					Extremely weak thinly laminated dark grey silty fine SANDSTONE. (Lias Group) (BDS)	22.40	209.20	
			100 80 75		23.00			Extremely weak to very weak thinly laminated dark grey sandy SILTSTONE with medium spaced thin and medium beds of weak to medium strong dark grey fine sandstone. Fractures are subhorizontal to 10° extremely closely and medium spaced. (Lias Group) (BDS)	23.00	208.60	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
						23.00	24.30	22.10	20			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1098			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)					
									35560			
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 4 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
35D 36C	24.30 - 24.50 24.30 - 25.80	24.30	100 90 86				S *214				xxxxxx
37CS	25.40 - 25.60										xxxxxx
38C	25.80 - 27.20	25.80	100 83 70	NI 100 250				Extremely weak thinly laminated dark grey sandy SILTSTONE. Fractures are subhorizontal and subvertical closely and medium spaced planar smooth with intersecting subvertical fractures. (Lias Group) (BDS)	25.80	205.80	xxxxxx
39D 40C	27.20 - 27.55 27.20 - 28.80	27.20	58 12 0	NI 60 80			S *150	27.20 - 28.80m: Limited recovery. Drilling disturbed.			xxxxxx
41C	28.80 - 30.30	28.80	94 82 72	NI 210 600				Extremely weak thinly laminated dark grey SILTSTONE with medium spaced thin beds of extremely weak dark grey siltstone. Fractures are subhorizontal to 20deg medium spaced planar smooth. Rare fossil fragments. (Lias Group) (BDS)	29.10	202.50	xxxxxx
42D 43C	30.30 - 30.53 30.30 - 31.80	30.30	100 100 100				S *400				xxxxxx
44CS	31.10 - 31.30										xxxxxx
45C	31.80 - 33.30	31.80	98					31.90 - 32.60m: 70-80deg planar smooth fractures.			xxxxxx

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)

CHECKED
CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 6 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
57C	40.80 - 42.40	40.80	100 88 85					Extremely weak thinly laminated dark grey SILTSTONE with medium spaced thin beds of extremely weak dark grey siltstone. Fractures are subhorizontal to 20deg medium spaced planar smooth. Rare fossil fragments. (Lias Group) (BDS) 40.20 - 40.50m: Subvertical planar smooth fracture.			XXXXXX
58CS	41.30 - 41.50							41.30m: PLI suggests very weak.			XXXXXX
59D 60C	42.40 - 42.65 42.40 - 43.90	42.40	100 93 84			S *316		41.85m: Subhorizontal undulating smooth fracture with silt veneer. 42.20 - 42.30m: Extremely weak grey siltstone.			XXXXXX
61C	43.90 - 45.40	43.90	100 96 86					42.80 - 42.85m: Extremely weak thinly laminated grey siltstone with greenish grey fine and medium sandstone gravel inclusions. 42.85 - 42.90m: Subhorizontal fracture with clay infill (up to 30mm).			XXXXXX
62CS	44.60 - 44.80							44.50m: Subhorizontal fracture with clay infill (up to 20mm). 44.60m: PLI suggests very weak.			XXXXXX
63D 64C	45.40 - 45.65 45.40 - 46.90	45.40	100 77 72	NI	250 800	S *286		Extremely weak thinly laminated dark grey MUDSTONE with medium spaced very thin beds of medium strong thinly laminated grey fine and medium sandstone and medium strong light grey limestone. Mudstone is frequently bioturbated with lenses (up to 50mm) of sandy silt. Rare shell and fossil fragments. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. (Lias Group) (WHM)	45.30	186.30	XXXXXX
65C	46.90 - 48.30	46.90	90 64 47					47.70 - 47.80m: Medium strong thinly laminated light grey siltstone and fine sandstone.			XXXXXX
66CS	47.90 - 48.20							47.90m: PLI suggests very weak.			XXXXXX

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098



BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED	
						CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 7 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 03 March 2020

Easting 393407

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
67D 68C	48.30 - 48.55 48.30 - 49.90	48.30	100 100 100				S *300	Extremely weak thinly laminated dark grey MUDSTONE with medium spaced very thin beds of medium strong thinly laminated grey fine and medium sandstone and medium strong light grey limestone. Mudstone is frequently bioturbated with lenses (up to 50mm) of sandy silt. Rare shell and fossil fragments. Fractures are subhorizontal to 10deg closely and medium spaced planar smooth. (Lias Group) (WHM) 48.60 - 48.65m: Subhorizontal fracture infilled (20mm) with clay. 49.30 - 49.35m: Medium strong light grey bioclastic limestone, undulating top and basal contacts.	49.35	182.25	
69C	49.90 - 51.45	49.90	100 81 81	NI 160 600							
70D 71C	51.45 - 51.60 51.45 - 52.90	51.45	100 93 83				S *462	51.10 - 51.20m: Subhorizontal fracture infilled (70mm) with clay.			
72C 73CS	52.90 - 54.40 53.10 - 53.30	52.90	100 96 83	20 130 300				Very weak thinly laminated dark grey MUDSTONE with closely and medium spaced grey bioclastic weak and medium strong limestone. Mudstone is frequently fossiliferous. Fractures are subhorizontal closely rarely medium spaced planar rough. (Lias Group) (WHM) 53.05 - 53.10m: Subhorizontal fracture with silt veneer. 53.45m: Subhorizontal undulating rough fracture with greenish grey sandy siltstone infill (up to 20mm). 53.95 - 54.00m: Medium strong light grey limestone.	52.90	178.70	
74C	54.40 - 55.80	54.40	98 91 91				C *429				
75CS	55.40 - 55.60							55.40m: Medium strong light grey limestone concretion (30mm).			
76C	55.80 - 57.30	55.80	100								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1098	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560
								CHECKED CT



BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 8 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 03 March 2020

Easting 393407

Scale 1:50

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
77C	57.30 - 58.90	57.30	92 90 96 75 68				C *225	Very weak thinly laminated dark grey MUDSTONE with closely and medium spaced grey bioclastic weak and medium strong limestone. Mudstone is frequently fossiliferous. Fractures are subhorizontal closely rarely medium spaced planar rough. (Lias Group) (WHM) 56.40 - 56.50m: 60deg undulating smooth fracture infilled (20mm) with clay. 56.90 - 57.00m: 60deg undulating rough fracture. 57.90 - 58.10m: 70deg undulating rough fracture.			
78C	58.90 - 60.60	58.90	100 89 60	NI 160 500				Very weak thinly laminated dark grey MUDSTONE. Fractures are 20deg closely to widely spaced undulating rough. Frequent fossil fragments. (Lias Group) (WHM)	59.10	172.50	
79CS	60.40 - 60.60										
80C	60.60 - 62.20	60.60	100 83 78				C *240	60.95 - 61.05m: Medium strong grey limestone. 61.05 - 61.30m: 70-80deg planar smooth fracture. 62.00 - 62.10m: Medium strong grey limestone.			
81C	62.20 - 63.80	62.20	100 93 93								
82CS	63.40 - 63.60										
83C	63.80 - 65.20	63.80	100				C *286				

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1098			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560			
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 9 of 9

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 03 March 2020

Easting 393407

End Date 09 March 2020

Northing 216148

Ground Level 231.60mOD

Depth 65.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
84CS	64.70 - 65.00		84 78					Very weak thinly laminated dark grey MUDSTONE. Fractures are 20deg closely to widely spaced undulating rough. Frequent fossil fragments. (Lias Group) (WHM) 64.20m: Medium strong grey limestone inclusions (up to 30mm). 64.75 - 64.80m: Medium strong grey limestone. 64.95 - 65.00m: Medium strong grey limestone.	65.20	166.40	
								Borehole Completed at 65.20m			

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



DSRC325

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 18 March 2020 Easting 393329

Depth 40.60 m

End Date 23 March 2020 Northing 216104 Ground Level 233.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.05 - 0.10							Topsoil (50mm) over very soft slightly sandy dark brown CLAY. Frequent roots (up to 50mm) and rootlets. (TOP)	0.15	233.10	
1ES	0.05 - 0.10										
2D	0.05 - 0.10										
2ES	0.15 - 0.20							Soft brown slightly sandy gravelly silty CLAY. Gravel is subangular fine to coarse limestone. Frequent rootlets. (HDD) (HEAD)			
3B	0.15 - 0.20										
4D	0.15 - 0.20										
3ES	0.45 - 0.50										
5B	0.45 - 0.50										
6D	0.45 - 0.50										
4ES	0.95 - 1.00	Nil					S 12	Firm brown sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse limestone. (HDD) (HEAD)	0.95	232.30	
7B	0.95 - 1.00										
8D	0.95 - 1.00										
10L	1.20 - 2.20										
9D	1.20 - 1.65										
11D	2.20 - 2.65	Nil					S 10				
12L	2.20 - 3.20										
13D	2.70 - 2.80										
14D	3.20 - 3.65	Nil					S 18	3.20m: Stiff.			
15L	3.20 - 4.20										
16D	3.50 - 3.60										
17D	4.20 - 4.65	Nil					S 40	Weak to medium strong light grey bioclastic LIMESTONE with closely and medium spaced very thin beds of extremely weak orangish brown calcareous mudstone. Fractures are subhorizontal to 30deg closely spaced undulating rough and irregular infilled (up to 60mm) with orange clay. Rare calcite mineralisation (up to 50mm). (IOG) (BLPL)	3.80	229.45	
18C	4.50 - 6.00	4.50	100 6 0	NI							
19D	4.80 - 4.90										
20C	6.00 - 7.50	6.00	100 30 8								
21D	7.10 - 7.20			NI 90 210							
22C	7.50 - 9.00	7.50	100 42 16								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Hand tools					
1.20	4.20	Window Sampler	Comacchio MC 405					
4.50	40.60	Rotary Core	Comacchio MC 405					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	4.50		0.00	0.50	Concrete	25.30	Standpipe	1098
140	40.60		0.50	3.80	Bentonite			
			3.80	25.80	Gravel			
			25.80	40.60	Bentonite			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			
102	4.20	18-03-2020 17:00	1.20	Nil	Dry	Borehole advanced by reaming casing (168mm) 4.20-4.50m. Driller notes loss of flush returns 16.40-40.60m.		35560
168	4.50	19-03-2020 08:30	1.20	Nil	Dry			CHECKED
146	40.60	19-03-2020 16:00	20.90	19.40	Dry			
		20-03-2020 08:30	20.90	19.40	Dry			
		20-03-2020 14:30	35.90	34.40	22.72			CT

BOREHOLE LOG



DSRC325

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 18 March 2020

Easting 393329

Scale 1:50

End Date 23 March 2020

Northing 216104

Ground Level 233.25mOD

Depth 40.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
23CS	8.30 - 8.45							Weak to medium strong light grey bioclastic LIMESTONE with closely and medium spaced very thin beds of extremely weak orangish brown calcareous mudstone. Fractures are subhorizontal to 30deg closely spaced undulating rough and irregular infilled (up to 60mm) with orange clay. Rare calcite mineralisation (up to 50mm). (IOG) (BLPL) 8.00 - 8.10m: 60-70deg vertical fracture stepped rough.			
24C	9.00 - 10.40	9.00	78 25 10								
25CS	9.40 - 9.75								9.75	223.50	
26D 27C	10.40 - 10.70 10.40 - 11.90	10.40	92 67 48	NI 150 200			S *207	Weak to medium strong orange and grey bioclastic LIMESTONE thinly interbedded with firm orange slightly sandy clay. Fractures are subhorizontal closely spaced irregular rough. Frequent irregular voids (up to 30mm). (IOG) (BLPL)			
28CS	11.10 - 11.30			NA			11.00 - 11.20m: Firm orange slightly sandy clay.	11.20	222.05		
29C	11.90 - 13.40	11.90	100 56 38	NI 80 180			11.60 - 11.75m: 70-80deg vertical fracture irregular smooth with clay veneer.	11.90	221.35		
30CS	12.55 - 12.72						Medium strong light grey and light yellowish brown locally stained orangish brown peloidal bioclastic LIMESTONE locally disintegrated to firm light brown gravelly clay. Gravel is subangular to rounded fine and medium limestone. Fractures are subhorizontal closely and medium spaced undulating rough locally stained orangish brown. (IOG) (BLPL)				
31C	13.40 - 14.90	13.40	82 46 32	NI 120 330			Weak yellowish brown and orangish brown locally peloidal bioclastic LIMESTONE. Fractures are subhorizontal to 20deg very closely to medium spaced undulating rough. (IOG) (BLPL)	13.05	220.20		
32C	14.90 - 16.40	14.90	89 78				14.40 - 14.65m: Disintegrated to firm light brown gravelly clay. Gravel is subangular to rounded fine and medium limestone.				
33CS	15.20 - 15.45		51	NI 160 400			Weak to medium strong light grey oolitic bioclastic LIMESTONE. Fractures are subhorizontal and 80deg closely and medium spaced undulating rough frequently stained orangish brown and rarely infilled (up to 40mm) with firm light orangish brown silty clay, surfaces weakened (up to 50mm). (IOG) (BLPL)	15.10	218.15		

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1098			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
			23-03-2020 08:30	35.90	34.40	22.10				CHECKED		
			23-03-2020 11:00	40.60	40.60	22.25				CT		
			18-09-2020 08:00	0.00	Nil	Dry						

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 3 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 18 March 2020

Easting 393329

End Date 23 March 2020

Northing 216104

Ground Level 233.25mOD

Depth 40.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
34C	16.40 - 17.90	16.40	96 83 69					Weak to medium strong light grey oolitic bioclastic LIMESTONE. Fractures are subhorizontal and 80deg closely and medium spaced undulating rough frequently stained orangish brown and rarely infilled (up to 40mm) with firm light orangish brown silty clay, surfaces weakened (up to 50mm). (IOG) (BLPL)			
35CS	17.00 - 17.40										
36C	17.90 - 19.40	17.90	95 82 70					17.90m: 50deg undulating rough fracture infilled (up to 100mm) with calcite.			
37C	19.40 - 20.90	19.40	100 93 58								
38CS	19.75 - 20.13										
39C	20.90 - 22.30	20.90	100 73 57								
40CS	21.40 - 21.75			NI 80 350				Weak to medium strong light orangish brown bioclastic LIMESTONE with frequent voids (up to 80mm), frequent calcified shell fragments (up to 100mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough, locally weakened (up to 40mm). (IOG) (BLPL) 22.10 - 22.55m: 90deg calcite vein (up to 90mm). 22.55 - 23.80m: Locally disintegrated to firm orangish brown gravelly clay. Gravel is subangular and subrounded fine to coarse limestone.	21.40	211.85	
41C	22.30 - 23.80	22.30	80 78 8								
42C	23.80 - 25.30	23.80	96					23.80 - 25.40m: Abundant voids (up to 50mm).			
Continued Next Page											

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC325

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 6

Start Date 18 March 2020

Easting 393329

Scale 1:50

End Date 23 March 2020

Northing 216104

Ground Level 233.25mOD

Depth 40.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43CS	25.02 - 25.30		63 28					Weak to medium strong light orangish brown bioclastic LIMESTONE with frequent voids (up to 80mm), frequent calcified shell fragments (up to 100mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough, locally weakened (up to 40mm). (IOG) (BLPL) 24.50 - 24.80m: 50deg undulating rough fracture infilled with calcite (up to 10mm).			
44C	25.30 - 27.00	25.30	79 15 15	250 NA	25.30				25.40 25.65	207.85 207.60	
45D	25.90 - 26.00							Very stiff laminated dark grey CLAY with very closely and closely spaced thin laminae to very thin beds of light grey silt. (Lias Group) (BDS)			
46D 47C	27.00 - 27.38 27.00 - 28.50	27.00	92 40 40			S *125					
48CS	27.60 - 27.84			600				27.45 - 27.60m: Frequent shell fragments (up to 50mm). Extremely weak grey silty fine SANDSTONE. No fractures observed. (Lias Group) (BDS)	27.60	205.65	
49C	28.50 - 30.00	28.50	100	NA			28.20 - 28.45m: Extremely weak grey siltstone. Very stiff/extremely weak laminated dark grey slightly micaceous silty CLAY/MUDSTONE with extremely closely to closely spaced thin and thick laminae of light grey silt. (Lias Group) (BDS)	28.30	204.95		
50D	29.80 - 29.90										
51D 52C	30.00 - 30.23 30.00 - 31.30	30.00	100 18			S *207	30.00 - 30.10m: Extremely weak grey mudstone with very closely spaced thin laminae of grey silt.				
53CS	30.30 - 30.54		0				30.70 - 30.80m: Extremely weak grey siltstone.				
54C	31.30 - 32.80	31.30	100				31.05 - 31.10m: Medium strong grey siltstone.				
55CS	32.00 - 32.30										

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
				25.30	25.30	22.00	20	
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



DSRC325

CLIENT HIGHWAYS ENGLAND

Sheet 5 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 18 March 2020

Easting 393329

Scale 1:50

End Date 23 March 2020

Northing 216104

Ground Level 233.25mOD

Depth 40.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
56D 57C	32.80 - 33.01 32.80 - 34.40	32.80	100 10 7				S *261	Very stiff/extremely weak laminated dark grey slightly micaceous silty CLAY/MUDSTONE with extremely closely to closely spaced thin and thick laminae of light grey silt. (Lias Group) (BDS)			
58C	34.40 - 35.90	34.40	100 10 10					33.65 - 33.70m: Extremely weak thinly laminated micaceous siltstone. 34.15 - 34.25m: Extremely weak thinly laminated micaceous siltstone.			
59CS	35.30 - 35.55										
60C	35.90 - 37.50	35.90	100 83 83	NI 100 300			C *222	Extremely weak dark grey MUDSTONE with very closely and closely spaced thin laminae of light grey silt and frequent lenses of light grey silt (up to 20mm). Fractures are subhorizontal closely and medium spaced planar rough. (Lias Group) (BDS) 36.55 - 36.80m: 80deg planar rough fracture.	35.75	197.50	
61C	37.50 - 39.00	37.50	100 93 88	NI 140 400				Extremely weak becoming very weak grey SILTSTONE with very closely and closely spaced thin laminae of light grey silt and frequent lenses of light grey silt (up to 20mm). Fractures are subhorizontal closely and medium spaced planar smooth surface locally disintegrated to firm silty clay (up to 10mm). (Lias Group) (BDS)			
62CS	38.55 - 38.85										
63C	39.00 - 40.60	39.00	100 100 84	NI 170 550			C *231	Extremely weak to very weak thinly and thickly cross laminated SILTSTONE and MUDSTONE. Fractures are subhorizontal and 50deg closely and medium spaced planar and undulating rough, surfaces locally disintegrated to stiff grey silty clay (up to 15mm). (Lias Group) (BDS)	39.10	194.15	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC325

CLIENT HIGHWAYS ENGLAND

Sheet 6 of 6

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 18 March 2020 Easting 393329

Depth 40.60 m

End Date 23 March 2020 Northing 216104 Ground Level 233.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
		40.60					C *214	Borehole Completed at 40.60m	40.60	192.65	XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS			
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)				
<table border="1"> <tr> <td>CONTRACT</td> </tr> <tr> <td>35560</td> </tr> <tr> <td>CHECKED</td> </tr> <tr> <td>CT</td> </tr> </table>						CONTRACT	35560	CHECKED
CONTRACT								
35560								
CHECKED								
CT								

BOREHOLE LOG



DSRC326

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 30 September 2019 Easting 394474

Scale 1:50

End Date 01 October 2019

Northing 214364

Ground Level 281.70mOD

Depth 21.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00 - 0.25							Grass over soft to firm dark brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse limestone. Frequent rootlets. (MG) (MGR)	0.25	281.45	
1ES	0.10 - 0.20										
2B	0.25 - 0.40										
2ES	0.30 - 0.40							Weak light yellowish brown oolitic LIMESTONE recovered as subangular fine to coarse gravel sized fragments. (GOG) (HMB)	0.60	281.10	
3C	0.60 - 1.10	Nil	100 5 0	NI 50 160							
4C	1.10 - 1.80	1.00	85 43 22					Medium strong very thinly bedded yellowish brown oolitic LIMESTONE with frequent shell fragments (up to 20mm). Locally disintegrated to clayey sandy subangular fine and medium gravel sized limestone lithorelicts. Fractures are subhorizontal to 15deg very closely and closely spaced planar and undulating rough. (GOG) (HMB)	1.80	279.90	
5C	1.80 - 2.60	1.00	94	NA				Very stiff fissured grey mottled greenish brown CLAY. Fissures are subhorizontal and subvertical very closely spaced planar and undulating smooth. (FEF) (FE) 2.60m: Thin bed of strong grey bioclastic limestone.	2.80	278.90	
6CS	2.15 - 2.42										
7C	2.60 - 4.20	1.00	93	NA				Very stiff grey slightly sandy gravelly silty CLAY with frequent shell fragments (up to 20mm) and closely spaced thin beds of weak grey bioclastic limestone. Gravel is subangular fine and medium lithorelicts of mudstone and limestone. (FEF) (FE) 3.70 - 4.25m: Relict subvertical undulating rough fracture with orangish brown penetrative staining up to 30mm either side of fracture.	4.25	277.45	
8C	4.20 - 5.70	1.00	99 93 75	NI 96 270							
9CS	4.75 - 5.02							Extremely weak thinly and thickly laminated grey MUDSTONE with rare shell fragments (up to 10mm). Locally disintegrated to very stiff slightly sandy slightly gravelly silty clay. Gravel is subangular fine and medium lithorelicts of mudstone. Bedding fractures are subhorizontal mainly closely spaced undulating rough. Fractures are 20deg, 70deg and subvertical closely spaced intersecting planar and undulating rough locally stained orangish brown. (FEF) (FE) 4.70m: Very thin bed of very weak grey bioclastic limestone. 5.35 - 5.50m: Bedding fractures are extremely closely spaced.	7.10	274.60	
10C	5.70 - 7.30	1.00	93 75 38								
11C	7.30 - 8.80	1.00	100 91 91	NI 270 440				Weak light yellowish brown locally grey oolitic LIMESTONE with closely and medium spaced thin beds of strong grey fine and medium calcareous sandstone with rare shell fragments (up to 5mm) and rare ooids. Locally disintegrated to slightly clayey sandy subangular fine and medium limestone lithorelicts. Bedding fractures are subhorizontal mainly medium spaced undulating rough locally stained orangish brown. (FEF) (FE)			
12CS	7.84 - 8.12										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	Hand tools			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.60	Inspection Pit	Comacchio GEO 205							
0.60	21.20	Rotary Core								

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	1.00	0.00	0.50	Arisings			
		0.50	21.20	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Inspection pit terminated at 0.60m due to encountering hard strata.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
131	21.20	30-09-2019 08:00	0.00	Nil	Dry		CHECKED
		30-09-2019 16:30	13.80	1.00	10.90		CT
		01-10-2019 08:00	13.80	1.00	9.20		
		01-10-2019 12:10	21.20	1.00	8.40		

BOREHOLE LOG



DSRC326

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 30 September 2019 Easting 394474

Scale 1:50

End Date 01 October 2019 Northing 214364 Ground Level 281.70mOD Depth 21.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13C 14CS	8.80 - 9.60 8.97 - 9.26	1.00	89 81 59					Weak light yellowish brown locally grey oolitic LIMESTONE with closely and medium spaced thin beds of strong grey fine and medium calcareous sandstone with rare shell fragments (up to 5mm) and rare ooids. Locally disintegrated to slightly clayey sandy subangular fine and medium limestone lithorelicts. Bedding fractures are subhorizontal mainly medium spaced undulating rough locally stained orangish brown. (FEF) (FE) 8.10 - 8.40m: Subvertical undulating rough fracture stained orangish brown. 8.10 - 8.50m: Bedding fractures are very closely spaced. 9.50 - 9.60m: 60deg undulating smooth fracture.	9.60	272.10	
15C	9.60 - 10.80	1.00	96 60 41	NI 80 190							
16C	10.80 - 12.30	1.00	100 49 19				Very weak thinly laminated grey MUDSTONE with closely spaced very thin beds of strong grey limestone. Locally disintegrated to very stiff slightly sandy slightly gravelly clay. Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Bedding fractures are subhorizontal mainly closely spaced planar smooth and rough locally stained orangish brown. Fractures are 70deg and subvertical intersecting planar smooth and rough. (FEF) (FE) 13.15 - 13.40m: Closely spaced thin and thick laminae of grey siltstone. 13.90 - 15.50m: Bedding fractures are mainly very closely spaced.	15.50	266.20		
17C 18CS	12.30 - 13.80 12.30 - 12.50	1.00	96 51 18								
19C	13.80 - 15.20	1.00	100 50 0	NI 40 80							
20C	15.20 - 16.70	1.00	100 85 80				Weak thinly bedded grey LIMESTONE. Bedding fractures are subhorizontal to 20deg medium spaced undulating smooth. (FEF) (FE) 15.60 - 15.90m: 80deg to subvertical incipient fracture.	15.50	266.20		
21CS	15.90 - 16.22			NI 240 410							

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC326

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 30 September 2019 Easting 394474

Scale 1:50

End Date 01 October 2019 Northing 214364 Ground Level 281.70mOD

Depth 21.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22C 23CS	16.70 - 18.20 16.87 - 17.03	1.00	97 97 73					Weak thinly bedded grey LIMESTONE. Bedding fractures are subhorizontal to 20deg medium spaced undulating smooth. (FEF) (FE) 16.80 - 17.45m: Closely spaced thin beds of weak grey mudstone with rare shell fragments (up to 10mm).	17.45	264.25	
24C	18.20 - 19.70	1.00	98 93 54	NI 95 160				Weak thinly and medium bedded grey MUDSTONE with closely and medium spaced curvilinear thin laminae and very thin beds of grey siltstone and bioclastic limestone. Bedding fractures are subhorizontal closely spaced undulating smooth. (FEF) (FE) 17.60 - 17.75m: 50deg undulating smooth fracture. 17.80 - 17.95m: 50deg undulating smooth fracture. 18.15 - 18.30m: Subvertical planar smooth fracture. 18.30 - 18.45m: 75deg planar smooth fracture. 18.55 - 18.60m: Subvertical planar smooth fracture. 18.65 - 18.80m: Vertical planar smooth fracture. 18.90 - 19.00m: Vertical planar smooth fracture.			
25C	19.70 - 21.20	1.00	99 87 71					19.80 - 20.10m: Subvertical planar smooth fracture. 20.45 - 20.65m: Subvertical planar smooth fracture.			
26CS	20.85 - 21.01								21.20	260.50	
Borehole Completed at 21.20m											

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRC327

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 02 October 2019

Easting 394614

Scale 1:50

End Date 03 October 2019

Northing 214324

Ground Level 280.40mOD

Depth 20.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00 - 0.25							Soft to firm dark brown silty CLAY with frequent rootlets. (TOP)	0.25	280.15	
1ES	0.10 - 0.20										
2B	0.25 - 0.50							Firm orangish brown mottled light grey slightly gravelly becoming gravelly silty CLAY. Gravel is subangular fine lithorelicts of mudstone. Rare shell fossils (up to 10mm). Rare rootlets. (FEF) (FE)			
2ES	0.30 - 0.40										
3B	0.50 - 0.80										
3ES	0.50 - 0.60										
4B	0.80 - 1.20										
4ES	1.00 - 1.10										
5D	1.20 - 1.65	Nil			1.20		S 5	1.20m: Soft becoming firm.			
6L	1.20 - 2.30										
7D	2.20 - 2.30							2.00 - 2.30m: Thinly laminated. Closely spaced thin laminae of shell debris.			
8D	2.30 - 2.75	2.30	0				S 92	2.30 - 2.75m: Limited recovery (SPT).			
9C	2.70 - 3.60	2.70	100 44 16	NA				Stiff thickly laminated grey mottled orangish brown silty CLAY tending to extremely weak MUDSTONE with frequent shell fossils (up to 10mm). (FEF) (FE)	2.80	277.60	
								3.10 - 3.15m: Weak grey bioclastic limestone.	3.15	277.25	
								3.35m: Orangish brown.	3.40	277.00	
10C	3.60 - 4.30	2.70	100 140 240					Weak thinly bedded light grey calcareous SILTSTONE. Fractures are subhorizontal very closely spaced planar rough stained orangish brown. (FEF) (FE)			
11CS	3.80 - 4.05		100 86					3.40 - 3.70m: Subvertical planar rough healed fracture with 20mm calcite precipitation.			
12C	4.30 - 5.40	2.70	71 71 59					4.40 - 5.20m: Subvertical undulating rough fracture locally infilled (up to 20mm) with brown sandy clay.			
13C	5.40 - 6.90	2.70	100 12 0	NI 50				4.40 - 5.40m: With medium spaced thin beds of very weak orange fine sandstone.	5.40	275.00	
14D	6.00 - 6.10							Extremely weak thinly and thickly laminated dark grey MUDSTONE locally disintegrated to claybound fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 10deg and randomly orientated extremely closely and very closely spaced planar smooth. (FEF) (FE)			
15C	6.90 - 8.40	2.70	100 49					5.40 - 5.60m: Stained orange and brown.			
16D	7.20 - 7.30		13					5.85m: 20mm bed of grey limestone.			
								6.40 - 6.50m: Two very closely spaced 10mm beds of grey limestone.			
								Very weak thinly and thickly laminated grey MUDSTONE locally disintegrated to fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal very closely and closely spaced planar smooth. (FEF) (FE)	7.40	273.00	
								7.90 - 7.95m: Medium strong grey limestone.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)
0.00	1.20	Inspection Pit	Hand tools	1.20	Nil	1.20	0
1.20	2.30	Window Sampler	Comacchio GEO 205				
2.30	20.10	Rotary Core	Comacchio GEO 205				
REMARKS Seepage.							

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	2.70	0.00	20.10	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Borehole advanced by reaming casing 2.30-2.70m.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
116	2.30	02-10-2019 08:00	0.00	Nil	Dry		CHECKED
131	20.10	02-10-2019 16:20	11.40	2.70	7.20		CT
		03-10-2019 09:00	11.40	2.70	4.90		
		03-10-2019 14:00	20.10	2.70	7.50		

BOREHOLE LOG



DSRC327

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 02 October 2019 Easting 394614

Depth 20.10 m


End Date 03 October 2019

Northing 214324

Ground Level 280.40mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
17C	8.40 - 9.90	2.70	100 93 45	NI 50 150				Very weak becoming weak thickly laminated dark grey SILTSTONE with closely spaced very thin beds of grey limestone. Fractures are subhorizontal very closely and closely spaced planar smooth. (FEF) (FE)	8.50	271.90	XXXXXX
18D	9.20 - 9.30			NI 50 120				8.80 - 8.95m: 70deg planar rough fracture. Very weak thinly and thickly laminated grey MUDSTONE locally disintegrated to fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal very closely and closely spaced planar smooth. (FEF) (FE)	9.30	271.10	XXXXXX
19C	9.90 - 11.40	2.70	100 81 37								
20D	10.50 - 10.60							10.95m: 40mm bed of grey limestone.			
21C	11.40 - 12.90	2.70	92 60 60	300 NI				11.20 - 11.35m: Subvertical planar rough fracture. Strong grey LIMESTONE. Intersecting subvertical planar rough fractures stained orange. (FEF) (FE)	11.40	269.00	XXXXXX
22C	12.90 - 14.40	2.70	100 70	NI 150 350				Very weak grey calcareous MUDSTONE with medium spaced thin beds of strong grey limestone. Bedding fractures are 5deg to 10deg closely rarely medium spaced planar smooth. Rare vertical planar smooth fractures. (FEF) (FE)	11.90	268.50	XXXXXX
23CS	13.27 - 13.92	2.70	100 70 66	80 300 500				11.90 - 12.35m: 70deg planar rough fracture stained orange. Extremely weak to very weak thickly laminated dark grey MUDSTONE. Bedding fractures are 5deg to 10deg closely and medium spaced planar smooth. Frequent randomly orientated planar smooth incipient fractures. (FEF) (FE)	13.10	267.30	XXXXXX
24C	14.40 - 15.60	2.70	100 79 45								
25C	15.60 - 16.90	2.70	98 73 73					15.40 - 15.60m: Disintegrated to claybound angular fine to coarse gravel sized mudstone lithorelicts.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC327

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 02 October 2019

Easting 394614

Scale 1:50

End Date 03 October 2019

Northing 214324

Ground Level 280.40mOD

Depth 20.10 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26CS	16.49 - 16.84							Extremely weak to very weak thickly laminated dark grey MUDSTONE. Bedding fractures are 5deg to 10deg closely and medium spaced planar smooth. Frequent randomly orientated planar smooth incipient fractures. (FEF) (FE)			
27C	16.90 - 18.50	2.70	93 93 93					16.12 - 16.29m: Strong light grey limestone. 17.00 - 17.50m: Rare shell fossils (up to 20mm). 17.20 - 20.10m: 10deg fractures frequently infilled (10mm) with firm dark grey clay.			
28CS	17.44 - 17.71										
29C	18.50 - 20.10	2.70	92 88 82					18.20m: 10mm bed of grey limestone. 19.40 - 19.60m: 50deg planar smooth fracture with a veneer of dark grey clay. 19.60 - 20.10m: Frequent 40deg to 60deg planar smooth incipient fractures.	20.10	260.30	
Borehole Completed at 20.10m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



DSRC329

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 03 October 2019

Easting 394740

Scale 1:50

End Date 07 October 2019

Northing 213921

Ground Level 270.60mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.00 - 0.25							Grass over soft to firm dark brown silty CLAY with frequent rootlets. (MG) (MGR)	0.25	270.35	
2B	0.30 - 0.50							Soft orangish brown mottled grey slightly gravelly silty CLAY. Gravel is subangular fine to coarse lithorelicts of very weak calcareous mudstone. (FEF) (FE)			
3B	0.50 - 1.00										
4B	1.00 - 1.20										
5B	1.20 - 1.30							Very weak grey calcareous MUDSTONE recovered as angular fine to coarse gravel (FEF) (FE) Firm becoming stiff fissured thinly and thickly laminated light grey mottled light brown CLAY. Fissures are subhorizontal and subvertical extremely closely spaced planar smooth. (FEF) (FE)	1.10	269.50	
6L	1.30 - 2.50								1.30	269.30	
7LS	1.30 - 1.65										
8C	2.50 - 3.00		100 48 30	NA					2.40	268.20	
9CS	2.80 - 2.95			NI				2.75	267.85		
10C	3.00 - 4.50	2.80	99 13 0					Extremely weak to very weak thickly laminated grey MUDSTONE locally tending to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 20deg and randomly orientated extremely closely spaced planar smooth rarely with a veneer of grey silt. (FEF) (FE)			
11CS	3.65 - 3.92										
12C	4.50 - 6.00	4.50	100 43 17	NI				4.30	266.30	4.30 - 4.30m: 40deg to 50deg white calcite vein (20mm thick). Very weak grey SILTSTONE. Single 80deg planar smooth fracture. (FEF) (FE)	
				NI				4.75	265.85		
				NI				5.25	265.35		
13C	6.00 - 7.50	6.00	100 90 73	NI				Medium strong thinly bedded grey bioclastic LIMESTONE. Bedding fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (SALS)			
				NI				6.20	264.40		
				100 350 610				6.40	264.20		
14CS	7.20 - 7.50							Very weak to weak light brown locally oolitic and peloidal LIMESTONE with frequent shell fossils (up to 50mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough frequently infilled (up to 5mm) with brown sandy clay. Surfaces weakened up to 10mm from fracture surface. (IOG) (SALS)			
15C	7.50 - 9.00	7.50	100 100 100					7.25m: PLI suggests medium strong. 7.75 - 8.05m: Grey. Locally oolitic.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.30	Inspection Pit	Hand tools							
1.30	2.50	Window Sampler	Comacchio GEO 405							
2.50	30.00	Rotary Core	Comacchio GEO 405							

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	3.00	0.00	30.00	Bentonite			
140	30.00						CONTRACT

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes reduced flush returns 12.00-18.00m (60% returned) and loss of flush returns 18.00-30.00m.	35560
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
113	2.50	03-10-2019 11:00	0.00	Nil	Dry		
146	30.00	03-10-2019 16:30	4.50	4.50	0.10		
		04-10-2019 08:30	4.50	4.50	0.10		CHECKED
		04-10-2019 15:30	19.50	19.50	Dry		
		07-10-2019 08:30	19.50	19.50	Dry		CT

BOREHOLE LOG



DSRC329

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 03 October 2019

Easting 394740

Scale 1:50

End Date 07 October 2019

Northing 213921

Ground Level 270.60mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
16CS	8.03 - 8.39							<p>Very weak to weak light brown locally oolitic and peloidal LIMESTONE with frequent shell fossils (up to 50mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough frequently infilled (up to 5mm) with brown sandy clay. Surfaces weakened up to 10mm from fracture surface. (IOG) (SALS)</p> <p>8.50 - 8.85m: Grey.</p> <p>9.75 - 9.80m: Frequent voids (up to 10mm) infilled with brown calcite mineralisation.</p> <p>10.30 - 10.50m: Tending to weak brown calcareous mudstone with coarse gravel sized limestone intraclasts.</p> <p>10.60 - 10.85m: Grey.</p> <p>10.85 - 11.15m: Locally argillaceous.</p> <p>11.15 - 11.30m: Grey with frequent shell fossils infilled with white calcite.</p> <p>11.80 - 12.10m: Grey. Contacts 30deg to 40deg.</p> <p>Medium strong light brown mottled orange bioclastic LIMESTONE. Fractures are 5deg to 10deg closely and medium spaced undulating rough with a veneer of brown clay. (IOG) (SALS)</p> <p>13.10 - 13.25m: Vertical vein of white calcite and brown clay (5mm thick).</p> <p>Medium strong medium bedded light grey mottled orangish brown bioclastic LIMESTONE. Abundant shell fossils (up to 60mm). Bedding fractures are subhorizontal to 10deg closely and medium spaced undulating rough and stained orangish brown, frequently infilled (10mm) with brown sandy clay. Surfaces weakened (10mm). (IOG) (SALS)</p> <p>14.26m: PLI suggests very weak.</p> <p>15.30m: Grey.</p> <p>Medium strong grey bioclastic LIMESTONE. Shell fossils are up to 80mm. (IOG) (ASLS)</p> <p>15.85 - 15.95m: Very thin bed (30deg) of very stiff greyish brown slightly sandy silty clay.</p>				
17C	9.00 - 10.50	9.00	100 100 97									
18C	10.50 - 12.00	10.50	100 100 100									
19CS	11.49 - 11.83											
20C	12.00 - 13.50	12.00	100 100 100									
			120 400 500							12.40	258.20	
21C	13.50 - 15.00	13.50	100 100 97	40 160 230						13.50	257.10	
22CS	14.26 - 14.52											
23C	15.00 - 16.50	15.00	97 91 66									
			150 300							15.70	254.90	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		07-10-2019 13:30	30.00	30.00	26.35		CHECKED
							CT

BOREHOLE LOG



DSRC329

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 03 October 2019

Easting 394740

Scale 1:50

End Date 07 October 2019

Northing 213921

Ground Level 270.60mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	16.50 - 18.00	16.50	91	40				Medium strong grey bioclastic LIMESTONE. Shell fossils are up to 80mm. (IOG) (ASLS)			
25CS	16.74 - 17.02		91 91 91	200				16.25 - 16.50m: With very closely spaced very thin beds of black and dark greyish brown slightly sandy clay.	16.90	253.70	
				130				Medium strong light brown oolitic locally bioclastic LIMESTONE. Rare shell fragments (up to 20mm). Fractures are 5deg to 10deg closely and medium spaced planar rough stained orangish brown with up to 50mm penetrative discolouration rarely with a veneer of orangish brown clay. (IOG) (BLPL)			
				600				17.45 - 17.75m: Vertical white calcite vein (10mm thick).			
26C	18.00 - 19.50	18.00	100 100 95	30 230 370				18.60 - 18.95m: Vertical undulating rough fracture stained orange. 18.95 - 19.01m: Thin bed of strong grey limestone. 19.15 - 19.70m: 80deg to vertical planar rough fracture stained orange.			
27C	19.50 - 21.00	19.50	100 94 82					20.00m: 30mm bed of extremely weak brown sandy mudstone.			
28CS	20.49 - 20.79										
29C	21.00 - 22.50	21.00	100 93 76					21.35 - 21.90m: Subvertical undulating rough fracture with localised dark grey staining. 21.90m: 30mm bed of very weak brown siltstone. 22.25 - 22.35m: 70deg planar rough fracture.			
30C	22.50 - 24.00	22.50	100 93 61					Strong grey LIMESTONE with abundant bivalve fossils replaced by white calcite. Fractures are 10deg to 30deg medium spaced undulating rough. (IOG) (BLPL) Extremely weak highly fractured light greyish brown calcareous SILTSTONE. Contacts 20deg. (IOG) (BLPL)	23.00	247.60	
				230				Medium strong light greyish brown mottled grey LIMESTONE. Locally argillaceous and with frequent fossil shells (up to 40mm). Fractures are 10deg and 40deg closely spaced undulating rough stained brown with up to 20mm penetrative discolouration. (IOG) (BLPL)	23.75	246.85	
31C	24.00 - 25.50	24.00		NI				23.90 - 24.05m: 40deg planar rough fracture.	23.90	246.70	xxxxxx

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
							CHECKED
							CT

BOREHOLE LOG



DSRC329

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 03 October 2019

Easting 394740

Scale 1:50

End Date 07 October 2019

Northing 213921

Ground Level 270.60mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
32CS	24.18 - 24.36		100 61 25	NI 120 180				Medium strong light greyish brown mottled grey LIMESTONE. Locally argillaceous and with frequent fossil shells (up to 40mm). Fractures are 10deg and 40deg closely spaced undulating rough stained brown with up to 20mm penetrative discolouration. (IOG) (BLPL) 24.36 - 24.55m: Intersecting fractures. Recovered non intact. 24.80 - 25.00m: Fracture stained orange. 25.15 - 25.65m: Two intersecting 80deg to vertical undulating rough fractures.			
33C	25.50 - 27.00	25.50	100 89 89	NI 250 550				Weak grey LIMESTONE with frequent shell fossils (up to 50mm) with medium spaced thin beds of very weak and weak thinly laminated dark grey siltstone. Bedding fractures are 5deg to 10deg closely and medium spaced planar smooth. (IOG) (BLPL) 25.80 - 26.00m: 80deg planar smooth fracture stained light orange.	25.65	244.95	
34CS	26.57 - 26.85										
35C	27.00 - 28.50	27.00	100 97 97								
				400				Very weak grey mottled greenish grey and orangish brown calcareous MUDSTONE. (IOG) (BLPL) 28.30 - 28.60m: Extremely closely fractured locally disintegrated to claybound mudstone lithorelicts.	27.90	242.70	
36C	28.50 - 30.00	28.50	96 92 50	NI 230 320				Weak medium bedded light brown locally oolitic and bioclastic LIMESTONE with medium spaced very thin beds of extremely weak light brown calcareous mudstone. Bedding fractures are 5deg to 10deg medium spaced undulating rough. (IOG) (BLPL)	28.60	242.00	
37CS	28.90 - 29.24										
									30.00	240.60	
									Borehole Completed at 30.00m		

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
							CHECKED	
							CT	

BOREHOLE LOG



DSRC332

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 08 October 2019

Easting 394913

Scale 1:50

End Date 10 October 2019

Northing 213497

Ground Level 268.20mOD

Depth 20.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1D 1ES 2B 2ES 3B 3ES	0.10 0.10 0.25 - 0.50 0.30 0.50 - 0.90 0.50							Grass over soft to firm brown slightly gravelly CLAY. Gravel is subangular fine limestone. (TOP)	0.25	267.95	
								Firm brown gravelly CLAY with medium limestone cobble content. Gravel is subangular fine to coarse limestone. (HDD) (HEAD)	0.50	267.70	
4C	1.00 - 1.70		76	NA				Orangish brown very gravelly CLAY with medium limestone cobble content. Gravel is subangular fine to coarse of bioclastic limestone. (HDD) (HEAD)	1.00	267.20	
								Firm extremely closely fissured light brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone. (HDD) (HEAD)	1.80	266.40	
5C	1.70 - 2.60	1.70	92 40 36	150				1.60 - 1.80m: With very closely spaced very thin beds of limestone.	2.15	266.05	
				NA				Medium strong grey and light brown LIMESTONE. Fractures are subhorizontal closely spaced planar rough stained orange and brown. (FEF) (FE)			
6CS 7C	2.45 - 2.60 2.60 - 4.10	2.60	80 23 13					Stiff extremely closely fissured thickly laminated orange, light brown and brownish grey CLAY with frequent subangular tabular mudstone lithorelicts. (FEF) (FE)	3.25	264.95	
				NA				2.90 - 3.25m: With very closely spaced thin beds of limestone.			
								Very stiff/extremely weak fissured thickly laminated grey CLAY/MUDSTONE with medium spaced very thin beds of medium strong light grey limestone. Fissures are subhorizontal to 20deg extremely closely spaced planar smooth. (FEF) (FE)			
8CS 9C	3.80 - 4.00 4.10 - 5.60	2.60	100 41 30					4.45 - 4.57m: Thin bed (120mm) of medium strong grey limestone. Intersecting vertical fractures planar rough stained orange (penetrating 10mm).	5.00	263.20	
				NI 120 190				Weak to medium strong dark grey bioclastic LIMESTONE. Fractures are 10deg to 20deg closely spaced undulating rough. (FEF) (FE)			
10CS 11C	5.40 - 5.56 5.60 - 7.00	2.60	100 87 67					6.00 - 6.10m: Extremely weak.	6.25	261.95	
				NI 120 230				6.20 - 6.25m: Stiff grey clay.			
								Weak dark grey calcareous SILTSTONE with frequent shell fossils (up to 20mm). Fractures are 10deg to 30deg closely and medium spaced undulating rough stained orange. (FEF) (FE)			
12CS 13C 14CS	6.80 - 7.10 7.00 - 8.50 7.36 - 7.67	4.10	100 57 43					7.10 - 8.90m: Staining absent.			
								7.85 - 8.15m: Very stiff/extremely weak extremely closely fissured dark grey clay/mudstone.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.00	Inspection Pit	Hand tools				
1.00	20.50	Rotary Core	Geotechnical Pioneer Rig				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	4.10	0.00	20.50	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes loss of flush 8.50-20.50m. Packer test attempted at 7.00m. High flow rates, not possible to achieve test pressures.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
146	20.50	08-10-2019 09:00	0.00	Nil	Dry	CHECKED	
		08-10-2019 14:40	7.00	2.60	1.80	CT	
		09-10-2019 08:30	7.00	4.10	2.80		
		09-10-2019 16:50	13.00	4.10	9.90		
		10-10-2019 08:00	13.00	4.10	10.10		

BOREHOLE LOG



DSRC332

CLIENT HIGHWAYS ENGLAND

Sheet 2 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 October 2019

Easting 394913

Scale 1:50

End Date 10 October 2019

Northing 213497

Ground Level 268.20mOD

Depth 20.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
15C	8.50 - 10.00	4.10	100 95 79					Weak dark grey calcareous SILTSTONE with frequent shell fossils (up to 20mm). Fractures are 10deg to 30deg closely and medium spaced undulating rough stained orange. (FEF) (FE) 8.15 - 8.20m: Medium strong grey bioclastic limestone. 8.40m: Thin lamination (5mm) of grey limestone. 8.90 - 9.05m: Bioclastic. Shell debris is black fine and medium gravel sized. 9.20m: 60deg planar rough fracture stained orange (penetrating 5mm). 9.30 - 9.40m: Stained orange.	9.40	258.80	XXXXXX
16CS	9.50 - 9.83		60 160 330					Medium strong thinly bedded light brown and light grey bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced planar rough stained orangish brown rarely infilled (up to 2mm) with orange clay. (FEF) (FE)			XXXXXX
17C	10.00 - 11.50	4.10	99 91 65					9.40 - 9.50m: Vertical planar rough fracture stained black. 10.10 - 10.15m: Firm thinly laminated orangish brown clay. 10.40 - 10.50m: Dark grey bioclastic limestone.			XXXXXX
18CS	10.69 - 10.90							11.00 - 11.10m: Extremely weak yellowish brown mudstone.			XXXXXX
19C	11.50 - 13.00	4.10	97 53 30					11.20 - 11.50m: Tending to very weak thinly laminated (10deg) light brown and light grey calcareous fine sandstone.	11.80	256.40	XXXXXX
								Extremely weak thinly laminated greyish brown MUDSTONE with a single thin bed (90mm) of medium strong brownish grey limestone, single 85deg planar rough fracture stained orangish brown. (FEF) (FE)	12.05	256.15	XXXXXX
20C	13.00 - 14.50	4.10	NI 40 60					Medium strong grey LIMESTONE thinly interbedded with very weak dark grey mudstone. Fractures are 10deg to 20deg rarely 50deg very closely spaced undulating rough. (FEF) (FE)	12.80	255.40	XXXXXX
			NI 70 150					Very weak grey and dark grey MUDSTONE, locally disintegrated to claybound fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 10deg very closely and closely spaced planar smooth. Frequent vertical planar smooth incipient fractures. (FEF) (FE)			XXXXXX
21C	14.50 - 16.00	4.10	70 62 43					13.20m: Thick lamination (20mm) of grey limestone. 14.20 - 14.40m: Tending to weak calcareous mudstone.			XXXXXX
22CS	15.25 - 15.48							14.60 - 14.70m: Medium strong dark grey limestone. 14.80 - 15.80m: Extremely weak dark grey calcareous siltstone.			XXXXXX
23C	16.00 - 17.50	4.10						15.85 - 15.90m: Medium strong grey limestone.			XXXXXX

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL				INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 			
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 10-10-2019 13:00 20.50 4.10 10.10				REMARKS				CONTRACT 35560		
											CHECKED CT		

BOREHOLE LOG



DSRC332

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 08 October 2019

Easting 394913

Scale 1:50

End Date 10 October 2019

Northing 213497

Ground Level 268.20mOD

Depth 20.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	17.50 - 19.00	4.10	87 37 7					Very weak grey and dark grey MUDSTONE, locally disintegrated to claybound fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 10deg very closely and closely spaced planar smooth. Frequent vertical planar smooth incipient fractures. (FEF) (FE) 16.00 - 16.60m: Subvertical stepped rough fracture.			
25CS	17.75 - 18.00		91 80 68						18.10	250.10	
26C	19.00 - 20.50	4.10						Weak grey locally bioclastic LIMESTONE with medium spaced thin beds of very weak dark grey calcareous siltstone. Fractures are 10deg medium spaced planar rough and 60deg to 80deg closely spaced undulating rough. (FEF) (FE)			
			120 580						19.45	248.75	
			99 85 62	220				Very weak dark grey calcareous SILTSTONE. Fractures are 10deg to 20deg closely spaced planar smooth. Frequent vertical incipient fractures. (FEF) (FE) 20.15m: 10mm bed of firm dark grey clay. 20.16m: Tending to mudstone.			
			80 140 220						20.50	247.70	
									Borehole Completed at 20.50m		

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)		CASING (m)	WATER (m)
						35560	
						CHECKED	
						CT	

BOREHOLE LOG



DSRC401

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 November 2019 Easting 394825

Scale 1:50

End Date 02 December 2019 Northing 213679 Ground Level 273.10mOD Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Grass over soft brown silty CLAY. Frequent rootlets. (MG)	0.15	272.95	[Pattern]
1B	0.15 - 0.30							(MGR)	0.30	272.80	
2C	0.30 - 1.80		100	NA				0.05m: Blue nylon rope (10mm diam). Firm light brown slightly gravelly CLAY. Gravel is angular and subangular fine to coarse limestone. Rare rootlets. (HDD) (HEAD)			[Pattern]
2ES	0.30							Very stiff indistinctly structured light brown gravelly CLAY with a low limestone cobble content. Gravel is angular to subangular fine to coarse limestone. (HDD) (HEAD)			
3D	0.90 - 1.00							0.30m: Limestone cobble. 1.50 - 1.55m: Limestone cobble.			[Pattern]
4C	1.80 - 3.30	1.80	80 39 33								
5CS	2.65 - 2.93			NI 100 200				Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to very stiff clay. Fractures are subhorizontal closely spaced planar smooth locally stained reddish brown. (FEF) (FE)	2.75	270.35	[Pattern]
6C	3.30 - 4.80	3.30	100 100 93					4.04 - 4.14m: Thin bed of shell debris. Abundant bivalve fragments (up to 10mm).			
7CS	4.18 - 4.38										[Pattern]
8C	4.80 - 6.30	3.30	95 91 79	20 145 280				Very weak light brown calcareous MUDSTONE. Fractures are subhorizontal to 20deg mainly closely spaced undulating rough locally stained orangish brown with rare calcite infill (up to 5mm). (FEF) (FE)	4.80	268.30	
9CS	5.08 - 5.29							5.29 - 5.36m: Thin bed of shell debris. Abundant bivalve fragments (up to 10mm).	5.30	267.80	[Pattern]
10C	6.30 - 7.80	6.30	66 63 39	NR				Medium strong light brown LIMESTONE. Fractures are subhorizontal to 20deg mainly closely spaced undulating rough locally stained orangish brown with rare calcite infill (up to 5mm). (FEF) (FE)			
11CS	6.80 - 7.08			NI 70 280				5.53 - 6.30m: Subvertical undulating rough with orangish brown staining infilled with calcite (up to 15mm). 6.30 - 6.80m: Assessed zone of core loss.	6.80	266.30	[Pattern]
12C	7.80 - 9.30	7.80	100					Medium strong to strong thinly bedded light brown and light grey LIMESTONE. Fractures are subhorizontal to 20deg mainly closely spaced undulating rough locally stained orangish brown with rare calcite infill (up to 5mm). (FEF) (FE)			
								7.00 - 7.05m: Cross-bedded. 7.70 - 7.80m: Disintegrated to very stiff gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts.			

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE		Hand tools				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.30	Inspection Pit		Geotechnical Pioneer Rig								
0.30	20.00	Rotary Core										

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1245		
168	6.30	0.00	0.50	Concrete	8.50	Standpipe			
140	20.00	0.50	1.00	Gravel					
		1.00	4.80	Bentonite					
		4.80	8.70	Sand					

BARREL DIAMETER		HOLE PROGRESS					REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Inspection pit terminated at 0.30m due to encountering a limestone cobble (possible thin bed). Driller notes reduced flush returns 10.80-20.00m (20% returned).				
146	6.30	27-11-2019 05:00	0.00	Nil	Dry	35560 CHECKED CT				
146	20.00	27-11-2019 16:10	0.30	Nil	Dry					
		28-11-2019 10:15	0.30	Nil	Dry					
		28-11-2019 15:20	10.80	9.30	2.90					
		29-11-2019 09:50	10.80	9.30	10.00					

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 2 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 27 November 2019 Easting 394825

Scale 1:50

End Date 02 December 2019 Northing 213679 Ground Level 273.10mOD Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13CS	8.75 - 8.85		75 51					Medium strong to strong thinly bedded light brown and light grey LIMESTONE. Fractures are subhorizontal to 20deg mainly closely spaced undulating rough locally stained orangish brown with rare calcite infill (up to 5mm). (FEF) (FE) 8.20 - 8.50m: Weak limestone. 8.50 - 8.70m: Disintegrated to clayey gravel. Gravel is angular to subangular fine to coarse limestone lithorelicts.	8.70	264.40	
14C	9.30 - 10.80	9.30	100 87 75	NI 120 250				Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to very stiff clay. Fractures are subhorizontal closely spaced planar smooth locally stained reddish brown. (FEF) (FE) 10.00 - 10.25m: Subvertical planar smooth fracture.			
15CS	9.80 - 9.93										
16C	10.80 - 12.30	10.80	100	NI				10.80 - 13.00m: Frequently disintegrated to clayey gravel. Gravel is angular to subangular fine to coarse mudstone lithorelicts.			
17CS	11.00 - 11.12		75 16	60 130							
18C	12.30 - 13.80	10.80	100 79 17								
19C	13.80 - 15.30	10.80	100 87 80	NI 110 250				Very weak to weak grey and light grey MUDSTONE with closely spaced thin beds of siltstone. Fractures are mainly subhorizontal closely spaced planar rough with orangish brown and dark reddish brown staining. (FEF) (FE) 13.90 - 14.60m: Subvertical undulating rough fracture with orangish brown and dark reddish brown staining.	13.90	259.20	
20CS	14.66 - 14.80										
21C	15.30 - 16.80	10.80	100 91 91	NI 130 300				Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to very stiff clay. Fractures are subhorizontal closely spaced planar smooth locally stained reddish brown. (FEF) (FE)	15.10	258.00	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
		8.70	20.00	Bentonite		
						1245

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
		29-11-2019 15:30	20.00	10.80		9.80	CHECKED
						CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 3 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 27 November 2019 Easting 394825

End Date 02 December 2019 Northing 213679 Ground Level 273.10mOD Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
22C	16.80 - 18.30	10.80	100 80 47					Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to very stiff clay. Fractures are subhorizontal closely spaced planar smooth locally stained reddish brown. (FEF) (FE)			
23CS	17.18 - 17.31							17.00 - 17.15m: Subvertical undulating smooth fracture.			
24C	18.30 - 19.80	10.80	100 93 73								
25C	19.80 - 20.00	10.80	100 100 95					19.85 - 19.90m: Belemnite fossil fragments (up to 10mm diam). Borehole Completed at 20.00m	20.00	253.10	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1245 	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560 CHECKED CT	
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BOREHOLE LOG



DSRC403

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 3

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 09 March 2020

Easting 394938

Scale 1:50

End Date 10 March 2020

Northing 213164

Ground Level 247.65mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES 1B 2ES 2B 3ES 3B	0.05 - 0.10 0.10 - 0.20 0.25 - 0.30 0.30 - 0.40 0.45 - 0.50 0.50 - 0.60							Plant material over very soft dark grey and dark brown slightly sandy CLAY. Frequent roots (up to 5mm diam) and rootlets. (MG) (MGR)	0.25	247.40	
4B 4ES 5L 6D	0.90 - 1.00 0.95 - 1.00 1.20 - 2.20 1.40 - 1.50			NA				Very soft light brown mottled brown and yellow slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. (MG) (MGR)	0.95	246.70	
7L	2.20 - 3.20	1.80		NA				Firm orangish brown mottled grey CLAY with frequent dark brown carbonaceous fragments (up to 2mm). (HDD) (HEAD)			
8L	3.20 - 4.20	1.80		NA				Firm to stiff extremely closely fissured light brown and orangish brown slightly gravelly CLAY with frequent tabular fine to coarse mudstone lithorelicts. Gravel is subangular fine to coarse limestone. (FEF) (FE)	2.60	245.05	
9D 10L	3.70 - 3.80 4.20 - 5.10			NI				Extremely weak brownish grey MUDSTONE locally disintegrated to claybound subangular fine to coarse mudstone lithorelicts with localised extremely closely spaced thin laminae of siltstone. (FEF) (FE)	4.20	243.45	
11D 12C	4.90 - 5.00 5.10 - 5.60		100 0 0								
13C 14D	5.60 - 7.10 5.70 - 5.80	5.10	100 40 27	NI 120 180				Very weak and medium strong light grey and brown LIMESTONE. Fractures are subhorizontal and 20deg closely spaced undulating rough frequently stained orangish brown. (FEF) (FE)	5.60	242.05	
15D 16C	6.90 - 7.00 7.10 - 8.50	5.10	100 6 0	NI 40 200				Extremely weak and very weak grey discoloured orangish brown MUDSTONE with closely spaced very thin beds of weak grey limestone. Fractures are subhorizontal and 30deg very closely and closely spaced planar smooth frequently stained orangish brown. (FEF) (FE)	6.20	241.45	
			100 6 0	NI 20 40				Extremely weak grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal and subvertical mainly extremely closely and very closely spaced planar smooth. (FEF) (FE)	7.20	240.45	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
0.00	1.20	Inspection Pit	Hand tools								
1.20	5.10	Window Sampler	Geotechnical Pioneer Rig								
5.10	20.00	Rotary Core	Geotechnical Pioneer Rig								
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1		
168	5.10		0.00	0.50	Concrete	19.60	Standpipe		AGS		
			0.50	4.00	Bentonite						
			4.00	20.00	Gravel						
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560	
128	5.10		09-03-2020 09:30	0.00	Nil	Dry				CHECKED	
146	20.00		09-03-2020 16:30	8.50	5.10	1.32				CT	
			10-03-2020 08:30	8.50	5.10	3.30					
			10-03-2020 17:30	20.00	5.10	3.27					
			11-03-2020 09:00	20.00	5.10	3.91					

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 09 March 2020

Easting 394938

Scale 1:50

End Date 10 March 2020

Northing 213164

Ground Level 247.65mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17C	8.50 - 10.00	5.10	100 49 49					Extremely weak grey MUDSTONE locally tending to very stiff clay. Fractures are subhorizontal and subvertical mainly extremely closely and very closely spaced planar smooth. (FEF) (FE)			
18D	9.35 - 9.45		220 160 900					9.25 - 9.65m: Subhorizontal fractures are closely to medium spaced. Medium strong grey LIMESTONE. No natural fractures observed. (FEF) (FE)	9.65	238.00	
19C 20CS 21CS	10.00 - 11.50 10.11 - 10.25 10.30 - 10.60	5.10	100 45 45					Extremely weak and very weak grey MUDSTONE locally disintegrated to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal and 30deg very closely and closely spaced planar smooth. (FEF) (FE)	10.55	237.10	
22C	11.50 - 13.00	5.10	100 6 0	NI 70 130				10.90 - 11.10m: Weak. 11.30 - 11.35m: Subvertical planar smooth fracture. 11.65 - 11.75m: Weak.			
23C	13.00 - 14.50	5.10	100 14 14								
24C 25CS	14.50 - 16.00 14.60 - 14.84	5.10	100 27 27	400 NI 180 270				Medium strong grey LIMESTONE. No natural fractures observed. (FEF) (FE) Very weak grey MUDSTONE locally disintegrated to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 20deg mainly closely and medium spaced planar smooth infilled (up to 2mm) with yellowish brown and grey silt. Frequent subhorizontal and subvertical extremely closely spaced incipient fractures. (FEF) (FE)	14.50 14.90	233.15 232.75	
26C	16.00 - 17.50	5.10									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC403

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 09 March 2020

Easting 394938

Scale 1:50

End Date 10 March 2020

Northing 213164

Ground Level 247.65mOD

Depth 20.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C 28CS	17.50 - 19.00 17.50 - 17.67	5.10	100 57 18								
29C 30CS	19.00 - 20.00 19.08 - 19.25	5.10	100 90 26								
Borehole Completed at 20.00m									20.00	227.65	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE				PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRC418

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 8

Start Date 14 November 2019 Easting 393132

Scale 1:50

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

Depth 61.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.30		100					MADE GROUND comprising TARMACADAM. (MG)	0.20	272.05	
1B	0.50 - 0.60							Light brown to light grey sandy GRAVEL. Gravel is angular and subangular fine to coarse limestone. (MG) (MGR)	0.60	271.65	
2ES	0.50	Nil	100								
2D	0.60 - 1.05		42								
3C	0.60 - 1.80		0								
4D	0.90 - 1.20							Firm light brown gravelly CLAY. Gravel is angular and subangular fine to coarse limestone. Rare limestone cobbles. (HDD) (HEAD)	1.20	271.05	
5C	1.80 - 3.10			NI 40 100				Very weak to weak light brown LIMESTONE. Locally disintegrated to gravelly clay. Fractures are subhorizontal to 20deg very closely and closely spaced undulating rough locally stained orangish brown. (IOG) (BLPL)			
6CS	1.90 - 2.00		100 15 15								
7C	3.10 - 4.10	3.10	95	60				Strong white oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with frequent calcite infill (up to 5mm). (IOG) (BLPL)	3.10	269.15	
8CS	3.25 - 3.44		95 95 95	300 550							
9C	4.10 - 4.60	4.10	94					6.55 - 6.70m: Subvertical undulating rough fracture locally stained orangish brown. 6.95 - 7.20m: Disintegrated to slightly sandy gravelly clay. Gravel is subangular and angular fine to coarse limestone. 7.20 - 7.60m: Subvertical undulating rough fracture locally stained orangish brown.			
10CS	4.30 - 4.60		94 82								
11C	4.60 - 5.50	4.60	83 67 50								
12C	5.50 - 6.10	5.50	100 100 58	50 250 430							
13CS	5.88 - 6.10							6.55 - 6.70m: Subvertical undulating rough fracture locally stained orangish brown. 6.95 - 7.20m: Disintegrated to slightly sandy gravelly clay. Gravel is subangular and angular fine to coarse limestone. 7.20 - 7.60m: Subvertical undulating rough fracture locally stained orangish brown.			
14C	6.10 - 7.60	6.10	100 83 65								
15CS	6.70 - 6.94							6.55 - 6.70m: Subvertical undulating rough fracture locally stained orangish brown. 6.95 - 7.20m: Disintegrated to slightly sandy gravelly clay. Gravel is subangular and angular fine to coarse limestone. 7.20 - 7.60m: Subvertical undulating rough fracture locally stained orangish brown.			
16C	7.60 - 9.10	7.60	93 87 78								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.20	Rotary Core	Geotechnical Pioneer Rig							
0.20	0.60	Inspection Pit	Geotechnical Pioneer Rig							
0.60	61.50	Rotary Core	Geotechnical Pioneer Rig							

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	4.10	0.00	0.50	Concrete	58.00	Standpipe	1095
140	61.50	0.50	1.00	Gravel			
		1.00	27.00	Bentonite			
		27.00	27.50	Sand			

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
300	0.20	14-11-2019 10:00	0.00	Nil	Dry	Inspection pit terminated at 0.60m due to limestone cobble. Driller notes reduced flush returns 4.60-7.60m, 15.10-16.20m (30% returned) and loss of flush 16.20-60.00m. On completion of	35560
146	4.10	14-11-2019 17:00	5.50	4.60	5.20		CHECKED
146	61.50	15-11-2019 08:20	5.50	4.60			CT
		15-11-2019 16:40	16.20	15.10	16.00		
		18-11-2019 08:00	16.20	15.10	Dry		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 2 of 8

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 14 November 2019 Easting 393132

Depth 61.50 m

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17CS	8.06 - 8.34							<p>Strong white oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with frequent calcite infill (up to 5mm). (IOG) (BLPL)</p> <p>10.10 - 10.60m: Subvertical undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm).</p> <p>13.35 - 14.15m: Subvertical undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm).</p> <p>14.70 - 14.85m: 60deg undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm). 14.90 - 15.15m: Subvertical undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm).</p>			
18C 19CS	9.10 - 10.60 9.10 - 9.53	9.10	96 96 92								
20C	10.60 - 12.10	10.60	99 99 93								
21CS	11.56 - 11.88										
22C	12.10 - 13.60	12.10	99 99 94								
23C	13.60 - 15.10	13.60	100 100 81								
24CS 25C	14.26 - 14.54 15.10 - 16.20	15.10	90 86 58								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
			27.50	59.00	Gravel		
			59.00	61.50	Bentonite		
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	drilling, hole flushed clean using 2500 litres water.	
		18-11-2019 16:40	16.20	15.10	Dry		
		19-11-2019 08:00	16.20	15.10	Dry		
		19-11-2019 16:30	30.00	28.50	Dry		
		20-11-2019 08:40	30.00	28.50	29.90		
		20-11-2019 16:30	45.00	43.50	39.20		
							CONTRACT
							35560
							CHECKED
							CT



BOREHOLE LOG



DSRC418

CLIENT HIGHWAYS ENGLAND

Sheet 3 of 8

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 14 November 2019 Easting 393132

Depth 61.50 m

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26C	16.20 - 16.50		83					<p>Strong white oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with frequent calcite infill (up to 5mm). (IOG) (BLPL)</p> <p>16.20 - 16.50m: Subvertical undulating rough fracture locally stained orangish brown.</p> <p>16.50 - 27.00m: Fractures are medium and widely spaced.</p> <p>16.80 - 17.20m: Subvertical undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm).</p> <p>18.35 - 18.70m: Subvertical closely spaced undulating rough fracture locally stained orangish brown infilled by calcite (up to 5mm).</p> <p>18.70 - 19.20m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).</p> <p>19.50 - 19.95m: Bivalve shell fragments (up to 40mm).</p> <p>20.25 - 20.30m: 50deg undulating rough locally stained orangish brown with rare calcite infill (up to 5mm).</p> <p>20.35 - 21.00m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).</p> <p>21.00 - 21.20m: 70-80deg undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).</p> <p>21.20 - 21.55m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).</p> <p>22.95 - 24.70m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).</p>			
27C	16.50 - 18.00	16.50	83 93 88 55	30 400 890							
28CS	17.53 - 17.77										
29C	18.00 - 19.50	18.00	100 100 73								
30CS	19.23 - 19.50										
31C	19.50 - 21.00	19.50	98 90 53								
32C	21.00 - 22.50	21.00	100 96 90								
33CS	22.04 - 22.33										
34C	22.50 - 24.00	22.50	100 100 100								
35C	24.00 - 25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION: 1095
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m) TYPE	
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		21-11-2019 08:00	45.00	43.50	44.90		
		21-11-2019 16:30	57.00	55.50	56.80		
		22-11-2019 08:00	57.00	55.50	52.93		
		22-11-2019 15:00	61.50	60.00	52.70		
							CONTRACT 35560
							CHECKED CT

BOREHOLE LOG



DSRC418

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 8

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 14 November 2019 Easting 393132

Depth 61.50 m

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
36CS 37C	25.30 - 25.50 25.50 - 27.00		100 91 85					Strong white oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with frequent calcite infill (up to 5mm). (IOG) (BLPL)			
		25.50	97 93 93					25.50 - 25.80m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm). 26.05 - 26.80m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			
38C	27.00 - 28.50	27.00	97 97 73	40 300 600				27.00 - 27.45m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm). 27.45 - 27.80m: Subvertical closely spaced undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm). 27.80 - 28.05m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			
39C 40CS	28.50 - 30.00 28.56 - 28.82	28.50	91 91 75					29.10 - 29.30m: 40-50deg undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			
41C	30.00 - 31.50	30.00	98 90 82					30.90 - 31.50m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			
42C	31.50 - 33.00	31.50	99 73 67					31.50 - 31.75m: Recovered non intact. Probable intersecting fractures. 31.75 - 31.95m: 40-50deg undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1095 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC418

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 8

Start Date 14 November 2019 Easting 393132

Scale 1:50

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

Depth 61.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43CS	32.62 - 32.87							Strong white oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with frequent calcite infill (up to 5mm). (IOG) (BLPL) 32.25 - 32.60m: Subvertical undulating rough fracture locally stained orangish brown with rare calcite infill (up to 5mm).			
44C	33.00 - 34.50	33.00	99 99 85								
45C 46CS	34.50 - 36.00 34.50 - 34.90	34.50	100 69 53					Medium strong to strong white and light brown oolitic and bioclastic locally peloidal LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with light brown clay infill. Rare bioturbation. (IOG) (BLPL) 34.95 - 35.15m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts. 36.60 - 36.65m: Recovered non intact as angular tabular fine to coarse gravel sized fragments.	34.90	237.35	
47C	36.00 - 37.50	36.00	96 87 47	NI 160 330	36.00						
48C	37.50 - 39.00	37.50	100					38.10 - 38.15m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts. 38.55 - 38.65m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts.			
49CS	37.80 - 38.00		100 100 96								
50C	39.00 - 40.50	39.00	100 90 75	NI 200 450				39.30 - 39.65m: Frequent bioturbation.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
				36.00	36.00	34.60	20	
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1095
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 6 of 8

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 14 November 2019 Easting 393132

Scale 1:50

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

Depth 61.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
51C	40.50 - 42.00	40.50	100 100 98					Medium strong to strong white and light brown oolitic and bioclastic locally peloidal LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with light brown clay infill. Rare bioturbation. (IOG) (BLPL)			
52CS	41.70 - 42.00							41.55 - 41.70m: Subvertical planar rough fracture.			
53C	42.00 - 43.50	42.00	100 79 47					42.30 - 42.50m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts. 42.60 - 42.90m: Frequent bioturbation.			
54C	43.50 - 45.00	43.50	100 100								
55CS	43.81 - 44.14		97								
56C	45.00 - 46.50	45.00	100 97 77					45.65 - 45.80m: Frequent bioturbation. 45.95 - 46.25m: Frequent bioturbation.			
57CS	45.08 - 45.30										
58C	46.50 - 48.00	46.50	80 37 25	NI 50 200				46.75 - 47.45m: Highly fractured. Recovered as coarse limestone gravel and cobbles.			
59C	48.00 - 49.50	48.00									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1095	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
									CHECKED	
									CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 8

Start Date 14 November 2019 Easting 393132

Scale 1:50

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

Depth 61.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
60CS	48.62 - 48.90		100 49 33					Medium strong to strong white and light brown oolitic and bioclastic locally peloidal LIMESTONE. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough locally stained orangish brown with light brown clay infill. Rare bioturbation. (IOG) (BLPL) 48.50 - 48.60m: Disintegrated to slightly sandy clayey gravel. Gravel is angular to subangular fine to coarse limestone lithorelicts. 48.90 - 50.35m: Subvertical undulating rough fracture infilled by light brown sandy clay.			
61C	49.50 - 51.00	49.50	83 38 30	NI 200 450							
62C	51.00 - 52.50	51.00	93 66 65								
63CS	51.50 - 51.84										
64C	52.50 - 54.00	52.50	100 63 60					51.85 - 52.05m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts. 52.80 - 53.05m: Disintegrated to light brown slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse limestone lithorelicts.			
65C	54.00 - 55.50	54.00	97 79 47	NA				Orangish brown slightly sandy silty CLAY with rare calcite crystals (up to 4mm). (IOG) (BLPL)	53.90	218.35	
66CS	55.00 - 55.22			NI 75 260				Strong thinly bedded light grey (bioturbated) LIMESTONE with frequent irregular voids stained orange. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough with local orangish brown staining. (IOG) (BLPL) 54.30m: Undulating contact.	54.30	217.95	
67C	55.50 - 57.00	55.50	100 90 73								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1095 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

Sheet 8 of 8

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 14 November 2019 Easting 393132

Depth 61.50 m

End Date 22 November 2019 Northing 216419 Ground Level 272.25mOD

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
68C	57.00 - 58.50	57.00	99 96 78	45 200 410				Strong thinly bedded light grey (bioturbated) LIMESTONE with frequent irregular voids stained orange. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough with local orangish brown staining. (IOG) (BLPL)			
69CS	57.69 - 58.10										
70C	58.50 - 60.00	58.50	99 89 83					58.25 - 58.40m: Subvertical undulating rough fracture. 58.50 - 58.85m: No bioturbation present.	58.85	213.40	
71CS	59.80 - 60.00			NI 150 370				Extremely weak to very weak thinly laminated grey MUDSTONE. Fractures are subhorizontal closely and medium spaced planar smooth locally stained orangish brown. (Lias Group) (BDS) 58.95 - 59.00m: Thin bed of light brown silty fine sand.			
72D	60.00 - 60.15	60.00	98			S *321		60.50 - 60.75m: 60deg planar smooth fracture with orangish brown staining.			
73C	60.00 - 61.50		71 32					61.15 - 61.35m: Subvertical planar smooth fracture with orangish brown staining.	61.50	210.75	
Borehole Completed at 61.50m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRC420

CLIENT HIGHWAYS ENGLAND

Sheet 1 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Scale 1:50

Start Date 24 September 2019 Easting 393950

End Date 30 September 2019 Northing 213950 Ground Level 277.10mOD Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10 - 0.20							Soft brown silty CLAY. (TOP)	0.20	276.90	
1B	0.20 - 0.35							Firm brown slightly gravelly CLAY. Gravel is subangular fine and medium limestone. Frequent rootlets. (HDD) (HEAD)	0.35	276.75	
2D	0.20 - 0.35										
2ES	0.30 - 0.40										
3L	0.40 - 0.80										
4D	0.45 - 0.55										
5C	0.80 - 1.30	Nil	100	NA				Brown slightly sandy clayey subangular fine to coarse limestone GRAVEL. (FEF) (FE) 0.80m: Very dense.			
6C	1.30 - 2.80	1.30	100 33 10	NI NI				Medium strong thinly bedded light grey oolitic LIMESTONE with frequent shell fragments (up to 5mm). Rare bivalve fossils. Fractures are subhorizontal undulating rough very closely and closely spaced locally stained orangish brown. (FEF) (FE)	1.20 1.40	275.90 275.70	
7CS	1.90 - 2.07			NI 80 150				Extremely weak highly fractured thinly bedded yellowish brown calcareous MUDSTONE locally tending to gravelly silt. Fractures are subhorizontal extremely closely spaced planar rough infilled (up to 4mm) with yellowish brown clay. (FEF) (FE)	1.90	275.20	
8C	2.80 - 3.80	2.80	96 0 0	NI NI				Medium strong yellowish brown calcareous fine SANDSTONE with very closely spaced thin beds of strong light grey limestone. Fractures are subhorizontal very closely and closely spaced undulating rough infilled (up to 3mm) with yellowish brown silt. (FEF) (FE) 2.20 - 2.30m: Thinly laminated light brown calcareous fine sandstone. 2.60 - 3.10m: Highly fractured, recovered non intact.	3.10	274.00	
9C	3.80 - 5.30	3.80	99 30 0	NI 20 60				Extremely weak thinly laminated greyish brown MUDSTONE. Fractures are 5deg to 10deg and subvertical closely spaced planar rough locally stained orangish brown. Frequent randomly orientated incipient fractures. (FEF) (FE)	3.80	273.30	
10CS	4.25 - 4.45							Extremely weak to very weak thinly laminated bluish grey MUDSTONE locally disintegrated to claybound subangular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal to 5deg and rarely subvertical extremely closely spaced undulating rough infilled (up to 4mm) with grey clay and locally stained orangish brown. (FEF) (FE) 4.70 - 4.80m: 80deg planar rough fracture. 5.10 - 5.20m: 80deg planar rough fracture.			
11C	5.30 - 6.60	5.30	95 30 10					6.20 - 6.45m: Weak bluish grey calcareous mudstone.			
12CS	6.20 - 6.33			130				7.05 - 7.15m: 80deg planar smooth fracture.			
13C	6.60 - 8.10	6.60	100 0 0	NI				7.60 - 7.70m: 80deg planar smooth fracture.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	0.40	Inspection Pit	Hand tools					
0.40	0.80	Window Sampler	Geotechnical Pioneer Rig					
0.80	30.00	Rotary Core	Geotechnical Pioneer Rig					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	15.80		0.00	0.50	Concrete	3.50	Standpipe	
140	30.00		0.50	0.80	Bentonite			
			0.80	3.70	Gravel			
			3.70	20.70	Bentonite			
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes reduced flush returns 0.80-5.30m (20% returned), 6.60-9.60m (40-50% returned), loss of flush 9.10-16.20m, 18.00-19.00m (45% returned) and loss of flush 19.00-30.00m.		35560
128	0.80	24-09-2019 15:00	0.00	Nil	Dry			CHECKED
146	30.00	24-09-2019 15:40	0.40	Nil	Dry			CT
		25-09-2019 10:45	0.40	Nil	Dry			
		25-09-2019 17:00	5.30	3.80	1.30			
		26-09-2019 09:35	5.30	3.80	2.00			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 24 September 2019 Easting 393950

Scale 1:50

End Date 30 September 2019 Northing 213950 Ground Level 277.10mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
14C	8.10 - 9.10	8.10	100 27 14						8.60	268.50	
15CS	8.95 - 9.08		100 150 200					Strong greyish brown LIMESTONE. Fractures are subhorizontal closely spaced planar rough locally infilled (up to 2mm) with yellowish brown silt. (FEF) (FE) 9.00 - 9.40m: Subvertical undulating rough fracture stained orangish brown infilled (up to 2mm) with greyish brown silt. Weak locally very weak grey calcareous SILTSTONE. Fractures are subhorizontal to 10deg and 80deg to subvertical very closely and closely rarely medium spaced planar rough and locally stained orangish brown. (FEF) (FE) 9.60 - 9.85m: 80deg undulating rough fracture.	9.10	268.00	
16C	9.10 - 10.60	9.10	91 91 87	NI 110 240					10.50	266.60	
17C	10.60 - 11.90	10.60	92 30 22	NI				Extremely weak to very weak thinly laminated grey MUDSTONE. Fractures are subhorizontal to 10deg and rarely subvertical extremely closely and very closely planar smooth. Frequent randomly orientated incipient fractures. (FEF) (FE)			
18CS	11.50 - 11.78		280					11.50 - 11.80m: Subhorizontal fractures are medium spaced.			
19C	11.90 - 13.40	11.90	100 10 7								
20C	13.40 - 14.90	13.40	100 20 7								
				NI 60 100				Extremely weak to very weak grey MUDSTONE. Fractures are subhorizontal to 10deg and rarely 80deg very closely and closely spaced planar smooth infilled (up to 2mm) with grey clay. Frequent randomly orientated incipient fractures. (FEF) (FE)	13.80	263.30	
21C	14.90 - 16.20	14.90	97 50 0					14.40 - 14.65m: Medium strong grey siltstone with single 45deg undulating rough fracture infilled (up to 2mm) with grey silt.			
22CS	15.60 - 15.90							15.90 - 16.30m: 80deg planar smooth fracture infilled (up to 2mm) with grey clay.			

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL 20.70 30.00 Gravel			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS		
			26-09-2019 17:40 16.20 14.90 8.60						
			27-09-2019 08:25 16.20 14.90 8.60						
			27-09-2019 16:00 20.50 20.00 8.60						
			30-09-2019 09:45 20.50 20.00 8.30						
			30-09-2019 14:35 30.00 29.50 18.45						
						CONTRACT 35560			
						CHECKED CT			

BOREHOLE LOG



DSRC420

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 24 September 2019 Easting 393950

Scale 1:50

End Date 30 September 2019 Northing 213950 Ground Level 277.10mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
23C	16.20 - 17.50	16.20	100 90 17	NI 60 260				Weak thinly bedded grey MUDSTONE. Fractures are subhorizontal to 10deg and rarely 80deg to subvertical extremely closely to medium rarely medium spaced undulating rough infilled (up to 3mm) with grey clay. Frequent randomly orientated incipient fractures. (FEF) (FE)	16.30	260.80	
24CS 25C	17.45 - 17.71 17.50 - 18.50	17.50	80 45 0					17.30 - 17.45m: Subvertical planar smooth fracture. 17.80 - 18.20m: 70-80deg intersecting planar smooth fractures locally infilled (up to 2mm) with grey clay.			
26C	18.50 - 20.00	18.50	100 20 0	NI 60 200				Weak very thinly to thinly bedded grey MUDSTONE. Fractures are subhorizontal very closely and closely spaced planar rough. Frequent randomly orientated incipient fractures. (FEF) (FE)			
27C 28CS	20.00 - 20.50 20.16 - 20.38	20.00	90 40 40					19.70 - 19.85m: 70deg planar rough fracture.			
29C 28CS	20.50 - 22.00 20.66 - 20.88	20.50	100 67 63	NI 300 670				20.50 - 20.60m: Disintegrated to grey clay. 20.70 - 20.90m: 70deg undulating rough fracture with reddish brown staining.	20.75	256.35	
30C	22.00 - 23.50	22.00	100 100 100					Medium strong thinly and medium bedded yellowish brown argillaceous LIMESTONE. Fractures are subhorizontal to 40deg closely to widely spaced undulating rough. Fracture surfaces weakened up to 10mm from surface. (IOG) (SALS)			
32C 31CS	23.50 - 25.00 23.69 - 24.00	24.00	100 93 93					23.10 - 23.20m: Thin bed of light brown gravelly clay.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 01-10-2019 09:00 30.00 29.50 19.80			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRC420

CLIENT HIGHWAYS ENGLAND

Sheet 4 of 4

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Start Date 24 September 2019 Easting 393950

Scale 1:50

End Date 30 September 2019 Northing 213950 Ground Level 277.10mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	25.00 - 26.50	25.00	100 97 93	60 300 600				Medium strong thinly and medium bedded yellowish brown argillaceous LIMESTONE. Fractures are subhorizontal to 40deg closely to widely spaced undulating rough. Fracture surfaces weakened up to 10mm from surface. (IOG) (SALS) 24.25 - 24.30m: Pocket of light brown gravelly clay.	25.00	252.10	
34CS	25.90 - 26.20						Medium strong yellowish brown bioclastic LIMESTONE with frequent shell fragments (up to 20mm). Fractures are subhorizontal to 10deg medium spaced planar rough. (IOG) (SALS) 25.20 - 25.60m: Grey. 25.60 - 25.80m: Thin bed of white limestone. 25.90 - 26.10m: Grey.				
35C	26.50 - 28.00	26.50	100 100 100				26.40 - 26.45m: Pocket of light brown gravelly clay. 26.70 - 27.00m: Grey.				
36CS 37C	28.00 - 28.25 28.00 - 29.50	28.00	100 100 94				27.80 - 28.40m: Grey. 28.15m: Fossilised coral fragments.				
38C	29.50 - 30.00	29.50	100 90 90				29.00 - 29.05m: Wisps of light yellowish brown mudstone. 29.10 - 29.35m: Thin bed of grey limestone. 29.80 - 29.90m: Wisps of light yellowish brown mudstone.	30.00	247.10		
Borehole Completed at 30.00m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED CT

BOREHOLE LOG



DSRCHO304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 3ES 5B 6D 4ES 7B 8D 10L 9D 11D	0.05 - 0.10 0.05 - 0.10 0.05 - 0.10 0.25 - 0.30 0.25 - 0.30 0.25 - 0.30 0.45 - 0.50 0.45 - 0.50 0.45 - 0.50 0.95 - 1.00 0.95 - 1.00 0.95 - 1.00 1.20 - 2.20 1.20 - 1.65 1.30 - 1.40							Very soft dark brown sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets and roots (up to 50mm diam). (TOP) Very soft orangish brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse limestone. (HDD) (HEAD)	0.25	231.60	
		Nil				S 24		Stiff orangish brown slightly sandy gravelly silty CLAY. Gravel is subangular fine to coarse limestone. (HDD) (HEAD)	1.20	230.65	
12D 13L	2.20 - 2.65 2.20 - 3.20	Nil				S 20					
14D	2.90 - 3.00										
15D 16L	3.20 - 3.65 3.20 - 4.20	Nil				S 34		Weak and medium strong light grey bioclastic LIMESTONE with medium spaced very thin beds of extremely weak grey mudstone and thin beds of firm brown calcareous slightly gravelly clay. Gravel is angular fine to coarse limestone. Fractures are 20-30deg closely spaced undulating rough and irregular with frequent clay infill (up to 50mm). Rare calcite crystals (up to 60mm). (IOG) (BLPL) 3.10 - 4.20m: Highly fractured. 4.20 - 4.50m: Minimal recovery (SPT).	3.10	228.75	
17D 18D	4.00 - 4.10 4.20 - 4.60	Nil				S *122					
19C	4.50 - 5.80	4.50	100 32 10	NI 70 200							
20D	5.30 - 5.40										
21C	5.80 - 6.90	5.80	95 33 15								
22C 23CS	6.90 - 7.90 7.00 - 7.30	6.90	95 35 25								
24C	7.90 - 8.90	7.90									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	1.20	Inspection Pit	Hand tools					
1.20	4.20	Window Sampler	Comacchio MC 405					
4.60	65.20	Rotary Core	Comacchio MC 405					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098
168	4.60		0.00	0.50	Concrete	54.20	Standpipe	
140	60.20		0.50	26.10	Bentonite			
			26.10	60.20	Gravel			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Borehole advanced by reaming casing (168mm) 4.20-4.50m. Driller notes loss of flush returns at 15.20m.		35560
102	3.20	11-03-2020 11:30	0.00	Nil	Dry			CHECKED
87	4.20	11-03-2020 15:00	4.20	Nil	Dry			CT
168	4.50	12-03-2020 08:30	4.20	Nil	Dry			
146	60.20	12-03-2020 17:00	27.10	25.60	24.00			
		13-03-2020 08:00	27.10	25.60	24.15			

BOREHOLE LOG



DSRCOH304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25CS	8.40 - 8.60		94 23 16								
26C	8.90 - 10.60	8.90	92	NI				Medium strong light grey and orange bioclastic oolitic and peloidal LIMESTONE. Fractures are (1) 10-30deg closely and medium spaced undulating rough and irregular infilled with gravelly clay; (2) 60-70deg undulating rough. Rare calcite veins (up to 10mm thick). (IOG) (BLPL)	8.80	223.05	
27CS	9.20 - 9.35		53 9	150 520							
28C	10.60 - 12.10	10.60	100								
29CS	10.80 - 10.97		45					10.80m: PLI suggests weak.			
30CS	10.97 - 11.20		40								
31C	12.10 - 13.60	12.10	86								
32CS	12.35 - 12.55		42 26	30	150	450		Medium strong light grey bioclastic and peloidal LIMESTONE with frequent thin beds of orange clay and extremely weak mudstone. Frequent irregular voids (up to 110mm) infilled with orange clay and mudstone. Fractures are 10-30deg closely and medium spaced undulating rough and irregular, infilled (up to 40mm) with clay and fine to coarse limestone gravel. (IOG) (BLPL)	12.30	219.55	
33C	13.60 - 15.20	13.60	98 65 45								
34CS	14.70 - 15.20										
35C	15.20 - 16.60	15.20	44 10 0					15.20 - 16.60m: Limited recovery. Driller notes jointed/voided, rough drilling.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS							
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 				
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 13-03-2020 14:30 45.20 43.70 24.41 16-03-2020 08:30 45.20 43.70 25.10 16-03-2020 15:30 60.20 60.20 25.30				REMARKS						CONTRACT 35560	
											CHECKED CT		

BOREHOLE LOG



DSRCOH304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
36C	16.60 - 17.80	16.60	100 68 68	NI 300 380				Weak to medium strong light grey bioclastic LIMESTONE. Fractures are 10deg medium spaced undulating rough and irregular with a clay veneer. (IOG) (BLPL)	16.60	215.25	
37CS	17.00 - 17.25										
38C 39CS	17.80 - 19.40 17.80 - 17.93	17.80	95 43 24	NI 140 300				Medium strong light grey bioclastic LIMESTONE with closely and medium spaced very thin beds of orange calcareous mudstone. Frequent irregular voids (up to 60mm). Fractures are 10-30deg closely and medium spaced undulating rough and irregular with a clay veneer. (IOG) (BLPL) 18.30 - 18.80m: 50deg fracture with clay veneer.	18.10	213.75	
40C	19.40 - 21.00	19.40	93 78 65								
41CS	20.75 - 21.00			NI 60 260				Weak to medium strong light grey bioclastic LIMESTONE. Fractures are 10-20deg closely and medium spaced undulating rough and irregular stained orange with clay infill (up to 30mm). (IOG) (BLPL) 21.15 - 21.30m: 70deg undulating rough fracture stained orange.	20.40	211.45	
42C	21.00 - 22.60	21.00	96 72 69								
43CS	21.60 - 21.90										
44C	22.60 - 24.10	22.60	94 72 52	NI 450 500				Weak grey bioturbated bioclastic LIMESTONE with medium spaced medium beds of orange bioturbated sandy limestone. Frequent irregular voids (up to 200mm) infilled with orange sandy mudstone and clay. Fractures are 10-20deg closely and medium spaced undulating rough and irregular. Rare orange staining. (IOG) (BLPL)	22.85	209.00	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCH0304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
45C	24.10 - 25.60	24.10	100								
46CS	24.50 - 24.80		90 90								
47C	25.60 - 27.10	25.60	100 92 90								
				NI 250 300				Extremely weak thinly laminated dark grey silty MUDSTONE. Bedding fractures are subhorizontal to 10deg medium spaced planar smooth. (Lias Group) (BDS) 26.30 - 26.35m: Sandy siltstone.	26.05	205.80	
48D 49C	27.10 - 27.50 27.10 - 28.70	27.10	90 70 60				S *122	27.10m: PLI suggests weak.			
50CS	27.60 - 27.90		170 200 570					Weak to medium strong dark grey silty fine SANDSTONE. Fractures are subhorizontal to 10deg closely and medium spaced undulating smooth with silt veneer. Rare fossils. (Lias Group) (BDS)	27.55	204.30	
				NI				Extremely weak thinly laminated grey SILTSTONE. Alternating dark and light grey laminae. (Lias Group) (BDS)	28.30	203.55	
51C	28.70 - 30.20	28.70	93 56 17	NI 140 350				Extremely weak to very weak dark grey SILTSTONE. Fractures are subhorizontal closely and medium spaced smooth undulating rough, with frequent silt veneer. Rare fossils and pyrite nodules (up to 20mm). (Lias Group) (BDS)	28.70	203.15	
52D 53C	30.20 - 30.50 30.20 - 31.70	30.20	85 46 37				S *200				
54CS	30.60 - 30.80							30.80 - 31.00m: 70deg undulating smooth fracture.			
55C	31.70 - 33.10	31.70	94 60								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			47					Extremely weak to very weak dark grey SILTSTONE. Fractures are subhorizontal closely and medium spaced smooth undulating rough, with frequent silt veneer. Rare fossils and pyrite nodules (up to 20mm). (Lias Group) (BDS)			XXXXXX
56D 57C	33.10 - 33.40 33.10 - 34.60	33.10	98 70 50				S *207	32.25 - 32.45m: 70-80deg undulating smooth fracture with silt veneer. 32.60 - 32.65m: 10deg fracture with clay infill (up to 50mm).			XXXXXX
58C	34.60 - 36.20	34.60	95 77 68					34.20 - 34.50m: 60-70deg undulating smooth fracture with silt veneer.			XXXXXX
59CS 60D 61C	36.00 - 36.20 36.20 - 36.48 36.20 - 37.70	36.20	100 79 41				S *231	36.10 - 36.40m: Light grey bioclastic limestone (drilling disturbed).			XXXXXX
62C 63CS	37.70 - 39.20 37.80 - 38.10	37.70	98 74 65					37.30 - 37.60m: 70-80deg fracture.			XXXXXX
64D 65C	39.20 - 39.44 39.20 - 40.70	39.20	100 84 72				S *333	38.50 - 38.80m: 80-90deg fracture with calcite infill (10mm).			XXXXXX
Continued Next Page											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1098		

BARREL DIAMETER			HOLE PROGRESS				REMARKS				CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					35560	
											CHECKED	
											CT	



BOREHOLE LOG

DSRCH0304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
66C	40.70 - 42.20	40.70	100 91 86					Extremely weak to very weak dark grey SILTSTONE. Fractures are subhorizontal closely and medium spaced smooth undulating rough, with frequent silt veneer. Rare fossils and pyrite nodules (up to 20mm). (Lias Group) (BDS)			XXXXXXXXXX
67CS	41.20 - 41.50										XXXXXXXXXX
68D 69C	42.20 - 42.41 42.20 - 43.70	42.20	100 88 76			S *300		42.00 - 42.10m: 10deg fracture with clay infill (up to 30mm).			XXXXXXXXXX
70C	43.70 - 45.20	43.70	100 96 84	40 300 670				Extremely weak and very weak thinly laminated dark grey silty MUDSTONE with frequent bioturbation infilled (up to 30mm) with silt. Fractures are subhorizontal medium and widely spaced undulating smooth with a silt veneer. Rare fossils. (Lias Group) (WHM)	43.10	188.75	XXXXXXXXXX
71CS	44.50 - 44.80										XXXXXXXXXX
72D 73C	45.20 - 45.37 45.20 - 46.70	45.20	96 80 66			S *429					XXXXXXXXXX
74C	46.70 - 48.20	46.70	99 79 64					47.30 - 47.60m: 80deg undulating rough fracture.			XXXXXXXXXX

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE		
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)
					TYPE	
BARREL DIAMETER			HOLE PROGRESS			REMARKS
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	
						CONTRACT
						35560
						CHECKED
						CT

BOREHOLE LOG



DSRCOH304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
75C	48.20 - 49.70	48.20	100 81 60				C *316	Extremely weak and very weak thinly laminated dark grey silty MUDSTONE with frequent bioturbation infilled (up to 30mm) with silt. Fractures are subhorizontal medium and widely spaced undulating smooth with a silt veneer. Rare fossils. (Lias Group) (WHM) 48.80m: Subhorizontal fracture with fine and medium gravel sized clasts of greenish grey fine sandstone.			
76CS	49.00 - 49.30										
77C	49.70 - 51.20	49.70	100 78 74					50.10m: Light grey limestone clast (30mm). 50.60 - 50.80m: 70-80deg vertical fracture undulating smooth with silt veneer.			
78C	51.20 - 52.60	51.20	100 92 77				C *222	51.10 - 51.30m: Medium strong light grey limestone.			
79CS	52.10 - 52.30										
80C	52.60 - 54.20	52.60	93 81 59					52.70 - 52.75m: Extremely weak thinly laminated light grey siltstone. 53.00 - 53.05m: Extremely weak thinly laminated light grey siltstone. 53.20 - 53.30m: 10deg horizontal fracture with silt infill (10mm).			
81C	54.20 - 55.70	54.20	97 83 75				C *207				
82CS	54.80 - 55.10							54.90m: Light grey limestone clast (10mm).			
83C	55.70 - 57.20	55.70	100 97								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS									
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1098 						
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS									
						<table border="1"> <tr> <td>CONTRACT</td> </tr> <tr> <td>35560</td> </tr> <tr> <td>CHECKED</td> </tr> <tr> <td>CT</td> </tr> </table>						CONTRACT	35560	CHECKED	CT
CONTRACT															
35560															
CHECKED															
CT															

BOREHOLE LOG



DSRCOH304

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 8

Start Date 11 March 2020

Easting 393249

Scale 1:50

End Date 16 March 2020

Northing 216080

Ground Level 231.85mOD

Depth 60.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
84C	57.20 - 58.70	57.20	97 96 95 91				C *200	Extremely weak and very weak thinly laminated dark grey silty MUDSTONE with frequent bioturbation infilled (up to 30mm) with silt. Fractures are subhorizontal medium and widely spaced undulating smooth with a silt veneer. Rare fossils. (Lias Group) (WHM) 56.25 - 56.30m: Subhorizontal fracture with clay infill (up to 40mm). 57.50 - 57.51m: Medium strong light grey limestone.			
85CS	58.20 - 58.45										
86C	58.70 - 60.20	58.70	99 95 95					58.55m: Subhorizontal fracture with light grey sand infill (up to 10mm). 59.00 - 59.10m: 40deg fracture (drilling induced?). 59.25 - 59.26m: Medium strong light grey limestone, undulating top and base. 59.55m: 30deg fracture (drilling induced?).			
87CS	59.90 - 60.10	60.20					C *214	Borehole Completed at 60.20m	60.20	171.65	

HOLE CONSTRUCTION			WATER STRIKE		
TOP (m)	BASE (m)	TYPE	DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1098
							AGS

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
							CHECKED	
							CT	

BOREHOLE LOG



DSRCOH308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Grass over soft brown slightly sandy slightly gravelly CLAY.	0.25	271.10	
1B	0.30 - 0.40							Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)	0.40	270.95	
2D	0.30 - 0.40		100	NI							
2ES	0.30		0								
3C	0.40 - 0.90		0					Soft brown slightly sandy gravelly CLAY locally tending to clayey gravel with low limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. (HDD)	0.90	270.45	
4D	0.80 - 0.90		87	NI							
5C	0.90 - 1.80		51	30				(HEAD)			
			0	70				Weak light grey and light brown bioclastic LIMESTONE. Recovered non intact. (IOG) (SALS)			
6CS	1.50 - 1.56							Medium strong light grey to light brown bioclastic LIMESTONE. Fractures are subhorizontal very closely and closely spaced undulating rough. (IOG) (SALS)			
7C	1.80 - 2.00		100								
8C	2.00 - 2.90	2.00	85					1.80 - 2.90m: Subvertical undulating rough fracture with orangish brown staining and rare calcite infill (up to 5mm). 2.30 - 2.35m: Bivalve fossils (up to 40mm diam).			
			0								
			98	NI							
			74	80							
			26	200							
9C	2.90 - 4.40	2.90	95	40				Medium strong light grey to light brown bioclastic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (SALS)	2.90	268.45	
			47	160							
			37	410							
10CS	3.29 - 3.53							Soft light brown slightly sandy silty CLAY. (IOG) (ASLS)	3.55	267.80	
				NA							
								Medium strong light grey to light brown bioclastic LIMESTONE. Fractures are subvertical very closely spaced undulating rough. (IOG) (ASLS)	3.80	267.55	
									3.95	267.40	
11D	4.30 - 4.40							Very stiff light brown slightly sandy slightly gravelly silty CLAY. Gravel is fine subangular and subrounded limestone lithorelicts. (IOG) (ASLS)	4.45	266.90	
12C	4.40 - 5.90	4.40	97	NI							
			72	160							
			57	410							
13CS	5.15 - 5.36							Medium strong to strong light grey to light brown bioclastic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL) 4.45 - 4.65m: Subvertical undulating rough fracture. 4.75 - 5.05m: Subvertical undulating rough fracture locally stained reddish brown with reddish brown clay infill.			
14C	5.90 - 7.40	5.90	100	20				Weak white to light brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough with orangish brown staining rarely infilled by calcite (up to 5mm). Rare thin beds (up to 20mm) with frequent shell fragments (<5mm). (IOG) (BLPL) 5.95 - 6.25m: 80deg undulating rough fracture with orangish brown staining locally infilled by calcite (up to 5mm).	5.90	265.45	
			97	250							
			89	680							
15CS	6.22 - 6.48							7.30 - 7.40m: Thin bed of strong light grey bioclastic limestone.			
								7.80 - 8.15m: Subvertical undulating rough fracture with orangish brown staining.			
16CS	7.40 - 7.58	7.40	99								
17C	7.40 - 8.90		95								
			67								

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE						DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.40	Inspection Pit										
0.40	70.40	Rotary Core										

CASING DEPTH		BACKFILL				INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE			
168	2.00	0.00	0.50	Concrete	58.50	Standpipe	1158		
140	70.40	0.50	1.50	Bentonite					
		1.50	59.50	Gravel					
		59.50	70.40	Bentonite					

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					
146	2.00	10-12-2019 10:30	0.00	Nil	Dry	Inspection pit terminated at 0.40m due to limestone cobbles. Driller notes loss of flush returns 2.40-70.40m.				
146	70.40	10-12-2019 16:00	4.40	2.90	3.50					
		11-12-2019 09:05	4.40	2.90	3.90					
		11-12-2019 16:00	22.40	20.90	Dry					
		12-12-2019 10:00	22.40	20.90	Dry					
							35560		CHECKED	
									CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18CS	8.45 - 8.55							Weak white to light brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough with orangish brown staining rarely infilled by calcite (up to 5mm). Rare thin beds (up to 20mm) with frequent shell fragments (<5mm). (IOG) (BLPL)			
19C	8.90 - 10.40	8.90	97 75 53								
20CS	9.27 - 9.56										
						9.55 - 9.75m: Subvertical undulating rough fracture with orangish brown staining.					
						9.95m: Ammonite fossil (10mm diam).					
						10.05 - 10.25m: Thin bed of light brown to white slightly sandy silty gravel. Gravel is subangular and subrounded fine to coarse limestone lithorelicts.					
21C	10.40 - 11.90	10.40	100				10.40m: PLI suggests strong.				
21CS	10.40 - 10.65		98				10.60 - 11.75m: Subvertical undulating rough fracture with orangish brown staining locally infilled by calcite (up to 5mm).				
22CS	10.40 - 10.65		87								
23C	11.90 - 13.40	11.90	100 89 49				12.00 - 13.20m: Subvertical undulating rough fracture with orangish brown staining locally infilled by calcite (up to 5mm).				
24C	13.40 - 14.90	13.40	100 99 90				13.55 - 13.75m: Subvertical undulating rough fracture locally stained orangish brown.				
25CS	13.74 - 14.09										
26C	14.90 - 16.40	14.90	100 97 97	NI	550 900						

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH				BACKFILL		INSTRUMENTATION	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER				HOLE PROGRESS			REMARKS
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		12-12-2019 15:00	32.90	31.40	Dry		
		13-12-2019 09:15	32.90	31.40	Dry		
		13-12-2019 15:45	44.90	43.40	Dry		
		16-12-2019 09:10	44.90	43.40	Dry		
		16-12-2019 16:00	47.90	46.40	Dry		
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRCOH308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.40 - 17.90	16.40	100					<p>Weak white to light brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough with orangish brown staining rarely infilled by calcite (up to 5mm). Rare thin beds (up to 20mm) with frequent shell fragments (<5mm). (IOG) (BLPL)</p> <p>17.20 - 17.50m: Subvertical undulating rough fracture with orangish brown staining. 17.50 - 17.75m: Subvertical undulating rough fracture with orangish brown staining. 17.60 - 17.80m: Subvertical very closely spaced undulating rough fractures with orangish brown staining. 17.90 - 18.15m: Subvertical very closely spaced undulating rough fractures with orangish brown staining. 17.90 - 18.80m: Subvertical undulating rough fracture with orangish brown staining. 18.20 - 18.40m: Subvertical very closely spaced undulating rough fractures with orangish brown staining. 18.70 - 18.80m: Thin bed of light brown and white slightly sandy silty gravel. Gravel is subangular and subrounded fine to coarse limestone lithorelicts.</p> <p>23.55 - 23.65m: 70deg planar rough fracture with orangish brown staining.</p>			
28CS	16.67 - 17.04		97 88								
29C	17.90 - 19.40	17.90	97 56 45	NI 60 160							
				520							
30CS 31C	19.40 - 19.77 19.40 - 20.90	19.40	95 95 95		910						
32C	20.90 - 22.40	20.90	100 100 95	25 300 780							
33C	22.40 - 23.90	22.40	100 100 94								
34CS	23.16 - 23.44										
35C	23.90 - 25.40	23.90									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		17-12-2019 09:15	47.90	46.40	Dry		CHECKED
		17-12-2019 16:00	59.90	58.40	56.60		
		18-12-2019 09:00	59.90	58.40	57.53		
		18-12-2019 15:45	68.90	67.40	56.80		
		19-12-2019 08:45	68.90	67.40	61.40	CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 100 100					Weak white to light brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough with orangish brown staining rarely infilled by calcite (up to 5mm). Rare thin beds (up to 20mm) with frequent shell fragments (<5mm). (IOG) (BLPL)			
36C	25.40 - 26.90	25.40	100 100 100								
37CS	25.65 - 25.90							25.65m: PLI suggests very weak.			
38C	26.90 - 28.40	26.90	93 91 79								
39CS	27.80 - 28.15										
40C	28.40 - 29.90	28.40	98 98 82					29.05 - 29.30m: Subvertical undulating rough fracture with orangish brown staining.			
41C	29.90 - 31.40	29.90	100 100 94								
42C	31.40 - 32.90	31.40	100 99 93					31.60m: Bivalve fossil (40mm diam). 31.75m: Very thin bed (20mm) of soft brown slightly sandy silty clay.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1158	
---	--	--	--	--	--	--	------------------------------	--



BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 19-12-2019 13:30 70.40 68.90 4.60				REMARKS		CONTRACT 35560	
								CHECKED CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD

Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
43CS	32.44 - 32.79							Weak white to light brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough with orangish brown staining rarely infilled by calcite (up to 5mm). Rare thin beds (up to 20mm) with frequent shell fragments (<5mm). (IOG) (BLPL) 32.25 - 32.35m: 50-60deg undulating rough fracture.			
44C	32.90 - 34.40	32.90	100 99 91						33.45	237.90	
				NI 85 350				Medium strong to strong light brown locally light grey and white bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg closely rarely medium spaced undulating rough with orangish brown staining. Locally bioturbated. Rare peloids. (IOG) (BLPL)			
45CS	34.05 - 34.21										
46C	34.40 - 35.90	34.40	100 69 37					35.10 - 35.90m: 80deg undulating rough fracture with orangish brown staining. 35.90 - 36.60m: Frequent bioturbation (recovered as non intact as gravel).			
47C	35.90 - 37.40	35.90	87 51 43								
				40 270 580				36.90 - 37.10m: 70deg undulating rough fracture with orangish brown staining with rare calcite infill (up to 5mm). Strong white and light grey bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg medium spaced undulating rough with orangish brown staining. (IOG) (BLPL)			
48C	37.40 - 38.90	37.40	90 87 83						37.10	234.25	
49CS	37.65 - 38.01							38.70 - 38.90m: Subvertical undulating rough fracture with orangish brown staining.			
50C	38.90 - 40.40	38.90	93 90 85								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD

Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
51C 52CS	40.40 - 41.90 40.52 - 40.73	40.40	100 100 89								
53C	41.90 - 43.40	41.90	98 96 82	NI 120 270				Medium strong to strong light brown to white bioclastic, oolitic and peloidal bioturbated LIMESTONE. Fractures are subhorizontal to 20deg closely rarely medium spaced undulating rough with orangish brown staining. (IOG) (BLPL)	42.25	229.10	
54C	43.40 - 44.90	43.40	80 43 35					43.40 - 44.00m: Frequent bioturbation (recovered as non intact as gravel). 44.10 - 44.35m: Frequent bioturbation (recovered as non intact as gravel).			
55CS 56C	44.67 - 44.85 44.90 - 46.40	44.90	93 73 29	NI 50 230				44.90 - 47.90m: Subvertical undulating rough fracture with orangish brown staining rarely infilled by calcite (up to 5mm).			
57C	46.40 - 47.90	46.40	70 29 7								
58C	47.90 - 49.40	47.90						47.90 - 48.45m: Recovered as subangular and subrounded medium and coarse limestone gravel.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
59CS	48.45 - 48.65		80	NI				Medium strong to strong light brown to white bioclastic, oolitic and peloidal bioturbated LIMESTONE. Fractures are subhorizontal to 20deg closely rarely medium spaced undulating rough with orangish brown staining. (IOG) (BLPL)			
			35								
			13								
60C	49.40 - 50.90	49.40	96								
			88								
			56								
61CS	49.94 - 50.15			NI							
				120							
				350							
62CS 63C	50.90 - 51.13 50.90 - 52.40	50.90	99								
			83								
			57								
64C	52.40 - 53.90	52.40	97								
			89								
			43								
65C	53.90 - 55.40	53.90	92								
			88								
			67								
66C 67CS	55.40 - 56.90 55.50 - 55.75	55.40	95					55.05 - 55.25m: Subvertical undulating rough with orangish brown staining.			
			67								
			25					55.75 - 56.35m: 80deg to subvertical undulating rough fracture with orangish brown staining infilled (up to 20mm) with light brown gravelly clay (surfaces weakened).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCHO308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD

Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
68C	56.90 - 58.40	56.90	97 62 42	NI 50 170							
69C	58.40 - 59.90	58.40	100 64 49	40 120 190							
70CS	58.65 - 58.83										
71C	59.90 - 61.40	59.90	100	NA				Soft to firm (possibly drilling disturbed) light brown slightly sandy silty CLAY. Rare pockets of orangish brown and grey micaceous silt. (Lias Group) (BDS)	59.45	211.90	
72C	61.40 - 62.90	61.40	100 43 34	40 180 270				Stiff indistinctly structured grey micaceous CLAY. Rare pockets of orangish brown and grey silt. Rare mudstone lithorelicts. (Lias Group) (BDS)	60.00	211.35	
73CS	61.79 - 62.03			NA				Weak orangish brown (ferruginous) SILTSTONE. Fractures are subhorizontal closely and medium spaced undulating rough with reddish brown staining. (Lias Group) (BDS) 61.55 - 61.80m: 80deg planar rough fracture with reddish brown staining.	61.40	209.95	
74C	62.90 - 64.40	62.90	100 65 39	NI 100 290				Greenish brown slightly sandy micaceous SILT. (Lias Group) (BDS) Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to clay. Fractures are subhorizontal to 20deg closely rarely medium spaced planar smooth with rare orangish brown staining. (Lias Group) (BDS) 63.50 - 63.90m: Subvertical planar smooth fracture.	62.10	209.25	
									62.60	208.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCHO308

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 9

Start Date 10 December 2019 Easting 393999

Scale 1:50

End Date 19 December 2019 Northing 215767 Ground Level 271.35mOD Depth 70.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
75C	64.40 - 65.90	64.40	95					Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to clay. Fractures are subhorizontal to 20deg closely rarely medium spaced planar smooth with rare orangish brown staining. (Lias Group) (BDS) 64.75 - 64.95m: Subvertical undulating smooth fracture with orangish brown staining.			
76CS	64.70 - 64.93		91 64								
77C	65.90 - 67.40	65.90	91 88 58					65.90 - 66.10m: Subvertical planar smooth fracture with orangish brown staining. 66.55 - 66.90m: Subvertical undulating smooth fracture.			
78CS	66.97 - 67.22										
79C	67.40 - 68.90	67.40	100 97 77								
80C	68.90 - 70.40	68.90	97 95 71					69.50 - 69.80m: Thin bed of fossiliferous mudstone. Frequent shell fragments (up to 25mm diam).			
81CS	70.14 - 70.40										
									70.40	200.95	
									Borehole Completed at 70.40m		

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1158
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



DSRCOH308A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 15 January 2020

Easting 393990

Scale 1:50

End Date 17 January 2020

Northing 215759

Ground Level 271.85mOD

Depth 18.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.10 - 0.30							Grass over soft dark brown slightly sandy slightly gravelly CLAY with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.40	271.45	
								LIMESTONE (Driller's description). No recovery. (IOG) (SALS)			
3C	1.20 - 2.00	1.20	50 0 0	NI				Very weak and weak highly fractured greyish brown LIMESTONE recovered as angular to subrounded fine to coarse gravel with a low subangular cobble content. (IOG) (SALS)	1.20	270.65	
								1.20 - 1.40m: Locally stained reddish brown.			
4C	2.00 - 3.50	2.00	97 55 31	NI 50 120				Weak and medium strong brownish grey becoming yellowish grey LIMESTONE. Fractures are subhorizontal to 15deg very closely and closely spaced undulating rough locally infilled (up to 5mm) with yellowish brown slightly sandy clay. (IOG) (ASLS)	2.20	269.65	
								2.50 - 2.60m: Locally bioturbated. Irregular voids (up to 30mm) stained orangish brown.			
								2.75 - 2.85m: Recovered as claybound angular fine to coarse gravel.			
5C	3.50 - 5.00	3.50	100 51 47					2.90 - 3.15m: Randomly orientated very closely spaced undulating incipient fractures stained orangish brown.			
								2.90 - 3.35m: Rare shell fossils (up to 25mm).			
								3.40 - 3.45m: 35deg undulating rough fracture stained orangish brown.			
								3.70 - 3.75m: 20deg undulating rough fracture surfaces weakened (up to 25mm).	4.20	267.65	
								3.75 - 4.00m: Rare subrounded voids (up to 15mm) infilled with orangish brown clayey fine sand.			
								3.80 - 3.90m: Strong.			
								3.90 - 4.05m: Recovered as claybound angular fine to coarse gravel.			
6C	5.00 - 6.50	5.00	97 67 55					4.10 - 4.20m: Subvertical undulating rough fracture.			
7CS	5.35 - 5.68							Medium strong greyish brown bioclastic LIMESTONE with closely and medium spaced medium beds of weakly cemented yellowish brown fine and medium sand. Fractures are subhorizontal closely and medium spaced planar and undulating rough. (IOG) (BLPL)			
								4.60 - 4.65m: Stained orangish brown.			
								5.60 - 5.70m: Frequent shell fossils (up to 20mm).			
								5.80m: Fracture infilled (25mm) with brown clay.			
8C	6.50 - 8.00	6.50	87 64 64					5.90 - 6.00m: Subhorizontal very closely spaced undulating rough fractures, surfaces weakened (20mm).			
								6.20 - 6.30m: Rare shell fossils (up to 35mm).			
								6.30 - 6.35m: Subvertical undulating rough fracture.	7.00	264.85	
								6.30 - 6.40m: Rare subrounded voids (up to 10mm diam) infilled with yellowish brown fine and medium sand.			
								6.60 - 6.75m: Subvertical undulating rough fracture.			
								6.90m: 30mm shell fossil.			
9C	8.00 - 9.50	8.00		NI 220 460				Medium strong light yellowish brown locally orangish brown ooidal LIMESTONE. Fractures are subhorizontal to 10deg			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	0.40	Inspection Pit	Hand tools					
1.20	18.50	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158
200	2.00		0.00	18.50	Bentonite			
140	18.50							CONTRACT
BARREL DIAMETER		HOLE PROGRESS				REMARKS		35560
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Borehole advanced by reaming casing (168mm) 0.40-1.20m using a water flush. Hand dug inspection pit terminated at 0.40m on encountering limestone. Driller notes reduced flush returns 1.20-2.00m		CHECKED
168	1.20	15-01-2020 14:00	0.00	Nil	Dry			CT
146	18.50	15-01-2020 16:10	1.20	0.40	Dry			
		16-01-2020 08:00	1.20	0.40	Dry			
		16-01-2020 14:40	18.50	17.00	Dry			
		17-01-2020 07:40	18.50	17.00	Dry			

BOREHOLE LOG



DSRCOH308A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 15 January 2020

Easting 393990

Scale 1:50

End Date 17 January 2020

Northing 215759

Ground Level 271.85mOD

Depth 18.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
10CS	8.40 - 8.80		100 97 89					closely and medium spaced planar and undulating rough locally stained orangish brown. (IOG) (BLPL) 7.00 - 7.20m: Recovered as claybound angular fine to coarse gravel. 7.25m: Rounded void (15mm diam). 7.60 - 7.70m: 60deg undulating incipient fracture. 9.05 - 9.10m: Subhorizontal undulating rough fracture, surfaces weakened (30mm). 9.40 - 10.50m: Locally peloidal. 9.50m: Frequent black specks. 9.65 - 9.80m: Very closely fractured.			
11C	9.50 - 11.00	9.50	100 71 54					10.30 - 10.35m: Intersecting 80deg stepped rough fracture and subhorizontal undulating rough fractures, surfaces weakened (15mm). 10.60 - 10.75m: Subvertical undulating rough fracture with frequent black specks. 10.85 - 11.00m: Very closely and closely fractured. 10.95 - 11.00m: Stained orange.			
12C 13CS	11.00 - 12.50 11.00 - 11.45	11.00	100 91 85	50 NI 220 460				11.45 - 11.50m: Subvertical undulating rough fracture. 11.65 - 12.00m: 80deg to 70deg undulating incipient fracture stained orangish brown.			
14C	12.50 - 14.00	12.50	100 83 83					12.20 - 12.35m: Weak and medium strong yellowish brown bioclastic limestone with black specks.			
15CS	13.60 - 13.85								13.85	258.00	
16C	14.00 - 15.50	14.00	100 70 62	NI 200 600				Medium strong locally weak light yellowish brown and white ooidal LIMESTONE with rare shell fragments (up to 25mm) locally replaced by grey and white calcite. Fracture set 1; 25deg closely and medium spaced undulating rough locally with a zone of weakening (up to 50mm) and locally infilled (up to 2mm) with yellowish brown clay. Fracture set 2; 75deg to subvertical undulating rough. (IOG) (BLPL) 14.85 - 15.05m: Fracture infilled (up to 20mm) with yellowish grey sparry calcite.			
17C	15.50 - 17.00	15.50	100 80 80					15.60 - 16.70m: 40deg medium spaced thin beds of medium strong greyish brown peloidal limestone.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS (50% returned) and loss of flush returns 2.00-18.50m.			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH308A

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 15 January 2020

Easting 393990

Scale 1:50

End Date 17 January 2020

Northing 215759

Ground Level 271.85mOD

Depth 18.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18C	17.00 - 18.50	17.00	100 77 73					Medium strong locally weak light yellowish brown and white ooidal LIMESTONE with rare shell fragments (up to 25mm) locally replaced by grey and white calcite. Fracture set 1; 25deg closely and medium spaced undulating rough locally with a zone of weakening (up to 50mm) and locally infilled (up to 2mm) with yellowish brown clay. Fracture set 2; 75deg to subvertical undulating rough. (IOG) (BLPL) 16.70 - 17.00m: Recovered non intact. Fractures probably very closely spaced with frequent black specks. 17.10 - 17.30m: 80deg fracture infilled (15mm) with calcite. 17.10 - 17.80m: 80deg undulating rough fracture locally stained brown with zones of weakening (up to 25mm) either side of the fracture surface. 17.30 - 17.80m: Subvertical fracture stained brown with frequent black specks.			
19CS	17.75 - 18.20										
Borehole Completed at 18.50m									18.50	253.35	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1158
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED CT	

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3B 3ES	0.00 - 0.20 0.10 0.20 - 0.50 0.30 0.50 - 1.00 0.50						H 36 H 40	Grass over soft brown to dark brown silty CLAY with frequent rootlets. (TOP) Soft to firm light grey and cream mottled orange slightly gravelly CLAY. Gravel is subangular fine to coarse lithorelicts of mudstone and limestone. Rare rootlets. (FEF) (FE)	0.20	267.75	
4B 4ES 5D 6L	1.00 - 1.20 1.00 1.20 - 1.65 1.20 - 2.20	Nil					S 5	Soft to firm light brown, orange and cream gravelly clayey SILT. Gravel is subangular fine to coarse lithorelicts of limestone. (FEF) (FE) Soft becoming firm extremely closely fissured light brownish grey slightly sandy slightly gravelly clayey SILT. Gravel is subangular fine to coarse lithorelicts of mudstone. Fissures stained orange. (FEF) (FE)	1.00 1.20	266.95 266.75	
7CS 7LS 8D 9L	1.85 - 2.11 1.85 - 2.11 2.20 - 2.65 2.20 - 3.20	Nil					S 13				
10UT 11L	3.20 - 3.60 3.20 - 4.20										
12D 13L	4.20 - 4.65 4.20 - 5.20	Nil					S 9				
14CS 14LS 15D 16L	4.84 - 5.14 4.84 - 5.14 5.20 - 5.65 5.20 - 6.50	Nil					S 14				
17D 18C 18L	6.50 - 6.95 6.50 - 7.90 6.50 - 7.90	Nil		NA			S 25	6.00 - 6.35m: Stiff, friable. Stiff fissured thinly laminated light brown and orangish brown slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse mudstone lithorelicts. Fissures are subhorizontal and randomly orientated very closely spaced planar rough stained orange and dark brown. (FEF) (FE)	6.35	261.60	
19CS 20D 21C	7.49 - 7.66 7.90 - 8.35 7.90 - 9.40	Nil					S 30	7.90 - 9.40m: Limited recovery.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE	Hand tools		DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Comacchio GEO405				
1.20	7.90	Window Sampler	Comacchio GEO405				
7.90	9.40	Rotary Core					

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	8.00	0.00	0.50	Concrete	76.50	Standpipe	
140	90.30	0.50	13.30	Bentonite			
		13.30	77.00	Gravel			
		77.00	90.30	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Driller notes voids 64.30-64.80m and 65.10-65.60m.		35560
102	6.50	30-09-2019 08:00	0.00	Nil	Dry			CHECKED
87	10.80	30-09-2019 16:30	1.20	Nil	Dry			CT
146	90.30	07-10-2019 12:30	1.20	Nil	Dry			
		07-10-2019 15:20	3.80	Nil	Dry			
		08-10-2019 08:30	3.80	Nil	Dry			

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22D 23L	9.40 - 9.85 9.40 - 10.80	8.00	40				S 16	Stiff thinly laminated grey CLAY. (FEF) (FE)	9.90	258.05	
24LS	10.46 - 10.77							Extremely weak thinly and medium bedded grey MUDSTONE. Fractures are subhorizontal to 5deg medium and widely spaced planar smooth. Frequent subvertical incipient fractures. (FEF) (FE)	10.40	257.55	
25D 26C	10.80 - 11.25 10.80 - 12.30	8.00 10.80	100 100 100	220 490 900			S 66				
27C 28CS	12.30 - 13.80 12.48 - 12.84	12.30	100 100 100					12.90 - 13.40m: Yellowish brown.			
29C	13.80 - 15.30	13.80	100 100 96	120 350 540				Weak to medium strong medium bedded light yellowish brown oolitic and bioclastic LIMESTONE with widely spaced thin beds of very stiff/extremely weak orangish brown bioclastic clay/mudstone. Rare voids (up to 30mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough stained orange infilled (up to 2mm) with orange clay. (IOG) (SALS)			
28CS	14.48							13.40 - 13.75m: 80deg planar rough fracture partially healed and infilled (up to 30mm) with white calcite, stained orange, black and dark brown.			
30C	15.30 - 16.80	15.30	99 87 87					14.30 - 14.60m: Subvertical planar rough fracture open (up to 5mm) partially healed with white calcite. 15.00m: 30deg planar rough fracture. Surfaces weakened (10mm).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) 9.40 BASE (m) 10.80 TYPE Window Sampler 10.80 90.30 Rotary Core			PLANT USED Comacchio GEO405 Comacchio GEO405			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 	
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31CS	16.10 - 16.46							Weak to medium strong medium bedded light yellowish brown oolitic and bioclastic LIMESTONE with widely spaced thin beds of very stiff/extremely weak orangish brown bioclastic clay/mudstone. Rare voids (up to 30mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough stained orange infilled (up to 2mm) with orange clay. (IOG) (SALS) 16.10m: PLI suggests very weak. 16.60m: 40deg planar rough fracture infilled (2mm) with yellowish brown silt. 17.70 - 20.50m: 80deg to subvertical undulating rough fracture open (20mm) partially healed with white calcite. Locally infilled (up to 10mm) with yellowish brown silt and calcified limestone fragments. Surfaces weakened (up to 10mm).			
32C	16.80 - 18.30	16.80	100 100 96								
33C	18.30 - 19.80	18.30	100 77 77								
34C	19.80 - 21.30	19.80	100 100 100								
35CS	21.09 - 21.30							Medium strong medium bedded light grey and light orangish brown bioclastic LIMESTONE with frequent wisps and very thin beds of orangish brown sandy clay and extremely weak mudstone. Frequent voids (up to 30mm). Fractures are 10deg and 30-40deg medium spaced planar rough. (IOG) (ASLS) 21.80 - 22.30m: 60deg and 80deg subparallel undulating rough fractures, surfaces weakened (5mm from surface).	21.60	246.35	
36C	21.30 - 22.80	21.30	100 100 100		150 400 600						
37CS	21.30 - 21.56										
38C	22.80 - 24.30	22.80	100 100 94								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 			
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 11-10-2019 08:30 82.80 81.30 70.64 11-10-2019 12:30 90.30 88.80 78.80			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
39C	24.30 - 25.80	24.30	100					Medium strong medium bedded light grey and light orangish brown bioclastic LIMESTONE with frequent wisps and very thin beds of orangish brown sandy clay and extremely weak mudstone. Frequent voids (up to 30mm). Fractures are 10deg and 30-40deg medium spaced planar rough. (IOG) (ASLS) 24.20 - 24.25m: 20mm (30deg) undulating thick lamination of greyish brown clay. Weak to medium strong medium and thickly bedded light yellowish brown oolitic and bioclastic LIMESTONE. Fractures are subhorizontal to 10deg and rarely 80deg medium and widely spaced planar rough locally stained orange rarely infilled (up to 5mm) with yellowish brown silt. (IOG) (BLPL) 26.40 - 26.50m: 60deg planar rough fracture infilled (10mm) with white calcite. 27.50 - 27.60m: 50deg planar rough fracture with black speckling. 28.00 - 28.10m: Intersecting subvertical irregular fractures open (10mm) and partially healed with white calcite. 28.10 - 28.65m: 80deg to subvertical stepped rough fracture. 29.75m: 10mm bed of orangish brown slightly sandy clay. 29.85 - 30.20m: Abundant shell fossils replaced by white calcite. 30.50 - 31.10m: 80deg undulating rough fracture stained orange with black speckling. 31.50 - 31.60m: Extremely weak orange and light grey siltstone.	24.95	243.00	
40CS	24.70 - 24.97		60 550 900								
41C	25.80 - 27.30	25.80	100 100 100								
42C	27.30 - 28.80	27.30	100 100 94								
43C 44CS	28.80 - 30.30 28.86 - 29.15	28.80	100 100 96								
45C	30.30 - 31.80	30.30	100 100 90								
46C	31.80 - 33.30	31.80	100								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCH0400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47CS	32.49 - 32.73		100					Weak to medium strong grey bioclastic LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced planar smooth rarely infilled (up to 2mm) with grey silt. (IOG) (BLPL) 32.30m: Contact 50deg.	32.30	235.65	
			96	230 340 710							
48C	33.30 - 34.80	33.30	100 96 96					34.00 - 35.90m: With medium spaced thin beds of extremely weak dark grey calcareous mudstone.			
49CS	34.44 - 34.80										
50C	34.80 - 36.30	34.80	100 100 100								
51C	36.30 - 37.80	36.30	100					Extremely weak greenish grey mottled orangish brown MUDSTONE with abundant bivalve shell fossils (up to 30mm). (IOG) (BLPL) Medium strong thickly bedded light yellowish brown LIMESTONE. Fractures are subhorizontal to 10deg medium rarely widely spaced planar rough. (IOG) (BLPL) 37.20 - 37.90m: Bioclastic.	35.90 36.10	232.05 231.85	
			100 100 96	100 650 1300							
52CS	37.55 - 37.80										
53C	37.80 - 39.30	37.80	100 100 100					Weak to medium strong light brown oolitic LIMESTONE. Fractures are 5-10deg medium and widely spaced planar rough stained orange. (IOG) (BLPL) 39.10 - 39.20m: 45deg planar rough fracture stained orange.	37.90	230.05	
54C	39.30 - 40.80	39.30	100 100 100								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
55C	40.80 - 42.30	40.80	100 100 98					Weak to medium strong light brown oolitic LIMESTONE. Fractures are 5-10deg medium and widely spaced planar rough stained orange. (IOG) (BLPL)				
56CS	41.57 - 41.81						41.00 - 41.55m: Frequent shell fragments replaced by calcite.					
57C	42.30 - 43.80	42.30	100 100 100				41.55m: 10mm bed of extremely weak orangish brown calcareous mudstone.					
58CS	43.57 - 43.80											
59C	43.80 - 45.30	43.80	100 100 100									
60C	45.30 - 46.80	45.30	100 100 100				45.55 - 45.65m: 30deg planar smooth fracture.					
61C	46.80 - 48.30	46.80	100				46.95m: PLI suggests very weak.					
62CS	46.95 - 47.20		100 94				47.35 - 48.30m: Bioclastic. Shell fragments replaced by calcite.					
Continued Next Page												

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
63C 64CS	48.30 - 49.80 48.48 - 48.71	48.30	100 100 100					Weak to medium strong light brown oolitic LIMESTONE. Fractures are 5-10deg medium and widely spaced planar rough stained orange. (IOG) (BLPL) 48.50m: Subhorizontal planar rough fracture infilled (2mm) with yellowish brown silt. Fracture surfaces weakened (5mm).	49.00	218.95	
65C	49.80 - 51.30	49.80	100 100 96					Medium strong thickly bedded light yellowish brown and orangish brown oolitic and bioclastic LIMESTONE with rare thin beds of weak yellowish brown bioclastic mudstone. Frequent voids (up to 50mm). Fractures are 5-10deg medium spaced planar smooth stained orange. (IOG) (BLPL)			
66C	51.30 - 52.80	51.30	100 100 100					Weak light greenish grey argillaceous bioclastic LIMESTONE with frequent voids (up to 50mm) stained orange and infilled with orange clay. Shell fossils replaced with calcite. Fractures are subhorizontal to 10deg closely and medium spaced planar rough. (IOG) (BLPL)	51.70	216.25	
67C 68CS	52.80 - 54.30 52.80 - 53.15	52.80	100 100 100					53.05 - 54.80m: Abundant voids (up to 80mm) with orange staining.			
69C	54.30 - 55.80	54.30	100 100 100					54.80 - 55.55m: Voids absent. Fossils rare.			
70C	55.80 - 57.30	55.80	90 230 460 100					Weak to medium strong thickly bedded orange mottled light grey calcareous SILTSTONE. Frequent shell fossils (up to 80mm) with associated grey limestone. Frequent voids (up to 50mm) infilled with orange sandy clay. Fractures are 5-10deg medium spaced undulating rough. (IOG) (BLPL)	55.55	212.40	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
71CS	56.90 - 57.19		100 94					Weak to medium strong thickly bedded orange mottled light grey calcareous SILTSTONE. Frequent shell fossils (up to 80mm) with associated grey limestone. Frequent voids (up to 50mm) infilled with orange sandy clay. Fractures are 5-10deg medium spaced undulating rough. (IOG) (BLPL)			XXXXXX
72C	57.30 - 58.80	57.30	100 100 93	100 330 600				57.80 - 61.15m: Voids rare.			XXXXXX
73CS	57.92 - 58.24										XXXXXX
74C	58.80 - 60.30	58.80	100 100 94								XXXXXX
75C	60.30 - 61.80	60.30	100 100 100								XXXXXX
76CS	60.77 - 61.13							61.15 - 62.90m: With medium spaced irregular and voided thin beds of medium strong grey and brown bioclastic limestone.			XXXXXX
77C	61.80 - 63.30	61.80	100 100 100								XXXXXX
78C 79CS	63.30 - 64.80 63.37 - 63.59	63.30	66 54 48	200				Weak to medium strong thinly bedded light yellowish brown locally orange peloidal and bioclastic LIMESTONE with frequent voids (up to 30mm) stained orange. Fractures are 10-20deg closely and medium spaced undulating rough stained orange, surfaces weakened (up to 40mm from surface). (IOG) (BLPL) 63.80 - 64.30m: Vertical undulating rough fracture stained orange with a veneer of orange clay.	63.60	204.35	XXXXXX

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS	CONTRACT 35560
						CHECKED CT

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
80C	64.80 - 66.30	64.80	62 41 41	NR	220			Weak to medium strong thinly bedded light yellowish brown locally orange peloidal and bioclastic LIMESTONE with frequent voids (up to 30mm) stained orange. Fractures are 10-20deg closely and medium spaced undulating rough stained orange, surfaces weakened (up to 40mm from surface). (IOG) (BLPL) 64.30 - 64.80m: Driller notes void. No core recovery. 64.80 - 65.10m: Vertical undulating rough fracture stained orange with a veneer of orange clay. 65.10 - 65.60m: Driller notes void. No core recovery.			
				NR							
81C	66.30 - 67.80	66.30	100 100 100		110 350 440						
82C	67.80 - 69.30	67.80	100 100 100								
83CS 84C	69.20 - 69.30 69.30 - 70.80	69.30	100 100 100					69.45 - 70.25m: Strong. Light grey. Rare voids. 70.10 - 70.20m: 40-50deg undulating rough fracture stained orange and black.			
85C 86CS	70.80 - 72.30 70.85 - 71.79	70.80	96 93 93								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD

Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
87C	72.30 - 73.80	72.30	100 100 100					Weak to medium strong thinly bedded light yellowish brown locally orange peloidal and bioclastic LIMESTONE with frequent voids (up to 30mm) stained orange. Fractures are 10-20deg closely and medium spaced undulating rough stained orange, surfaces weakened (up to 40mm from surface). (IOG) (BLPL) 72.10 - 73.00m: Grey and dark grey mottled orange.			
88C 89CS	73.80 - 75.30 73.93 - 74.13	73.80	100 100 100					74.25 - 74.80m: Light brown becoming dark grey. Frequent shell fossils (up to 50mm) and frequent large voids (up to 80mm).	74.80	193.15	
90C	75.30 - 76.80	75.30	100 100 93	250 50 200 420			Medium strong grey bioclastic LIMESTONE with irregular thin beds of extremely weak orangish brown calcareous siltstone. Bedding fractures are 10deg medium spaced undulating rough, surfaces weakened (up to 5mm from surface). (IOG) (BLPL) Weak grey mottled orangish brown LIMESTONE with frequent calcite filled fossils (up to 80mm) and abundant voids (up to 50mm). Fractures are 10-20deg medium rarely very closely spaced undulating rough. (IOG) (BLPL)	75.40	192.55		
91CS	76.36 - 76.74										
92C	76.80 - 78.30	76.80	100 100 91	50 150 760			76.90 - 77.30m: Dark grey. Bioclastic.	77.30	190.65		
93C	78.30 - 79.80	78.30	100 93 55				Very weak thickly laminated dark grey calcareous SILTSTONE with frequent thin and thick laminae of light grey silt and rare shell debris. Fractures are subhorizontal closely to widely spaced planar smooth. Frequent vertical and randomly orientated incipient fractures. (Lias Group) (BDS) 77.50 - 78.20m: Weak. Dark brownish grey.				
94CS	78.92 - 79.27						79.30 - 79.40m: Thin bed of grey silt (10deg).				
95C	79.80 - 81.30	79.80	100				79.90 - 80.40m: Weak. Dark brownish grey.				

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118	
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS		CONTRACT 35560	
							CHECKED CT	

BOREHOLE LOG



DSRCOH400

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 12

Start Date 30 September 2019 Easting 394666

Scale 1:50

End Date 11 October 2019 Northing 213848 Ground Level 267.95mOD Depth 90.30 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
103C S	88.31 - 88.52							Very weak thickly laminated dark grey calcareous SILTSTONE with frequent thin and thick laminae of light grey silt and rare shell debris. Fractures are subhorizontal closely to widely spaced planar smooth. Frequent vertical and randomly orientated incipient fractures. (Lias Group) (BDS) 88.20m: 20mm bed of grey limestone. 89.35 - 89.55m: Weak dark grey calcareous siltstone with abundant fine to coarse sand sized shell debris. Single thin bed of grey limestone.			xxxxxx
104C	88.80 - 90.30	88.80	100 100 78						90.30	177.65	xxxxxx
Borehole Completed at 90.30m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



DSRCOH412

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 22 October 2019

Easting 394241

Scale 1:50

End Date 29 October 2019

Northing 215146

Ground Level 250.30mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.10							Firm to stiff brown CLAY. Frequent rootlets. (SLIP) (SLIP)			
2ES	0.30							0.20 - 0.25m: Thin bed of sandy angular fine to coarse gravel of limestone.			
1B	0.50 - 0.70							Light brown slightly clayey gravelly fine to coarse SAND. Gravel is subangular fine to coarse limestone. (SLIP) (SLIP)	0.70	249.60	
2D	0.50 - 0.70								0.75	249.55	
3ES	0.50	Nil									
3L	0.75 - 1.20										
4D	0.90 - 1.00										
5D	1.20 - 1.65							Dense locally medium dense light grey and light brown clayey sandy subangular fine to coarse limestone GRAVEL with a medium limestone cobble content. (SLIP) (SLIP)			
6L	1.20 - 2.00	Nil									
7D	2.00 - 2.45	2.00									
8C	2.00 - 3.00		68					Dense light brown sandy very clayey subangular fine to coarse limestone and calcareous mudstone GRAVEL with high limestone cobble content. (SLIP) (SLIP)	2.30	248.00	
9D	2.30 - 2.40										
10C	3.00 - 4.00	2.00	81								
11D	4.00 - 4.45	2.00						Firm becoming stiff very closely fissured thinly laminated light greyish brown silty CLAY with rare pockets (up to 10mm) of orangish brown silt. (FEF) (FE)			
12L	4.00 - 5.00										
13D	4.80 - 4.90							5.60 - 6.30m: Rare decomposed shell fragments (white silt) (up to 5mm).			
14UT	5.00 - 5.45	5.00									
17L	5.00 - 6.00										
15D	5.45 - 5.55										
16D	5.55 - 5.60										
18D	6.00 - 6.45	6.00						Stiff very closely fissured bluish grey mottled greyish brown CLAY with frequent subangular fine and medium gravel sized lithorelicts of very stiff clay. (FEF) (FE)	6.30	244.00	
19L	6.00 - 7.00										
20D	6.50 - 6.60							Stiff becoming very stiff very closely fissured light brown mottled grey slightly gravelly CLAY. Gravel is subangular fine to coarse mudstone lithorelicts. Fissures are stained orange and black. Rare shell fragments (up to 5mm). (FEF) (FE)			
21D	7.00 - 7.45	6.00									
22L	7.00 - 7.60										
23D	7.60 - 8.05	6.00						7.45 - 7.60m: Frequent thin laminae of dark orange shell debris.	7.25	243.05	
24C	7.60 - 9.00	7.50	100								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS	
0.00	0.75	Inspection Pit	Hand tools					
0.75	2.00	Window Sampler	Comacchio 305					
2.00	4.00	Rotary Core	Comacchio 305					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	7.50		0.00	0.50	Concrete	30.00	Standpipe	
			0.50	13.20	Bentonite			
			13.20	30.00	Gravel			
BARREL DIAMETER		HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Inspection pit terminated at 0.75m due to encountering hard strata. Driller notes loss of flush below 22.00m.		35560
128	2.00	22-10-2019 11:00	0.00	Nil	Dry			CHECKED
146	4.00	22-10-2019 17:00	3.00	2.00	2.88			CT
128	7.50	23-10-2019 08:00	3.00	2.00	3.00			
146	30.00	23-10-2019 17:00	12.00	7.50	3.50			
		24-10-2019 08:00	12.00	7.50	3.92			

BOREHOLE LOG



DSRCOH412

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 22 October 2019

Easting 394241

Scale 1:50

End Date 29 October 2019

Northing 215146

Ground Level 250.30mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25D	8.20 - 8.30										
26C 27CS	9.00 - 10.50 9.15 - 9.32	7.50	100 0 0	NI 20 120				Extremely weak dark grey mottled greyish brown MUDSTONE locally disintegrated to claybound angular fine to coarse gravel sized mudstone lithorelicts. Fractures are subhorizontal and randomly orientated intersecting very closely and closely spaced planar smooth stained orange and brown with up to 20mm penetrative discolouration. (FEF) (FE)	9.10	241.20	
28C	10.50 - 12.00	7.50	100 16 16					11.00 - 12.40m: Dark grey.			
29D	11.36 - 11.46										
30C	12.00 - 13.50	7.50	100 20 20	NA				Very stiff (friable) dark grey gravelly silty CLAY. Gravel is subangular fine to coarse gravel sized mudstone lithorelicts. (FEF) (FE)	12.40	237.90	
								Very stiff/extremely weak bluish grey mottled orangish brown clayey SILT/SILTSTONE with abundant fine to coarse sand sized shell debris. (FEF) (FE)	12.80	237.50	
				300				Medium strong grey oolitic and peloidal bioclastic LIMESTONE. Fractures are 20-40deg medium spaced planar and rough with a veneer of dark grey clay. Surfaces weakened (up to 10mm from fracture surfaces). (IOG) (SALS)	13.20	237.10	
31C	13.50 - 15.00	7.50	100 100 100	500 320				Weak to medium strong medium bedded light brown and bluish grey oolitic bioclastic LIMESTONE with medium and widely spaced undulating very thin beds of (firm) light brown sandy clay and extremely weak light brown calcareous mudstone. Fractures are subhorizontal to 20deg medium spaced undulating rough stained orange. (IOG) (SALS)	14.35	235.95	
32C	15.00 - 16.50	7.50	100 100 100	80 300 620				14.85 - 15.25m: Bluish grey.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
4.00	7.50	Window Sampler	Comacchio 305				
7.50	30.00	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		24-10-2019 15:50	25.50	7.50	24.30		CHECKED
		25-10-2019 08:00	25.50	7.50	24.30		CT
		25-10-2019 11:45	30.00	7.50	24.30		

BOREHOLE LOG



DSRCOH412

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 22 October 2019

Easting 394241

Scale 1:50

End Date 29 October 2019

Northing 215146

Ground Level 250.30mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	16.50 - 18.00	7.50	90 90 85					Weak to medium strong medium bedded light brown and bluish grey oolitic bioclastic LIMESTONE with medium and widely spaced undulating very thin beds of (firm) light brown sandy clay and extremely weak light brown calcareous mudstone. Fractures are subhorizontal to 20deg medium spaced undulating rough stained orange. (IOG) (SALS) 16.60 - 16.90m: Subvertical stepped rough fracture open (up to 5mm) partially healed with white and grey calcite. 16.80 - 16.90m: 30deg white calcite vein (up to 40mm thick).			
34CS	17.32 - 17.63							17.80 - 18.70m: Abundant shell fossils (up to 30mm).			
35C	18.00 - 19.50	7.50	100 91 91					18.70 - 18.90m: Bluish grey limestone.			
36C 37CS	19.50 - 21.00 19.58 - 19.86	7.50	100 100 96					19.35 - 19.65m: Bluish grey limestone. 19.58m: PLI suggests very weak. 20.15 - 20.40m: Bluish grey limestone.			
38C	21.00 - 22.50	7.50	120 300 450 100 100 100					Medium strong to strong medium bedded light brown and light grey oolitic and bioclastic LIMESTONE with frequent elongated and irregular voids (up to 80mm) stained orange and brown partially infilled with orangish brown sandy clay. Fractures are 10-20deg medium spaced undulating rough stained orangish brown. (IOG) (SALS) 22.14 - 22.32m: Prominent (open 10-20mm) subvertical fracture with calcite precipitation (up to 20mm) (see water strike notes).	20.60	229.70	
39C 40CS	22.50 - 24.00 22.50 - 22.91	7.50	97 94 94					Medium strong light grey LIMESTONE. Frequent shell fossils (up to 50mm). (IOG) (ASLS) 23.85 - 23.95m: Extremely weak dark grey siltstone.			
41C	24.00 - 25.50	7.50	350					Very stiff dark greyish brown silty CLAY with abundant shell debris. (IOG) (ASLS)	23.65 23.95	226.65 226.35	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH412

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 22 October 2019

Easting 394241

Scale 1:50

End Date 29 October 2019

Northing 215146

Ground Level 250.30mOD

Depth 30.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42C	25.50 - 27.00	7.50	96 NA	450	25.50			Medium strong light brown bioclastic LIMESTONE. Shell fossils replaced by calcite. (IOG) (BLPL) 24.65 - 24.80m: Subvertical undulating rough fracture stained brown. 24.65 - 25.80m: Thinly bedded. Bedding is irregular. Closely spaced thick laminae and thin beds of (firm) greyish brown clay.	24.20	226.10	
			83						25.80	224.50	
43C	27.00 - 28.50	7.50	100 NI	100				Very weak to weak light grey and light brown oolitic LIMESTONE. Fractures are subhorizontal to 10deg medium rarely widely spaced undulating rough with rare orangish brown staining and a veneer of light brown clay. (IOG) (BLPL) 26.40 - 26.60m: 70deg incipient fracture. 26.80 - 27.30m: 70-80deg planar rough fracture stained light yellow.			
			97 86								
44CS	27.76 - 28.02							27.70 - 27.75m: Extremely weak brown calcareous mudstone.			
45C	28.50 - 30.00	7.50	99	100				28.20 - 28.25m: (Firm) thinly laminated light brown and black clay. 28.25 - 28.35m: Tending to weak light brown calcareous siltstone. 28.75 - 28.90m: 70deg incipient fracture.			
			99 95								
46CS	29.50 - 29.76							29.50 - 29.60m: 10mm bed (20deg) of brown sandy clay. Sand is ooids and shell debris.			
									30.00	220.30	

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
				25.50	7.50	24.30	30

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)		TYPE
							1118

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1D 1ES 2C 2ES 3D	0.10 - 0.20 0.10 - 0.20 0.30 - 1.80 0.30 - 0.40 0.30 - 0.40		74 40 15				H 85	Firm to stiff dark brown slightly sandy gravelly CLAY with a low limestone cobble content. Gravel is subangular fine to coarse limestone. (TOP)	0.30	274.30	
				NI 140 345				Light yellowish brown slightly sandy angular to subrounded fine to coarse limestone GRAVEL with a medium subrounded limestone cobble content. (HDD) (HEAD)	1.00	273.60	
4C	1.80 - 3.00	1.80	100 76 56					Weak thinly to medium bedded light yellowish brown locally peloidal bioclastic and oolitic LIMESTONE with frequent shell fragments (up to 30mm). Fractures are subhorizontal to 20deg closely and medium spaced undulating rough rarely stained orangish brown infilled (up to 10mm) with light yellowish brown sandy clayey silt. (IOG) (SALS)			
5CS	2.40 - 2.65							2.40m: PLI suggests very weak.			
6C	3.00 - 4.50	3.00	100 95 66	NI 210 390				2.65 - 2.75m: Extremely weak light brown bioclastic calcareous mudstone.	2.80	271.80	
7CS	3.55 - 3.95							Medium strong to strong light grey and light brown bioclastic LIMESTONE. Shell fragments replaced by white calcite. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough rarely stained orangish brown and rarely infilled (up to 10mm) with light yellowish brown clayey silt, surfaces weakened (up to 5mm from fracture surface). (IOG) (SALS)			
8C 9CS	4.50 - 6.00 4.50 - 4.70	4.50	100 100 89					4.90 - 5.40m: Frequent voids (up to 30mm) stained orange brown partially infilled with orangish brown sandy clay.			
10C 11CS	6.00 - 7.50 6.16 - 6.47	6.00	100 100 65	NI 90 165				Very weak greyish brown LIMESTONE. Single 30deg planar rough fracture. (IOG) (SALS)	6.00	268.60	
								6.35 - 6.45m: Extremely weak orangish brown mudstone with abundant shell debris.	6.45	268.15	
12C	7.50 - 9.00	7.50	100 100 88					Medium strong light brown and light grey bioclastic LIMESTONE with closely and medium spaced very thin beds of (firm) light brown slightly sandy clay with abundant shell debris. Fractures are subhorizontal to 20deg closely spaced undulating rough stained orangish brown infilled (up to 10mm) with orange clay. (IOG) (ASLS)			
								7.55 - 8.10m: Subvertical undulating rough fracture stained orangish brown and infilled (up to 20mm) with calcite.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.30	Inspection Pit	Hand tools						
0.30	90.00	Rotary Core	Comacchio GEO405						

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
168	4.50	0.00	0.50	Concrete	59.80	Standpipe	1118
140	90.00	0.50	28.30	Bentonite			
		28.30	60.30	Gravel			
		60.30	90.00	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Inspection pit terminated at 0.30m due to encountering hard strata. Driller notes reduced flush returns 1.80-6.00m (10-40% returned) and loss of flush 6.00-90.00m.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
146	90.00	19-09-2019 14:40	0.00	Nil	Dry		CHECKED
		19-09-2019 16:30	4.50	3.00	4.00		CT
		20-09-2019 08:30	4.50	3.00	4.20		
		20-09-2019 15:30	15.00	13.50	14.70		
		23-09-2019 08:30	15.00	13.50	14.90		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
13CS	8.22 - 8.58							Weak to medium strong medium bedded light yellowish brown oolitic LIMESTONE with frequent thick laminae and very thin beds of shell debris. Fractures are subhorizontal to 20deg closely and medium spaced planar rough stained orangish brown rarely infilled (up to 20mm) with dark yellowish brown sandy clay. (IOG) (BLPL) 8.90 - 10.25m: Light yellowish brown and dark yellowish brown. 9.45 - 10.35m: Fractures are 10deg closely spaced planar rough. 11.10 - 11.15m: 50mm bed of extremely weak thinly laminated orangish brown calcareous siltstone. 11.40 - 11.55m: 70deg undulating rough fracture stained orangish brown. 12.60 - 12.70m: 70-80deg undulating rough fracture stained orangish brown. 12.70 - 13.00m: Vertical incipient fracture with localised calcite mineralisation. 13.40 - 13.60m: 60deg undulating rough stained orange fracture. 14.40 - 14.90m: Abundant fossils (up to 30mm) replaced by calcite. 14.90 - 15.00m: 30deg planar rough fracture. 15.65 - 17.15m: 80deg to subvertical undulating rough stained orangish brown fracture with a veneer of brown clay and localised calcite mineralisation.	8.20	266.40	
14C	9.00 - 10.50	9.00	100 97								
15CS	9.32 - 9.54		87								
16C	10.50 - 12.00	10.50	100 100								
17CS	10.88 - 11.07		88								
18C	12.00 - 13.50	12.00	100 100								
19CS	12.33 - 12.60		91								
20C	13.50 - 15.00	13.50	100 100 87								
21CS	14.14 - 14.43			750							
22C	15.00 - 16.50	15.00	100 87 55								
23CS	15.54 - 15.77										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		23-09-2019 16:25	22.50	21.00	22.40		CHECKED
		24-09-2019 08:30	22.50	21.00	22.40		
		24-09-2019 16:30	42.00	40.50	41.20		
		25-09-2019 08:30	42.00	40.50	41.90		
		25-09-2019 16:30	54.00	52.50	39.95	CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	16.50 - 18.00	16.50	100 86 85					Weak to medium strong medium bedded light yellowish brown oolitic LIMESTONE with frequent thick laminae and very thin beds of shell debris. Fractures are subhorizontal to 20deg closely and medium spaced planar rough stained orangish brown rarely infilled (up to 20mm) with dark yellowish brown sandy clay. (IOG) (BLPL) 16.80 - 16.90m: Extremely weak light brown calcareous siltstone.			
25CS	17.65 - 17.88										
26C 27CS	18.00 - 19.50 18.07 - 18.34	18.00	100 89 76					18.50 - 18.70m: Subvertical white calcite vein (3mm thick).			
28C	19.50 - 21.00	19.50	96 94					19.50 - 19.75m: 70deg undulating rough fracture stained orange infilled (1mm) with calcite. 19.80m: 5mm thick dark orange porous ironstone concretion.			
29CS	19.81 - 20.05		69					20.15 - 20.90m: Subvertical undulating rough fracture stained orange infilled (1mm) with calcite. Intersected by 70deg to subvertical incipient fractures stained orange.			
30C	21.00 - 22.50	21.00	98 98 71					21.05 - 21.25m: 60deg undulating rough fracture stained orange.			
31CS	21.85 - 22.13							21.55 - 21.70m: 60-70deg undulating rough fracture stained orangish brown.			
32C	22.50 - 24.00	22.50	90 59 17	NI				22.50 - 23.05m: Recovered non-intact. Possible intersecting fractures.			
				NI				23.00 - 23.05m: Firm light brown sandy clay with abundant shell debris.			
33C	24.00 - 25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118

BARREL DIAMETER		HOLE PROGRESS				REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		26-09-2019 08:30	54.00	52.50	49.80		CHECKED
		26-09-2019 16:20	67.50	66.00	49.10		
		27-09-2019 08:30	67.50	66.00	61.15		
		27-09-2019 15:45	88.50	87.00	52.25		
		30-09-2019 08:30	88.50	87.00	56.85	CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
34CS	24.57 - 25.04		100					Weak to medium strong medium bedded light yellowish brown oolitic LIMESTONE with frequent thick laminae and very thin beds of shell debris. Fractures are subhorizontal to 20deg closely and medium spaced planar rough stained orangish brown rarely infilled (up to 20mm) with dark yellowish brown sandy clay. (IOG) (BLPL)			
			100	NI							
			79								
35C	25.50 - 27.00	25.50	100					25.15 - 25.55m: 80deg undulating rough fracture stained orangish brown.			
36CS	25.70 - 26.05		87								
			66					26.00 - 26.10m: 60deg planar rough fracture stained orangish brown.			
								26.35 - 26.55m: 50-80deg intersecting planar rough fractures stained orangish brown.			
37C	27.00 - 28.50	27.00	100					26.60 - 28.10m: Bioclastic. Closely spaced very thin beds of fine and medium gravel sized shell fossils.			
			81	40				27.10 - 27.30m: 60-70deg planar rough fracture stained orangish brown.			
			68	105							
				310				28.00 - 28.50m: Vertical incipient planar rough fracture.			
38C	28.50 - 30.00	28.50	100								
			100								
			87								
39C	30.00 - 31.50	30.00	95								
			95								
			64								
40CS	31.00 - 31.32										
41C	31.50 - 33.00	31.50	97	NI				31.60 - 32.40m: 70deg to subvertical undulating rough fracture stained orange.			
			65	55							
			37	110							

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560
			30-09-2019 09:00	90.00	88.50	54.95				CHECKED
			01-10-2019 08:30	90.00	88.50	63.20				CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42CS	32.41 - 32.66			NI				Weak to medium strong medium bedded light yellowish brown oolitic LIMESTONE with frequent thick laminae and very thin beds of shell debris. Fractures are subhorizontal to 20deg closely and medium spaced planar rough stained orangish brown rarely infilled (up to 20mm) with dark yellowish brown sandy clay. (IOG) (BLPL)			
				NI 165 240							
43C	33.00 - 34.50	33.00		99				32.10 - 32.40m: Drilling induced horizontal fractures. 32.40m: 10mm bed of light brown sandy silt. 32.40 - 32.60m: Frequent irregular voids (up to 50mm). 33.40 - 35.10m: Medium strong light yellowish brown bioclastic limestone with medium spaced very thin beds of orangish brown sandy silt. Fractures are 0-30deg and 60-90deg intersecting undulating rough stained orangish brown.			
				38							
				38							
44C	34.50 - 36.00	34.50		NI				36.20 - 36.60m: 70deg to subvertical undulating rough fracture stained orange. Frequent tubular voids (up to 10mm diam x 50mm). 37.00 - 37.35m: Extremely weak light brown, brown and orangish brown bioclastic mudstone thinly and thickly interlaminated with siltstone and bioclastic limestone. Rare thin laminae of dark brown clay. 37.80 - 37.85m: 70deg planar rough fracture infilled (10-20mm) with white calcite. Surfaces stained orange. 37.85 - 39.60m: Bioclastic. Medium spaced thick laminae and very thin beds of extremely weak light brown siltstone.			
				NI 90 160							
				99 81 81							
45CS	35.25 - 38.50			NI 230 310							
46C	36.00 - 37.50	36.00		97				Weak thin bedded light grey and yellowish brown locally bioclastic LIMESTONE with medium and widely spaced very thin beds of (firm) light brown slightly sandy clay. Abundant voids (up to 60mm) partially infilled with dark yellowish brown sandy clay. Fractures are subhorizontal to 10deg closely spaced undulating rough stained orangish brown rarely with a veneer of light brown clay. (IOG) (BLPL)		39.60	235.00
				83							
				67							
47C	37.50 - 39.00	37.50		100							
				83							
				49							
48C	39.00 - 40.50	39.00		92							
				83							
49CS	39.37 - 39.58			NI 60 170							

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
50C	40.50 - 42.00	40.50	100 77 23					Weak thinly bedded light grey and yellowish brown locally bioclastic LIMESTONE with medium and widely spaced very thin beds of (firm) light brown slightly sandy clay. Abundant voids (up to 60mm) partially infilled with dark yellowish brown sandy clay. Fractures are subhorizontal to 10deg closely spaced undulating rough stained orangish brown rarely with a veneer of light brown clay. (IOG) (BLPL)			
51CS	41.50 - 41.64										
52C	42.00 - 43.50	42.00	100 73 69					42.90m: 80mm void with dark brown concretionary staining. Possible ironstone nodule. 42.90 - 44.10m: Very thinly bedded. Bedding is irregular.			
53C	43.50 - 45.00	43.50	100 92 82								
54CS	43.76 - 44.12										
				30 160 430				Weak to medium strong medium bedded light brown and light yellowish brown oolitic LIMESTONE with frequent thick laminae and very thin beds of shell debris. Fractures are 10-20deg closely and medium spaced planar rough stained orangish brown. (IOG) (BLPL)	44.10	230.50	
55C	45.00 - 46.50	45.00	97 77 70					45.00 - 45.45m: Bioclastic. Subvertical undulating rough fracture stained light orange.			
56CS	45.55 - 46.00							45.45 - 45.55m: Extremely weak thinly laminated greyish brown mudstone.			
								46.10 - 47.05m: Peloidal. Frequent shell fossils (up to 50mm).			
57C	46.50 - 48.00	46.50	97 90 59					Weak thinly to medium bedded light grey and yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm) partially infilled with dark yellowish brown sandy clay. With medium spaced very thin beds (up to 50mm) of (soft) orange slightly sandy clay. Fractures are subhorizontal to 30deg closely and medium spaced undulating rough stained orangish brown rarely infilled (up to 5mm) with light brown clay. Fracture surfaces weakened (up to 20mm either side of fracture). (IOG) (BLPL)	47.05	227.55	
58C	48.00 - 49.50	48.00									

Continued Next Page

HOLE CONSTRUCTION		PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush	
TOP (m)	BASE (m) TYPE			DEPTH (m)	CASING (m) ROSE TO (m) AFTER (min) REMARKS
CASING DEPTH		BACKFILL		INSTRUMENTATION	
DIAM (mm)	BASE (m)	TOP (m) BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER		HOLE PROGRESS		REMARKS	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m) CASING (m) WATER (m)		
				CONTRACT	
				35560	
				CHECKED	
				CT	

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
59C	49.50 - 51.00	49.50	79					Weak thinly to medium bedded light grey and yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm) partially infilled with dark yellowish brown sandy clay. With medium spaced very thin beds (up to 50mm) of (soft) orange slightly sandy clay. Fractures are subhorizontal to 30deg closely and medium spaced undulating rough stained orangish brown rarely infilled (up to 5mm) with light brown clay. Fracture surfaces weakened (up to 20mm either side of fracture). (IOG) (BLPL)			
			43								
			29								
			99								
			91								
			66								
60CS	50.75 - 51.00							50.75m: PLI suggests weak to medium strong.			
61C	51.00 - 52.50	51.00	100						51.45	223.15	
			97								
			87								
			30								
			210								
			300								
62C	52.50 - 54.00	52.50	100					Medium strong locally strong medium bedded light grey and light brown locally peloidal bioclastic LIMESTONE. Fractures are subhorizontal to 10deg medium spaced planar smooth stained orange rarely infilled (up to 5mm) with orangish brown slightly sandy clay. Surfaces weakened (up to 10mm either side of fracture). (IOG) (BLPL)			
			100					52.50 - 52.90m: Abundant voids (up to 80mm) stained orangish brown and partially infilled with orangish brown slightly sandy clay.			
			100								
			69								
63CS	53.06 - 53.37										
64C	54.00 - 55.50	54.00	100	NI				Weak to medium strong thinly to medium bedded light grey and light yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 50mm) partially infilled with yellowish brown sandy clay. With closely and medium spaced very thin beds of (firm) orangish brown clay. Fractures are subhorizontal to 15deg closely spaced undulating rough stained orangish brown rarely with a veneer of light brown clay. Surfaces weakened (up to 10mm either side of fracture). (IOG) (BLPL)	53.95	220.65	
			90	65							
			73	190							
65C	55.50 - 57.00	55.50	100					55.30 - 55.70m: Bluish grey mottled light brown.			
			89								
			77								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
66CS	56.22 - 56.64			NI 135 410				Weak to medium strong thinly to medium bedded light grey and light yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 50mm) partially infilled with yellowish brown sandy clay. With closely and medium spaced very thin beds of (firm) orangish brown clay. Fractures are subhorizontal to 15deg closely spaced undulating rough stained orangish brown rarely with a veneer of light brown clay. Surfaces weakened (up to 10mm either side of fracture). (IOG) (BLPL) 56.25 - 57.70m: Fractures are closely and medium spaced. 57.00 - 57.70m: Voids are rare. 57.65 - 57.70m: Stained orange and brown. Bioturbated. Frequent shell fossils.			
67C	57.00 - 58.50	57.00	95 67 53	NI 160 360					57.70	216.90	
68C	58.50 - 60.00	58.50	100 85 74					Weak light grey and light yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm, burrows and fossils) partially infilled with orange and yellowish brown slightly sandy clay. Frequent nodular ironstone concretions. Fractures are subhorizontal to 20deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL) 57.90 - 58.60m: Weak to medium strong dark bluish grey bioclastic limestone. Rare voids and ironstone nodules (up to 10mm). 60.00 - 60.10m: Medium strong grey limestone. Rare voids. 60.25 - 60.30m: Medium strong grey bioclastic limestone.			
69CS	59.58 - 59.89										
70C	60.00 - 61.50	60.00	100 43 43	NA				Very stiff fissured thinly laminated dark bluish grey clayey SILT with closely spaced thin laminae of grey silt. Fissures are subhorizontal closely spaced planar smooth stained orangish brown. (Lias Group) (BDS) 60.80 - 60.85m: Thinly laminated grey silt.	60.30	214.30	
71CS	60.97 - 61.18			NI 260 550					60.85	213.75	
72C	61.50 - 63.00	61.50	67 57 33					Extremely weak to very weak thinly laminated dark bluish grey and grey MUDSTONE locally tending to siltstone. Frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (BDS) 61.25 - 65.66m: 70deg planar smooth with orange staining. 61.50 - 62.00m: Assessed zone of core loss. 62.20 - 62.50m: Intersecting 60deg and 40deg planar smooth fractures stained orangish brown with 20mm penetrative discolouration. 62.50 - 63.10m: Horizontal fracture stained orangish brown with 20mm penetrative discolouration. 63.15 - 63.80m: Medium spaced thin beds of medium strong grey limestone and weak dark grey calcareous siltstone. Rare thin laminae of black pyritic fine sand.			
73C	63.00 - 64.50	63.00	97 97 97								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
74C	64.50 - 66.00	64.50	100 100 95		30 150 330			Extremely weak to very weak thinly laminated dark bluish grey and grey MUDSTONE locally tending to siltstone. Frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (BDS)			
75C	66.00 - 67.50	66.00	100 71 71		NI 300 620			65.75 - 65.95m: 60deg planar smooth fracture with yellowish brown staining. 66.50 - 67.20m: Locally tending to very stiff thinly laminated dark grey clayey silt.			
76CS	67.26 - 67.45										
77C	67.50 - 69.00	67.50	91 91 81								
78C	69.00 - 70.50	69.00	100 100								
79CS	69.33 - 69.52		93								
80C	70.50 - 72.00	70.50	100 80 57	NA				70.05 - 70.40m: Medium strong grey bioclastic limestone. Rare ironstone nodules (up to 20mm). 70.50 - 70.80m: Very stiff dark grey clayey silt.			
81CS	71.61 - 71.96										
82C	72.00 - 73.50	72.00									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
83C	73.50 - 75.00	73.50	100 100 100 95 95 81					Extremely weak to very weak thinly laminated dark bluish grey and grey MUDSTONE locally tending to siltstone. Frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (BDS) 72.75 - 73.50m: Subvertical undulating rough fracture. 73.10m: Coarse gravel sized limestone nodule. 73.90 - 73.95m: Grey silt.			
84C	75.00 - 76.50	75.00	100 57 57	NA				75.10 - 75.70m: Tending to very stiff thickly laminated dark grey clayey silt with rare thin laminae of dark grey clay.			
85CS	76.00 - 76.30		50 350 530								
86C	76.50 - 78.00	76.50	100 100 78					76.35 - 76.40m: Grey silt.			
87CS	77.04 - 77.35										
88C	78.00 - 79.50	78.00	100 100 99					77.35 - 77.55m: Subvertical undulating rough fracture. 77.50 - 77.56m: Medium strong grey bioclastic limestone. 78.25 - 78.40m: Medium strong grey bioclastic limestone.			
89C	79.50 - 81.00	79.50	100 100 96								
90CS	79.90 - 80.18										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
91C	81.00 - 82.50	81.00	100 100 97		90 270 440			Extremely weak to very weak thinly laminated dark bluish grey and grey MUDSTONE locally tending to siltstone. Frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (BDS) 80.55m: 10mm bed of grey limestone. 81.70 - 81.95m: 60deg undulating rough fracture.			
92C	82.50 - 84.00	82.50	100 100 100					82.50 - 82.62m: Medium strong grey and dark grey bioclastic limestone.			
93CS	83.01 - 83.27							83.50 - 83.60m: Mottled light greyish brown.			
94C	84.00 - 85.50	84.00	100 100 88					84.50 - 85.50m: Rare thin laminae of firm dark grey clay.			
95C	85.50 - 87.00	85.50	100 100 84					85.55 - 85.70m: Weak.			
96CS	86.06 - 86.24							86.60m: 50mm spherical pyrite nodule.			
97C	87.00 - 88.50	87.00	100 57 54	NA				87.00 - 87.60m: Recovered as stiff extremely closely fissured thinly laminated dark grey clayey silt.			
								Continued Next Page			

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m) TYPE	
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	35560
							CHECKED
							CT

BOREHOLE LOG



DSRCOH414

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 12

Start Date 19 September 2019 Easting 393482

Scale 1:50

End Date 28 September 2019 Northing 215561 Ground Level 274.60mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
98C	88.50 - 90.00	88.50	63 63 63					Extremely weak to very weak thinly laminated dark bluish grey and grey MUDSTONE locally tending to siltstone. Frequent thin laminae and lenses of light grey silt. Fractures are subhorizontal closely and medium spaced planar smooth. (Lias Group) (BDS) 88.15 - 88.35m: 60deg undulating rough fracture. 88.35 - 88.50m: Very weak.			
99CS	88.95 - 89.20			NR			89.45 - 90.00m: Assessed zone of core loss.				
Borehole Completed at 90.00m									90.00	184.60	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1ES	0.00 - 0.10							Grass over dark brown slightly gravelly SILT. Gravel is angular and subangular fine to coarse limestone. Frequent roots (up to 3mm diam) and rootlets. (HDD) (HEAD) Soft (friable) dark brown slightly sandy gravelly silty CLAY with a medium subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (HDD) (HEAD) Soft brown slightly gravelly silty CLAY with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (HDD) (HEAD) Light greyish brown slightly clayey slightly gravelly medium and coarse SAND with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (HDD) (HEAD) Very dense light grey slightly sandy angular and subangular fine to coarse limestone GRAVEL. (GOG) (WHL) Weak light brown ooidal LIMESTONE. Fractures are subhorizontal to 10deg and subvertical closely spaced undulating rough rarely stained orangish brown. (GOG) (WHL) 2.80 - 2.95m: Locally extremely weak. Weak light brown bioclastic and ooidal LIMESTONE with frequent calcite veining (up to 3mm). Fractures are subhorizontal to 20deg closely spaced undulating rough rarely infilled (up to 3mm) with orangish brown sandy clay. (GOG) (HMB) 3.40 - 3.45m: Extremely weak orangish brown ooidal limestone. 4.00 - 4.20m: Subvertical undulating rough fracture Medium strong light brown bioclastic and ooidal LIMESTONE with frequent calcite veining (up to 3mm). Fractures are subhorizontal and 30deg to 40deg closely and medium spaced undulating rough stained orangish brown. (GOG) (HMB) 5.15 - 5.20m: Extremely weak. Weak light brown ooidal LIMESTONE with frequent calcite veining (up to 3mm). Fractures are subhorizontal and 30-40deg closely and medium spaced undulating rough stained orangish brown. (GOG) (HMB) 6.70 - 6.90m: 70deg undulating rough fracture. 7.30 - 7.55m: Subvertical undulating rough fracture stained orangish brown.	0.20	280.30	
1B	0.10 - 0.20						0.50		280.00		
2D	0.10 - 0.20						0.80		279.70		
2ES	0.30 - 0.40						1.00		279.50		
3B	0.30 - 0.50						1.40		279.10		
4D	0.30 - 0.40										
3ES	0.50 - 0.60										
5B	0.50 - 0.70	Nil									
6D	0.50 - 0.60	Nil									
4ES	0.80 - 0.90										
7B	0.80 - 1.00										
8D	0.80 - 0.90										
9L	1.00 - 1.40										
10C	1.80 - 3.20	1.80	100 100 54	NI 90 190							
11CS	2.45 - 2.65										
12C	3.20 - 4.70	3.20	100 100 43	NI 100 200				3.30	277.20		
13CS	4.35 - 4.55										
14C	4.70 - 6.20	4.70	100 100 73	NI 170 230				5.05	275.45		
15CS	5.50 - 5.65										
16C	6.20 - 7.70	6.20	100 80 67	NI 170 250				6.20	274.30		
17C	7.70 - 9.20	7.70	100 53								

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.00	Inspection Pit	Hand tools					Groundwater not encountered prior to use of flush
1.00	1.40	Window Sampler	Comacchio GEO405					
1.80	100.95	Rotary Core	Comacchio GEO405					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1143
168	1.80		0.00	0.50	Concrete	85.70	Standpipe	
140	100.95		0.50	22.00	Bentonite			
			22.00	86.20	Gravel			
			86.20	100.95	Bentonite			
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Borehole advanced by reaming casing (168mm) 1.40-1.80m. Driller notes loss of flush throughout borehole.		35560
102	1.40	29-05-2020 10:00	0.00	Nil	Dry			CHECKED
168	1.80	29-05-2020 10:30	1.00	Nil	Dry			CT
146	100.95	01-06-2020 08:30	1.00	Nil	Dry			
		01-06-2020 16:00	19.10	19.10	Dry			
		02-06-2020 08:30	19.10	19.10	Dry			

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18CS	8.65 - 8.80		49						8.70	271.80	[Brick pattern legend]
19C	9.20 - 10.70	9.20	100 51 39	130 150 220			Strong light brownish grey crystalline LIMESTONE locally tending to extremely weak brown limestone. Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (GOG) (HMB)	9.85	270.65		
20C	10.70 - 12.20	10.70	100 83 83	NI 50 150			Extremely weak grey MUDSTONE closely and medium interbedded with weak light grey bioclastic siltstone. Rare bivalve fossils (up to 4mm). Fractures are subhorizontal to 10deg closely spaced undulating rough rarely stained orangish brown. (FEF) (FE)	10.85	269.65	[Horizontal line legend]	
21CS 22C 22C	11.85 - 12.20 12.00 - 13.70 12.20 - 13.70	12.20	100 97 20	NI 50 200			Weak light grey bioclastic MUDSTONE. Frequent bivalve fossils (up to 8mm). Fractures are subhorizontal and 10deg closely and medium spaced undulating rough. (FEF) (FE) 11.95 - 12.20m: Medium bed of weak light grey bioclastic siltstone. Extremely weak grey MUDSTONE. Fractures are subhorizontal to 10deg and 25-35deg closely spaced undulating rough rarely stained orangish brown. (FEF) (FE) 12.50 - 12.70m: 70deg undulating rough fracture.	12.20	268.30		
23C	13.70 - 15.20	13.70	100 95 65								[Horizontal line legend]
24CS	14.65 - 14.90			NI 230 390			Strong light grey crystalline LIMESTONE with frequent calcite veining (up to 5mm). Fractures are subhorizontal to 10deg medium spaced undulating rough. (FEF) (FE)	14.65	265.85		
25C 26CS	15.20 - 16.70 15.25 - 15.65	15.20	99 60 56				15.25 - 15.50m: Thinly laminated and cross-bedded. Coarse grained. Frequent shell fragments (up to 20mm). 15.50 - 16.10m: Medium interbedded, fine and coarse grained.				[Brick pattern legend]

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1143
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS				REMARKS		CONTRACT 35560
		DATE TIME		DEPTH (m)	CASING (m)	WATER (m)		CHECKED CT
		02-06-2020 16:00		37.70	37.70	Dry		
		03-06-2020 08:30		37.70	37.70	Dry		
		03-06-2020 16:00		61.70	61.70	Dry		
		04-06-2020 08:30		61.70	61.70	Dry		
		04-06-2020 16:00		85.80	85.80	Dry		

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27C	16.70 - 17.90	16.70	100 9 0	NI				Weak thinly laminated grey MUDSTONE. (FEF) (FE)	16.10	264.40	
				NI				Extremely weak grey MUDSTONE locally disintegrated to soft very gravelly clay. Gravel is angular and subangular fine to coarse mudstone lithorelicts. Fractures are 10-20deg closely and medium spaced undulating rough. (FEF) (FE)	16.40	264.10	
28CS 29C	17.75 - 18.00 17.90 - 19.10	17.90	100 88 75	NI 150 260				18.50 - 19.00m: Fractures are subhorizontal to 10deg and 40-50deg closely spaced undulating rough.			
30C	19.10 - 19.70	19.10	92 62 0								
31C	19.70 - 21.20	19.70	100 93 43								
32C	21.20 - 22.70	21.20	100 97 33								
33CS	21.65 - 21.80										
34C	22.70 - 24.20	22.70	93 87 67	110 220 370				Strong light brown ooidal and bioclastic crystalline LIMESTONE. Frequent shell fragments (up to 5mm). Rare bivalve fossils (up to 30mm). Fractures are subhorizontal to 10deg and subvertical closely and medium spaced undulating rough stained orangish brown. (IOG) (SALS) 22.00 - 22.20m: Locally disintegrated to orangish brown slightly clayey gravelly fine to coarse sand.	22.00	258.50	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 05-06-2020 08:30 85.80 85.80 80.00 05-06-2020 16:00 100.95 100.95 81.20			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
35C	24.20 - 25.70	24.20	99 93 91								
36CS	24.65 - 25.05										
37C	25.70 - 27.20	25.70	99 96 95	90 290 380				Weak light orangish brown ooidal and bioclastic LIMESTONE. Frequent shell fragments (up to 5mm). Fractures are subhorizontal to 20deg medium spaced undulating rough rarely stained orangish brown. (IOG) (SALS) 26.65 - 26.95m: Rare light grey coarse grained limestone clasts.	25.70	254.80	
38C	27.20 - 28.70	27.20	100 96 96	170 360 800				Medium strong grey locally light brown bioclastic and peloidal LIMESTONE. Frequent shell fragments (up to 10mm). Fractures are subhorizontal to 10deg mainly medium spaced undulating rough. (IOG) (SALS) 27.50 - 27.80m: Thick laminae of weak light orangish brown ooidal and bioclastic limestone.	27.15	253.35	
39C	28.70 - 30.20	28.70	100 99 92					28.70 - 30.20m: Weak. Frequent shell fragments (up to 50mm).			
40C	30.20 - 31.70	30.20	100 95 87	100 200 370				Weak orangish brown bioclastic LIMESTONE. Frequent burrows (up to 50mm). Frequent shell fragments (up to 20mm). Single fossil bone fragment (30x20x100mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (IOG) (SALS)	30.35	250.15	
41CS	30.55 - 30.90										
42C	31.70 - 33.20	31.70	100 87	NI 230 490				Strong light brown bioclastic and crystalline LIMESTONE. Frequent shell fragments (up to 20mm). Frequent calcite veining (up to 4mm). Fractures are subhorizontal to 15deg, rarely 50deg mainly medium spaced undulating rough stained orangish brown. (IOG) (ASLS)	31.20	249.30	
43CS	32.00 - 32.30										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	
BARREL DIAMETER			HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	
								CONTRACT
								35560
								CHECKED
								CT

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
44C	33.20 - 34.70	33.20	60 100 93 87					Strong light brown bioclastic and crystalline LIMESTONE. Frequent shell fragments (up to 20mm). Frequent calcite veining (up to 4mm). Fractures are subhorizontal to 15deg, rarely 50deg mainly medium spaced undulating rough stained orangish brown. (IOG) (ASLS) 32.25 - 32.85m: Locally disintegrated to orangish brown slightly clayey sand. 32.80 - 32.95m: Parallel subvertical fractures closely spaced undulating rough.	34.10	246.40	
45C	34.70 - 36.20	34.70	100 93 92	NI 220 320				Medium strong thinly laminated light yellowish brown bioclastic and ooidal LIMESTONE. Fractures are subhorizontal and 10deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL)			
46CS	35.40 - 35.75										
47C	36.20 - 37.70	36.20	100 88 86					36.80 - 37.00m: Subvertical fracture undulating rough stained orangish brown. 37.35 - 37.50m: 45deg fracture undulating rough stained orangish brown.			
48C	37.70 - 39.20	37.70	100 93 93	70 150 630				Medium strong light brown ooidal LIMESTONE. Frequent shell fragments (up to 5mm). Fractures are subhorizontal to 10deg closely and medium spaced undulating rough. (IOG) (BLPL)	38.00	242.50	
49C	39.20 - 40.70	39.20	100 71 71	NI 250 350				Medium strong light brown bioclastic LIMESTONE. Frequent shell fragments (up to 5mm). Fractures are subhorizontal to 20deg mainly medium spaced undulating rough stained orangish brown. (IOG) (BLPL)	39.45	241.05	
50CS	39.42 - 39.68										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
51C	40.70 - 42.20	40.70	100 71 60					Medium strong light brown bioclastic LIMESTONE. Frequent shell fragments (up to 5mm). Fractures are subhorizontal to 20deg mainly medium spaced undulating rough stained orangish brown. (IOG) (BLPL) 40.05 - 40.20m: Subvertical fracture undulating rough stained orangish brown. 40.70 - 41.35m: Speckled black.	41.35	239.15	
52C	42.20 - 43.70	42.20	100 97 97					Medium strong light greyish brown ooidal LIMESTONE. Rare shell fragments (up to 10mm). Fractures are subhorizontal to 10deg mainly medium spaced undulating rough. (IOG) (BLPL) 42.70 - 42.95m: Frequent shell fragments.			
53CS	43.40 - 43.70										
54C	43.70 - 45.20	43.70	100 97 93								
55C	45.20 - 46.70	45.20	100 97 97					45.50 - 46.25m: Frequent shell fragments.			
56CS	45.95 - 46.25										
57C	46.70 - 48.20	46.70	100 97 97					46.25 - 46.30m: Subhorizontal fracture infilled (up to 10mm) with orangish brown sandy clay.			
58CS	46.85 - 47.05										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
59C	48.20 - 49.70	48.20	100 97 97					Medium strong light greyish brown ooidal LIMESTONE. Rare shell fragments (up to 10mm). Fractures are subhorizontal to 10deg mainly medium spaced undulating rough. (IOG) (BLPL) 48.60m: Subvertical fracture undulating rough.			
60C	49.70 - 51.20	49.70	100 52 47	NI 200 70				Medium strong light greyish brown ooidal and peloidal LIMESTONE. Fractures are subhorizontal to 10deg medium spaced rarely widely spaced undulating rough rarely stained orangish brown. (IOG) (BLPL) 49.50 - 49.70m: Subvertical fracture undulating rough. 49.70 - 50.30m: Subvertical fracture undulating rough. 50.35 - 50.75m: Subvertical fracture undulating rough stained orangish brown.	49.50	231.00	
61C	51.20 - 52.70	51.20	100 32 28	30 420 1070							
62CS	51.70 - 51.95										
63C	52.70 - 54.20	52.70	100 99 99								
64CS	52.95 - 53.20										
65C	54.20 - 55.70	54.20	100 97 91								
66C	55.70 - 57.20	55.70	100 97								
67CS	55.95 - 56.20										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



OH411

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
68C	57.20 - 58.70	57.20	94 98 93 93					Medium strong light greyish brown ooidal and peloidal LIMESTONE. Fractures are subhorizontal to 10deg medium spaced rarely widely spaced undulating rough rarely stained orangish brown. (IOG) (BLPL) 56.70 - 56.75m: Fracture infilled (up to 3mm) with brown sandy clay.			
69C	58.70 - 60.20	58.70	100 98 98								
70CS	59.70 - 60.00							59.90 - 60.30m: White.			
71C	60.20 - 61.70	60.20	100 67 53	NI 100 370				60.85 - 60.90m: Soft orangish brown slightly sandy gravelly clay.	60.90	219.60	
72C	61.70 - 63.20	61.70	99 65 62	NI 210 450				Weak light grey and white bioclastic and peloidal bioturbated LIMESTONE. Frequent voids (up to 50mm) stained orange and frequently lined with orange sandy clay. Frequent shell fossils replaced by calcite (up to 10mm). Fractures are subhorizontal to 20deg medium spaced undulating rough rarely stained orangish brown. (IOG) (BLPL) 60.90 - 61.60m: Orangish brown. 62.60 - 62.63m: Burrows infilled (up to 2mm) with orangish brown sandy clay. 62.60 - 62.70m: 70deg fracture undulating rough stained orangish brown.			
73C	63.20 - 64.70	63.20	99 64 62								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
74CS	64.25 - 64.60							Weak light grey and white bioclastic and peloidal bioturbated LIMESTONE. Frequent voids (up to 50mm) stained orange and frequently lined with orange sandy clay. Frequent shell fossils replaced by calcite (up to 10mm). Fractures are subhorizontal to 20deg medium spaced undulating rough rarely stained orangish brown. (IOG) (BLPL) 64.70 - 65.70m: Locally recovered NI. 65.70 - 66.00m: Partial recovery, large void. 66.50 - 66.60m: Parallel 40deg fractures closely spaced undulating rough stained orangish brown. 67.00 - 67.30m: Abundant shell fragments (up to 5mm). 67.65 - 67.70m: Light orangish brown sandy clay. 67.70 - 70.75m: Abundant shell fragments (up to 5mm). 68.75 - 69.00m: Frequent thin laminae of light orangish brown slight sandy slightly gravelly clay. 69.20 - 69.60m: Recovered non intact. 69.60 - 69.90m: Extremely weak.			
75C	64.70 - 66.20	64.70	90 33 20								
76C	66.20 - 67.70	66.20	97 60 37								
77CS	67.30 - 67.65										
78C	67.70 - 69.20	67.70	100 95 95								
79C	69.20 - 70.70	69.20	95 71 71	NI 300 610							
80CS	69.90 - 70.20										
81C	70.70 - 72.20	70.70	100 97 93	NI 250 620					70.75	209.75	
82CS	71.65 - 72.00										

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
83C	72.20 - 73.70	72.20	100 61 53					Weak light grey and light brown ooidal and peloidal bioturbated LIMESTONE. Frequent shell fragments (up to 5mm). Fractures are subhorizontal to 15deg medium and closely spaced undulating rough stained orangish brown. (IOG) (BLPL) 73.00 - 74.20m: Highly bioturbated. 73.15 - 73.25m: Brown slightly clayey slightly sandy gravel.			
84C	73.70 - 75.20	73.70	97 81 81						74.10	206.40	
85CS	74.80 - 75.20				530 580 800			Medium strong light brownish grey peloidal and bioclastic LIMESTONE. Frequent shell fragments (up to 20mm). Fractures are subhorizontal to 10deg widely spaced undulating rough. (IOG) (BLPL)			
86C	75.20 - 76.70	75.20	99 97 97								
87C	76.70 - 78.20	76.70	100 97 91		90 250 650			Weak light greyish brown peloidal and bioclastic bioturbated LIMESTONE. Fractures are subhorizontal to 10deg mainly medium spaced undulating rough stained orangish brown frequently infilled (up to 5mm) with orangish brown clayey gravel (fracture surfaces weakened). (IOG) (BLPL)	76.50	204.00	
88CS	77.60 - 77.90										
89C	78.20 - 79.70	78.20	99 89 83								
90C	79.70 - 81.20	79.70	98 93					79.70 - 80.00m: Medium strong.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
91CS	80.90 - 81.20		93					Weak light greyish brown peloidal and bioclastic bioturbated LIMESTONE. Fractures are subhorizontal to 10deg mainly medium spaced undulating rough stained orangish brown frequently infilled (up to 5mm) with orangish brown clayey gravel (fracture surfaces weakened). (IOG) (BLPL) 80.00 - 80.10m: Light greyish brown slightly gravelly sandy clay.	80.20	200.30	
92C	81.20 - 82.80	81.20	100 99 95					Medium strong grey and dark grey bioclastic and peloidal LIMESTONE with frequent shell fragments (up to 10mm). Fractures are subhorizontal to 15deg closely and medium rarely widely spaced undulating rough. (IOG) (BLPL) 81.80 - 82.40m: Abundant shell fragments (up to 10mm).			
93C	82.80 - 84.30	82.80	98 91 91					83.00 - 83.05m: Thin bed of soft dark grey gravelly clay. 83.40 - 83.95m: Weak dark grey bioclastic limestone. Highly weathered and bioturbated. Burrows infilled with soft orangish brown slightly sandy gravelly clay.			
94C 95CS	84.30 - 85.70 84.30 - 84.70	84.30	100 99 99								
96C	85.70 - 87.20	85.70	99 60 43								
97C	87.20 - 88.80	87.20	98 94 63					Very weak light and dark grey cross-bedded micaceous MUDSTONE with medium spaced thin laminae of grey silt. Fractures are subhorizontal to 10deg mainly medium spaced undulating and planar smooth. (Lias Group) (BDS) 86.25 - 88.00m: Fractures are very closely and closely spaced.	86.25	194.25	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
98CS	88.25 - 88.55			NI 360 690				Very weak light and dark grey cross-bedded micaceous MUDSTONE with medium spaced thin laminae of grey silt. Fractures are subhorizontal to 10deg mainly medium spaced undulating and planar smooth. (Lias Group) (BDS) 88.90 - 89.00m: Thin laminae of weak grey siltstone. 90.20 - 90.30m: Weak. 92.70 - 92.75m: Extremely weak thinly cross-laminated light grey and dark grey siltstone. 94.80 - 94.90m: Locally disintegrated to light grey silt.			
99C	88.80 - 90.30	88.80	100 99 81								
100C	90.30 - 91.80	90.30	100 99 86	NI 270 880							
101C S	90.70 - 91.15										
102C	91.80 - 93.30	91.80	100 92 91								
103C	93.30 - 94.80	93.30	100 99 95								
104C S	93.55 - 93.85										
105C 106C S	94.80 - 96.30 94.90 - 95.10	94.80	100 98 78								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 13

Start Date 29 May 2020

Easting 393819

Scale 1:50

End Date 10 June 2020

Northing 215306

Ground Level 280.50mOD

Depth 100.95 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
107C	96.30 - 97.80	96.30	100 100 51					Very weak light and dark grey cross-bedded micaceous MUDSTONE with medium spaced thin laminae of grey silt. Fractures are subhorizontal to 10deg mainly medium spaced undulating and planar smooth. (Lias Group) (BDS)			
								97.10 - 97.35m: Frequent rounded clasts (up to 35mm diam) of weak light grey siltstone.			
108C	97.80 - 99.30	97.80	100 90 84					97.80 - 97.90m: Recovered as light grey clayey silt.			
109C	99.30 - 100.95	99.30	100 98 95					100.00 - 100.35m: Weak thinly cross laminated light grey and dark grey siltstone.			
110C S	99.55 - 99.90										
Borehole Completed at 100.95m									100.95	179.55	

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1143
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED CT	

BOREHOLE LOG



OH413

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES	0.00 - 0.10 0.10 - 0.15 0.10 - 0.45 0.30 - 0.35						H 29	Grass over firm dark brown slightly sandy gravelly CLAY. Gravel is subrounded fine to coarse limestone. (TOP)	0.10	270.55	
								Firm brown slightly sandy slightly gravelly CLAY with a low subangular limestone cobble content. Gravel is subangular fine to coarse limestone. (HDD) (HEAD)	0.40	270.25	
								NO RECOVERY. Driller notes limestone gravel.	1.00	269.65	
3C	1.00 - 1.40	1.00	100 25 40	NI 80				Weak to medium strong medium bedded light yellowish brown bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg and 70deg to 80deg very closely to medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. Frequent randomly orientated calcite veins. (GOG) (WHL) 1.00 - 1.85m: Fractures are closely spaced.			
4C	1.40 - 2.90	1.40	94 72 66								
5CS	2.19 - 2.42			40 175 255							
6C 7CS	2.90 - 4.40 2.95 - 3.27	2.90	66 51 49								
				NR				3.40 - 3.80m: Driller notes void.			
				40 210 320							
8C	4.40 - 5.90	4.40	70 8 0	NI 20 60				4.40 - 5.45m: Very closely spaced horizontal fractures intersected by vertical fracture.			
				NR				5.45 - 5.90m: Assessed zone of core loss.			
9C	5.90 - 7.40	5.90	73 60 48	20 150 400							
10CS	6.43 - 6.85			NR				7.00 - 7.40m: Assessed zone of core loss.			
								Weak to medium strong medium bedded light yellowish brown bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg and 70deg to 80deg very closely to medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. Frequent randomly orientated calcite veins. (GOG) (HMB) 7.50 - 9.55m: Medium spaced thin and thick beds of extremely weak dark yellowish brown calcareous mudstone. 7.60 - 8.00m: Recovered non-intact.	7.40	263.25	

Continued Next Page

HOLE CONSTRUCTION				PLANT USED				WATER STRIKE			
TOP (m)	BASE (m)	TYPE		PLANT USED		DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
0.00	0.40	Inspection Pit		Hand tools							
0.40	100.40	Rotary Core		Comacchio GEO405							
CASING DEPTH				BACKFILL				INSTRUMENTATION			
DIAM (mm)	BASE (m)			TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		SUB LOCATION:	
168	8.90			0.00	0.50	Concrete	16.20	Standpipe		1118	
140	100.40			0.50	2.70	Bentonite					
				2.70	16.70	Gravel					
				16.70	39.20	Bentonite					
BARREL DIAMETER				HOLE PROGRESS				REMARKS			
DIAM (mm)	BASE (m)			DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				
168	1.00			18-09-2019 11:00	0.00	Nil	Dry			Borehole advanced by reaming casing (168mm) 0.40-1.00m.	
146	100.40			18-09-2019 16:10	8.90	7.40	Dry			Inspection pit terminated at 0.40m due to encountering hard strata.	
				19-09-2019 08:30	8.90	7.40	Dry			Driller notes loss of flush returns below 10.40m.	
				19-09-2019 16:30	26.90	25.40	25.80				
				20-09-2019 08:30	26.90	25.40	22.90				
											CONTRACT
											35560
											CHECKED
											CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
12C	8.90 - 10.40	8.90	84 63 59	110 300 410				Weak to medium strong medium bedded light yellowish brown bioclastic and oolitic LIMESTONE. Fractures are subhorizontal to 20deg and 70deg to 80deg very closely to medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. Frequent randomly orientated calcite veins. (GOG) (HMB) 9.10 - 9.50m: Partially disintegrated to dark yellowish brown sandy clay. 9.90 - 10.10m: 20mm calcite vein (80deg). 10.40 - 10.80m: Assessed zone of core loss.			
13C	10.40 - 11.90	10.40	74 50 44	NR							
14CS	11.53 - 11.90			40 230 450							
15C 16CS	11.90 - 13.40 12.00 - 12.31	11.90	100 48 42	NI 120 310				11.70m: PLI suggests medium strong to strong. 12.30 - 13.30m: Intersecting fractures.			
17C	13.40 - 14.90	13.40	84 40 40								
18CS	14.41 - 14.63										
19C	14.90 - 16.40	14.90	86 40 21								
20CS	15.30 - 15.50							15.65 - 16.20m: Recovered non-intact.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
			39.20	100.40	Gravel		
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		20-09-2019 14:30	37.40	35.90	28.00		CHECKED
		23-09-2019 09:00	37.40	35.90	28.00		CT
		23-09-2019 16:30	52.40	50.90	Dry		
		24-09-2019 08:30	52.40	50.90	49.00		
		24-09-2019 16:30	70.40	68.90	Dry		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	16.40 - 17.90	16.40	100								
22CS	16.63 - 16.87		88 84						16.70	253.95	
								Extremely weak and very weak thinly laminated dark grey calcareous SILTSTONE with closely to widely spaced thin and thick beds of weak yellowish brown bioclastic limestone. Fractures are subhorizontal to 20deg and 60deg to 75deg closely and medium spaced planar and undulating rough stained orangish brown. (FEF) (FE)			
23C	17.90 - 19.40	17.90	99 70 65					17.75 - 17.90m: Thin bed of strong light bluish grey limestone.			
								19.00 - 19.60m: Subvertical planar rough fracture stained orange.			
24C	19.40 - 20.90	19.40	99								
25CS	19.41 - 19.75		86 86								
26CS	19.97 - 20.20							20.10 - 21.90m: Dark grey.			
27C	20.90 - 22.40	20.90	94 88 88								
28CS	21.60 - 21.81										
29C	22.40 - 23.90	22.40	78 74 25	50				22.40 - 23.30m: Fractures are very closely spaced.			
30CS	23.52 - 23.90			NI							
				380							
31C	23.90 - 25.40	23.90									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
BARREL DIAMETER		HOLE PROGRESS			REMARKS		
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		
		25-09-2019 08:30	70.40	68.90	Dry		
		25-09-2019 16:30	92.90	91.40	79.90		
		26-09-2019 08:30	92.90	91.40	78.80		
		26-09-2019 14:30	100.40	98.90	79.10		
							CONTRACT
							35560
							CHECKED
							CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42CS	32.20 - 32.35							Very weak and weak thinly laminated grey calcareous MUDSTONE with medium and widely spaced thin beds of medium strong light bluish grey limestone. Fractures are 20deg to 30deg and 50deg to 70deg closely and medium spaced planar and undulating smooth rarely infilled (up to 1mm) with dark grey clay. (FEF) (FE) 32.00m: Thick lamination of medium strong dark bluish grey limestone.			
43C	32.90 - 34.40	32.90	100 100 100								
44CS	33.90 - 34.05										
45C	34.40 - 35.90	34.40	100 96 96								
46CS	35.28 - 35.40										
47C	35.90 - 37.40	35.90	100 96 74								
48CS	36.80 - 36.90										
49C	37.40 - 38.90	37.40	100 88 87								
50CS	38.16 - 38.46										
51C	38.90 - 40.40	38.90	100 100 100	60 490 850			Very weak to weak thickly bedded dark grey and light grey bioclastic argillaceous LIMESTONE. Fractures are subhorizontal to 20deg medium rarely widely spaced undulating rough stained orangish brown. (IOG) (SALS) 39.20 - 39.45m: Subvertical undulating rough fracture stained orangish brown. 39.20 - 42.30m: Medium to widely spaced thick beds of weak dark yellowish brown coarse grained bioclastic limestone.		39.20	231.45	
52CS	39.99 - 40.28										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560	
									CHECKED		
									CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
53C 54CS	40.40 - 41.90 40.40 - 40.79	40.40	100 100 100								
55C	41.90 - 43.40	41.90	100 100 100								
56CS	43.10 - 43.40										
57C	43.40 - 44.90	43.40	100 100 98								
58CS	44.47 - 44.79										
59C	44.90 - 46.40	44.90	100 100 96								
60CS	46.09 - 46.40										
61C	46.40 - 47.90	46.40	100 100 100								
62CS	46.75 - 47.02			60 135 410				Weak medium bedded yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg and rarely 40deg to 50deg closely and medium spaced undulating rough and stained orangish brown. (IOG) (ASLS)	46.75	223.90	
63C	47.90 - 49.40	47.90									

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
64CS	48.29 - 48.46		100 86 63					Weak medium bedded yellowish brown bioclastic LIMESTONE. Fractures are subhorizontal to 20deg and rarely 40deg to 50deg closely and medium spaced undulating rough and stained orangish brown. (IOG) (ASLS) 48.05 - 48.15m: Abundant shell debris. 48.95 - 49.25m: Abundant shell fragments (up to 25mm).			
65C	49.40 - 50.90	49.40	100 86 63					50.00 - 50.20m: Shell fragments absent. 50.20 - 50.40m: Thin bed of weak dark brownish grey calcareous mudstone. 50.25m: PLI suggests very weak.			
66CS	50.25 - 50.45										
67C	50.90 - 52.40	50.90	100 100 100								
68CS	51.87 - 52.18								51.95	218.70	
69C	52.40 - 53.90	52.40	100 100 93					Medium strong thickly bedded light yellowish brown LIMESTONE. Fractures are subhorizontal to 10deg medium rarely widely spaced planar and undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown silty clay. (IOG) (BLPL)			
70C	53.90 - 55.40	53.90	94								
71CS	54.05 - 54.29		43 27					54.05m: PLI suggests strong. 54.30 - 55.40m: Fractures are subhorizontal and 80deg to subvertical very closely spaced planar and undulating rough.			
72C	55.40 - 56.90	55.40	100 99 99					55.86 - 58.63m: Very oolitic with fewer shell fragments.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:	
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118	
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560		
									CHECKED	
									CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
73C	56.90 - 58.40	56.90	100 96 96					Medium strong thickly bedded light yellowish brown LIMESTONE. Fractures are subhorizontal to 10deg medium rarely widely spaced planar and undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown silty clay. (IOG) (BLPL)			
74CS	57.90 - 58.23										
75C	58.40 - 59.90	58.40	100 83 72					58.50 - 59.05m: Two 80deg undulating rough stained orangish brown fractures.			
76C	59.90 - 61.40	59.90	100	175				Very weak to weak thinly to medium bedded yellowish brown and dark grey argillaceous LIMESTONE. Fractures are subhorizontal closely to widely spaced planar and undulating rough. Frequent shell fragments (up to 30mm). (IOG) (BLPL) 60.50 - 60.70m: Yellowish brown.	59.85	210.80	
77CS	60.09 - 60.46		100 100 100	590 815							
78C	61.40 - 62.90	61.40	100 100 97								
79CS	62.33 - 62.55							62.20 - 62.90m: Yellowish brown.			
80C	62.90 - 64.40	62.90	93 53 53	NI 410 600				Weak thickly bedded light yellowish brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg rarely 40deg to 50deg medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. (IOG) (BLPL) 63.10 - 63.65m: Weakened, recovered non-intact.	62.90	207.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
81C 82CS	64.40 - 65.90 64.56 - 64.77	64.40	83 39 39					Weak thickly bedded light yellowish brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg rarely 40deg to 50deg medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. (IOG) (BLPL) 64.90 - 65.65m: Subvertical undulating rough fracture. 65.65 - 65.90m: Assessed zone of core loss. 65.90 - 66.20m: Weakened, recovered non-intact.			
83C	65.90 - 67.40	65.90	99 72 72								
84C	67.40 - 68.90	67.40	100 100 100								
85C	68.90 - 70.40	68.90	96 72 72					69.20 - 69.50m: Fractures are randomly orientated extremely closely spaced and intersecting planar rough stained orangish brown infilled (up to 20mm) with dark yellowish brown silty clay.			
86CS	69.55 - 69.83										
87C	70.40 - 71.90	70.40	94 94 90								
88CS	70.98 - 71.32										
89C	71.90 - 73.40	71.90									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			<div style="border: 1px solid black; padding: 5px; display: inline-block;"> AGS </div> CONTRACT 35560 CHECKED CT		
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)				

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
90C 91CS	73.40 - 74.90	73.40	100			[Dotted pattern]		Weak thickly bedded light yellowish brown oolitic LIMESTONE. Fractures are subhorizontal to 20deg rarely 40deg to 50deg medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with yellowish brown clay. (IOG) (BLPL)			[Brick pattern]
	73.40 - 73.63		100								
92C	74.90 - 76.40	74.90	100								
			100					76.00 - 76.40m: Subvertical planar rough fracture.			
93C	76.40 - 77.90	76.40	100					76.50 - 77.35m: Subvertical undulating rough fracture.			
94CS	77.36 - 77.66										
95C	77.90 - 79.40	77.90	100	NI				Weak thinly to medium bedded light grey and yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm) partially infilled with dark yellowish brown sandy clay. Fractures are subhorizontal to 15deg and 80deg to subvertical medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with light grey clay. (IOG) (BLPL)	77.90	192.75	
			96	275							
96C 97CS	79.40 - 80.90 79.60 - 79.98	79.40	90					79.60m: PLI suggests weak to medium strong.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
98C	80.90 - 82.40	80.90	100 71 68		▼			Weak thinly to medium bedded light grey and yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm) partially infilled with dark yellowish brown sandy clay. Fractures are subhorizontal to 15deg and 80deg to subvertical medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with light grey clay. (IOG) (BLPL)			
99C	82.40 - 83.90	82.40	100 100 100								
100C	83.90 - 85.40	83.90	90 84 74								
101C S	84.14 - 84.47							84.50 - 84.85m: Medium bed of dark grey and dark yellowish brown argillaceous limestone.			
102C	85.40 - 86.90	85.40	68 58 50		▽ 85.40						
103C	86.90 - 88.40	86.90	100 88 78								
104C S	87.87 - 88.40							87.95 - 88.40m: Medium bed of dark grey argillaceous limestone.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
				85.40	85.40	80.90	20	
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
BARREL DIAMETER			HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
								CHECKED
								CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
105C 106C S	88.40 - 89.90 88.62 - 88.86	88.40	100 100 85					Weak thinly to medium bedded light grey and yellowish brown locally bioclastic LIMESTONE with abundant voids (up to 80mm) partially infilled with dark yellowish brown sandy clay. Fractures are subhorizontal to 15deg and 80deg to subvertical medium spaced undulating rough stained orangish brown rarely infilled (up to 1mm) with light grey clay. (IOG) (BLPL) 88.30 - 88.95m: Voids absent. 89.25 - 89.40m: Medium bed of dark grey argillaceous limestone. 89.40 - 90.50m: Voids absent. 90.75 - 91.60m: Thick bed of dark grey argillaceous limestone. 92.30 - 94.40m: Voids absent. Weak medium and thickly bedded dark grey bioclastic LIMESTONE. Fractures are subhorizontal to 10deg medium and widely spaced planar rough rarely stained orangish brown. (IOG) (BLPL)			
107C	89.90 - 91.40	89.90	93 87 77								
108C 109C S	91.40 - 92.90 91.40 - 91.70	91.40	100 100 95								
110C	92.90 - 94.40	92.90	90 77 70								
111C	94.40 - 95.90	94.40	94 60 56								
112C S 113C	95.68 - 95.90 95.90 - 97.40	95.90	350 815						95.70	174.95	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)					35560
									CHECKED		
									CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 13

Start Date 18 September 2019 Easting 394312

Scale 1:50

End Date 26 September 2019 Northing 214960 Ground Level 270.65mOD

Depth 100.40 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
114C S	96.66 - 96.98		100 100 98	1360				Weak medium and thickly bedded dark grey bioclastic LIMESTONE. Fractures are subhorizontal to 10deg medium and widely spaced planar rough rarely stained orangish brown. (IOG) (BLPL)			
115C	97.40 - 98.90	97.40	100 94 90					97.25 - 98.20m: Medium strong dark yellowish brown voided (bioturbated) limestone.			
116C	98.90 - 100.40	98.90	98 98 98					98.40 - 98.90m: Rare shell fragments.			
117C S	98.90 - 99.26							100.00 - 100.25m: 70deg contact.			
								100.25 - 100.40m: Grey and brown voided limestone.	100.40	170.25	
Borehole Completed at 100.40m											

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 1118
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3ES	0.00 - 0.30 0.10 - 0.20 0.30 - 0.50 0.30 - 0.40 0.50 - 0.60							Stubble over firm dark brown slightly sandy silty CLAY. (TOP)	0.30	275.35	X
3B 4B 4ES	0.80 - 1.00 1.00 - 1.20 1.00 - 1.10							Soft and firm brownish orange mottled light grey sandy silty CLAY. (FEF) (FE)			
5L	1.40 - 2.00							Soft to firm light brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine mudstone lithorelicts. (FEF) (FE)	1.40	274.25	
6L	2.00 - 3.00										
7LS	2.33 - 2.49							Stiff light brown slightly gravelly CLAY locally tending to extremely weak mudstone. Gravel is subangular fine and medium mudstone lithorelicts. (FEF) (FE)	2.20	273.45	
8L	3.00 - 4.50	3.00									
								Stiff grey slightly gravelly CLAY with rare thin beds of orangish grey limestone. Gravel is subangular fine and medium mudstone lithorelicts. (FEF) (FE)			
9C	4.50 - 6.00	4.50	100	750				Extremely weak to very weak grey MUDSTONE. No fractures observed. (FEF) (FE)	4.45	271.20	
10CS	4.74 - 5.04		100 57								
								5.20 - 5.35m: Thin bed of very stiff light brown slightly sandy clay.			
11C	6.00 - 7.50	6.00	100 93 52	NA NI 110 390				Medium strong light grey to light brown peloidal and oolitic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. Frequent shell fragments (up to 40mm). (IOG) (SALS) 5.45 - 5.55m: Subvertical undulating rough fracture. 5.65 - 6.00m: Subvertical undulating rough fracture. 6.25 - 6.85m: Subvertical undulating rough fracture.	5.35	270.30	
12CS	7.20 - 7.50										
13C	7.50 - 9.00	7.50	93 93 80					7.70 - 7.80m: Subvertical undulating rough fracture.			

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE				
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.40	Inspection Pit	Hand tools					
1.40	4.50	Window Sampler	Comacchio Geo 602 HT					
4.50	90.00	Rotary Core	Comacchio Geo 602 HT					
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118
168	4.50		0.00	0.50	Concrete	71.40	Standpipe	
140	90.00		0.50	5.50	Bentonite			
			5.50	71.90	Gravel			
			71.90	90.00	Bentonite			
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560
128	41.50	20-09-2019 14:30	0.00	Nil	Dry	Driller notes reduced flush returns 4.50-6.00m (approx 80% returned) and loss of flush returns 7.50-90.00m.		CHECKED
146	90.00	20-09-2019 16:30	1.40	Nil	Dry			CT
		23-09-2019 08:00	1.40	Nil	Dry			
		23-09-2019 17:00	12.00	10.50	Dry			
		24-09-2019 08:20	12.00	10.50	Dry			

BOREHOLE LOG



OH417

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
14CS	8.70 - 8.90							Medium strong light grey to light brown peloidal and oolitic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. Frequent shell fragments (up to 40mm). (IOG) (SALS)			
15C	9.00 - 10.50	9.00	100 100 71					9.00 - 9.20m: Subvertical undulating rough fracture. 9.50 - 9.70m: Subvertical undulating rough fracture. 10.00 - 10.15m: Subvertical undulating rough fracture.			
16C 17CS	10.50 - 12.00 10.50 - 10.70	10.50	93 93 67					10.50m: PLI suggests weak. 11.25 - 11.35m: Subvertical undulating rough fracture.			
18C	12.00 - 13.50	12.00	100 75 53								
19C	13.50 - 15.00	13.50	99 87 75								
20CS	14.23 - 14.62										
21C	15.00 - 16.50	15.00	100 99 61					Medium strong grey sandy LIMESTONE. Frequent shell fragments (up to 40mm). Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (SALS)	15.90	259.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118 		
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT	
		24-09-2019 16:45 31.50 30.00 Dry							
		25-09-2019 08:20 31.50 30.00 31.20							
		25-09-2019 16:30 43.50 42.00 43.10							
		26-09-2019 08:00 43.50 42.00 41.00							
		26-09-2019 16:00 66.00 64.50 Dry							

BOREHOLE LOG



OH417

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
22CS	16.12 - 16.36			160 190 390							
23C	16.50 - 18.00	16.50	100 100 73	NI 100 240				Medium strong brownish grey and brown peloidal ferruginous LIMESTONE. Abundant shell fragments (up to 50mm). Fractures are subhorizontal closely and medium spaced undulating rough. Rare thin beds of brown clay. (IOG) (ASLS)	16.50	259.15	
24C	18.00 - 19.50	18.00	100 80 42	NI 100 270				Weak light grey to white oolitic LIMESTONE. Fractures are subhorizontal closely rarely medium spaced undulating rough. (IOG) (BLPL) 17.90 - 19.15m: Subvertical very closely spaced undulating rough fracture with orangish brown staining.	17.90	257.75	
25C	19.50 - 21.00	19.50	100 87 30	NI 40 100				19.50 - 21.00m: Subhorizontal very closely spaced undulating rough fractures.			
26CS	19.92 - 20.02										
27C	21.00 - 22.50	21.00	100 90 61	NI 160 640				21.30 - 21.70m: Subvertical undulating rough fracture. 21.90 - 22.10m: Thin bed of light brown slightly sandy slightly gravelly clay.			
28CS	22.20 - 22.50										
29C	22.50 - 24.00	22.50	100 100 92								
30C	24.00 - 25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1118
BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		27-09-2019 08:00	66.00	64.50	64.30		CHECKED CT
		27-09-2019 14:30	72.00	70.50	70.00		
		30-09-2019 08:00	72.00	70.50	70.00		
		30-09-2019 16:00	82.50	81.00	70.00		
		01-10-2019 08:30	82.50	81.00	76.30		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31C	25.50 - 27.00	25.50	100					Weak light grey to white oolitic LIMESTONE. Fractures are subhorizontal closely rarely medium spaced undulating rough. (IOG) (BLPL)			
			57								
			49								
32CS	26.30 - 26.57	25.50	100					24.95 - 25.50m: Subvertical very closely spaced undulating rough fractures.	26.20	249.45	
			81								
			65								
32CS	26.30 - 26.57	26.20	40					26.05 - 26.25m: Thin bed of light brown to grey slightly sandy slightly gravelly clay.	26.75	248.90	
			140								
			270								
33C	27.00 - 28.50	27.00	NI					Weak grey LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL)	27.50	248.15	
			110								
			170								
33C	27.00 - 28.50	27.00	100					Weak white to light brown oolitic LIMESTONE. (IOG) (BLPL)	27.50	248.15	
			81								
			69								
34C	28.50 - 30.00	28.50	NI					26.80 - 26.85m: Very thin bed of light brown to grey slightly sandy slightly gravelly clay. Gravel is subangular fine and medium limestone.	27.50	248.15	
			100								
			300								
34C	28.50 - 30.00	28.50	100					26.85 - 27.00m: Subvertical undulating rough fracture.	27.50	248.15	
			73								
			56								
35CS	28.80 - 29.00	28.50	100					27.00 - 27.50m: Subvertical undulating rough fracture.	27.50	248.15	
			73								
			56								
34C	28.50 - 30.00	28.50	100					Medium strong grey LIMESTONE with frequent shell fragments (up to 20mm). Locally disintegrated to stiff gravelly clay. Gravel is subangular fine to coarse limestone. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL)	29.60	246.05	
			73								
			56								
36C	30.00 - 31.50	30.00	98					27.65 - 27.75m: Subvertical undulating rough fracture.	29.60	246.05	
			73								
			48								
37CS	30.05 - 30.36	30.00	100					Weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL)	29.60	246.05	
			73								
			48								
38C	31.50 - 33.00	31.50	100					29.75 - 30.00m: Subvertical undulating rough fracture.	29.60	246.05	
			100								
			100								
			100								

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
			01-10-2019 12:00	90.00	88.50	76.50				CHECKED		
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
39C	33.00 - 34.50	33.00	100		33.00			Weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL)			
40CS	33.30 - 33.57		100								
41C	34.50 - 36.00	34.50	100 100 77								
42CS	35.41 - 35.78						34.80 - 35.00m: Subvertical undulating rough fracture.				
43C	36.00 - 37.50	36.00	100 100 77								
44C	37.50 - 39.00	37.50	95 87 51	NI 100 200			37.50 - 38.00m: Subvertical undulating rough fracture.				
45CS	38.40 - 38.58										
46C	39.00 - 40.50	39.00	100 100 81					39.65 - 39.85m: Subvertical undulating rough fracture.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
						33.00	33.00	26.00	20			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
										CHECKED		
										CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47C	40.50 - 42.00	40.50	99 99 77					Weak white and light brown oolitic LIMESTONE. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL) 40.00 - 40.25m: Subvertical undulating rough fracture.			
48C	42.00 - 43.50	42.00	100 100 65								
49CS	43.30 - 43.50										
50C	43.50 - 45.00	43.50	99 91 65								
51CS	43.90 - 44.09										
52C	45.00 - 46.50	45.00	97 59 7	NI 70 140				45.00 - 48.00m: Subhorizontal closely and very closely spaced undulating rough fractures.			
53C	46.50 - 48.00	46.50	95 73 31					46.90 - 47.20m: Subvertical undulating rough fracture infilled with peloidal brown clay.			
54C	48.00 - 49.50	48.00									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)		
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT		
DIAM (mm)	BASE (m)		DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)		35560		
									CHECKED		
									CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
55CS	49.08 - 49.34		100	50							
			100	100							
			59	260							
56C	49.50 - 51.00	49.50	100								
57CS	49.65 - 49.90		98								
			67								
			20						50.40	225.25	
			60								
			160								
58C	51.00 - 52.50	51.00	100	NI				Medium strong light brown bioclastic peloidal LIMESTONE. Fractures are subhorizontal very closely and closely spaced undulating rough. (IOG) (BLPL)			
			100	80							
			67	200				Medium strong white oolitic and bioclastic LIMESTONE. Fractures are subhorizontal closely spaced undulating rough stained light brown. (IOG) (BLPL)	51.00	224.65	
59CS	51.62 - 51.82										
60C	52.50 - 54.00	52.50	100								
			100								
			69								
61C	54.00 - 55.50	54.00	100								
62CS	54.00 - 54.19		100								
			71								
63C	55.50 - 57.00	55.50	100	NI				55.25m: Bivalve fragment (40mm). Medium strong to strong light brown peloidal bioturbated LIMESTONE. Fractures are subhorizontal closely spaced undulating rough. (IOG) (BLPL)	55.40	220.25	
			77	75							
			31	170							

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1118			
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
64C	57.00 - 58.50	57.00	98 73 37								
65C 66CS	58.50 - 60.00 58.55 - 58.80	58.50	50 100 100 75					Medium strong grey peloidal LIMESTONE. Fractures are 20° closely spaced planar rough. (IOG) (BLPL)	58.35	217.30	
67C	60.00 - 61.50	60.00	NI 100 100 400 65					Medium strong to strong white to light grey oolitic and peloidal LIMESTONE with frequent shell fragments (up to 40mm) locally bioturbated to light brown. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL) 59.25 - 59.30m: Thin bed of grey peloidal limestone.	58.90	216.75	
68C	61.50 - 63.00	61.50	97 97 68								
69CS	62.30 - 62.56										
70C	63.00 - 64.50	63.00	100 100 85								
Continued Next Page											

HOLE CONSTRUCTION				WATER STRIKE					
TOP (m) BASE (m) TYPE		PLANT USED		DEPTH (m) CASING (m) ROSE TO (m) AFTER (min)		REMARKS			
CASING DEPTH			BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm) BASE (m)		TOP (m) BASE (m) MATERIAL			DEPTH (m) TYPE		1118		
BARREL DIAMETER		HOLE PROGRESS				REMARKS		CONTRACT	
DIAM (mm) BASE (m)		DATE TIME		DEPTH (m) CASING (m) WATER (m)				35560	
								CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
71CS	64.22 - 64.50							Medium strong to strong white to light grey oolitic and peloidal LIMESTONE with frequent shell fragments (up to 40mm) locally bioturbated to light brown. Fractures are subhorizontal closely and medium spaced undulating rough. (IOG) (BLPL)			
72C	64.50 - 66.00	64.50	98 98 69								
73C	66.00 - 67.50	66.00	100 100 79					67.10 - 67.20m: Thin bed of very stiff grey shelly clay. 67.20m: Bivalve (40mm).			
74C	67.50 - 69.00	67.50	99 99 91								
75CS	68.27 - 68.67							Medium strong thinly laminated grey LIMESTONE. Fractures not observed. (IOG) (BLPL)	69.15	206.50	
76C	69.00 - 70.50	69.00	99 99 67	400						69.55	
77C	70.50 - 72.00	70.50	91 88 44	NI 80 230				71.50 - 71.70m: 60deg planar rough fracture. Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to clay. Fractures are subhorizontal closely spaced and rarely medium spaced undulating and planar rough. Rare pockets of light grey silt. (Lias Group) (BDS)			
78CS	71.25 - 71.48										
79C	72.00 - 73.50	72.00		NI					71.80	203.85	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE			REMARKS			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)			
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:			
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1118				
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT			
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)				35560		
									CHECKED			
									CT			

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
80CS	73.10 - 73.28		100	80				Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to clay. Fractures are subhorizontal closely spaced and rarely medium spaced undulating and planar rough. Rare pockets of light grey silt. (Lias Group) (BDS) 72.50 - 72.80m: Subvertical undulating rough fracture with orangish brown staining. 72.70 - 72.80m: Thin bed of light brown fine sandy siltstone.			
			95	180							
81C	73.50 - 75.00	73.50	100					73.50 - 74.20m: Light brown mudstone.			
			53								
82C	75.00 - 76.50	75.00	100				74.80 - 75.00m: Subvertical planar smooth fracture with reddish brown staining. 75.25 - 75.45m: Subvertical undulating rough fracture with reddish brown staining. 75.50 - 75.65m: Subvertical undulating rough fracture with reddish brown staining. 75.90 - 76.05m: Subvertical undulating rough fracture with reddish brown staining.				
			87								
83C	76.50 - 78.00	76.50	89				76.50 - 77.15m: Subvertical undulating smooth fracture.				
			89								
84CS	77.47 - 77.60		85				77.55 - 77.60m: Light grey, silty. Cross bedded.				
			69								
85C	78.00 - 79.50	78.00	85				78.20 - 78.50m: Subvertical planar smooth fracture.				
			69								
86C	79.50 - 81.00	79.50	100	NI							
			61	370							
87CS	79.60 - 79.80		100	130							

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HOLE CONSTRUCTION				WATER STRIKE					
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
CASING DEPTH				BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m) BASE (m) MATERIAL		DEPTH (m)	TYPE		1118		
BARREL DIAMETER				HOLE PROGRESS			REMARKS		CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560	
								CHECKED	
								CT	

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
88C	81.00 - 82.50	81.00	100 100 57					Extremely weak to very weak thinly laminated grey MUDSTONE locally disintegrated to clay. Fractures are subhorizontal closely spaced and rarely medium spaced undulating and planar rough. Rare pockets of light grey silt. (Lias Group) (BDS)			
89CS	82.14 - 82.50							82.20 - 82.30m: Thin bed of light grey fine grained oolitic limestone with frequent shell fragments (up to 20mm).			
90C	82.50 - 84.00	82.50	99 87 64								
91C	84.00 - 85.50	84.00	99 89 85								
92CS	84.55 - 84.80										
93C	85.50 - 87.00	85.50	92 87 61								
94C	87.00 - 88.50	87.00	97								
95CS	87.16 - 87.40		96 75								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS			
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1118		
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT	



BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 12

Start Date 20 September 2019 Easting 394178

Scale 1:50

End Date 01 October 2019 Northing 214889 Ground Level 275.65mOD

Depth 90.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
96C	88.50 - 90.00	88.50	100 100 81								
97CS	89.00 - 89.20										
Borehole Completed at 90.00m									90.00	185.65	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION: 1118
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



RC504

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 06 January 2020

Easting 393964

Scale 1:50

End Date 08 January 2020

Northing 215810

Ground Level 270.70mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 2D 1ES	0.00 - 0.30 0.00 - 0.30 0.10 - 0.30							Grass over soft brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. (MG) (MGR) LIMESTONE (Driller's description). No recovery, borehole advanced by reaming casing. (IOG) (BLPL)	0.30	270.40	
3C 4D	1.50 - 2.50 1.60 - 1.70	1.50	100 5 0	NI				Weak and medium strong highly fractured light orangish brown and greyish brown LIMESTONE recovered as claybound angular and subangular fine to coarse gravel. Locally stained reddish brown. (IOG) (BLPL)	1.50	269.20	
5C 6D	2.50 - 4.00 2.60 - 2.70	2.50	100 36 22					Medium strong brownish grey bioclastic LIMESTONE with frequent shell fragments (up to 10mm) replaced by white calcite and frequent randomly orientated grey and white calcite veins (up to 8mm thick). Fractures are 40deg to 50deg very closely and closely spaced undulating rough stained orangish brown locally infilled (up to 5mm) with brown slightly sandy clay. (IOG) (BLPL) 3.70 - 4.00m: Fractures are 20-30deg closely spaced.	3.05	267.65	
7D	3.60 - 3.70			NI 15 160				Weak and medium strong light yellowish grey bioclastic LIMESTONE with frequent orangish brown wisps (up to 4mm thick), rare voids (up to 25mm diam) stained orangish brown and frequent shell fragments (up to 5mm) locally replaced by white calcite. Fractures are 40-50deg rarely subhorizontal closely and medium spaced undulating rough infilled (up to 2mm) with orangish brown clay. (IOG) (BLPL)	4.00	266.70	
8C 9CS	4.00 - 5.50 4.25 - 4.60	4.00	90 69 60	NI 140 350				4.75 - 4.80m: Very weak. Highly fractured. 5.20 - 5.50m: Frequent subvertical to 70deg grey and white calcite veins (up to 4mm thick). 5.50 - 5.90m: Probably very closely fractured. 5.65 - 5.80m: 50deg white and grey sparry calcite vein (up to 50mm thick) locally stained yellow. 6.40m: Light grey calcite pocket (25mm).			
10D	4.95 - 5.05							6.60 - 6.80m: Abundant randomly orientated subrounded burrows (up to 60mm) stained orangish brown. 7.05 - 7.10m: 40deg stepped rough fracture infilled (up to 4mm) with orangish brown slightly sandy clay. 7.25 - 7.60m: Rare subrounded voids (up to 5mm diam) stained orangish brown and locally infilled with orangish brown sandy clay.	6.60	264.10	
11C 12D	5.50 - 7.00 5.90 - 6.00	5.50	97 81 73					Very weak and weak light brown bioclastic LIMESTONE with closely and medium spaced medium beds of stiff brown clay with abundant shell fragments (up to 3mm). Fractures are 25deg to 40deg closely spaced undulating rough. (IOG) (BLPL) 7.90 - 8.30m: Locally disintegrated to yellowish brown slightly clayey fine to coarse sand.	7.90	262.80	
13CS 14C	6.65 - 7.00 7.00 - 8.50	7.00	50 150 300 100 70 65	500							
15D	8.00 - 8.10										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	Hand tools		DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	0.30	Inspection Pit	Geotechnical Pioneer Rig						
1.50	31.00	Rotary Core							

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158
200	1.50	0.00	31.00	Bentonite			
140	31.00						

BARREL DIAMETER		HOLE PROGRESS				REMARKS Borehole advanced by reaming casing (200mm) 0.30-1.50m. Hand dug inspection pit terminated at 0.30m on encountering bedrock. Borehole drilled at an inclination of 45deg and on a bearing of 225deg.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
200	1.50	06-01-2020 09:00	0.00	Nil	Dry		CHECKED
146	31.00	06-01-2020 16:00	4.00	4.00	Dry		CT

BOREHOLE LOG



RC504

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 06 January 2020

Easting 393964

Scale 1:50

End Date 08 January 2020

Northing 215810

Ground Level 270.70mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C	8.50 - 10.00	8.50	97 61 54	NI 65 180				Very weak and weak light brown bioclastic LIMESTONE with closely and medium spaced medium beds of stiff brown clay with abundant shell fragments (up to 3mm). Fractures are 25deg to 40deg closely spaced undulating rough. (IOG) (BLPL) 8.00m: Reddish brown staining. 8.30 - 8.35m: 60deg undulating rough fracture.	9.10	261.60	
17C	10.00 - 11.50	10.00	60 19 10	NI 50 185				Medium strong greyish brown and yellowish brown LIMESTONE. Fractures are 10deg to 30deg very closely and closely spaced undulating rough and stepped rough locally stained orangish brown. (IOG) (BLPL) 9.30 - 9.40m: 50deg stepped rough fracture stained reddish brown with rare white calcite (up to 5mm). 9.40 - 9.55m: Frequent shell fossils (up to 40mm) replaced with light grey calcite. 9.55 - 11.50m: Limited recovery. Locally recovered no intact, probably very closely fractured.	11.50	259.20	
18C	11.50 - 13.00	11.50	84 78 68	20 200 580				Medium strong light yellowish brown oolitic LIMESTONE. Fractures are 30deg closely and medium spaced undulating and stepped rough. (IOG) (BLPL) 12.05 - 12.20m: 60deg white calcite vein (up to 4mm thick). 12.30 - 12.60m: 75deg undulating incipient fracture locally stained brown. 12.50 - 13.00m: 80deg undulating rough fracture stained reddish brown.	13.00	257.70	
19CS	12.75 - 13.00										
20C	13.00 - 14.50	13.00	57 25 13	NI 90				Medium strong locally weak highly fractured greyish brown and brown LIMESTONE. Fractures are 30-50deg and randomly orientated very closely and closely spaced undulating and stepped rough locally stained dark brown and locally infilled with white calcite (up to 1mm). Limited recovery. (IOG) (BLPL) 13.05m: White sparry calcite nodule (80mm). 13.10 - 13.30m: Subvertical undulating rough fracture infilled (up to 7mm) with yellowish brown sandy clay.	14.50	256.20	
21C	14.50 - 16.00	14.50	60 37 26	NI 210 450				Medium strong locally weak light yellowish brown oolitic LIMESTONE. Fractures are 30-50deg and subhorizontal closely and medium spaced planar and undulating rough locally infilled (up to 3mm) with yellowish brown slightly sandy clay. (IOG) (BLPL) 14.50 - 16.00m: Limited recovery. 14.55 - 14.70m: Recovered non intact. Fractures probably very closely spaced.			
22C	16.00 - 17.50	16.00									

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
CASING DEPTH			BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE
							1158
BARREL DIAMETER			HOLE PROGRESS			REMARKS	
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
			08-01-2020 12:30	31.00	31.00	Dry	Driller notes reduced flush returns 4.00-5.50m (50% returned) and loss of flush returns 5.50-31.00m. Driller notes possible fractured ground 10.00-11.50m due to reduced core recovery and quicker run time (5
						35560	
						CHECKED	
						CT	

BOREHOLE LOG



RC504

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 06 January 2020

Easting 393964

Scale 1:50

End Date 08 January 2020

Northing 215810

Ground Level 270.70mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
23CS	16.10 - 16.40		97 73 59					Medium strong locally weak light yellowish brown oolitic LIMESTONE. Fractures are 30-50deg and subhorizontal closely and medium spaced planar and undulating rough locally infilled (up to 3mm) with yellowish brown slightly sandy clay. (IOG) (BLPL) 16.00 - 16.10m: Subvertical undulating smooth fracture locally stained reddish brown. 16.12m: Subhorizontal white calcite vein (5mm). 16.20 - 16.40m: Intersecting 70-90deg incipient fractures. 16.65m: 40deg stepped rough fracture stained reddish brown. 16.65 - 17.05m: Recovered non intact. Fractures probably very closely spaced. 17.90m: 40deg undulating rough fracture. 18.15 - 18.25m: 75deg undulating incipient fracture.			
24C	17.50 - 19.00	17.50	100 89 89					18.55m: 25deg undulating rough fracture. 18.60m: 25deg undulating rough fracture. 18.62m: Locally weak. 19.00 - 20.10m: Light brownish grey.			
25CS	18.65 - 18.95										
26C	19.00 - 20.50	19.00	100 90 77								
27CS	19.35 - 19.65										
28C	20.50 - 22.00	20.50	100 85 80	NI 450 620				19.80m: Subhorizontal undulating rough fracture stained orangish brown infilled (2mm) with yellowish grey clay. 19.90 - 19.95m: Highly fractured. Recovered as claybound angular fine to coarse gravel. Weak locally medium strong light greyish yellow and white oolitic LIMESTONE. Fractures are 20deg to 40deg medium and widely spaced undulating rough locally with frequent black specks. (IOG) (BLPL) 20.15 - 20.35m: 70deg undulating rough fracture stained orangish brown. 20.60 - 20.85m: Randomly orientated closely spaced undulating rough fractures locally stained orangish brown. 20.90m: 55deg planar smooth fracture stained orangish brown with frequent black specks. 21.35m: 45deg stepped rough fracture. 22.30 - 22.35m: 40deg stepped rough fracture stained dark brown. 22.70 - 22.80m: 50deg planar rough fracture. 22.90 - 23.10m: Very weak. 22.90 - 23.30m: Recovered non intact. Fractures probably very closely spaced. 23.00 - 23.10m: Randomly orientated yellowish grey calcite vein (up to 15mm thick). 23.30 - 23.50m: Subvertical undulating rough fracture locally infilled with greyish brown calcite precipitate. 23.50 - 23.80m: Frequent black specks. 23.50 - 24.00m: Recovered non intact. Fractures probably very closely spaced. 23.75 - 23.80m: Grey calcite nodule (up to 60mm diam).	20.10	250.60	
29CS	20.80 - 21.30										
30C	22.00 - 23.50	22.00	100 77 71								
31CS	22.00 - 22.35										
32C	23.50 - 25.00	23.50	93 42 42								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1158
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS minutes). All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.	CONTRACT 35560
						CHECKED CT

BOREHOLE LOG



RC504

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 06 January 2020

Easting 393964

Scale 1:50

End Date 08 January 2020

Northing 215810

Ground Level 270.70mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	25.00 - 26.50	25.00	100 65 57	NI 90 250				Weak locally medium strong light greyish yellow and white oolitic LIMESTONE. Fractures are 20deg to 40deg medium and widely spaced undulating rough locally with frequent black specks. (IOG) (BLPL) 24.10 - 24.25m: 60deg undulating rough fracture. 24.25 - 24.35m: Recovered non intact. Fractures probably very closely spaced. 24.40 - 24.90m: Subvertical undulating rough fracture.	24.90	245.80	
34C	26.50 - 28.00	26.50	100 79 77	NI 350 800			Very weak and weak light yellowish brown oolitic LIMESTONE. Fractures are 50deg to 60deg very closely to medium spaced undulating rough. (IOG) (BLPL) 25.45 - 25.65m: Intersecting randomly orientated planar rough fractures. 25.80m: 80deg undulating rough fracture. 25.80 - 25.85m: Extremely weak. Recovered non intact.	26.20	244.50		
35CS	27.60 - 27.90						Weak light greyish brown oolitic LIMESTONE. Fractures are 20-50deg closely to widely spaced planar and undulating rough. (IOG) (BLPL) 26.21 - 26.25m: Stained orangish brown. 26.30 - 26.50m: Recovered non intact. Fractures probably very closely spaced. 26.65 - 26.80m: 75deg undulating rough fracture stained orangish brown.				
36C	28.00 - 29.50	28.00	100 90 77				27.05 - 27.20m: Recovered non intact. Fractures probably very closely spaced. 27.20 - 27.25m: 60deg planar rough fracture. 27.55 - 27.65m: Intersecting 60deg planar rough fractures. 27.70m: Mottled grey and white. 27.90 - 28.00m: Subvertical undulating rough fracture stained reddish brown. 28.30 - 28.70m: Rare 70deg undulating grey and white calcite veins (up to 4mm thick). 28.30 - 29.10m: 30-40deg fractures are widely spaced.				
37C	29.50 - 31.00	29.50	100 92 88				29.40 - 29.50m: 60deg planar rough fracture.				
38CS	30.70 - 31.00						30.10 - 30.25m: Recovered non intact. Fractures probably very closely spaced. 30.30 - 30.50m: 45deg light grey calcite veins (25mm thick). 30.40m: 50deg undulating rough fracture. 30.55m: Intersecting 40deg and 50deg undulating rough fractures.	31.00	239.70		
Borehole Completed at 31.00m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	35560	
							CHECKED	
							CT	

BOREHOLE LOG



RC506

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 19 October 2020

Easting 394030

Scale 1:50

End Date 20 October 2020

Northing 215586

Ground Level 274.50mOD

Depth 22.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES	0.20 0.20 0.40 0.40							Crops over soft orangish brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse limestone. Frequent rootlets. (TOP) Light yellowish brown slightly sandy clayey angular to subrounded fine to coarse limestone GRAVEL with a medium subrounded limestone cobble content. (HDD) (HEAD) Highly fractured LIMESTONE (Driller's description). No recovery, borehole advanced by reamed casing. (IOG) (SALS)	0.20 0.40	274.30 274.10	
3C	2.50 - 3.50	2.50	100 50 13	NI 95 110				Weak yellowish brown bioclastic LIMESTONE. Frequent bivalve fragments (up to 40mm). Fractures are 40-60deg closely spaced undulating rough rarely stained orangish brown and brown. (IOG) (SALS)	2.50	272.00	
4C	3.50 - 5.00	3.50	100 90 35								
5C	5.00 - 6.50	5.00	97 97 73	NI 170 300							
6CS	5.45 - 5.70										
7C	6.50 - 8.00	6.50	100 80 68	NI 180 310				Weak orangish brown and grey bioclastic LIMESTONE. Frequent bivalve fragments (up to 60mm). Fractures are 40-60deg medium spaced undulating rough rarely stained orangish brown. (IOG) (SALS)	6.95	267.55	
8C	8.00 - 9.50	8.00									

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush					
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS	
0.00	0.40	Inspection Pit	Hand tools								
0.40	2.50	Rotary Open Hole	Geotechnical Pioneer Rig								
2.50	22.00	Rotary Core	Geotechnical Pioneer Rig								
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:		
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1219		
168	2.50		0.00	22.00	Bentonite						
140	22.00								CONTRACT		
BARREL DIAMETER			HOLE PROGRESS			REMARKS			35560		
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	Hole drilled at 45deg from vertical on a bearing of 225deg. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to			CHECKED	
146	22.00		19-10-2020 11:40	0.00	Nil	Dry				EC	
			19-10-2020 12:40	0.40	Nil	Dry					
			20-10-2020 10:50	0.40	Nil	Dry					
			20-10-2020 16:30	20.00	20.00	Dry					

BOREHOLE LOG



RC506

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 19 October 2020

Easting 394030

Scale 1:50

End Date 20 October 2020

Northing 215586

Ground Level 274.50mOD

Depth 22.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
9C	9.50 - 11.00	9.50	100					Weak orangish brown and grey bioclastic LIMESTONE. Frequent bivalve fragments (up to 60mm). Fractures are 40-60deg medium spaced undulating rough rarely stained orangish brown. (IOG) (SALS) 8.25 - 9.25m: Burrow mottled orangish brown.			
			90								
			74								
10CS	10.02 - 10.32		100	NI				10.02m: PLI suggests weak to medium strong.			
			100								
			100								
11C	11.00 - 12.50	11.00	90	700			Weak light brownish grey bioclastic LIMESTONE. Fractures are 40-60deg widely spaced undulating rough frequently stained orangish brown. Rare bivalve fragments (up to 30mm). (IOG) (ASLS) 11.85 - 12.30m: Soft orangish brown silt.	11.15	263.35		
			80								
			80								
12D	12.10 - 12.20			NA			12.50 - 12.95m: Soft orangish brown silt.				
			200								
13C	12.50 - 14.00	12.50	98	NA			Very weak locally extremely weak orangish brown and grey bioclastic and ooidal LIMESTONE. Fractures are subhorizontal to 50deg medium spaced undulating rough. Frequent bivalve fragments replaced with calcite (up to 50mm). (IOG) (BLPL) 13.65 - 13.90m: Abundant bivalve fragments.	12.95	261.55		
			86								
			81								
14D	12.65 - 12.75			NI			14.95 - 15.35m: Abundant bivalve fragments.				
			450								
15CS	13.05 - 13.35		96	NI			Medium strong yellowish brown and grey bioclastic and ooidal LIMESTONE. Fractures are 40-60deg medium spaced undulating rough rarely stained yellowish brown. (IOG) (BLPL)	15.35	259.15		
			83								
			83								
16C	14.00 - 15.50	14.00	96	NI			Continued Next Page				
			83								
			83								
17C	15.50 - 17.00	15.50	100	NI							
			100								
			100								

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1219	

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE	TIME	DEPTH (m)	CASING (m)	WATER (m)	the axis of the core.	
							35560	
							CHECKED	
							EC	

BOREHOLE LOG



RC506

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 19 October 2020

Easting 394030

Scale 1:50

End Date 20 October 2020

Northing 215586

Ground Level 274.50mOD

Depth 22.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18CS	16.05 - 16.30							Medium strong yellowish brown and grey bioclastic and ooidal LIMESTONE. Fractures are 40-60deg medium spaced undulating rough rarely stained yellowish brown. (IOG) (BLPL)			
19C	17.00 - 18.50	17.00	100 92 84					17.90 - 18.05m: Stained orangish brown.			
20C	18.50 - 20.00	18.50	100 95 65					18.90 - 19.00m: Stained orangish brown. 19.20 - 19.30m: Stained orangish brown. 19.35 - 19.40m: 50deg fracture stained reddish brown.			
21CS	18.98 - 19.26										
22C	20.00 - 21.50	20.00	100 100 72	NI 160 320				Medium strong orangish brown and grey bioclastic and ooidal LIMESTONE. Fractures are 30-50deg closely and medium spaced undulating rarely planar rough frequently stained orangish brown rarely infilled (up to 5mm) with light brown silt. (IOG) (BLPL)	20.20	254.30	
23SC	21.23 - 21.36										
24C	21.50 - 22.00	21.50	100 100 78						22.00	252.50	
Borehole Completed at 22.00m											

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED	
						EC	

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2B 2ES 3B 3ES 4C	0.00 - 0.30 0.10 0.30 - 0.50 0.30 0.50 - 0.80 0.50 0.70 - 1.50						H 47	Grass over firm dark brown slightly gravelly sandy CLAY. Gravel is subangular fine to coarse limestone. (TOP) Weak locally medium strong to strong thinly bedded light yellowish brown oolitic LIMESTONE. Highly fractured recovered as subrounded medium and coarse gravel. (IOG) (BLPL)	0.30	234.90	
5C	1.50 - 3.00	1.50	64 0 0	NI					1.60	233.60	
6CS	2.00 - 2.08		93 78 47	60 220 450				Weak medium to thickly bedded (40-50deg) light yellowish brown oolitic LIMESTONE with thin to medium beds of weak yellowish brown bioclastic mudstone. Fractures are 45-90deg closely and medium spaced undulating rough stained orange with rare <1mm clay infill. (IOG) (BLPL) 2.25 - 2.30m: Extremely weak light brown bioclastic mudstone.			
7CS	2.72 - 2.92										
8C	3.00 - 3.60	3.00									
9CS	3.20 - 3.35		100 68 16								
10C	3.60 - 5.10	3.60						3.78 - 3.93m: Recovered non-intact.			
11CS	4.16 - 4.35							4.00 - 4.10m: Extremely weak light brown bioclastic mudstone. 4.35 - 4.48m: Extremely weak light brown bioclastic mudstone disintegrated to soft clay. 4.48 - 4.79m: Extremely weak light brown bioclastic mudstone.			
12C	5.10 - 6.60	5.10	100 100 56					5.42 - 5.45m: Extremely weak light brown bioclastic mudstone.			
13CS	5.95 - 6.16										
14C	6.60 - 8.10	6.60	64 44 20					6.60 - 7.10m: Assessed zone of core loss.			
15CS	7.29 - 7.47							7.82 - 7.87m: Extremely weak light brown bioclastic mudstone.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
0.00	0.70	Inspection Pit	Hand tools				
0.70	45.60	Rotary Core	Geotechnical Pioneer Rig				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106
168	3.00	0.00	45.60	Bentonite			
140	45.60						

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes loss of flush 0.70-45.60m. Borehole inclined 45deg and orientated 290deg. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
146	45.60	25-09-2019 16:30	0.00	Nil	Dry	
		26-09-2019 16:00	0.70	Nil	Dry	
		26-09-2019 17:30	1.50	1.50	Dry	
		27-09-2019 09:20	1.50	1.50	Dry	
		27-09-2019 15:00	8.10	8.10	Dry	

AGS
CONTRACT
35560
CHECKED
CT

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C 17CS	8.10 - 9.60 8.17 - 8.46	8.10	100 100 80	50 100 120				Extremely weak light brown bioclastic MUDSTONE with closely spaced very thin beds (30-50deg) of weak grey limestone. Fractures are 30-50deg closely spaced planar rough. (IOG) (BLPL)	8.20	227.00	
18C 19CS	9.60 - 11.10 10.08 - 10.44	9.60	93 58 50	NI 300 360				Very weak to weak medium to thickly bedded (30-50deg) light yellowish brown oolitic LIMESTONE with thin to medium beds of weak yellowish brown bioclastic mudstone. Fractures are 45-90deg closely and medium spaced undulating rough stained orange with rare <1mm clay infill. (IOG) (BLPL) 9.86 - 10.07m: Recovered non-intact.	9.70	225.50	
20C	11.10 - 12.60	11.10	96 80 66	50 200 400				11.10 - 11.20m: Extremely weak light brown bioclastic mudstone. Medium strong to strong medium to thickly bedded light yellowish grey bioclastic LIMESTONE with rare very thin beds of extremely weak yellowish brown mudstone. Fractures are 45-90deg closely and medium spaced undulating rough and orange stained. (IOG) (BLPL) 11.54 - 11.56m: Extremely weak yellowish brown mudstone.	11.20	224.00	
21C 22CS	12.60 - 14.10 12.93 - 13.23	12.60	94 88 67					12.54 - 12.75m: Extremely weak yellowish brown bioclastic mudstone.			
23C 24CS	14.10 - 15.60 14.53 - 14.73	14.10	87 66 43					13.88 - 13.95m: Extremely weak yellowish brown bioclastic mudstone. 14.41 - 14.47m: Extremely weak yellowish brown bioclastic mudstone.			
25C	15.60 - 17.10	15.60	66 33 22					15.60 - 17.10m: Limited recovery.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1106

BARREL DIAMETER		HOLE PROGRESS				REMARKS inclinations are measured normal to the axis of the core.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		30-09-2019 08:30	8.10	8.10	Dry		CHECKED CT
		30-09-2019 16:00	24.60	24.60	Dry		
		01-10-2019 08:30	24.60	24.60	Dry		
		01-10-2019 16:00	36.60	36.60	Dry		
		02-10-2019 09:00	36.60	36.60	Dry		

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
26C	17.10 - 18.60	17.10	94 84 70	80 400 1000				Weak medium to thickly bedded yellowish brown bioclastic LIMESTONE with rare thin to medium beds of grey bioclastic limestone and yellowish brown bioclastic mudstone. Fractures are 60deg closely to widely spaced undulating rough and orange stained. (IOG) (BLPL) 17.35 - 17.38m: Extremely weak yellowish brown bioclastic mudstone. 17.46 - 17.75m: Extremely weak yellowish brown bioclastic mudstone. 17.82 - 17.92m: Medium strong grey bioclastic limestone. 17.92 - 18.03m: Extremely weak yellowish brown mudstone. 18.26 - 18.30m: Extremely weak yellowish brown mudstone. 18.30 - 18.36m: Thin bed of medium strong grey bioclastic limestone. 18.36 - 18.60m: Extremely weak yellowish brown mudstone. 18.84 - 18.87m: Extremely weak yellowish brown mudstone. 18.93 - 19.06m: Extremely weak yellowish brown mudstone. 19.20 - 19.64m: Extremely weak yellowish brown mudstone.	17.10	218.10	
27CS	17.71 - 17.96										
28C	18.60 - 20.10	18.60	78 57 26								
29C	20.10 - 21.60	20.10	100 100 80								
30C 31CS	21.60 - 23.10 21.60 - 21.90	21.60	100 100 96					20.24 - 20.29m: Extremely weak yellowish brown mudstone. 20.63 - 20.77m: Extremely weak yellowish brown mudstone. 21.86 - 21.92m: Extremely weak yellowish brown mudstone. 22.33 - 22.39m: Extremely weak yellowish brown mudstone.			
32C	23.10 - 24.60	23.10	100 100 88					Medium strong thickly bedded light yellowish brown bioclastic LIMESTONE with rare thin beds of extremely weak yellowish brown mudstone. Fractures are 45-90deg closely to widely spaced undulating rough and orange stained with rare calcite infill. (IOG) (BLPL)	23.80	211.40	

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS	
CASING DEPTH			BACKFILL			INSTRUMENTATION			SUB LOCATION:
DIAM (mm)	BASE (m)		TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE		1106
BARREL DIAMETER			HOLE PROGRESS			REMARKS			CONTRACT
DIAM (mm)	BASE (m)		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)			35560
			02-10-2019 15:00	45.60	45.60	Dry			CHECKED
									CT

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33CS	24.37 - 24.60				450			Medium strong thickly bedded light yellowish brown bioclastic LIMESTONE with rare thin beds of extremely weak yellowish brown mudstone. Fractures are 45-90deg closely to widely spaced undulating rough and orange stained with rare calcite infill. (IOG) (BLPL) 25.48 - 25.50m: Extremely weak yellowish brown mudstone. 26.48 - 26.49m: Extremely weak yellowish brown mudstone. 26.81 - 26.84m: Extremely weak yellowish brown mudstone. 27.34 - 27.35m: Extremely weak yellowish brown mudstone. 27.60 - 27.62m: Extremely weak yellowish brown mudstone. Medium strong thickly bedded (45-50deg) grey LIMESTONE with widely spaced medium to thick beds of medium strong light yellowish brown mottled yellow bioturbated bioclastic limestone and rare very thin to medium beds of extremely weak yellowish brown mudstone. Fractures are 30-60deg medium and widely spaced undulating rough and orange stained with rare calcite infill. (IOG) (BLPL) 28.98 - 29.39m: Medium strong light yellowish brown mottled yellow bioturbated bioclastic limestone. 29.39 - 29.45m: Extremely weak yellowish brown mudstone. 29.45 - 29.82m: Medium strong light yellowish brown mottled yellow bioturbated bioclastic limestone. 30.29 - 32.27m: Medium strong light yellowish brown mottled yellow bioturbated bioclastic limestone. 30.58 - 30.60m: Extremely weak yellowish brown mudstone.			
34C	24.60 - 26.10	24.60	100 86 86								
35C	26.10 - 27.60	26.10	100 86 86								
36CS	27.35 - 27.60										
37C	27.60 - 29.10	27.60	100 100 100								
38C	29.10 - 30.60	29.10	90 90 79		200 650 1150						
39CS	29.47 - 29.79										
40C	30.60 - 32.10	30.60	96 90 74								
41CS	31.60 - 31.82										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42C	32.10 - 33.60	32.10	100 100 88					Medium strong thickly bedded (45-50deg) grey LIMESTONE with widely spaced medium to thick beds of medium strong light yellowish brown mottled yellow bioturbated bioclastic limestone and rare very thin to medium beds of extremely weak yellowish brown mudstone. Fractures are 30-60deg medium and widely spaced undulating rough and orange stained with rare calcite infill. (IOG) (BLPL) 32.72 - 33.50m: Medium strong light yellowish brown mottled yellow bioclastic limestone.			
43C	33.60 - 35.10	33.60	99 99 90					34.26 - 34.87m: Medium strong light yellowish brown mottled yellow bioclastic limestone.			
44C	35.10 - 36.60	35.10	100 100 100					35.31 - 35.61m: Medium strong light yellowish brown mottled yellow bioclastic limestone.			
45CS	35.63 - 35.99							35.65m: PLT suggests weak.			
46C	36.60 - 38.10	36.60	81 81 68								
47CS	36.84 - 37.22										
					100 500 680				37.30	197.90	
48C	38.10 - 39.60	38.10	100 100 90					Very weak thickly bedded (40-50deg) dark grey calcareous MUDSTONE with subordinate very weak grey and yellowish brown siltstone and medium strong thin and medium beds of limestone. Fractures are 30-60deg medium and widely rarely very closely spaced undulating rough and orange stained with rare silt infill. (Lias Group) (BDS) 38.01 - 38.08m: Medium strong grey bioclastic limestone.			
								39.09 - 39.12m: Medium strong grey bioclastic limestone. 39.31 - 39.52m: Weak yellowish brown calcareous siltstone.			
49C	39.60 - 41.10	39.60	100 100 96					39.58 - 40.05m: Extremely weak yellowish brown calcareous siltstone.			
50CS	39.72 - 39.93										

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1106 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC507

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 6

Start Date 25 September 2019 Easting 393259

Scale 1:50

End Date 02 October 2019 Northing 215967 Ground Level 235.20mOD

Depth 45.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
51C	41.10 - 42.60	41.10	100 100 90					Very weak thickly bedded (40-50deg) dark grey calcareous MUDSTONE with subordinate very weak grey and yellowish brown siltstone and medium strong thin and medium beds of limestone. Fractures are 30-60deg medium and widely rarely very closely spaced undulating rough and orange stained with rare silt infill. (Lias Group) (BDS) 40.15 - 40.56m: Extremely weak yellowish brown calcareous siltstone. 41.01 - 41.48m: Medium strong grey bioclastic limestone.			
52C	42.60 - 44.10	42.60	99 94 94								
53CS	43.68 - 44.01										
54C	44.10 - 45.60	44.10	100 100 94								
Borehole Completed at 45.60m									45.60	189.60	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m) WATER (m)		35560
						CHECKED
						CT

BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.10 - 0.30							Grass over dark brown slightly sandy SILT. Frequent rootlets. (MG) (MGR)	0.30	234.20	
2ES 3B 4D 3ES 5B 6D 7C	0.50 - 0.80 0.50 - 0.80 0.50 - 0.80 0.80 - 1.00 0.80 - 1.00 0.80 - 1.00 1.20 - 2.70							Light brown mottled yellowish brown gravelly clayey fine to coarse SAND with a low angular to subrounded oolitic limestone cobble content. Gravel is angular to subrounded fine to coarse oolitic limestone. Rare rootlets. (HDD) (HEAD)	0.50	234.00	
		1.20	90 0 0	NA				Light brownish yellow clayey very sandy angular to subrounded fine to coarse oolitic limestone GRAVEL. (IOG) (BLPL)	1.20	233.30	
								Brownish yellow slightly sandy clayey angular and subangular fine to coarse limestone GRAVEL with a medium cobble content. (IOG) (BLPL)	2.10	232.40	
8C	2.70 - 4.20	2.70	93 31 0	NI				Weak brownish yellow oolitic LIMESTONE. Fractures are 40deg and randomly orientated extremely closely and very closely spaced planar rough and undulating smooth stained brownish orange. (IOG) (BLPL)	3.20	231.30	
								Weak brownish yellow oolitic LIMESTONE with frequent shell fragments (up to 8mm). Fractures are 40deg extremely closely to closely spaced undulating smooth strength reduced to extremely weak (up to 20mm) either side of fracture. (IOG) (BLPL)	4.20	230.30	
9C	4.20 - 5.70	4.20	87 25 11	NI 60 170				Weak brownish yellow oolitic LIMESTONE. Fractures are subhorizontal and 45deg very closely and closely spaced undulating rough stained brownish orange. (IOG) (BLPL) 4.30 - 4.60m: Extremely weak highly fractured limestone recovered as angular clay bound gravel.	5.50	229.00	
								5.20 - 5.35m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled Up to 5mm) with light orangish brown clay.	6.50	228.00	
10C	5.70 - 7.20	5.70	87 4 0	NI				Weak highly fractured brownish yellow bioclastic LIMESTONE. Fractures are subhorizontal and 45deg extremely closely spaced intersecting undulating rough stained orangish brown. (IOG) (BLPL)			
								Weak light grey LIMESTONE with rare shell fragments (up to 50mm) and frequent voids (up to 40mm). Fractures are subhorizontal and 30deg very closely and closely spaced undulating rough stained orangish brown infilled (up to 2mm) with orangish brown slightly sandy clay strength reduced to extremely weak (up to 20mm) either side of fracture surface. (IOG) (BLPL)			
11C	7.20 - 8.70	7.20	89 55 39	NI 120 220							

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Hand tools				
1.20	41.70	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	987
140	41.70	0.00	1.00	Arisings			
		1.00	41.70	Bentonite			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Borehole drilled 45deg from vertical on a bearing of 150deg. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
146	41.70	14-03-2019 09:10	0.00	Nil	Dry		CHECKED
		14-03-2019 16:45	10.20	10.20	Dry		CT
		15-03-2019 09:00	10.20	10.20	Dry		
		15-03-2019 16:30	17.70	17.70	13.16		
		18-03-2019 10:50	17.70	17.70	Dry		

BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
12C	8.70 - 10.20	8.70	87 23 8	NI 70 170				Very weak light yellowish grey LIMESTONE with abundant 45deg white calcite veins (up to 35mm thick). Fractures are subhorizontal and 20deg extremely closely to closely spaced undulating rough infilled (up to 2mm) with orangish brown slightly sandy clay strength reduced to extremely weak (up to 20mm) either side of fracture surface. (IOG) (BLPL)	8.30	226.20	
13C	10.20 - 11.70	10.20	97 17 8					10.40 - 10.55m: Subhorizontal and 40deg very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay.			
14C	11.70 - 13.20	11.70	90 35 15					11.60 - 11.70m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay. 12.40 - 12.55m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay. 12.60 - 12.65m: Subhorizontal and 50deg stepped rough fractures stained brownish orange.			
15C	13.20 - 14.70	13.20	97 47 35	NI				13.65 - 14.20m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay. 14.00 - 14.20m: Rare brownish red staining.			
16C	14.70 - 16.20	14.70	97 26 17	NI 70 260				Weak brownish yellow LIMESTONE with closely spaced zones of extremely weak highly fractured limestone recovered as angular and subrounded coarse gravel and cobbles. Fractures are 50deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL) Weak light yellowish grey bioclastic LIMESTONE with frequent voids (up to 15mm) infilled with brownish orange clay and rare ooids (up to 1mm). Fractures are subhorizontal and 30deg very closely and closely spaced undulating smooth stained brownish grey. (IOG) (BLPL)	14.50	220.00	
				NI 80 150					15.60	218.90	

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 987
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS the axis of the core. Driller notes reduced flush returns (approx 30-50% returned) 1.20-5.70m and loss of flush returns 7.20-41.70m.	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			0	NR				Weak light yellowish grey bioclastic LIMESTONE with frequent voids (up to 15mm) infilled with brownish orange clay and rare ooids (up to 1mm). Fractures are subhorizontal and 30deg very closely and closely spaced undulating smooth stained brownish grey. (IOG) (BLPL) 16.10 - 16.20m: Light greyish brown slightly gravelly sandy clay. Gravel is angular and subangular fine to coarse limestone. NO RECOVERY. Assessed zone of core loss.	16.20	218.30	
17C	17.70 - 19.20	17.70	100 76 76	NI 180 720				Very weak and weak light greyish yellow bioclastic LIMESTONE with abundant ooids and pisoids (up to 15mm) and rare voids (up to 25mm). Fractures are 50deg to 60deg closely to widely spaced stepped rough stained brownish orange reduced to extremely weak (up to 25mm) either side of fracture. (IOG) (BLPL) 17.85 - 17.90m: Subvertical fracture infilled (2mm) with brownish orange sandy clay. 19.20 - 19.30m: Subvertical fracture stained brownish orange. 19.60m: Shell fragment (32mm) replaced by white calcite. 19.90 - 20.30m: 40deg undulating rough fracture stained orangish brown. 21.00 - 21.25m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled with light orangish brown clay. 21.30 - 21.35m: Very closely spaced undulating rough fractures stained orange strength reduced to extremely weak (up to 20mm) either side of fracture surface.	17.70	216.80	
18C	19.20 - 20.70	19.20	100 73 58								
19C	20.70 - 22.20	20.70	89 61 55								
20CS	21.50 - 21.85			40 230 360				Very weak and medium strong light yellowish grey bioclastic LIMESTONE with abundant pisoids (up to 10mm) and medium spaced zones (up to 100mm) of extremely weak highly fractured limestone recovered as angular claybound gravel. Fractures are 40deg medium spaced stepped rough stained orangish brown strength reduced to extremely weak (up to 7mm) either side of fracture surface. (IOG) (BLPL)	21.50	213.00	
21C	22.20 - 23.70	22.20	91 55 53	NI 270 561				Weak light yellowish grey bioclastic LIMESTONE with abundant pisoids (up to 10mm) with abundant voids (up to 140mm) stained orangish brown. Fractures are subhorizontal and 40deg medium spaced undulating rough stained brownish orange strength reduced to extremely weak up to 10mm either side of fracture surface. (IOG) (BLPL) 22.30 - 22.70m: Extremely weak highly fractured limestone recovered as angular clay bound gravel. 23.10 - 23.15m: Extremely weak highly fractured limestone recovered as angular clay bound gravel. 23.95 - 25.05m: Frequent voids (up to 12mm) infilled with white calcite.	22.15	212.35	
22CS 23C	23.70 - 24.05 23.70 - 25.20	23.70	98 76								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS		
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL		INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS	CONTRACT 35560
						CHECKED CT

BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	25.20 - 26.70	25.20	66 97 81 67					Weak light yellowish grey bioclastic LIMESTONE with abundant pisoids (up to 10mm) with abundant voids (up to 140mm) stained orangish brown. Fractures are subhorizontal and 40deg medium spaced undulating rough stained brownish orange strength reduced to extremely weak up to 10mm either side of fracture surface. (IOG) (BLPL) 24.70 - 25.00m: 80deg undulating rough fracture stained orangish brown.			
25C 26CS	26.70 - 28.20 26.85 - 27.20	26.70	95 59 59	NI 125 560				Weak and medium strong light yellowish grey bioclastic LIMESTONE with frequent voids (up to 30mm) infilled with brownish orange clay and rare ooids (up to 1mm) stained orangish brown. Fractures are subhorizontal and 20deg closely and medium spaced undulating rough stained brownish orange. (IOG) (BLPL) 26.60 - 26.65m: 40deg undulating rough fracture stained brownish orange. 27.10 - 27.30m: 50deg undulating rough fracture strength infilled (2mm) with orangish brown slightly sandy clay reduced to extremely weak (up to 20mm) either side of fracture surface. 27.20 - 27.70m: Subvertical undulating rough fracture stained orangish brown intersecting 40deg closely spaced fractures. 28.00 - 28.20m: Recovered as angular and subangular fine to coarse gravel with a high angular and subangular cobble content.	26.00	208.50	
27C	28.20 - 29.70	28.20	98 79 79	NI 230 640				Weak light yellowish grey bioclastic LIMESTONE with frequent veins of white calcite (up to 110mm thick), rare voids (up to 10mm) infilled with brownish orange clay. Fractures are 40deg closely and medium spaced undulating smooth infilled (2mm) with brownish orange slightly sandy clay. (IOG) (BLPL) 28.20 - 28.25m: Subvertical white calcite vein (20mm thick). 29.10 - 29.30m: Abundant voids (up to 40mm) infilled with brownish orange clay. 29.15 - 29.35m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay. 29.60 - 29.65m: Extremely weak highly fractured limestone recovered as angular clay bound gravel. 29.95 - 30.10m: Subvertical stepped rough fracture. 30.30 - 30.40m: Extremely weak highly fractured limestone recovered as angular clay bound gravel.	28.20	206.30	
28C	29.70 - 31.20	29.70	99 76 76					Very weak and weak light yellowish grey bioclastic LIMESTONE with abundant voids (up to 55mm) infilled with brownish orange clay. Fractures are 40deg medium and widely spaced undulating rough stained light orangish brown. (IOG) (BLPL) 30.90 - 31.00m: 80deg stepped rough fracture intersecting 20deg stepped rough fracture. 31.20 - 31.50m: 70deg undulating rough fracture stained dark orangish red.			
29CS	30.55 - 30.95			NI 450 860					30.50	204.00	
30C	31.20 - 32.70	31.20	100 93 93								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
31C	32.70 - 34.20	32.70	99	NI				1.60 - 31.70m: 40deg undulating smooth fracture infilled (2mm) with orangish brown clay strength reduced to extremely weak (up to 10mm) either side of fracture surface.	32.75	201.75	
			89								
32C	34.20 - 35.70	34.20	89	260				Very weak and weak light yellowish grey bioclastic LIMESTONE with abundant voids (up to 100mm) infilled with brownish orange clay, frequent thin laminae of dark brownish red ferruginous limestone and rare brachiopods (up to 40mm). Fractures are 30deg closely and medium spaced undulating rough stained light orangish brown. (IOG) (BLPL)	33.80	200.70	
			550								
32C	34.20 - 35.70	34.20	98	NI				33.15 - 33.30m: Randomly orientated very closely spaced intersecting undulating rough fractures infilled (2mm) with light orangish brown clay.	34.35	200.15	
			94								
32C	34.20 - 35.70	34.20	94	400				Weak grey and light grey bioclastic LIMESTONE. (IOG) (BLPL)	34.35	200.15	
			94								
33C	35.70 - 37.20	35.70	100					33.85m: Shell fragment (60mm). 33.90m: Shell (30mm) infilled with white calcite.			
34CS	36.00 - 36.40		96					Very weak light yellowish grey LIMESTONE with abundant voids (up to 110mm) infilled with brownish orange clay and frequent shell fragments (up to 4mm) and frequent shells replaced by white calcite (up to 50mm). Fractures are 40deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL)	36.95	197.55	
			96								
35C	37.20 - 38.70	37.20	99	NI				34.90 - 35.00m: Light grey. 35.05m: Horizontal stepped rough fracture infilled (30mm) with orangish brown clay. 35.40 - 35.45m: 40deg undulating rough fractures stained orange reduced to extremely weak (up to 15mm) either side of fracture surface. 35.70m: 40deg vein of white calcite (up to 8mm thick). 35.80 - 35.90m: Subvertical undulating incipient fracture.	36.95	197.55	
			99								
35C	37.20 - 38.70	37.20	99	540				Weak grey LIMESTONE with frequent shell fragments (up to 10mm) locally replaced with white calcite and medium spaced medium thick beds of very weak light yellowish grey LIMESTONE with abundant voids (up to 110mm) infilled with brownish orange clay with frequent shell fragments (up to 4mm). Fractures are 40deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL)	36.95	197.55	
			99								
36CS	38.20 - 38.70							37.15 - 37.25m: 40deg vein of white calcite (up to 5mm thick).			
37C	38.70 - 40.20	38.70	93					39.60 - 39.75m: Extremely weak highly fractured limestone recovered as angular clayey gravel. 39.65 - 39.75m: Subvertical undulating rough fracture stained orangish brown intersecting 40deg closely spaced fractures.			
			93								
37C	38.70 - 40.20	38.70	91								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC508

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 6

Start Date 14 March 2019

Easting 393347

Scale 1:50

End Date 19 March 2019

Northing 216033

Ground Level 234.50mOD

Depth 41.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
38C	40.20 - 41.70	40.20	100 10 10	NA				Very stiff fissured dark grey clayey SILT with very closely and extremely closely spaced thick laminae of light grey silt. Fissures are subhorizontal to 30deg extremely closely spaced undulating. (Lias Group) (BDS)	40.40	194.10	
								Borehole Completed at 41.70m	41.70	192.80	

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE	PLANT USED	WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS
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CASING DEPTH DIAM (mm) BASE (m)	BACKFILL TOP (m) BASE (m) MATERIAL	INSTRUMENTATION DEPTH (m) TYPE	SUB LOCATION: 987
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BARREL DIAMETER DIAM (mm) BASE (m)	HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)	REMARKS	CONTRACT 35560 CHECKED CT
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BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 4DES 3ES 5B 6D	0.10 - 0.20 0.10 - 0.20 0.10 - 0.20 0.30 - 0.40 0.30 - 0.40 0.30 - 0.40 0.30 - 0.40 0.50 - 0.60 0.50 - 0.60 0.50 - 0.60							Grey and light brown sandy angular to subrounded fine to coarse limestone, sandstone and clinker GRAVEL. (MG) (MGR) Dark greyish brown very sandy angular and subangular fine to coarse limestone, sandstone, clinker and brick GRAVEL. (MG) (MGR) 0.30 - 0.40m: High angular and subangular brick cobble content. Dark greyish brown clayey sandy angular and subangular fine to coarse limestone and sandstone GRAVEL. (MG) (MGR) 0.50 - 0.60m: Frequent rootlets.	0.10 0.40 0.70	238.10 237.80 237.50	
4ES 7B 8D 8DES 9C	1.00 - 1.10 1.00 - 1.10 1.00 - 1.10 1.00 - 1.10 1.20 - 2.70	1.20	90 23 10	NI 50 180				Light brown very gravelly fine and medium SAND with a medium angular and subangular light yellowish brown limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. Rare rootlets. (IOG) (BLPL) Weak brownish yellow oolitic LIMESTONE with zones of extremely weak highly fractured limestone. Fractures are 20deg very closely and closely spaced planar rough stained orangish brown. (IOG) (BLPL) 1.20 - 1.40m: Extremely weak clayey angular and subangular medium and coarse oolitic limestone gravel. 1.80 - 1.85m: Subvertical dark grey calcite vein (up to 2mm thick). 2.30m: Light grey calcite pocket (up to 30mm). 2.55 - 2.65m: 40deg undulating rough fracture stained orangish brown. 2.80 - 3.00m: Extremely weak oolitic limestone recovered non intact. Fractures probably very closely spaced infilled with brown clay (up to 6mm). 3.00 - 3.02m: Subvertical planar rough fracture infilled (up to 2mm) with orangish brown clay. 3.20 - 3.35m: Recovered non intact. Fractures probably very closely spaced.	1.20	237.00	
10C	2.70 - 4.20	2.70	99 53 41					Weak brownish yellow oolitic LIMESTONE with frequent subvertical light grey and white calcite veins (up to 5mm thick). Fractures are subhorizontal to 30deg closely and medium spaced planar rough and undulating rough locally infilled (up to 2mm) with orangish brown clay. (IOG) (BLPL) 3.60 - 3.90m: 70deg conjugating undulating rough fractures infilled with orangish brown slightly gravelly clay (up to 3mm).	3.35	234.85	

Continued Next Page

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS
0.00	1.20	Inspection Pit	Hand tools				
1.20	49.20	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	DEPTH (m)	TYPE	987
140	49.20	0.00	1.20			
		1.20	49.20			

BARREL DIAMETER		HOLE PROGRESS				REMARKS Hole drilled at 45deg from vertical on a bearing of 050deg. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
146	49.20	20-03-2019 10:00	0.00	Nil	Dry		CHECKED CT
		20-03-2019 16:55	8.70	8.70	Dry		
		21-03-2019 08:30	8.70	8.70	Dry		
		21-03-2019 16:30	25.20	25.20	Dry		
		22-03-2019 09:20	25.20	25.20	Dry		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
11C	4.20 - 5.70	4.20	97					Weak brownish yellow oolitic LIMESTONE with frequent subvertical light grey and white calcite veins (up to 5mm thick). Fractures are subhorizontal to 30deg closely and medium spaced planar rough and undulating rough locally infilled (up to 2mm) with orangish brown clay. (IOG) (BLPL)	4.75	233.45	
			58 56								
12C	5.70 - 7.20	5.70	99	NI 200 440				4.50 - 4.55m: 40deg planar rough fracture stained yellowish brown and reddish brown. Abundant black specks. 4.55 - 4.65m: Subvertical dark grey and white calcite vein (up to 20mm thick).			
			86 84								
13CS	6.73 - 7.10							Weak to medium strong brownish yellow oolitic LIMESTONE with 20deg to 40deg closely and medium spaced very thin beds of bioclastic limestone. Fractures are subhorizontal to 40deg medium spaced planar rough and undulating rough stained orangish brown. (IOG) (BLPL) 5.00 - 5.25m: 70deg very closely spaced undulating rough fractures stained orangish brown. 5.25m: 35deg planar rough fracture infilled with orangish brown clay (up to 2mm).			
14C	7.20 - 8.70	7.20	100					5.60 - 5.70m: Recovered non intact. Fractures probably very closely spaced. 5.70 - 5.90m: Subvertical light grey and white calcite vein (up to 25mm thick).			
			69 69								
15CS	7.60 - 8.00							6.32 - 6.35m: 35deg planar incipient fracture. 6.50 - 6.55m: 70deg planar incipient fracture.			
								6.95 - 7.10m: Subhorizontal thin bed of light greyish yellow bioclastic limestone.			
								7.30m: 45deg stepped rough fracture.			
								7.50 - 7.60m: Recovered non intact. Fractures probably very closely spaced.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987			
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS			REMARKS		CONTRACT		
		DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	the axis of the core. Driller notes reduced flush returns 1.20-2.70m (approx. 50% returned) and loss of flush returns 2.70-49.20m.	35560		
		22-03-2019 16:20	46.20	46.20	Dry		CHECKED	CT	
		25-03-2019 09:55	46.20	46.20	Dry				
		25-03-2019 12:00	49.20	49.20	Dry				

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
16C	8.70 - 10.20	8.70	100 56 32	NI 30 120				Weak brownish yellow oolitic LIMESTONE with rare subhorizontal to 20deg closely spaced very thin beds of bioclastic limestone. Fracture set 1; subhorizontal to 30deg very closely and closely spaced planar rough and undulating rough stained orangish brown. Fracture set 2; subvertical very closely and closely spaced undulating rough stained orangish brown. (IOG) (BLPL) 8.40 - 8.60m: Randomly orientated undulating incipient fractures. 8.75 - 9.10m: Subvertical dark grey and white calcite vein (up to 8mm thick).	8.25	229.95	
17C	10.20 - 11.70	10.20	83 15 14	NI 60 150				10.30 - 10.60m: Recovered non intact. Fractures probably very closely spaced. 10.55m: Shell fragments (up to 20mm) stained orangish brown. 10.75 - 10.80m: 50deg dark grey and white calcite vein (up to 10mm thick). Very weak and weak highly fractured light yellowish brown oolitic LIMESTONE with frequent subvertical white calcite veins (up to 2mm thick). Fractures are randomly orientated very closely and closely spaced planar rough and undulating rough locally stained orangish brown with black specks. (IOG) (BLPL) 10.80 - 11.20m: Weak claybound angular and subangular fine to coarse oolitic limestone gravel.	10.80	227.40	
18C	11.70 - 13.20	11.70	80 10 8					11.75 - 11.85m: Extremely weak clayey subangular fine and medium oolitic limestone gravel.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 987				
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560			
									CHECKED CT		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
19C	13.20 - 14.70	13.20	93 29 20	NI 60 150				Very weak and weak light grey LIMESTONE with frequent shell fragments (up to 30mm) replaced by calcite. Fractures are randomly orientated very closely and closely spaced undulating rough locally incipient stained orangish brown locally frequent black specks. (IOG) (BLPL) 12.10 - 12.30m: Recovered non intact. Fractures probably very closely spaced. 12.40 - 12.70m: Extremely weak greyish brown very clayey angular to subrounded fine and medium limestone and crystalline gravel. 12.90 - 13.20m: Assessed zone of core loss. 13.20 - 13.40m: Recovered non intact. Fractures probably very closely spaced.	12.10	226.10	
										14.30 - 14.55m: Fractures infilled with yellowish brown clay (up to 4mm). 14.50 - 15.00m: Orangish brown and reddish brown staining. 14.70 - 14.90m: Recovered non intact. Fractures probably very closely spaced.	
20C	14.70 - 16.20	14.70	87 38 19	50 230 470				15.40 - 15.60m: Recovered non intact. Fractures probably very closely spaced. Medium strong light grey LIMESTONE with frequent shell fragments (up to 40mm) replaced by white calcite with rare vugs (up to 30mm) locally partly infilled with sparry calcite or stained orangish brown. Fractures are 45deg closely and medium spaced undulating incipient stained greyish brown. (IOG) (BLPL)	15.60	222.60	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 5 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru -ment	test type & value	description	depth (m)	reduced level (m)	legend
21C	16.20 - 17.70	16.20	100 91 91								
22CS	16.55 - 17.00										
				NI 30 170				Weak to medium strong highly fractured light greyish brown LIMESTONE with frequent shell fragments (up to 30mm) stained orangish brown or replaced with orangish brown clay. Fractures are randomly orientated extremely closely and closely spaced undulating rough cemented with grey calcite stained orangish brown locally infilled with brown clay (up to 4mm). (IOG) (BLPL)	17.05	221.15	
23C	17.70 - 19.20	17.70	97 18 7								
24C	19.20 - 20.70	19.20	99 57 45					19.40 - 19.80m: Subvertical undulating rough fracture partly infilled with yellowish grey calcite (up to 3mm).			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 6 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
25CS	20.20 - 20.50										
26C	20.70 - 22.20	20.70	93 44 34	NI 35 200				Weak to medium strong light greyish brown LIMESTONE with closely and medium spaced zones (up to 150mm) of extremely weak highly fractured limestone recovered as claybound gravel. Fractures are mainly very closely and closely spaced undulating rough cemented with grey calcite locally stained orangish brown infilled with yellowish brown clay (up to 3mm). (IOG) (BLPL)	20.70	217.50	
27C	22.20 - 23.70	22.20	97 73 67					21.75 - 21.79m: 60deg dark grey and white calcite vein (up to 25mm thick).			
28C	23.70 - 25.20	23.70	100 51 47	NI 70 290				Weak and medium strong light grey LIMESTONE with frequent 45deg to 65deg calcite veins (up to 11mm thick). Fracture set 1; subhorizontal to 20deg closely spaced undulating rough infilled with yellowish brown clay (up to 2mm). Fracture set 2; 45deg closely spaced undulating rough stained orangish brown. (IOG) (BLPL)	23.80	214.40	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 7 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29CS	24.20 - 24.50							Weak and medium strong light grey LIMESTONE with frequent 45deg to 65deg calcite veins (up to 11mm thick). Fracture set 1; subhorizontal to 20deg closely spaced undulating rough infilled with yellowish brown clay (up to 2mm). Fracture set 2; 45deg closely spaced undulating rough stained orangish brown. (IOG) (BLPL) 24.50m: Fracture infilled with dark greyish brown clay (up to 3mm). 24.70 - 24.80m: Locally disintegrated to stiff brown friable clay. 25.05 - 25.20m: Zone of extremely weak highly fractured limestone recovered as angular and subangular gravel.			
30C	25.20 - 26.70	25.20	97 68 56						25.40	212.80	
31CS	25.40 - 25.80			NI 150 390				Weak light yellowish brown oolitic LIMESTONE with abundant pisoids (up to 3mm). Fractures are subhorizontal to 20deg closely and medium spaced planar rough and undulating rough stained orangish brown. (IOG) (BLPL) 25.65m: Shell fragments (up to 25mm) replaced by calcite. 25.80 - 25.90m: 70deg planar rough fracture stained orangish brown with frequent black specks. 26.00 - 26.10m: 45deg undulating rough fracture infilled with calcite (up to 5mm).			
32C	26.70 - 28.20	26.70	100 47 41	NI 45 120				Weak light greyish brown oolitic LIMESTONE with abundant pisoids (up to 3mm), rare shell fragments (up to 6mm) stained orangish brown and closely and medium spaced zones (up to 200mm) of weak and extremely weak highly fractured limestone recovered as claybound gravel. Fractures are subhorizontal to 30deg very closely and closely spaced undulating rough stained orangish brown. (IOG) (BLPL) 26.70 - 26.90m: 75deg conjugating planar rough and undulating rough fractures stained orangish brown.	26.40	211.80	
				NI 60 160				Weak light yellowish grey oolitic LIMESTONE with abundant pisoids (up to 4mm), abundant shell fragments (up to 6mm) and extremely closely to medium spaced burrows (up to 80mm) infilled with angular and subangular fine and medium gravel stained orangish brown. Fractures are 45deg very closely and closely spaced undulating rough stained yellowish brown. (IOG) (BLPL)	27.45	210.75	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 8 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
33C	28.20 - 29.70	28.20	80 42 39					Weak light yellowish grey oolitic LIMESTONE with abundant pisoids (up to 4mm), abundant shell fragments (up to 6mm) and extremely closely to medium spaced burrows (up to 80mm) infilled with angular and subangular fine and medium gravel stained orangish brown. Fractures are 45deg very closely and closely spaced undulating rough stained yellowish brown. (IOG) (BLPL) 28.15 - 28.20m: 50deg stepped rough fracture stained yellowish brown. 28.55 - 28.60m: 60deg dark grey and white calcite vein (up to 4mm thick). 28.75 - 28.90m: Recovered non intact. Fractures probably very closely spaced. 29.40 - 29.70m: Assessed zone of core loss.			
34C	29.70 - 31.20	29.70	100 60 60								
35CS	30.30 - 30.85			NI 140 350				Weak and medium strong yellowish brown bioclastic LIMESTONE with frequent 50deg to 70deg calcite veins (up to 30mm thick) and rare burrows (up to 40mm) infilled with pisoids (up to 3mm) stained orangish brown. Fracture set 1; 45deg closely and medium spaced planar rough infilled with orangish brown clay (up to 2mm). Fracture set 2; subhorizontal medium spaced undulating rough stained yellowish brown. (IOG) (BLPL)	30.20	208.00	
36C	31.20 - 32.70	31.20	100 84 84					31.70 - 31.85m: Subvertical conjugating undulating rough fractures locally infilled with yellowish brown clay (up to 2mm). 31.75m: Shell fragment (3mm) replaced by white calcite.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 9 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
37CS	32.20 - 32.70								32.50	205.70	
38C	32.70 - 34.20	32.70	100 90 85	NI 100 400				Weak light greyish brown bioclastic LIMESTONE with frequent subvertical and 45deg white calcite veins (up to 4mm thick) and rare burrows (up to 50mm) stained orangish brown. Fractures are closely and medium spaced subhorizontal to 30deg planar rough and undulating rough stained orangish brown and reddish brown. (IOG) (BLPL)			
39CS	32.90 - 33.20							33.18m: Subhorizontal band (up to 11mm thick) of shell fragments infilled with light grey and white calcite. 33.30m: 30deg conjugating planar rough fractures infilled with reddish brown sandy clay. 33.35m: Vug (10mm) infilled with sparry calcite.			
40C	34.20 - 35.70	34.20	90 50 48					33.85 - 40.00m: Subvertical incipient undulating fracture.			
41C	35.70 - 37.20	35.70	87 15 13					35.40m: Fracture infilled with light grey sparry calcite (up to 3mm). 35.70 - 36.00m: Recovered non intact. Fractures probably very closely spaced.			

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS					
									CONTRACT 35560		
									CHECKED CT		

BOREHOLE LOG



RC509

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 10 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
42C	37.20 - 38.70	37.20	93 46 39	NI 40 140				Weak light greyish brown bioclastic LIMESTONE with frequent subvertical and 45deg white calcite veins (up to 4mm thick) and rare burrows (up to 50mm) stained orangish brown. Fractures are closely and medium spaced subhorizontal to 30deg planar rough and undulating rough stained orangish brown and reddish brown. (IOG) (BLPL) 36.05 - 36.26m: Subvertical undulating rough fracture stained orangish brown. Weak and medium strong greyish brown bioclastic LIMESTONE with frequent subvertical to 30deg white calcite veins (up to 4mm thick) and zones (up to 120mm) of highly fractured limestone recovered as subangular and subrounded fine and medium claybound gravel. Fractures are 35deg very closely and closely spaced planar rough and undulating rough stained orangish brown with frequent slickensides. (IOG) (BLPL) 37.00 - 37.20m: Assessed zone of core loss. 37.70 - 37.75m: 60deg conjugating undulating rough fractures stained reddish brown. 38.20 - 38.35m: Subvertical undulating fracture cemented with calcite (up to 8mm thick). 39.00 - 39.05m: Weak dark grey bioclastic limestone stained dark greenish grey. 39.05 - 39.15m: 60deg undulating rough fracture partly infilled with brown clay (up to 2mm). 39.60 - 39.65m: 55deg planar rough fracture cemented with grey and white sparry calcite (up to 4mm).	36.40	201.80	
43CS	38.20 - 38.60										
44C	38.70 - 40.20	38.70	97 49 41								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 11 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
45C	40.20 - 41.70	40.20	73	NI				Weak and medium strong highly fractured light yellowish brown LIMESTONE with frequent randomly orientated grey calcite veins (up to 3mm thick). Fracture set 1; 20deg to 40deg very closely and closely spaced undulating rough stained reddish brown and orangish brown with frequent slickensides. Fracture set 2; subvertical to 75deg closely spaced undulating rough locally cemented with white calcite (up to 3mm) or locally partly infilled with sparry calcite (up to 5mm). (IOG) (BLPL)	40.20	198.00	
			36 35								
46C	41.70 - 43.20	41.70	80					41.30 - 41.70m: Assessed zone of core loss.			
			17 10								
47C	43.20 - 44.70	43.20	97	NA				42.90 - 43.20m: Assessed zone of core loss. Yellowish brown clayey gravelly fine and medium SAND. Gravel is subangular and subrounded fine to coarse limestone. (IOG) (BLPL)	43.20	195.00	
			30 21								
								Very weak and weak light yellowish grey stained orangish brown LIMESTONE with frequent voids (up to 18mm) stained orangish brown, frequent shell fragments (up to 5mm) replaced by white calcite and frequent zones (up to 210mm) of very weak highly fractured limestone recovered as angular and subangular fine and medium claybound gravel. Fracture set 1; 20deg to 40deg very closely and closely spaced planar rough and undulating rough locally infilled with yellowish brown clay (up to 2mm) or stained orangish brown. Fracture set 2; randomly orientated very closely and closely spaced undulating incipient stained orangish brown. (IOG) (BLPL)	43.50	194.70	

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HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 12 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
48C 49CS	44.70 - 46.20 44.70 - 45.10	44.70	93 50 47					Very weak and weak light yellowish grey stained orangish brown LIMESTONE with frequent voids (up to 18mm) stained orangish brown, frequent shell fragments (up to 5mm) replaced by white calcite and frequent zones (up to 210mm) of very weak highly fractured limestone recovered as angular and subangular fine and medium claybound gravel. Fracture set 1; 20deg to 40deg very closely and closely spaced planar rough and undulating rough locally infilled with yellowish brown clay (up to 2mm) or stained orangish brown. Fracture set 2; randomly orientated very closely and closely spaced undulating incipient stained orangish brown. (IOG) (BLPL) 44.85 - 45.05m: 70deg conjugating undulating incipient fractures infilled with white calcite (up to 2mm). 45.10m: 75deg undulating rough fracture infilled with white calcite (up to 2mm) stained dark brownish red. 45.30 - 45.45m: 60deg white calcite vein (up to 6mm thick). 45.80 - 46.10m: 80deg conjugating undulating rough fractures infilled with white calcite (up to 5mm) stained dark brownish red. 45.85 - 45.95m: Abundant burrows (up to 30mm) stained orangish brown. 46.20 - 46.50m: Abundant burrows (up to 40mm) stained orangish brown. 46.25 - 46.29m: Subvertical white and yellowish grey calcite vein (up to 3mm thick). 46.40m: 20deg stepped rough fracture stained dark brownish red.			
50C	46.20 - 47.70	46.20	100 97 93	40 110 660				Weak dark grey mottled light grey bioclastic LIMESTONE with frequent shell fragments (up to 12mm) infilled with light grey and white calcite. Fractures are subvertical planar rough and undulating rough. (IOG) (BLPL) 46.60 - 46.90m: Subvertical to 70deg dark grey and white calcite vein (up to 5mm thick).	46.60	191.60	
51C 52CS	47.70 - 49.20 47.70 - 48.10	47.70	100 23 23								

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 987 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 13 of 13

Start Date 20 March 2019

Easting 393397

Scale 1:25

End Date 25 March 2019

Northing 216035

Ground Level 238.20mOD

Depth 49.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NA				Very stiff fissured thinly laminated dark grey clayey SILT with very closely spaced thick laminae of light grey silt. Fissures are randomly orientated very closely spaced. Laminae inclined 30deg. (Lias Group) (BDS)	48.05	190.15	
								48.80 - 48.90m: Firm dark grey silty clay.			
								Borehole Completed at 49.20m	49.20	189.00	

HOLE CONSTRUCTION				WATER STRIKE			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED	
						CT	

BOREHOLE LOG



RC514

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 09 January 2020

Easting 393899

Scale 1:50

End Date 15 January 2020

Northing 215727

Ground Level 274.20mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.10 - 0.30							Soft dark brown slightly sandy gravelly CLAY. Gravel is angular and subangular fine to coarse weak limestone. (TOP)	0.45	273.75	
								LIMESTONE (Driller's description). No recovery, hole advanced by reaming casing. (IOG)			
3C	2.00 - 3.50	2.00	67 0 0	NI				2.00 - 2.40m: Assessed zone of core loss.	2.40	271.80	
								Very weak highly fractured light greyish yellow locally light reddish orange LIMESTONE recovered as clayey sandy angular to subrounded fine to coarse gravel with a low subangular and subrounded cobble content. (IOG) (SALS)			
4C	3.50 - 5.00	3.50	100 53 18	NI 70 160				2.85 - 3.00m: Angular bioclastic limestone cobble (120mm). Weak locally very weak poorly cemented light yellowish grey bioclastic LIMESTONE. Fractures are subhorizontal and 30deg closely spaced undulating rough infilled (up to 10mm) with orange sandy clay. (IOG) (SALS)	3.50	270.70	
								Medium strong light yellowish grey bioclastic LIMESTONE with rare randomly orientated calcite veins (up to 10mm thick). Fractures are subhorizontal to 20deg closely spaced undulating rough. (IOG) (SALS)	4.85	269.35	
5C	5.00 - 6.50	5.00	100 45 15	NI 50 140				5.25 - 5.55m: Fractures are 30deg to 60deg extremely closely and very closely spaced undulating rough infilled with light yellow clay, surfaces weakened (25mm).	5.90	268.30	
								Weak light yellowish grey bioclastic LIMESTONE with rare randomly orientated white calcite veins (up to 10mm). Fractures are randomly orientated extremely closely spaced stepped rough infilled (up to 10mm) with light yellowish brown clay, surfaces weakened (up to 20mm). (IOG) (SALS)	6.50	267.70	
6C	6.50 - 8.00	6.50	80 43 33	NI 80 210				Medium strong light grey bioclastic LIMESTONE with rare shell fragments (up to 40mm) and rare grey calcite veins (up to 15mm). Fractures are 30-75deg rarely subhorizontal very closely and closely spaced undulating rough stained dark yellow. (IOG) (SALS)			
7C	8.00 - 9.50	8.00						Continued Next Page			

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
0.00	0.40	Inspection Pit	Hand tools				
0.45	31.00	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158
200	2.00	0.00	31.00	Bentonite			
140	31.00						

BARREL DIAMETER		HOLE PROGRESS				REMARKS Borehole advanced by reaming casing (200mm) 0.45-2.00m. Hand dug inspection pit terminated at 0.45m on encountering limestone. Borehole drilled at an inclination of 45deg and on a bearing of 045deg.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
200	2.00	09-01-2020 10:40	0.00	Nil	Dry		CHECKED
146	31.00	09-01-2020 13:05	0.45	Nil	Dry		CT

BOREHOLE LOG



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CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 09 January 2020

Easting 393899

Scale 1:50

End Date 15 January 2020

Northing 215727

Ground Level 274.20mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
8C	9.50 - 11.00	9.50	97 45 19					Medium strong light yellowish grey bioclastic LIMESTONE. Fractures are 30deg to 50deg extremely and very closely spaced stepped rough stained yellow, surfaces weakened (up to 20mm either side of fracture). (IOG) (SALS)	8.40	265.80	
			NI 40 50							9.20	
9CS	10.30 - 10.55		100 51 37	NI 70 160				Medium strong light grey LIMESTONE with frequent shells replaced with white and grey calcite and rare voids (up to 50mm diam) infilled with orange slightly sandy clay. Fractures are 30-50deg and subhorizontal very closely and closely spaced undulating rough stained orange. (IOG) (SALS) 9.65 - 10.10m: Extremely closely and very closely fractured.	10.30	263.90	
			140 200 250							10.80	
10C	11.00 - 12.50	11.00	97 50 41	NI 120 300				Medium strong light grey LIMESTONE with frequent shells (up to 30mm) locally infilled (up to 20mm) with white and grey calcite and rare voids (up to 25mm diam) infilled with orange clay. Fractures are subhorizontal closely and medium spaced undulating rough stained orange. (IOG) (ASLS) Yellowish brown slightly sandy SILT. (IOG) (ASLS)	11.00	263.20	
			NA								
11CS	12.20 - 12.50							Weak and medium strong yellowish brown LIMESTONE with closely and medium spaced thin and medium beds of slightly sandy silty clay. Fractures are 40deg closely and medium spaced undulating rough locally stained reddish brown and locally with a veneer of clay. (IOG) (BLPL) 11.30 - 11.40m: Stained orangish brown. 11.80 - 12.00m: Locally mottled dark brown and orange. 12.15 - 12.25m: 55deg undulating rough fracture. 12.30 - 12.50m: Rare subhorizontal grey and white calcite veins (up to 5mm thick).			
12C	12.50 - 14.00	12.50	80 21 11	NI 50 105					12.90	261.30	
13C	14.00 - 15.50	14.00	100 66 66	NI 180 335				Medium strong dark greyish brown mottled orangish brown bioclastic LIMESTONE with frequent shells (up to 25mm diam) and frequent shell fragments (up to 20mm) locally replaced by white and grey calcite. Fractures are subhorizontal to 20deg very closely and closely spaced undulating rough locally infilled with orangish brown slightly gravelly sandy clay. (IOG) (BLPL) 12.95 - 13.00m: 45deg stepped rough fracture. 13.35 - 13.50m: Frequent shell fragments. 13.50 - 14.00m: Frequent randomly orientated undulating rough fractures infilled (up to 5mm) with orangish brown and yellowish brown slightly gravelly sandy clay.	14.00	260.20	
14CS	14.65 - 14.95										
15C	15.50 - 17.00	15.50	100 75 65					Weak light yellowish brown ooidal and peloidal LIMESTONE. Fractures are 30-50deg and subhorizontal to 20deg closely and medium spaced undulating rough and stepped rough. (IOG) (BLPL) 14.30m: Rare subrounded voids (up to 15mm) diam. 14.95 - 15.25m: Recovered non intact. Fractures probably very closely spaced locally stained dark brown.			
16CS	15.95 - 16.25										

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158

BARREL DIAMETER		HOLE PROGRESS				REMARKS Driller notes reduced flush returns 2.00-6.50m (50% returned) and loss of flush returns 6.50-31.00m. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
		13-01-2020 16:10	21.50	21.50	Dry		CHECKED CT
		14-01-2020 08:00	21.50	21.50	Dry		
		14-01-2020 12:00	30.00	30.00	Dry		
		15-01-2020 08:30	30.00	30.00	Dry		
		15-01-2020 09:10	31.00	31.00	Dry		

BOREHOLE LOG



RC514

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 09 January 2020

Easting 393899

Scale 1:50

End Date 15 January 2020

Northing 215727

Ground Level 274.20mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17C	17.00 - 18.50	17.00	100 79 64					5.40 - 15.50m: Subvertical planar rough fracture. 5.95 - 16.00m: 45deg stepped rough fracture stained orangish brown. 6.25 - 16.40m: Stained reddish brown and orange. 6.45 - 16.55m: Rare shell fragments (up to 25mm) and rare peloids (up to 5mm) diam. 6.50m: Subhorizontal grey and white calcite vein. 6.60 - 16.70m: 60deg planar rough fracture stained orangish brown. 6.80 - 16.95m: Intersecting 70deg and subvertical fractures. 7.10 - 17.35m: 45deg planar rough fractures stained orangish brown with frequent black specks 7.40 - 17.50m: 60deg very closely spaced thin bands of orangish brown staining. 7.55m: Becoming peloidal. 7.60 - 17.70m: Intersecting 40deg and subvertical fractures. 7.75 - 17.80m: 50deg undulating rough fracture. 7.90 - 18.40m: Fractures are randomly orientated very closely and closely spaced planar and undulating rough locally stained yellowish brown. 8.20 - 18.25m: Shell fragment (30mm) partially replaced by grey and white calcite (up to 15mm). 8.50 - 18.65m: Recovered non intact. Fractures probably very closely spaced. 8.70 - 20.00m: Weak and medium strong yellowish grey ooidal and peloidal limestone. Localised thin beds of extremely weak limestone recovered non intact. Weak to medium strong locally strong light yellowish brown mottled brown ooidal LIMESTONE. Fractures are 30-50deg and subhorizontal closely and medium spaced planar and undulating rough. (IOG) (BLPL) 20.30 - 20.35m: 35deg undulating rough stained yellowish orange. 21.10 - 21.15m: 50deg stepped rough fracture.			
18CS	17.40 - 17.65										
19C	18.50 - 20.00	18.50	100 47 27								
20C	20.00 - 21.50	20.00	97 80 80	NI 250 300					20.00	254.20	
21CS	20.75 - 21.05										
22C	21.50 - 23.00	21.50	80 49 41	NR NI 180 320							
23C	23.00 - 24.50	23.00	100 77 63					21.50 - 21.80m: Assessed zone of core loss. 21.95m: Shell fragments (up to 5mm diam). 21.95 - 22.10m: Intersecting 60deg planar rough fractures. 22.20 - 22.40m: Recovered non intact. Fractures probably very closely spaced. 22.55 - 22.70m: 50deg undulating rough fracture. Medium strong locally weak orangish grey bioclastic LIMESTONE with frequent shell fragments (up to 30mm). Fractures are subhorizontal to 15deg closely and medium spaced undulating rough. (IOG) (BLPL) 23.05m: Fracture stained orangish brown. 23.50 - 23.80m: 45deg undulating rough fractures with zone of weakness. 23.85 - 23.95m: Bioturbation.	23.00	251.20	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS				
CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1158 			
BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS inclinations are measured normal to the axis of the core.			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC514

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 09 January 2020

Easting 393899

Scale 1:50

End Date 15 January 2020

Northing 215727

Ground Level 274.20mOD

Depth 31.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24C	24.50 - 26.00	24.50	100 67 58					Medium strong locally weak orangish grey bioclastic LIMESTONE with frequent shell fragments (up to 30mm). Fractures are subhorizontal to 15deg closely and medium spaced undulating rough. (IOG) (BLPL) 24.00m: Becoming light yellowish brown. 24.00 - 24.05m: 50deg stepped rough fracture. 24.50 - 24.90m: Recovered non intact. Fractures are very closely and closely spaced. 25.25m: Fractures partly infilled (up to 3mm) with yellowish brown clay. 25.35 - 25.65m: Recovered non intact. Fractures probably very closely spaced locally stained orangish brown.	25.65	248.55	
25CS	24.90 - 25.25		NI								
26C	26.00 - 27.50	26.00	100 93 90	NI 240 270			Weak to medium strong locally strong light yellowish brown mottled brown ooidal LIMESTONE. Fractures are 30-50deg and subhorizontal closely and medium spaced planar and undulating rough. (IOG) (BLPL) 25.70m: 20deg undulating rough fracture.				
27C	27.50 - 29.00	27.50	87 35 35				27.50 - 27.70m: Assessed zone of core loss.				
28CS	28.10 - 28.35						28.00 - 28.40m: Recovered non intact. Fractures probably very closely and closely spaced.				
29C	29.00 - 30.00	29.00	60 45 40								
30C	30.00 - 31.00	30.00	100 75 75								
31CS	30.40 - 30.60										
Borehole Completed at 31.00m									31.00	243.20	

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE				DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158

BARREL DIAMETER		HOLE PROGRESS			REMARKS	CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)		WATER (m)	35560
						CHECKED	
						CT	

BOREHOLE LOG



RC516

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 3

Start Date 13 May 2020

Easting 393921

Scale 1:50

End Date 15 May 2020

Northing 215528

Ground Level 277.35mOD

Depth 22.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 3ES 4D	0.10 - 0.20 0.10 - 0.20 0.10 - 0.20 0.30 - 0.40 0.50 - 0.60 0.50 - 0.60 0.50 - 0.60						H 35	Grass over soft dark brown gravelly silty CLAY with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	277.15	
4ES 5B 6D 7L 8D	1.00 - 1.10 1.00 - 1.10 1.00 - 1.10 1.20 - 2.70 1.40 - 1.50							Soft to firm orangish brown slightly gravelly CLAY with a low subangular limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (HDD) (HEAD) 0.40 - 0.75m: Orange mottled grey. Firm orange and light grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse limestone. (HDD) (HEAD)	0.75 1.20	276.60 276.15	
9LS	2.00 - 2.40							Stiff bluish grey mottled orangish brown and reddish brown locally slightly sandy CLAY. (FEF) (FE) 1.20 - 1.95m: Frequent black rootlets. 1.95 - 2.60m: Abundant fine and medium sized shell debris.			
10C	2.70 - 4.20	2.70	60 31 31	NR				Limited recovery. Single angular irregular limestone COBBLE with much soft orangish brown slightly sandy gravelly clay. Gravel is angular fine and medium limestone. (IOG) (SALS) No recovery.	2.60 2.70	274.75 274.65	
11C 12CS	4.20 - 5.70 4.40 - 4.70	4.20	95 90 90	NI 90 170				Weak to medium strong bioclastic LIMESTONE with frequent bivalve fossils (up to 40mm). Fractures are 40deg to 60deg closely spaced undulating rough stained orangish brown with a veneer of orangish brown clay. (IOG) (SALS)			
13CS 14C	5.60 - 5.70 5.70 - 7.20	5.70	87 83 74	670				Weak light brownish grey and white bioclastic LIMESTONE with rare bivalve fossils (up to 25mm). Fractures are 40deg to 50deg medium rarely closely spaced undulating rough stained orangish brown. (IOG) (SALS) 4.80 - 4.90m: Irregular void open 30mm with smooth surfaces, possible karstic feature. 5.90 - 6.05m: Light brown.	4.40	272.95	
15C	7.20 - 8.70	7.20	97 94 84	NI 190 400				Weak light brown bioclastic LIMESTONE with rare bivalve fossils (up to 30mm). Fractures are subhorizontal and 40deg to 50deg closely and medium spaced undulating rough stained orangish brown rarely infilled (up to 25mm) with soft brown sandy clay. (IOG) (SALS)	6.75	270.60	
16CS	7.85 - 8.25							7.80 - 8.25m: Light greyish brown.			

Continued Next Page

HOLE CONSTRUCTION			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush				
TOP (m)	BASE (m)	TYPE	Hand tools			DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
0.00	1.20	Inspection Pit	Geotechnical Pioneer Rig							
1.20	22.20	Rotary Core								

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1143
168	2.00	0.00	22.20	Bentonite			
140	22.20						

BARREL DIAMETER		HOLE PROGRESS				REMARKS Borehole drilled at an inclination of 45deg and at a bearing of 045deg. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)	
146	22.20	13-05-2020 09:40	0.00	Nil	Dry	
		13-05-2020 15:55	2.70	Nil	Dry	
		14-05-2020 10:45	2.70	2.70	Dry	
		14-05-2020 16:40	13.20	13.20	8.60	
		15-05-2020 08:15	13.20	13.20	9.30	

AGS

CONTRACT

35560

CHECKED

CT

BOREHOLE LOG



RC516

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 3

Start Date 13 May 2020

Easting 393921

Scale 1:50

End Date 15 May 2020

Northing 215528

Ground Level 277.35mOD

Depth 22.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
17C 18CS	8.70 - 10.20 8.70 - 8.85	8.70	88 83 81					Weak light brown bioclastic LIMESTONE with rare bivalve fossils (up to 30mm). Fractures are subhorizontal and 40deg to 50deg closely and medium spaced undulating rough stained orangish brown rarely infilled (up to 25mm) with soft brown sandy clay. (IOG) (SALS)			
19C	10.20 - 11.70	10.20	91 85 73	NI 140 220				9.20 - 9.70m: Light greyish brown.	10.50	266.85	
20CS	11.15 - 11.45							Extremely weak light greyish brown bioclastic LIMESTONE with frequent bivalve fossils (up to 20mm). Fractures are 10deg to 30deg closely spaced undulating rough rarely stained orangish brown. (IOG) (SALS)			
21C 22CS	11.70 - 13.20 11.85 - 11.95	11.70	91 70 39	NI 100 140				Weak light brown bioclastic LIMESTONE. Fractures are subhorizontal and 20deg to 30deg closely spaced undulating rough stained orangish brown rarely infilled (up to 15mm) with light brown clay. (IOG) (SALS)	11.60	265.75	
23C 24CS	13.20 - 14.70 13.35 - 13.65	13.20	100 300 340 95 84 60	NI 160 360				12.70m: Ammonite fossil fragment (50mm).	12.95	264.40	
25C	14.70 - 16.20	14.70	96 90 61					Weak light greyish brown bioclastic and ooidal LIMESTONE with rare bivalve fossils (up to 20mm). Rare calcite veining (up to 2mm). Fractures are 10deg to 30deg closely and medium spaced undulating rough stained orangish brown. (IOG) (SALS)	13.65	263.70	
								Medium strong light brown and light grey bioclastic LIMESTONE with abundant fossils (up to 30mm) replaced with calcite. Fractures are subhorizontal and 30deg to 50deg closely and medium spaced undulating rough rarely stained orangish brown. (IOG) (SALS)			
								15.40 - 15.65m: Subvertical fracture undulating rough stained orangish brown.			

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1143 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m) 15-05-2020 12:30 22.20 22.20 15.00			REMARKS to the axis of the core. Driller notes loss of flush returns below 4.90m.			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC516

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 3

Start Date 13 May 2020

Easting 393921

Scale 1:50

End Date 15 May 2020

Northing 215528

Ground Level 277.35mOD

Depth 22.20 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26C	16.20 - 17.70	16.20	93 73 53					Extremely weak light grey bioclastic LIMESTONE, locally disintegrating to brown gravelly silt. Frequent shell debris (up to 15mm). Fractures are 40deg to 50deg closely spaced planar smooth. (IOG) (SALS)	16.90	260.45	
27CS	17.30 - 17.65			NI					17.35	260.00	
28C	17.70 - 19.20	17.70	97 89 69					Weak light grey and light brown bioclastic LIMESTONE with abundant calcified bivalve fossils (up to 30mm). Fractures are subhorizontal and 40deg to 50deg closely and medium spaced undulating rough rarely stained orangish brown rarely infilled (up to 30mm) with brown gravelly clay. (IOG) (ASLS)			
29C	19.20 - 20.70	19.20	95 89 83						19.60	257.75	
30CS	20.00 - 20.35			NI 230 400				Weak light brown bioclastic and ooidal LIMESTONE with rare shell debris (up to 15mm). Fractures are subhorizontal and 40deg closely and medium spaced undulating rough stained orangish brown. (IOG) (BLPL)			
31C	20.70 - 22.20	20.70	98 95 72						22.20	255.15	
Borehole Completed at 22.20m											

HOLE CONSTRUCTION				WATER STRIKE Groundwater not encountered prior to use of flush			
TOP (m)	BASE (m)	TYPE	PLANT USED	DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min) REMARKS

CASING DEPTH		BACKFILL		INSTRUMENTATION		SUB LOCATION:	
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1143

BARREL DIAMETER		HOLE PROGRESS			REMARKS		CONTRACT	
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560	
							CHECKED	
							CT	

BOREHOLE LOG



RC520

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 4

Start Date 23 January 2020

Easting 393706

Scale 1:50

End Date 24 January 2020

Northing 215210

Ground Level 283.90mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D	0.10 - 0.20 0.10 - 0.20 0.10 - 0.20 0.30 - 0.40 0.30 - 0.40 0.30 - 0.40							Grass over soft dark brown gravelly silty CLAY with a low subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP) Light brownish grey slightly sandy clayey angular and subangular fine to coarse limestone GRAVEL with a low subangular limestone cobble content. (HDD) (HEAD) Heavily fractured LIMESTONE (Driller's description). No recovery, borehole advanced by reaming casing.	0.30 0.45	283.60 283.45	
5C	1.50 - 3.00	1.50	86 10 0	NI 45				Weak and medium strong highly fractured yellowish grey LIMESTONE recovered as claybound angular and subangular fine to coarse gravel with a medium cobble content. Fractures are probably randomly orientated very closely spaced undulating rough locally stained brown and locally with a greyish brown calcite precipitate (up to 2mm thick). (GOG) (WHL) 2.30m: Root (3mm diam).	1.50	282.40	
6C	3.00 - 4.50	3.00	97 17 0								
7C	4.50 - 6.00	4.50	100 59 48	NI 105 220				Strong brownish grey LIMESTONE. Fracture set 1; 45deg closely and medium spaced undulating rough with zones of weakening (up to 25mm) either side of the fracture surface. Fracture set 2; subhorizontal to 15deg very closely and closely spaced planar rough and undulating rough locally with a calcite precipitate (up to 2mm thick). (GOG) (WHL) 5.40m: Frequent black specks. 5.55 - 5.70m: 45deg stepped rough fracture stained reddish brown and grey locally infilled (up to 15mm) with reddish brown sparry calcite. 5.70 - 5.80m: 45deg fracture surface with frequent slickensides. 6.00 - 6.15m: Locally mottled orangish brown. 6.45 - 7.30m: Light greyish brown. 6.50 - 6.55m: Frequent black specks. 6.70 - 7.10m: Randomly orientated incipient fractures infilled (up to 1mm) with grey and white calcite. 7.00 - 7.20m: 45deg undulating rough intersecting fractures infilled (up to 20mm) with weak angular and subangular fine to coarse claybound limestone gravel. 7.20 - 7.30m: Frequent 45deg shell fragments (up to 20mm). 7.30m: Abundant black specks. 7.50 - 8.50m: Limited recovery. Probably very closely fractured, recovered non intact.	4.40	279.50	
8C	6.00 - 7.50	6.00	100 55 47								
9C	7.50 - 8.50	7.50	60 0 0	NI							

Continued Next Page

HOLE CONSTRUCTION			PLANT USED		WATER STRIKE Groundwater not encountered prior to use of flush		
TOP (m)	BASE (m)	TYPE			DEPTH (m)	CASING (m)	ROSE TO (m) AFTER (min) REMARKS
0.00	0.45	Inspection Pit	Hand tools				
0.45	25.50	Rotary Core	Comacchio 305				

CASING DEPTH		BACKFILL			INSTRUMENTATION		SUB LOCATION:
DIAM (mm)	BASE (m)	TOP (m)	BASE (m)	MATERIAL	DEPTH (m)	TYPE	1158
200	2.00	0.00	25.50	Bentonite			
140	25.50						

BARREL DIAMETER		HOLE PROGRESS				REMARKS Hole advanced by reaming casing (200mm diam) 0.45-1.50m. Hand dug inspection pit terminated at 0.45m on encountering limestone. Borehole drilled at an inclination of 45deg and on a bearing of 045deg.	CONTRACT
DIAM (mm)	BASE (m)	DATE TIME	DEPTH (m)	CASING (m)	WATER (m)		35560
200	1.50	23-01-2020 10:15	0.00	Nil	Dry		CHECKED
146	25.50	23-01-2020 16:25 24-01-2020 08:00 24-01-2020 15:30	7.50 7.50 7.50	7.50 7.50 7.50	Dry Dry Dry		CT

BOREHOLE LOG



RC520

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 4

Start Date 23 January 2020

Easting 393706

Scale 1:50

End Date 24 January 2020

Northing 215210

Ground Level 283.90mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend	
10C	8.50 - 9.00	8.50	100 96 96	NI 45 210				<p>Weak locally medium strong thinly to medium bedded light yellowish brown bioclastic LIMESTONE with closely and medium spaced thin and medium beds of very weak and weak limestone recovered as claybound angular and subangular fine to coarse gravel. Fractures are 40-50deg and subhorizontal to 15deg very closely and closely spaced undulating rough locally stained orangish brown and locally with a veneer of brown slightly sandy clay. (GOG) (HMB)</p> <p>8.70 - 8.80m: 75deg stepped rough fracture stained greyish brown.</p> <p>9.35m: Frequent black specks.</p> <p>9.55 - 9.60m: Abundant shell fragments (up to 10mm).</p> <p>9.70 - 9.90m: Subvertical grey and white calcite vein (up to 5mm thick).</p> <p>9.90 - 10.50m: Clay mottled greenish brown.</p> <p>Weak and medium strong bluish grey mottled orangish brown LIMESTONE. Fractures are 30-50deg and rarely 15-25deg closely and medium spaced undulating rough stained orangish brown with frequent black specks. (GOG) (HMB)</p> <p>11.85 - 12.05m: Subhorizontal band of soft light brown clay.</p> <p>12.15 - 12.30m: 45deg undulating rough fracture.</p> <p>12.35 - 12.45m: 30deg undulating rough fracture stained reddish brown with a zone of weakening (up to 15mm) either side of the fracture surface.</p> <p>12.50 - 12.80m: Randomly orientated undulating incipient fractures stained reddish brown.</p> <p>12.80 - 13.25m: Fractures are 40deg very closely and closely spaced undulating rough stained orangish brown and reddish brown with frequent black specks.</p> <p>13.25 - 13.50m: Locally disintegrating to soft yellowish brown clay.</p> <p>13.50 - 13.80m: Orangish brown and locally disintegrating to yellowish brown clay.</p> <p>13.80 - 13.90m: Firm locally stiff orangish brown silty clay with frequent pockets (up to 40mm) of medium orange sand. Lower contact 50deg.</p> <p>Extremely weak locally weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding inclined 50deg rare calcite nodules (up to 25mm). Fractures are 40deg medium spaced undulating smooth with a grey silt infill (up to 2mm). (FEF) (FE)</p> <p>14.90 - 15.00m: Weak and grey.</p> <p>15.65 - 15.95m: Thin bed (inclined 50deg) of medium strong light grey bioclastic limestone with frequent shell fragments (up to 10mm). Fractures are 50deg and 70deg undulating rough with orange penetrative staining.</p>	8.50	275.40		
11C 12CS	9.00 - 10.50 9.15 - 9.35	9.00	100 39 39									
13C	10.50 - 12.00	10.50	97 58 54									
14CS	11.50 - 11.85			NI 180 350						11.40	272.50	
15C	12.00 - 13.50	12.00	100 67 49									
16C	13.50 - 15.00	13.50	100 75 45	NI 35 60								
17C	15.00 - 16.50	15.00	95 35 20	NI 240 270						13.90	270.00	

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS Driller notes reduced flush returns 3.00-4.50m (50% returned) and loss of flush returns 4.50-25.50m. All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All			CONTRACT 35560 CHECKED CT		

BOREHOLE LOG



RC520

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 3 of 4

Start Date 23 January 2020

Easting 393706

Scale 1:50

End Date 24 January 2020

Northing 215210

Ground Level 283.90mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
18CS	16.05 - 16.35							Extremely weak locally weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Bedding inclined 50deg rare calcite nodules (up to 25mm). Fractures are 40deg medium spaced undulating smooth with a grey silt infill (up to 2mm). (FEF) (FE) 16.00 - 16.65m: Disintegrated to very stiff dark grey clay. Weak grey mottled dark grey bioclastic LIMESTONE with abundant shell fragments (up to 10mm). Fractures 40deg medium spaced undulating rough locally with an orange silt infill (up to 3mm) and orange penetrative staining (up to 5mm). (FEF) (FE) 16.80 - 17.15m: Locally disintegrated to dark grey clay. 17.50m: PLI suggests extremely weak. 17.95 - 18.00m: Stained orange.			
19C	16.50 - 18.00	16.50	100 79 79	NI 400 700					16.65	267.25	
20CS	17.50 - 17.85							18.50 - 19.05m: Frequent calcite nodules (up to 50x10mm) with orange penetrative staining (up to 5mm) and 70deg incipient fractures. Frequent orange staining (up to 70mm). Fractures infilled with calcite crystals (up to 10mm). Weak thickly laminated dark grey MUDSTONE with rare shell fragments (up to 5mm). Fractures are 30deg and 80deg closely and medium spaced undulating rough with orange penetrative staining (up to 5mm). (FEF) (FE)			
21C	18.00 - 19.50	18.00	100 89 69	NI 150 300					19.05	264.85	
22C	19.50 - 21.00	19.50	100 97 53	NI 300 600				Very weak thinly laminated dark grey SILTSTONE. Laminae inclined 60deg. Rare 70deg and 30deg incipient fractures with orange penetrative staining (up to 50mm). Fractures are 40deg medium spaced undulating rough. (FEF) (FE) 20.15 - 20.30m: Calcite vein (up to 15mm) around fracture surface.			
23CS	20.50 - 20.70								19.85	264.05	XXXXXX
24C	21.00 - 22.50	21.00	93 61 47	NI 140 300				Extremely weak locally weak thinly laminated dark grey MUDSTONE locally tending to very stiff clay. Laminae inclined 35deg. Rare calcite veins (up to 5mm) inclined 35deg. Fractures are 30-40deg closely and medium spaced undulating rough with rare orange staining. (FEF) (FE) 22.20 - 22.50m: Rare 10deg and 50deg incipient fractures with orange penetrative staining (up to 2mm). Strong locally medium strong grey mottled dark grey LIMESTONE with frequent shell fragments (up to 5mm) and orange staining (up to 50x5mm). Fractures are 50deg closely and medium spaced undulating rough. (IOG) (SALS) 23.10 - 23.20m: Thin bed of brown clay. Strong locally very strong orangish brown and grey LIMESTONE with frequent shell fragments (up to 10mm). Rare calcite veins (up to 5mm) inclined 30deg to 50deg. Fractures are 40-50deg closely and medium spaced undulating rough stained brown. (IOG) (SALS)			
25C	22.50 - 24.00	22.50	100 87 79	NI 300 460					21.25	262.65	XXXXXX
26CS	22.80 - 23.10							22.55	261.35		
27C	24.00 - 25.50	24.00		NI 130 240				23.55	260.35		

Continued Next Page

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
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CASING DEPTH DIAM (mm) BASE (m)		BACKFILL TOP (m) BASE (m) MATERIAL				INSTRUMENTATION DEPTH (m) TYPE		SUB LOCATION: 1158		
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BARREL DIAMETER DIAM (mm) BASE (m)		HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)				REMARKS inclinations are measured normal to the axis of the core.		CONTRACT 35560	
								CHECKED CT	

BOREHOLE LOG



RC520

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 4 of 4

Start Date 23 January 2020

Easting 393706

Scale 1:50

End Date 24 January 2020

Northing 215210

Ground Level 283.90mOD

Depth 25.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	lf	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 68 52					<p>Strong locally very strong orangish brown and grey LIMESTONE with frequent shell fragments (up to 10mm). Rare calcite veins (up to 5mm) inclined 30deg to 50deg. Fractures are 40-50deg closely and medium spaced undulating rough stained brown. (IOG) (SALS)</p> <p>24.60 - 25.00m: 60deg undulating rough fractures with calcite crystal infill (up to 5mm).</p> <p>25.25 - 25.40m: Thin bed (45deg) of extremely weak brown mudstone.</p> <p>25.40 - 25.50m: Contact 50deg. Extremely weak dark grey siltstone.</p> <p style="text-align: center;">Borehole Completed at 25.50m</p>			

HOLE CONSTRUCTION TOP (m) BASE (m) TYPE			PLANT USED			WATER STRIKE Groundwater not encountered prior to use of flush DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS					
CASING DEPTH DIAM (mm) BASE (m)			BACKFILL TOP (m) BASE (m) MATERIAL			INSTRUMENTATION DEPTH (m) TYPE			SUB LOCATION: 1158 		
BARREL DIAMETER DIAM (mm) BASE (m)			HOLE PROGRESS DATE TIME DEPTH (m) CASING (m) WATER (m)			REMARKS			CONTRACT 35560 CHECKED CT		



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP102	1.20		1.65	Nil	Dry	1	2	75	75	1	2	2	2	75	75	75	75	S	7	65
CP102	2.00		2.45	Nil	1.20	1	1	75	75	2	2	3	3	75	75	75	75	S	10	65
CP102	3.00		3.45	3.00	0.20	1	2	75	75	3	3	3	3	75	75	75	75	S	12	65
CP102	4.00		4.45	3.00	2.20	2	2	75	75	2	2	2	3	75	75	75	75	S	9	65
CP102	5.00		5.45	4.50	1.20	2	2	75	75	2	2	2	3	75	75	75	75	S	9	65
CP102	6.00		6.45	6.00	0.30	3	4	75	75	3	4	4	4	75	75	75	75	S	15	65
CP102	7.00		7.45	7.00	0.40	2	4	75	75	4	4	5	5	75	75	75	75	S	18	65
CP104	1.50		1.95	1.50	Dry	1	2	75	75	1	2	2	3	75	75	75	75	S	8	74
CP104	4.00		4.45	1.50	Dry	2	2	75	75	2	3	2	4	75	75	75	75	S	11	74
CP104	6.00		6.45	1.50	Dry	1	2	75	75	2	3	3	3	75	75	75	75	S	11	74
CP104	8.00		8.45	1.50	Dry	2	3	75	75	5	5	4	5	75	75	75	75	S	19	74
CP104	10.50		10.95	1.50	10.20	2	4	75	75	4	5	6	7	75	75	75	75	S	22	74
CP104	13.50		13.95	1.50	Dry	3	4	75	75	6	6	6	7	75	75	75	75	S	25	74
CP104A	15.00		15.45	15.00	11.00	3	4	75	75	6	6	6	8	75	75	75	75	S	26	74
CP104A	16.50		16.76	16.50	11.60	13	12	75	57	26	24			75	48			S	122	74
CP105	1.20	75	1.73	Nil	Dry	1	0	75	75	2	2	2	3	75	75	75	75	S	9	76
CP105	2.00		2.45	Nil	Dry	1	1	75	75	2	2	2	3	75	75	75	75	S	9	76
CP105	3.00		3.45	Nil	Dry	1	2	75	75	3	3	2	3	75	75	75	75	S	11	76
CP105	4.00		4.30	Nil	Dry	12	13	75	75	33	17			75	75			S	100	76
CP106	1.20		1.65	Nil	Dry	2	1	75	75	0	1	1	1	75	75	75	75	S	3	76
CP106	2.00		2.45	2.00	1.00	2	3	75	75	1	2	2	1	75	75	75	75	S	6	76
CP106	3.50		3.95	3.00	3.00	2	1	75	75	2	3	3	3	75	75	75	75	S	11	76
CP106	4.00		4.45	3.00	3.00	1	2	75	75	3	3	3	3	75	75	75	75	S	12	76
CP106	5.50		5.95	3.00	3.00	2	4	75	75	8	12	10	4	75	75	75	75	S	34	76
CP106	6.00		6.45	3.00	5.30	2	4	75	75	4	3	4	8	75	75	75	75	S	19	76

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows	pen (mm)	blows	pen (mm)	blows	pen (mm)	blows	pen (mm)							
CP106	7.00		7.45	3.00	5.80	2	2	75	75	3	3	4	5	75	75	75	75	S	15	76
CP106	9.00		9.45	8.00	5.40	2	3	75	75	3	4	6	6	75	75	75	75	S	19	76
CP106	10.50		10.95	8.00	6.80	1	2	75	75	3	4	6	10	75	75	75	75	S	23	76
CP200	1.20		1.65	1.20	0.10	1	1	75	75	1	1	1	1	75	75	75	75	S	4	65
CP200	2.00		2.45	2.00	0.10	1	0	75	75	1	1	0	1	75	75	75	75	S	3	65
CP200	3.00		3.45	3.00	0.20	1	0	75	75	1	0	0	1	75	75	75	75	S	2	65
CP200	4.00		4.45	4.00	Dry	1	1	75	75	1	1	1	1	75	75	75	75	S	4	65
CP200	5.00		5.45	4.00	Dry	1	0	75	75	1	1	1	0	75	75	75	75	S	3	65
CP200	6.00		6.45	6.00	Dry	1	1	75	75	1	1	2	2	75	75	75	75	S	6	65
CP200	7.00		7.45	7.00	0.10	2	3	75	75	5	5	6	7	75	75	75	75	S	23	65
CP200	8.00		8.45	7.00	0.80	12	12	75	75	7	7	8	8	75	75	75	75	S	30	65
CP200	9.00		9.45	9.00	0.90	7	8	75	75	8	9	10	10	75	75	75	75	S	37	65
CP200	10.00		10.45	10.00	1.10	7	7	75	75	9	9	11	12	75	75	75	75	C	41	65
CP202	1.20		1.65	Nil	1.15	1	1	75	75	1	10	10	1	75	75	75	75	S	22	65
CP202	2.00		2.45	Nil	1.80	1	0	75	75	1	1	1	1	75	75	75	75	S	4	65
CP202	3.00		3.45	3.00	0.20	2	2	75	75	2	2	3	3	75	75	75	75	S	10	65
CP202	4.00		4.45	3.00	0.70	3	3	75	75	4	4	4	4	75	75	75	75	S	16	65
CP202	5.00		5.45	4.50	0.40	5	5	75	75	7	8	8	9	75	75	75	75	S	32	65
CP204	1.20		1.65	Nil	Dry	1	2	75	75	1	2	2	3	75	75	75	75	S	8	70
CP204	2.00		2.45	Nil	Dry	1	2	75	75	2	3	7	10	75	75	75	75	S	22	70
CP204	3.00		3.45	3.00	0.80	3	4	75	75	6	6	5	5	75	75	75	75	S	22	70
CP204	4.00		4.45	3.00	2.57	1	1	75	75	1	2	2	2	75	75	75	75	S	7	70
CP204	5.00		5.45	3.00	4.70	2	2	75	75	2	3	2	3	75	75	75	75	S	10	70
CP204	6.00		6.45	6.00	1.36	2	2	75	75	3	3	6	7	75	75	75	75	S	19	70
CP204	7.00		7.45	6.00	2.26	3	4	75	75	5	7	10	17	75	75	75	75	S	39	70

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP206	1.20		1.65	Nil	Dry	1	1	75	75	2	2	2	2	75	75	75	75	S	8	76
CP206	2.00		2.45	Nil	2.00	1	1	75	75	1	1	3	3	75	75	75	75	S	8	76
CP206	3.00		3.45	Nil	3.00	1	0	75	75	1	1	2	3	75	75	75	75	S	7	76
CP206	4.00	150	4.60	3.00	3.00	1	0	75	75	1	0	1	1	75	75	75	75	S	3	76
CP206	6.00		6.45	5.00	3.30	1	2	75	75	2	2	3	5	75	75	75	75	S	12	76
CP206	7.00		7.45	5.00	5.00	1	1	75	75	1	2	3	4	75	75	75	75	S	10	76
CP206	8.00		8.45	5.00	5.00	2	2	75	75	3	4	5	6	75	75	75	75	S	18	76
CP206	9.00		9.45	5.00	5.40	5	5	75	75	4	3	4	5	75	75	75	75	S	16	76
CP206	10.00		10.45	5.00	5.40	1	2	75	75	3	5	4	7	75	75	75	75	S	19	76
CP206	11.00		11.45	10.00	4.00	10	8	75	75	6	6	4	30	75	75	75	75	S	46	76
CP206	13.70		14.15	13.70	5.25	4	7	75	75	6	6	13	13	75	75	75	75	S	38	76
CP208	1.20		1.65	Nil	Dry	1	1	75	75	1	1	1	2	75	75	75	75	S	5	76
CP208	2.00		2.45	1.20	Dry	2	2	75	75	3	3	3	4	75	75	75	75	S	13	76
CP208	3.00		3.45	1.20	Dry	3	4	75	75	4	4	4	5	75	75	75	75	S	17	76
CP208	4.00		4.45	1.20	Dry	3	3	75	75	4	5	5	8	75	75	75	75	S	22	76
CP208	5.00		5.45	4.00	0.20	3	5	75	75	5	7	7	7	75	75	75	75	S	26	76
CP208	6.00		6.45	5.00	3.00	3	5	75	75	7	9	9	11	75	75	75	75	S	36	76
CP208	7.00		7.45	5.80	3.10	6	6	75	75	6	7	7	8	75	75	75	75	S	28	76
CP208	8.00		8.45	7.00	3.10	5	5	75	75	7	6	7	8	75	75	75	75	S	28	76
CP208	9.00		9.45	8.80	3.20	5	6	75	75	4	7	7	8	75	75	75	75	S	26	76
CP208	10.00		10.45	10.00	1.90	11	4	75	75	11	5	10	10	75	75	75	75	S	36	76
CP209	1.20		1.65	Nil	Dry	2	1	75	75	3	3	3	3	75	75	75	75	S	12	76
CP209	1.90		2.35	Nil	Dry	9	7	75	75	3	5	2	3	75	75	75	75	S	13	76
CP209	3.00		3.45	2.00	2.70	3	1	75	75	1	0	1	1	75	75	75	75	S	3	76
CP210	1.20		1.65	Nil	Dry	4	5	75	75	6	3	3	4	75	75	75	75	S	16	84

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP210	2.00		2.45	2.00	1.00	5	7	75	75	11	8	6	4	75	75	75	75	S	29	84
CP210	3.00		3.45	2.00	1.82	2	2	75	75	2	2	3	4	75	75	75	75	S	11	84
CP210	5.00		5.45	4.00	2.89	3	2	75	75	3	3	4	3	75	75	75	75	S	13	84
CP210	8.00		8.45	6.00	3.00	7	6	75	75	6	7	8	7	75	75	75	75	S	28	84
CP210	9.00		9.45	6.00	3.82	4	4	75	75	6	8	7	8	75	75	75	75	S	29	84
CP210	12.00		12.45	6.00	8.47	8	10	75	75	11	10	9	12	75	75	75	75	S	42	84
CP210	15.00		15.45	6.00	10.12	12	12	75	75	13	12	12	11	75	75	75	75	C	48	84
CP210	18.00		18.12	6.00	11.39	14	11	75	20	50				20				C	750	84
CP210	20.50		20.72	6.00	Dry	15	10	75	30	32	18			75	40			C	130	84
CP210	23.50		23.67	6.00	17.21	19	6	75	10	41	9			75	10			C	176	84
CP211	1.10		1.55	Nil	Dry	5	3	75	75	7	8	3	6	75	75	75	75	S	24	84
CP211	2.00		2.45	Nil	Dry	4	5	75	75	5	5	4	3	75	75	75	75	S	17	84
CP211	3.00		3.45	3.00	0.40	5	2	75	75	3	3	3	3	75	75	75	75	S	12	84
CP211	4.00		4.45	3.00	0.33	2	3	75	75	3	4	3	3	75	75	75	75	S	13	84
CP211	6.00		6.45	6.00	0.11	2	3	75	75	3	4	4	6	75	75	75	75	S	17	84
CP211	7.50		7.95	6.00	2.17	4	6	75	75	10	10	11	13	75	75	75	75	C	44	84
CP211	9.00		9.36	6.00	4.17	9	12	75	75	15	17	18		75	75	60		C	71	84
CP211	10.50		10.90	7.50	2.50	12	13	75	75	14	14	15	7	75	75	75	20	C	61	84
CP211	13.50		13.88	7.50	13.00	15	10	75	70	15	15	18	2	75	75	75	5	C	65	84
CP211	16.50		16.70	7.50	15.11	18	7	75	15	34	16			75	30			C	143	84
CP211	19.50		19.70	7.50	17.89	22	3	75	5	25	25			75	40			C	130	84
CP211	22.50		22.69	7.50	Dry	21	4	75	5	27	23			75	35			C	136	84
CP211	25.00		25.15	7.50	Dry	25		60		42	8			75	10			C	176	84
CP211	27.50		27.60	7.50	Dry	25		30		50				70				C	214	84
CP211	30.00		30.10	7.50	Dry	25		35		50				60				C	250	84

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)
						blows		pen (mm)		blows		pen (mm)				
CP211	33.00		33.19	7.50	Dry	20	5	75	5	28	22	75	35	C	136	84
CP211	35.00		35.10	7.50	Dry	25		40		50		60		C	250	84
CP212	1.20		1.65	Nil	Dry	2	3	75	75	7	8	9	10	S	34	76
CP212	2.20		2.65	2.20	0.80	5	5	75	75	6	6	7	8	S	27	76
CP212	3.00		3.45	2.20	2.70	2	5	75	75	5	8	4	4	S	21	76
CP212	3.70		4.15	3.70	0.10	7	7	75	75	8	11	16	5	S	40	76
CP212	5.20		5.65	5.20	0.50	5	5	75	75	7	8	10	11	S	36	76
CP212	6.70		7.15	5.20	3.90	4	6	75	75	10	10	11	11	C	42	76
CP213	1.20		1.65	Nil	Dry	1	2	75	75	3	3	3	2	S	11	70
CP213	2.00		2.45	Nil	Dry	2	2	75	75	3	3	4	5	S	15	70
CP213	3.00		3.45	Nil	Dry	4	4	75	75	5	4	3	5	S	17	70
CP213	4.00		4.45	4.00	1.90	6	5	75	75	4	4	5	5	S	18	70
CP213	5.00		5.45	4.00	2.52	4	5	75	75	6	6	7	7	S	26	70
CP213	6.00		6.45	4.00	Dry	3	4	75	75	4	4	4	6	S	18	70
CP213	7.00		7.45	7.00	2.82	3	3	75	75	2	4	7	9	S	22	70
CP213	9.00		9.45	7.00	3.86	3	2	75	75	3	5	6	8	S	22	70
CP213	10.00		10.45	10.00	2.11	4	4	75	75	5	6	9	9	S	29	70
CP213	11.50		11.95	10.00	3.41	4	4	75	75	5	7	8	8	S	28	70
CP213	12.50		12.95	10.00	4.45	7	6	75	75	7	7	7	8	S	29	70
CP213	13.50		13.95	10.00	5.10	8	10	75	75	11	11	14	14	S	50	70
CP213	15.00		15.45	10.00	3.52	7	8	75	75	8	7	8	9	S	32	70
CP213	16.50		16.95	10.00	4.10	4	7	75	75	7	5	5	6	S	23	70
CP213	18.00		18.45	10.00	5.00	6	6	75	75	5	6	7	11	S	29	70
CP213	19.50		19.95	10.00	4.86	7	6	75	75	6	6	7	6	S	25	70
CP213	21.00		21.31	10.00	8.60	8	13	75	75	20	28	2	75	S	97	70

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP213	22.50		22.84	10.00	7.66	15	10	75	30	16	16	17	1	75	75	75	5	S	65	70
CP213	24.00		24.34	10.00	8.71	16	9	75	50	22	16	12		75	75	60		S	71	70
CP213	25.50		25.75	10.00	24.90	19	6	75	10	18	19	13		75	75	15		C	91	70
CP213	26.50		26.76	10.00	25.22	16	9	75	15	19	20	11		75	75	20		C	88	70
CP214	2.00		2.45	Nil	Dry	1	2	75	75	2	3	3	3	75	75	75	75	S	11	69
CP214	4.00		4.45	3.00	0.20	3	3	75	75	5	5	6	6	75	75	75	75	S	22	69
CP214	5.00		5.45	3.00	1.60	7	7	75	75	8	8	11	11	75	75	75	75	S	38	69
CP214	7.00		7.45	5.00	2.10	8	11	75	75	12	12	13	13	75	75	75	75	S	50	69
CP214	9.00		9.45	6.50	1.90	12	13	75	75	13	13	14	17	75	75	75	75	S	57	69
CP214	11.50		11.95	11.20	0.20	6	8	75	75	12	13	14	17	75	75	75	75	C	56	69
CP214	14.50		14.91	11.20	2.30	9	9	75	75	18	22	26	34	75	75	75	35	C	115	69
CP214	17.50		17.90	11.20	4.70	10	14	75	75	21	25	25	29	75	75	75	25	C	120	69
CP214	20.50		20.94	11.20	6.02	10	15	75	65	15	19	20	25	75	75	75	75	C	79	69
CP214	23.50		23.65	11.20	7.40	25		75		100				70				C	429	69
CP214	25.00		25.26	11.20	9.32	14	11	75	55	40	60			75	55			C	231	69
CP215	1.25		1.78	Nil	Dry	1	1	75	75	1	0	1	1	75	75	75	150	S	2	69
CP215	3.20		3.65	2.20	Dry	1	1	75	75	2	2	1	2	75	75	75	75	S	7	69
CP215	5.20		5.65	2.20	Dry	1	2	75	75	3	5	4	4	75	75	75	75	S	16	69
CP215	6.20		6.65	2.20	Dry	2	2	75	75	3	4	6	7	75	75	75	75	S	20	69
CP215	8.20		8.65	7.20	3.14	1	3	75	75	4	5	4	5	75	75	75	75	S	18	69
CP215	9.10		9.55	7.20	4.34	2	3	75	75	3	4	4	4	75	75	75	75	S	15	69
CP215	10.00		10.45	7.20	1.64	1	2	75	75	3	3	6	6	75	75	75	75	S	18	69
CP215	13.00		13.40	11.50	2.24	6	12	75	75	18	50	27	5	75	75	75	20	C	122	69
CP215	16.00		16.38	11.50	2.20	6	10	75	75	13	28	59		75	75	75		C	133	69
CP215	18.90		19.35	11.50	15.12	8	10	75	75	14	17	20	22	75	75	75	75	C	73	69

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP215	22.00		22.36	11.50	15.03	10	15	75	55	23	34	43	75	75	75	C	133	69		
CP215	25.00		25.26	11.50	15.34	16	9	75	15	23	49	28	75	75	20	C	176	69		
CP216	1.20		1.65	Nil	Dry	1	1	75	75	1	1	2	1	75	75	75	75	S	5	70
CP216	2.20		2.65	2.20	1.00	1	1	75	75	2	1	2	1	75	75	75	75	S	6	70
CP216	3.20		3.65	3.20	1.00	1	2	75	75	2	2	2	2	75	75	75	75	S	8	70
CP216	4.20		4.65	4.20	3.00	4	5	75	75	11	11	7	6	75	75	75	75	S	35	70
CP216	5.20		5.65	5.20	1.00	2	4	75	75	4	3	2	2	75	75	75	75	S	11	70
CP216	6.20		6.65	6.20	1.00	2	5	75	75	4	4	4	3	75	75	75	75	S	15	70
CP216	7.20		7.65	7.20	1.00	1	1	75	75	3	4	4	4	75	75	75	75	S	15	70
CP216	8.20		8.65	8.20	1.00	3	5	75	75	5	5	7	6	75	75	75	75	S	23	70
CP217	1.25		1.70	1.25	Dry	1	2	75	75	3	2	3	4	75	75	75	75	S	12	71
CP217	2.20		2.65	1.25	Dry	2	1	75	75	3	3	2	1	75	75	75	75	C	9	71
CP217	3.20		3.65	3.20	2.25	3	3	75	75	3	5	7	6	75	75	75	75	C	21	71
CP217	4.20		4.62	4.20	2.25	12	13	75	40	16	7	10	12	75	75	75	75	C	45	71
CP217	6.20		6.65	4.20	2.24	1	3	75	75	2	3	4	5	75	75	75	75	S	14	71
CP217	8.20		8.65	7.20	2.67	2	3	75	75	4	6	6	8	75	75	75	75	S	24	71
CP217	10.10		10.52	7.20	2.04	8	17	75	50	22	28	24	26	75	75	75	65	S	103	71
CP217	13.10		13.38	7.20	1.93	10	15	75	50	22	78			75	75			C	200	71
CP217	16.10		16.37	7.20	2.27	10	15	75	40	34	56	10		75	75	5		C	194	71
CP217	18.80		19.16	10.15	2.42	10	15	75	50	23	32	40	5	75	75	75	10	C	128	71
CP217	21.80		22.00	10.15	2.46	14	11	75	25	60	40			75	20			C	316	71
CP217	24.80		25.08	10.15	2.89	13	12	75	45	34	54	12		75	75	5		C	194	71
CP217	27.80		27.92	10.15	2.84	25		75		100				40				C	750	71
CP217	32.00		32.16	10.15	3.49	25		75		70	30			75	5			C	375	71
CP223	1.20		1.65	Nil	Dry	1	1	75	75	1	1	1	2	75	75	75	75	S	5	76

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
CP223	3.00		3.45	Nil	Dry	1	2	75	75	2	2	3	3	75	75	75	75	S	10	76
CP223	4.00		4.45	Nil	Dry	1	2	75	75	3	3	6	7	75	75	75	75	S	19	76
CP223	5.00		5.45	5.00	Dry	1	5	75	75	5	4	5	6	75	75	75	75	S	20	76
CP230	1.20		1.65	Nil	Dry	5	5	75	75	3	4	5	5	75	75	75	75	S	17	76
CP230	2.00		2.45	Nil	Dry	3	3	75	75	3	4	4	5	75	75	75	75	S	16	76
CP230	2.80		3.25	2.00	0.30	2	3	75	75	4	4	5	5	75	75	75	75	S	18	76
DSRC107	1.20		1.65	Nil	Dry	1	2	75	75	5	7	8	9	75	75	75	75	S	29	70
DSRC107	2.20		2.65	2.20	1.00	1	2	75	75	2	2	2	3	75	75	75	75	S	9	70
DSRC107	3.20		3.65	3.20	1.00	1	0	75	75	1	1	2	2	75	75	75	75	S	6	70
DSRC107	4.20		4.65	4.20	1.00	1	1	75	75	1	2	1	1	75	75	75	75	S	5	70
DSRC107	5.20		5.65	5.20	1.00	2	3	75	75	3	4	4	4	75	75	75	75	S	15	70
DSRC107	7.20		7.65	7.20	1.00	3	5	75	75	5	5	5	5	75	75	75	75	S	20	70
DSRC108	1.20		1.65	Nil	Dry	1	1	75	75	1	1	1	1	75	75	75	75	S	4	70
DSRC108	2.20		2.65	2.20	1.00	1	1	75	75	1	1	1	1	75	75	75	75	S	4	70
DSRC108	3.20		3.65	3.20	1.00	1	1	75	75	1	2	1	1	75	75	75	75	S	5	70
DSRC108	4.20		4.65	4.20	1.00	1	3	75	75	4	4	3	4	75	75	75	75	S	15	70
DSRC108	6.00		6.42	6.00	1.00	5	10	75	75	13	13	13	11	75	75	75	45	S	56	70
DSRC109	1.20		1.65	Nil	Dry	7	6	75	75	11	9	9	10	75	75	75	75	S	39	85
DSRC109	2.20		2.56	Nil	Dry	7	9	75	75	6	12	32		75	75	60		C	71	85
DSRC109	3.20		3.33	3.20	0.50	25		60		50				70				C	214	85
DSRC109	4.20		4.59	4.20	3.10	7	15	75	75	17	25	55	3	75	75	75	10	C	128	85
DSRC109	5.20		5.58	5.20	4.00	14	11	75	30	36	13	19	32	75	75	75	50	C	109	85
DSRC109	8.00		8.10	8.00	1.20	25		60		100				40				C	750	85
DSRC109	11.00		11.09	8.00	Dry	25		40		100				50				C	600	85
DSRC109	14.00		14.06	8.00	13.70	25		30		100				30				C	**	85

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRC109	17.00		17.41	8.00	16.60	18	7	75	30	16	10	6	18	75	75	75	75	C	50	85
DSRC109	20.00		20.15	8.00	Dry	20	5	75	20	100				50				C	600	85
DSRC109	22.60		22.87	8.00	20.00	4	20	75	75	55	45			75	45			C	250	85
DSRC109	25.60		25.78	8.00	23.30	13	12	75	40	100				65				C	462	85
DSRC109	28.60		28.76	8.00	23.60	25		75		75	25			75	10			C	353	85
DSRC109	31.60		31.79	8.00	24.70	20	5	75	30	82	18			75	10			C	353	85
DSRC109	34.60		34.81	8.00	24.10	20	5	75	20	50	50			75	40			C	261	85
DSRC109	37.60		37.85	8.00	24.80	18	7	75	40	25	75			75	60			C	222	85
DSRC109	40.10		40.24	8.00	25.10	25		75		100				65				C	462	85
DSRC109	43.10		43.24	8.00	24.20	25		40		80	20			75	20			C	316	85
DSRC109	47.60		47.80	43.40	14.90	18	8	75	20	70	30			75	30			C	286	85
DSRC109	50.60		50.70	43.40	16.40	25		70		70	30			30				C	**	85
DSRC109	53.60		53.74	43.40	14.60	25		55		85	15			75	10			C	353	85
DSRC109	56.60		56.68	43.40	29.00	25		30		100				50				C	600	85
DSRC109	59.60		59.75	43.40	26.10	22	3	75	10	100				60				C	500	85
DSRC109	62.90		63.04	43.30	20.20	25		50		90	10			75	10			C	353	85
DSRC109	65.90		66.02	43.30	26.00	25		50		100				65				C	462	85
DSRC109	68.50		68.87	43.60	12.10	7	9	75	75	15	20	65		75	75	70		C	136	85
DSRC109	71.50		71.61	43.60	24.20	25		50		100				60				C	500	85
DSRC109	74.50		74.64	43.60	23.20	25		60		80	20			75	5			C	375	87
DSRC109	77.00		77.13	77.00	19.88	25		75		100				55				C	545	87
DSRC109	80.00		80.12	80.00	22.08	25		55		100				60				C	500	87
DSRC109	83.00		83.19	83.00	19.02	25		75		64	35			75	35			C	270	87
DSRC109	86.00		86.12	86.00	19.08	25		65		100				55				C	545	87
DSRC109	89.00		89.13	89.00	20.71	25		70		100				55				C	545	87

notes:

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3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRC109	92.00		92.13	92.00	21.53	25	75	100	55	C	545	87								
DSRC109	95.00		95.14	95.00	26.90	25	45	78	22	75	15	C	333	87						
DSRC109	98.00		98.25	98.00	31.70	40	10	75	10	45	55	75	90	C	182	87				
DSRC109	101.00		101.21	101.00	32.56	42	8	75	5	59	41	75	50	C	240	87				
DSRC109	104.00		104.21	104.00	32.72	40	10	75	10	60	40	75	45	C	250	87				
DSRC109	105.00		105.23	105.00	34.32	38	12	75	20	42	58	75	60	C	222	87				
DSRC110	1.10		1.55	Nil	Dry	6	5	75	75	9	11	12	13	75	75	75	75	S	45	68
DSRC205	1.20		1.65	Nil	Dry	4	6	75	75	5	5	6	6	75	75	75	75	S	22	84
DSRC205	2.00		2.45	Nil	Dry	7	5	75	75	6	8	12	10	75	75	75	75	S	36	84
DSRC205	3.00		3.45	3.00	0.72	8	8	75	75	17	13	10	10	75	75	75	75	S	50	84
DSRC205	4.00		4.45	3.00	2.10	1	3	75	75	3	4	5	7	75	75	75	75	S	19	84
DSRC205	5.00		5.45	3.00	Dry	5	5	75	75	4	6	7	9	75	75	75	75	S	26	84
DSRC205	7.00		7.45	7.00	2.95	5	8	75	75	8	7	7	10	75	75	75	75	S	32	84
DSRC205	7.60		8.05	7.00	3.66	7	8	75	75	9	10	11	12	75	75	75	75	S	42	84
DSRC205	8.50		8.95	7.00	2.11	6	7	75	75	8	10	9	10	75	75	75	75	S	37	84
DSRC205	10.00		10.45	7.00	3.00	5	7	75	75	8	8	9	10	75	75	75	75	S	35	84
DSRC205	13.00		13.45	7.00	10.22	13	11	75	75	12	13	13	12	75	75	75	70	C	51	84
DSRC205	16.00		16.23	10.00	6.37	20	5	75	5	25	25	75	75	C	100	84				
DSRC205	19.00		19.22	10.00	17.80	22	3	75	5	26	24	75	65	C	107	84				
DSRC205	22.00		22.13	10.00	19.00	25	50	48	2	75	5	C	188	84						
DSRC205	25.00		25.17	10.00	20.10	25	60	45	5	75	30	C	143	84						
DSRC205	28.00		28.09	10.00	Dry	25	30	50	55	C	273	84								
DSRC205	30.00		30.07	10.00	Dry	25	25	50	40	C	375	84								
DSRC207	1.20		1.65	Nil	Dry	2	2	75	75	1	1	2	2	75	75	75	75	S	6	70
DSRC207	2.20		2.65	2.20	Dry	2	2	75	75	3	3	4	5	75	75	75	75	S	15	70

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows	pen (mm)	blows	pen (mm)	blows	pen (mm)	blows	pen (mm)							
DSRC207	3.20		3.65	3.20	1.00	3	3	75	75	3	2	3	3	75	75	75	75	S	11	70
DSRC207	4.20		4.65	4.20	1.00	3	3	75	75	4	4	5	4	75	75	75	75	S	17	70
DSRC220	1.00		1.45	Nil	Dry	2	3	75	75	6	5	14	22	75	75	75	75	S	47	54
DSRC220	1.50		1.95	1.50	Dry	16	15	75	75	14	9	8	7	75	75	75	75	C	38	54
DSRC220	5.00		5.30	2.00	4.90	49	16	75	75	24	68			75	75			C	184	54
DSRC224	1.20		1.65	1.20	Dry	1	1	75	75	1	2	2	1	75	75	75	75	S	6	70
DSRC224	2.20		2.65	2.20	1.00	1	2	75	75	3	3	3	3	75	75	75	75	S	12	70
DSRC224	3.20		3.65	2.20	1.00	2	2	75	75	3	3	4	3	75	75	75	75	S	13	70
DSRC224	4.20		4.65	4.20	2.00	2	3	75	75	5	5	5	8	75	75	75	75	S	23	70
DSRC224	5.20		5.65	4.20	1.00	4	5	75	75	5	5	5	5	75	75	75	75	S	20	70
DSRC224	6.20		6.65	6.20	1.00	4	5	75	75	6	6	7	7	75	75	75	75	S	26	70
DSRC224	7.20		7.65	7.20	1.00	3	4	75	75	5	5	5	5	75	75	75	75	S	20	70
DSRC224	8.50		8.95	8.50	2.00	2	5	75	75	5	6	7	7	75	75	75	75	S	25	70
DSRC229	1.20		1.65	Nil	Dry	1	3	75	75	2	4	4	5	75	75	75	75	S	15	78
DSRC229	2.20		2.65	Nil	Dry	3	6	75	75	5	5	5	6	75	75	75	75	S	21	78
DSRC229	3.20		3.65	3.20	2.20	2	3	75	75	2	2	3	2	75	75	75	75	S	9	78
DSRC229	4.20		4.65	4.20	2.20	1	2	75	75	2	2	3	2	75	75	75	75	S	9	78
DSRC229	6.20		6.65	5.20	3.70	2	5	75	75	7	6	8	7	75	75	75	75	S	28	78
DSRC229	7.20		7.65	7.20	3.10	3	4	75	75	4	6	7	9	75	75	75	75	S	26	78
DSRC229	8.00		8.45	7.20	5.10	3	5	75	75	6	7	7	9	75	75	75	75	S	29	78
DSRC229	9.20		9.65	8.20	3.10	1	2	75	75	7	9	12	12	75	75	75	75	S	40	78
DSRC229	10.70		11.15	8.20	3.10	2	5	75	75	6	4	5	6	75	75	75	75	S	21	78
DSRC229	12.20		12.65	8.20	3.00	1	3	75	75	6	5	5	7	75	75	75	75	S	23	78
DSRC229	13.70		14.15	8.20	3.70	5	11	75	75	8	4	6	5	75	75	75	75	S	23	78
DSRC229	15.20		15.65	8.20	3.10	2	4	75	75	4	3	5	5	75	75	75	75	S	17	78

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
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STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRC229	16.70		17.15	8.20	1.40	4	4	75	75	2	8	12	8	75	75	75	75	S	30	78
DSRC229	18.20		18.65	8.20	4.10	1	5	75	75	10	12	19	15	75	75	75	75	S	56	78
DSRC229	19.70		20.15	8.20	4.10	2	1	75	75	8	11	18	26	75	75	75	75	S	63	78
DSRC229	21.20		21.65	8.20	4.10	6	15	75	75	17	22	21	23	75	75	75	75	S	83	78
DSRC229	22.70		23.15	8.20	5.40	3	5	75	75	10	12	16	21	75	75	75	75	C	59	78
DSRC229	24.20		24.54	8.20	7.10	6	16	75	75	24	38	38		75	75	40		C	158	78
DSRC229	25.00		25.25	8.20	8.40	7	14	75	75	37	63			75	25			C	300	78
DSRC301	1.20		1.60	Nil	Dry	4	9	75	75	11	20	10	9	75	75	75	20	C	61	87
DSRC301	2.20		2.58	1.50	1.50	6	10	75	75	42	50	8		75	75	80		C	130	87
DSRC301	3.20		3.48	1.50	2.00	15	10	75	20	41	31	28		75	75	30		C	167	87
DSRC301	4.20		4.65	1.50	3.10	7	8	75	75	14	16	12	25	75	75	75	75	C	67	87
DSRC301	5.20		5.49	5.20	3.60	4	5	75	75	45	55			75	60			C	222	87
DSRC301	8.20		8.61	5.20	3.60	11	14	75	45	13	28	25	34	75	75	75	65	C	103	87
DSRC301	11.20		11.33	5.20	3.70	21	4	75	5	100				45				C	667	87
DSRC301	14.20		14.26	5.20	Dry	25		35		100				25				C	**	87
DSRC301	16.20		16.50	5.20	15.00	25		30		11	5	10	74	75	75	75	45	C	111	87
DSRC301	19.20		19.61	5.20	18.60	4	13	75	75	12	16	34	38	75	75	75	35	C	115	87
DSRC301	22.20		22.30	5.20	20.60	25		75		100				25				C	**	87
DSRC301	25.20		25.65	5.20	Dry	3	3	75	75	2	2	3	4	75	75	75	75	C	11	87
DSRC301	28.20		28.58	5.20	25.50	15	10	75	5	22	25	23	22	75	75	75	75	C	92	87
DSRC301	31.20		31.65	5.20	24.80	6	7	75	75	12	10	17	20	75	75	75	75	C	59	87
DSRC301	34.20		34.65	33.40	24.00	7	10	75	75	20	17	19	16	75	75	75	75	C	72	87
DSRC301	37.20		37.65	37.20	12.70	6	8	75	75	10	11	10	10	75	75	75	75	C	41	87
DSRC301	40.20		40.46	38.70	6.80	15	10	75	35	32	68			75	75			C	200	87
DSRC301	43.20		43.42	38.70	11.70	20	5	75	5	41	59			75	60			C	222	87

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRC301	46.20		46.35	38.70	25.00	19	5	75	5	100		70	C	429	87					
DSRC301	49.20		49.36	46.20	3.20	25		75		84	16	75	5	C	375	87				
DSRC301	52.20		52.37	46.20	14.20	25		70		69	31	75	20	C	316	87				
DSRC301	55.20		55.39	46.20	18.20	25		75		70	30	75	35	C	273	87				
DSRC301	58.20		58.32	46.20	19.70	25		70		100		45		C	667	87				
DSRC301	61.20		61.35	46.20	19.20	25		55		70	30	75	15	C	333	87				
DSRC301	64.20		64.38	64.20	20.40	7	18	75	30	100		70		C	429	87				
DSRC301	66.30		66.42	66.30	29.40	25		40		83	17	75	5	C	375	87				
DSRC301	69.30		69.42	69.30	22.60	25		60		100		55		C	545	87				
DSRC301	72.30		72.45	72.30	Dry	20	5	75	5	100		65		C	462	87				
DSRC301	75.30		75.45	75.30	Dry	25		75		100		70		C	429	87				
DSRC301	78.30		78.43	78.30	30.30	25		70		100		55		C	545	87				
DSRC301	81.30		81.39	81.30	29.10	25		45		100		45		C	667	87				
DSRC301	84.30		84.35	84.30	36.60	25		15		100		35		C	857	87				
DSRC301	87.30		87.40	87.30	17.36	25		35		100		60		C	500	87				
DSRC301	90.30		90.40	90.30	17.63	25		55		100		45		C	667	87				
DSRC301	93.30		93.40	93.30	19.64	25		45		100		50		C	600	87				
DSRC301	96.30		96.41	96.30	19.71	25		55		100		50		C	600	87				
DSRC301	99.30		99.41	99.30	18.21	25		55		100		55		C	545	87				
DSRC301	102.30		102.40	102.30	17.87	25		45		100		50		C	600	87				
DSRC302	1.20		1.65	Nil	Dry	3	6	75	75	8	8	8	13	75	75	75	75	S	37	68
DSRC302	2.20		2.60	Nil	Dry	19	6	75	25	15	13	15	7	75	75	75	75	S	50	68
DSRC303	1.20		1.65	Nil	Dry	4	5	75	75	7	6	5	14	75	75	75	75	S	32	68
DSRC303	2.00		2.18	2.00	1.69	11	14	75	50	50		55		S	273	68				
DSRC310	1.20		1.65	Nil	Dry	2	2	75	75	3	3	4	3	75	75	75	75	S	13	78

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
 2. s.w.p = self weight penetration.
 3. N values have not been subjected to any correction.
 4. Test carried out using split spoon S, solid cone C.
 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT 35560	CHECKED CT
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STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRC310	2.00		2.45	Nil	Dry	13	7	75	75	11	11	17	25	75	75	75	75	C	64	78
DSRC311	1.20		1.65	Nil	Dry	5	2	75	75	2	2	2	3	75	75	75	75	S	9	78
DSRC311	2.20		2.65	Nil	Dry	15	8	75	75	26	25	14	12	75	75	75	75	S	77	78
DSRC312	1.05		1.34	Nil	Dry	21	4	75	10	31	36	33		75	75	50		S	150	78
DSRC315	1.20		1.65	Nil	Dry	1	1	75	75	2	2	3	3	75	75	75	75	C	10	54
DSRC315	2.20		2.65	Nil	Dry	10	9	75	75	12	9	5	3	75	75	75	75	C	29	54
DSRC315	3.00		3.13	Nil	Dry	25		75		100				50				C	600	54
DSRC319	1.20		1.65	Nil	Dry	4	4	75	75	5	7	6	6	75	75	75	75	S	24	56
DSRC319	2.20		2.65	Nil	Dry	2	3	75	75	3	3	4	6	75	75	75	75	S	16	56
DSRC319	3.20		3.65	Nil	Dry	2	4	75	75	5	6	11	12	75	75	75	75	S	34	56
DSRC319	4.20		4.65	Nil	Dry	4	11	75	75	17	9	15	19	75	75	75	75	S	60	56
DSRC319	6.90		7.35	6.90	Dry	2	3	75	75	4	3	9	25	75	75	75	75	S	41	56
DSRC319	21.20		21.54	21.20	Dry	4	16	75	75	27	50	23		75	75	35		S	162	56
DSRC319	24.30		24.59	24.30	22.00	5	20	75	75	55	45			75	65			S	214	56
DSRC319	27.20		27.55	27.20	22.00	7	14	75	75	22	45	33		75	75	50		S	150	56
DSRC319	30.30		30.53	30.30	22.00	9	20	75	75	100				75				S	400	56
DSRC319	33.30		33.57	33.30	22.00	12	25	75	75	68	32			75	40			S	261	56
DSRC319	36.30		36.51	36.30	22.00	11	30	75	75	100				60				S	500	56
DSRC319	39.30		39.56	39.30	21.60	14	34	75	75	75	25			75	30			S	286	56
DSRC319	42.40		42.65	42.40	21.00	11	31	75	75	80	20			75	20			S	316	56
DSRC319	45.40		45.66	45.40	21.00	15	30	75	75	72	28			75	30			S	286	56
DSRC319	48.30		48.55	48.30	21.30	5	20	75	75	75	25			75	25			S	300	56
DSRC319	51.45		51.67	51.45	21.60	9	35	75	75	100				65				S	462	56
DSRC319	54.40		54.56	54.40	22.00	35	15	75	10	100				70				C	429	56
DSRC319	57.30		57.50	57.30	22.00	50		75		62	28			75	45			C	225	56

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
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4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)
						blows		pen (mm)		blows		pen (mm)				
DSRC319	60.60		60.88	60.60	22.43	5	33	75	75	57	43	75	50	C	240	56
DSRC319	63.80		63.97	63.80	20.80	50		65		75	25	75	30	C	286	56
DSRC319	65.20		65.37	65.20	21.40	50		70		80	20	75	20	C	316	56
DSRC325	1.20		1.65	Nil	Dry	2	2	75	75	2	3	4	3	S	12	56
DSRC325	2.20		2.65	Nil	Dry	1	1	75	75	2	3	2	3	S	10	56
DSRC325	3.20		3.65	Nil	Dry	1	2	75	75	2	5	6	5	S	18	56
DSRC325	4.20		4.65	Nil	Dry	7	8	75	75	7	10	10	13	S	40	56
DSRC325	10.40		10.70	10.40	Dry	2	16	75	75	35	65		75	S	207	56
DSRC325	27.00		27.38	27.00	22.90	7	18	75	65	22	24	44	10	S	125	56
DSRC325	30.00		30.23	30.00	23.00	20	5	75	10	50	50		75	S	207	56
DSRC325	32.80		33.01	32.80	22.60	19	6	75	15	65	35		75	S	261	56
DSRC325	35.90		36.10	35.90	22.10	25		65		42	58		75	C	222	56
DSRC325	39.00		39.19	39.00	23.30	25		60		50	50		75	C	231	56
DSRC325	40.60		40.81	40.60	22.70	25		70		46	54		75	C	214	56
DSRC326	0.60		0.89	Nil	Dry	14	19	75	75	27	50		75	C	171	58
DSRC327	1.20		1.65	Nil	Dry	2	2	75	75	2	1	1	1	S	5	58
DSRC327	2.30		2.75	2.30	Dry	7	12	75	75	17	19	24	32	S	92	58
DSRC418	0.60		1.05	Nil	Dry	15	8	75	75	4	2	2	4	S	12	85
DSRC418	60.00		60.15	60.00	51.70	25		75		75			70	S	321	85
DSRC420	0.80		0.99	Nil	Dry	25		70		30	20		75	C	130	85
DSRCHO304	1.20		1.65	Nil	Dry	4	5	75	75	6	6	6	6	S	24	56
DSRCHO304	2.20		2.65	Nil	Dry	5	5	75	75	5	5	5	5	S	20	56
DSRCHO304	3.20		3.65	Nil	Dry	7	6	75	75	7	8	12	7	S	34	56
DSRCHO304	4.20		4.60	Nil	Dry	17	27	75	75	16	42	32	10	S	122	56
DSRCHO304	27.10		27.50	27.10	24.15	7	17	75	75	23	30	37	10	S	122	56

notes:
 1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
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 3. N values have not been subjected to any correction.
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 5. Where full test drive not completed, linearly extrapolated N value reported.
 6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRCOH304	30.20		30.50	30.20	25.10	4	11	75	75	32	68		75	75	S	200	56			
DSRCOH304	33.10		33.40	33.10	24.35	3	14	75	75	43	57		75	70	S	207	56			
DSRCOH304	36.20		36.48	36.20	24.60	5	14	75	75	52	48		75	55	S	231	56			
DSRCOH304	39.20		39.44	39.20	24.40	7	23	75	75	82	18		75	15	S	333	56			
DSRCOH304	42.20		42.41	42.20	24.30	21	29	75	30	75	25		75	25	S	300	56			
DSRCOH304	45.20		45.37	45.20	25.10	20	30	75	25	100			70		S	429	56			
DSRCOH304	48.20		48.45	48.20	26.30	9	27	75	75	75	25		75	20	C	316	56			
DSRCOH304	51.20		51.46	51.20	25.40	22	30	75	50	50	50		75	60	C	222	56			
DSRCOH304	54.20		54.47	54.20	25.70	5	20	75	45	49	51		75	70	C	207	56			
DSRCOH304	57.20		57.41	57.20	25.30	25		60		40	60		75	75	C	200	56			
DSRCOH304	60.20		60.41	60.20	25.30	25		70		37	63		75	65	C	214	56			
DSRCOH400	1.20		1.65	Nil	Dry	0	0	75	75	1	1	1	2	75	75	75	75	S	5	54
DSRCOH400	2.20		2.65	Nil	Dry	1	2	75	75	2	3	4	4	75	75	75	75	S	13	54
DSRCOH400	4.20		4.65	Nil	Dry	0	2	75	75	1	2	3	3	75	75	75	75	S	9	54
DSRCOH400	5.20		5.65	Nil	Dry	1	2	75	75	3	3	4	4	75	75	75	75	S	14	54
DSRCOH400	6.50		6.95	Nil	Dry	4	5	75	75	4	5	8	8	75	75	75	75	S	25	54
DSRCOH400	7.90		8.35	Nil	Dry	4	6	75	75	5	6	9	10	75	75	75	75	S	30	54
DSRCOH400	9.40		9.85	8.00	5.40	2	3	75	75	3	4	5	4	75	75	75	75	S	16	54
DSRCOH400	10.80		11.25	8.00	5.40	5	10	75	75	18	15	13	20	75	75	75	75	S	66	54
DSRCOH412	0.75		1.20	Nil	Dry	13	12	75	75	11	11	10	11	75	75	75	75	C	43	84
DSRCOH412	1.20		1.65	Nil	Dry	9	6	75	75	7	3	4	5	75	75	75	75	S	19	84
DSRCOH412	2.00		2.45	2.00	0.98	7	9	75	75	9	10	9	8	75	75	75	75	S	36	84
DSRCOH412	3.00		3.45	2.00	2.65	7	7	75	75	7	9	8	9	75	75	75	75	C	33	84
DSRCOH412	4.00		4.45	2.00	2.11	3	3	75	75	2	3	3	5	75	75	75	75	S	13	84
DSRCOH412	6.00		6.45	6.00	0.80	3	3	75	75	4	4	5	4	75	75	75	75	S	17	84

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



STANDARD PENETRATION TEST

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	bottom depth (m)	casing depth (m)	water level (m)	seating drive				test drive				test type	N	energy ratio (%)				
						blows		pen (mm)		blows		pen (mm)								
DSRCOH412	7.00		7.45	6.00	2.00	3	4	75	75	5	5	5	7	75	75	75	75	S	22	84
DSRCOH412	7.60		8.05	6.00	2.62	4	9	75	75	10	7	7	8	75	75	75	75	S	32	84
OH411	1.00		1.43	Nil	Dry	13	12	75	50	21	18	15	10	75	75	75	75	C	64	59
OH411	1.40		1.61	Nil	Dry	25		75		54	46			75	55			C	231	59

notes:

1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
35560	CT



IN-SITU HAND VANE/POCKET PENETROMETER

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Depth (m)	Hand Vane Peak (kPa)	Average Hand Vane Peak (kPa)	Hand Vane Remoulded (kPa)	Average Hand Vane Remoulded (kPa)	Pocket Penetrometer (kPa)	Average Pocket Penetrometer (kPa)	Remarks
CP206	2.60	35	35	12	12			
CP206	3.50	70 / 55 / 74	66	16 / 14 / 15	15			
CP206	7.70	55	55	15	15			
CP206	7.80	64	64	20	20			
CP206	8.60	74	74	18	18			
CP206	8.80	40	40	12	12			
CP206	9.70	38	38	15	15			
CP206	9.80	58	58	17	17			
CP206	9.90	62	62	16	16			
CP213	20.40	92	92					
CP215	3.90	88	88	20	20			
CP215	5.00	96	96	14	14			
CP215	8.00	103	103	29	29			
CP215	12.40	95	95	23	23			
General Remarks:								
Hand vane and pocket penetrometer test results reported as undrained shear strength							CONTRACT 35560	CHECKED CT



IN-SITU HAND VANE/POCKET PENETROMETER

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Depth (m)	Hand Vane Peak (kPa)	Average Hand Vane Peak (kPa)	Hand Vane Remolded (kPa)	Average Hand Vane Remoulded (kPa)	Pocket Penetrometer (kPa)	Average Pocket Penetrometer (kPa)	Remarks
DSRC110	35.00	140	140	90	90			
DSRC207	11.10	93	93	57	57			
DSRC207	11.40	100	100	21	21			
DSRC218	0.20	95 / 70 / 55	73	40 / 31 / 40	37			
DSRC220	0.10	34 / 24 / 28	29	17 / 15 / 10	14			
DSRC220	0.30	39 / 42 / 38	40	22 / 12 / 17	17			
DSRC326	0.20	35 / 28 / 31	31	16 / 10 / 16	14			
DSRC408	18.80	120 / 68 / 124	104	24 / 16 / 26	22			
DSRCOH400	0.20	29 / 38 / 40	36	12 / 15 / 18	15			
DSRCOH400	0.30	40 / 37 / 42	40	18 / 18 / 16	17			
DSRCOH414	0.10	62 / 100 / 92	85	40 / 49 / 40	43			
General Remarks:								
Hand vane and pocket penetrometer test results reported as undrained shear strength							CONTRACT 35560	CHECKED CT



IN-SITU HAND VANE/POCKET PENETROMETER

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Depth (m)	Hand Vane Peak (kPa)	Average Hand Vane Peak (kPa)	Hand Vane Remolded (kPa)	Average Hand Vane Remoulded (kPa)	Pocket Penetrometer (kPa)	Average Pocket Penetrometer (kPa)	Remarks
OH413	0.10	29 / 28 / 29	29	18 / 12 / 18	16			
RC507	0.20	53 / 40 / 47	47	18 / 15 / 22	18			
RC516	0.50	40 / 38 / 26	35	21 / 20 / 22	21			
General Remarks:								
Hand vane and pocket penetrometer test results reported as undrained shear strength							CONTRACT 35560	CHECKED CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP201

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 19 November 2019 Easting 392380.0

Scale 1:25

End Date 19 November 2019 Northing 215680.0 Ground Level 134.00mOD

Depth 2.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10			Grass over firm brown silty CLAY. Frequent rootlets. (TOP)			
2ES	0.30			Soft light brown silty CLAY. Rare rootlets and root fragments (up to 20mm diam). (SLIP) (SLIP)	0.25	133.75	
1B 3ES	0.50 0.50 - 0.70						
2B 4ES	1.00 1.00 - 1.20		▼	0.90m: Land drain (80mm diam) perpendicular to long edge of pit. Soft to firm bluish grey mottled orangish brown silty CLAY. Rare decomposing rootlets. (SLIP) (SLIP) 1.00m: Land drain (80mm diam) parallel to long edge of pit.	1.00	133.00	
3BLK	1.90 - 2.10						
4B	2.20 - 2.40						
				Soft bluish grey slightly gravelly CLAY. Gravel is angular to subangular fine to coarse limestone. (SLIP) (SLIP)	2.45 2.50	131.55 131.50	
Trial pit Completed at 2.50m							

Equipment: Tracked 16 tonne excavator
 Pit width x length: 2.20m x 4.90m Sidewall stability: Sidewalls spalling following 1.10m water strike
 Remarks: Trial pit terminated at 2.50m due to ingress of water. Survey data extrapolated from adjacent positions CPT202 and CP202, awaiting access permissions and formal survey.

Groundwater:

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks
1.10	1.10	20	

SUB LOCATION:
948



Backfill details:

Depth Top (m)	Depth Base (m)	Material	Remarks
0.00	2.50	Arisings	

CONTRACT

35560

CHECKED

CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP202

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 12 July 2019

Easting 392507.6

Scale 1:25

End Date 12 July 2019

Northing 215637.4 Ground Level 148.90mOD

Depth 2.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.10			Grass over soft dark brown slightly sandy clayey SILT. Frequent rootlets. (TOP)			
1ES	0.10			Soft light brown clayey SILT. Rare rootlets. (SLIP) (SLIP)	0.20	148.70	
2ES	0.30						
3ES	0.50			Firm light grey mottled orangish brown silty CLAY with a low limestone cobble content. Rare pockets (up to 50mm) of dark brown silty clay. Frequent rootlets. (SLIP) (SLIP)	0.40	148.50	
4ES	1.00			Soft light grey and brown slightly sandy silty CLAY with high limestone cobble content. (SLIP) (SLIP)	0.75	148.15	
2B	1.50			Stiff light grey mottled orangish brown slightly gravelly CLAY. Gravel is angular and subangular fine to coarse bioclastic limestone. (SLIP) (SLIP)	1.30	147.60	
5ES	1.50						
				1.80 - 2.00m: Frequent pockets (up to 120mm) of firm grey mottled dark grey clay.			
3B	2.00			Trial pit Completed at 2.00m	2.00	146.90	

Equipment: Tracked mechanical excavator
 Pit width x length: 1.20m x 2.70m Sidewall stability: Stable
 Remarks: Trial pit terminated at 2.00m due to limited time available.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				948
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	2.00	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP204

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 28 May 2019 Easting 392663.0

Scale 1:25

End Date 29 May 2019 Northing 215653.0 Ground Level 164.30mOD

Depth 5.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES	0.30 - 0.40 0.30 - 0.40 0.30 - 0.40 0.50 - 0.60			Grass over firm greyish brown slightly sandy silty CLAY. Frequent rootlets. (MG) (MGR) Firm light brown silty CLAY. (MG) (MGR)	0.20	164.10	
3B 4D	0.90 - 1.00 0.90 - 1.00			Firm light yellowish brown mottled light greenish grey slightly gravelly locally gravelly silty CLAY locally with a medium subrounded bioclastic limestone cobble content. Gravel is subangular to rounded fine to coarse bioclastic limestone. (SLIP)	0.70	163.60	
5D	1.40 - 1.50			Light yellowish brown mottled light grey slightly sandy slightly gravelly SILT with a low subrounded bioclastic limestone cobble content. Gravel is subangular to rounded fine to coarse bioclastic limestone. Rare pockets (up to 40mm) of light yellowish brown fine to coarse sand. (SLIP) (SLIP)	1.40	162.90	
3ES 6B 7D	2.00 - 2.10 2.00 - 2.10 2.00 - 2.10						
8D	2.50 - 2.60			Firm light grey mottled orangish brown slightly gravelly silty CLAY. Gravel is subrounded and rounded fine to coarse bioclastic limestone. (SLIP) (SLIP)	2.40	161.90	
10D 9B	3.20 - 3.40 3.20 - 3.40			Firm bluish grey slightly sandy clayey SILT. (SLIP_LIAS) (SLIP)	3.15	161.15	
11B 12D	3.90 - 4.00 3.90 - 4.00			Stiff dark bluish grey CLAY with rare medium gravel sized lithorelicts of mudstone. (SLIP_LIAS) (SLIP)	3.70	160.60	
Continued Next Page							

Equipment: Tracked 360° 22 tonne excavator
 Pit width x length: 1.60m x 3.20m Sidewall stability: Stable
 Remarks: Sidewalls supported by shoring box. No shear surfaces observed.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1077
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	5.00	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP204

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 2

Start Date 28 May 2019 Easting 392663.0

Scale 1:25

End Date 29 May 2019 Northing 215653.0 Ground Level 164.30mOD

Depth 5.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
13BL K	4.80 - 5.00			Stiff dark bluish grey CLAY with rare medium gravel sized lithorelicts of mudstone. (SLIP_LIAS) (SLIP)	5.00	159.30	
				Trial pit Completed at 5.00m			

Equipment: Tracked 360° 22 tonne excavator
 Pit width x length: 1.60m x 3.20m Sidewall stability: Stable
 Remarks: Sidewalls supported by shoring box. No shear surfaces observed.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1077
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	5.00	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP205

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 31 May 2019 Easting 392763.0

Scale 1:25

End Date 31 May 2019 Northing 215678.0 Ground Level 169.80mOD

Depth 4.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.20 - 0.30			Grass over light brown slightly clayey fine to coarse SAND. Frequent roots (up to 30mm diam) and rootlets. (MG) (MGR)	0.30	169.50	
2ES 3D	0.50 - 0.70			Firm yellowish brown sandy CLAY. (MG) (MGR)			
3ES 4B 5D	1.10 - 1.20			Soft yellowish brown mottled reddish brown and grey slightly sandy silty CLAY. Rare fragments of charcoal (up to 30mm). (SLIP) (SLIP) 1.20m: 45mm diam terracotta drainage pipe 1.30m from eastern corner of pit orientated north-south.	1.10	168.70	
6D	1.60 - 1.70			Firm light grey mottled yellowish brown slightly sandy silty CLAY. Rare rootlets. (SLIP) (SLIP)	1.50	168.30	
7B 8D	2.40 - 2.50			Soft light brown mottled grey and reddish brown slightly sandy gravelly silty CLAY with a low subangular bioclastic limestone cobble content. Gravel is subangular fine to coarse bioclastic limestone. Rare pockets (up to 30mm) of light brown silty fine and medium sand. Frequent thin beds of soft light grey clay. (SLIP) (SLIP) 2.90 - 3.10m: High limestone cobble and boulder content. 3.20m: Limestone boulder.	2.40	167.40	
10D 9B	3.30 - 3.40				4.00	165.80	
Trial pit Completed at 4.00m							

Equipment: Tracked 360° 22 tonne excavator
 Pit width x length: 1.70m x 3.00m Sidewall stability: Stable
 Remarks: Sidewalls supported by shoring box.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1077
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	4.00	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP207

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 02 May 2019

Easting 392859.0

Scale 1:25

End Date 02 May 2019

Northing 215658.0 Ground Level 182.15mOD

Depth 4.10 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1D 1ES	0.10 - 0.20 0.10 - 0.20			Grass over firm orangish brown mottled brown slightly sandy clayey SILT. Abundant rootlets and rare roots (up to 20mm diam.) and rare fragments (up to 5mm) of charcoal. (MG) (MGR)	0.25	181.90	
2B 2ES 3D	0.50 - 0.60 0.50 - 0.60 0.50 - 0.60			Firm light orangish brown slightly sandy slightly gravelly silty CLAY with a medium subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (SLIP) (SLIP)	0.80	181.35	
4D	0.90 - 1.00			Firm orangish brown mottled bluish grey gravelly silty CLAY with a medium subangular limestone cobble content. Gravel is angular and subangular medium and coarse limestone. (SLIP) (SLIP)	1.20	180.95	
5B 6D	1.50 - 1.60 1.50 - 1.60			Weak light grey fossiliferous LIMESTONE. Fractures are randomly orientated very closely spaced planar and undulating rough infilled (up to 20mm) with yellowish brown clay. (SLIP) (SLIP) 1.20 - 1.40m: Fractures are closely and medium spaced.			
3ES 7B 8D	2.30 - 2.40 2.30 - 2.40 2.30 - 2.40						
9D	2.90 - 3.00			3.35 - 3.50m: Firm light brownish grey mottled grey silty clay.			
10B 11D 4ES	3.80 - 3.90 3.80 - 3.90 3.80 - 3.90 3.90 - 4.10			Stiff dark bluish grey CLAY with rare belemnites (up to 50mm) and subangular medium gravel sized lithorelicts of mudstone. (SLIP_LIAS) (SLIP)	3.70	178.45	

Continued Next Page

Equipment: Tracked 360° 22 tonne excavator
 Pit width x length: 1.10m x 3.20m Sidewall stability: Stable
 Remarks: Sidewalls supported by shoring box.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1077
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	4.10	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP207

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 2

Start Date 02 May 2019 Easting 392859.0

Scale 1:25

End Date 02 May 2019 Northing 215658.0 Ground Level 182.15mOD

Depth 4.10 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
12BL K				Stiff dark bluish grey CLAY with rare belemnites (up to 50mm) and subangular medium gravel sized lithorelicts of mudstone. (SLIP LIAS) (SLIP) <small>Trial pit Completed at 4.10m</small>	4.10	178.05	

Equipment: Tracked 360° 22 tonne excavator
 Pit width x length: 1.10m x 3.20m Sidewall stability: Stable
 Remarks: Sidewalls supported by shoring box.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1077
Backfill details:				CHECKED CT
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	4.10	Arisings		

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 06 August 2019 Easting 392339.1

Scale 1:25

End Date 06 August 2019 Northing 215549.5 Ground Level 169.90mOD

Depth 3.60 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.20 - 0.30			Grass over soft light brown slightly sandy clayey SILT. Frequent roots (up to 5mm diam) and rootlets. (TOP)	0.30	169.60	
2B 2ES	0.40 - 0.50			Firm light greyish brown mottled orangish brown slightly sandy silty CLAY. (SLIP) (SLIP)	0.60	169.30	
3B 3ES	0.50 - 0.60			Stiff fissured light grey mottled orangish brown CLAY. Fissures are 20-30deg closely to widely spaced planar smooth. (SLIP) (SLIP)	1.60	168.30	
4B	1.70 - 1.80			Stiff fissured thinly bedded dark grey CLAY. Fissures are 20-30deg closely to widely spaced planar smooth with frequent orangish brown staining on surfaces. Rare ferrous nodules (50mm diam). (SLIP_LIAS) (SLIP)	2.70	167.20	
5B	2.80 - 2.90			Very stiff fissured light brown clayey SILT. Fissures are 20-30deg closely and medium spaced planar smooth. (SLIP_LIAS) (SLIP)	3.50	166.40	
6B	3.50 - 3.60		▼	Strong grey LIMESTONE. Frequent orangish brown staining. (SLIP_LIAS) (SLIP)	3.60	166.30	
Trial pit Completed at 3.60m							

Equipment: Kobelco 5 SK140SR 5 tonne
 Pit width x length: 1.20m x 3.00m Sidewall stability: Stable
 Remarks: Trial pit terminated at 3.60m due to limestone obstruction.

Groundwater:

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks
3.60	0.00	0	

SUB LOCATION:
948

Backfill details:

Depth Top (m)	Depth Base (m)	Material	Remarks
0.00	3.60	Arisings	

CONTRACT
35560
CHECKED
CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP210

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 April 2020

Easting 394095.6

Scale 1:25

End Date 27 April 2020

Northing 215182.0 Ground Level 256.65mOD

Depth 3.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20	H 51		Grass over soft dark brown slightly sandy gravelly clayey SILT. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	256.45	
2B 2ES	0.30 - 0.40 0.30 - 0.40			Soft light brown slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse limestone. (SLIP) (SLIP)			
3B 3ES	0.50 - 0.60 0.50 - 0.60			0.90	255.75	Soft light brown slightly sandy gravelly silty CLAY. Gravel is angular and subangular fine to coarse limestone. (SLIP) (SLIP)	
4B 4ES	1.00 - 1.10 1.00 - 1.10						
5B	2.00 - 2.10			2.20	254.45	Firm light greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine and medium limestone with rare angular and subangular tabular medium and coarse mudstone lithorelicts. (SLIP) (SLIP)	
6B	2.90 - 3.00						
Trial pit Completed at 3.00m					3.00	253.65	

Equipment: Kobelco 5 tonne excavator Bearing from North: 210 degrees
 Pit width x length: 0.60m x 3.00m Sidewall stability: Stable
 Remarks: Trial pit completed at 3.00m at maximum reach of excavator.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	3.00	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP211

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 May 2020

Easting 394180.3

Scale 1:25

End Date 28 May 2020

Northing 215202.2 Ground Level 247.00mOD

Depth 2.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend						
1B 2D 1ES	0.00 - 0.20	H 74		Grass over soft to firm brown slightly sandy silty CLAY. Frequent rootlets. (TOP)	0.25	246.75							
2ES 3LB 4D 3ES 5B 6D	0.30 - 0.40 0.30 - 0.50 0.30 - 0.50 0.50 - 0.60 0.50 - 0.70 0.50 - 0.70		Firm light brown slightly sandy gravelly silty CLAY with a medium limestone cobble content. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)										
4ES 7LB 8D 11D 9BLK	1.00 - 1.10 1.00 - 1.20 1.00 - 1.20 1.10 - 1.25 1.10 - 1.25		H 77	Firm locally firm to stiff light brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine and medium limestone. (SLIP) (SLIP)				0.90	246.10				
10B 11D 12B	2.00 - 2.20 2.00 - 2.20 2.20 - 2.50			Firm light brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)							2.30	244.70	
				Very weak white and light yellowish brown ooidal and bioclastic LIMESTONE. (IOG) (SALS)									
								Trial pit Completed at 2.50m	2.50	244.50			

Equipment: JCB 3CX
 Pit width x length: 0.80m x 3.30m
 Sidewall stability: Stable

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1118
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	2.50	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP601

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 2

Start Date 30 April 2019

Easting 393021.0

Scale 1:25

End Date 30 April 2019

Northing 215832.0 Ground Level 191.25mOD

Depth 4.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1D 1ES	0.10 - 0.30 0.10 - 0.30			Grass over reddish brown becoming dark brown very clayey very gravelly fine and medium SAND with frequent rootlets. Gravel is subangular and subrounded fine to coarse sandstone, mudstone and flint. Rare fragments of red plastic (up to 20mm). (MG) (MGR)			Legend
2B 2ES	0.50 - 0.60 0.50 - 0.60			Dark grey slightly gravelly very clayey fine to coarse SAND. Gravel is angular to subrounded fine to coarse brick, mudstone, sandstone, concrete and rarely limestone. Rare decomposing carbonaceous fragments. Pungent odour. (MG) (MGR)	0.60	190.65	
3D 3ES	0.70 - 0.80 0.70 - 0.80						
4D 4ES 5B	1.50 - 1.60 1.50 - 1.60 1.50 - 1.60			Firm grey slightly sandy slightly gravelly CLAY with a medium subangular concrete cobble content. Gravel is subangular and subrounded fine to coarse sandstone, mudstone, limestone and rare brick. (MG) (MGR)	1.70	189.55	
6D	2.00 - 2.10						
7D 8B	2.70 - 2.80 2.70 - 2.80			Firm dark grey slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone, sandstone and concrete. (MG) (MGR)	2.50	188.75	
10D	4.00 - 4.10						

Continued Next Page

Equipment: Tracked 360° 22 tonne excavator Bearing from North: 210 degrees Shoring used: 0.00-4.50m

Pit width x length: 0.80m x 2.50m Sidewall stability: Stable

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1077
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	4.50	Arising		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP601

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 2 of 2

Start Date 30 April 2019

Easting 393021.0

Scale 1:25

End Date 30 April 2019

Northing 215832.0 Ground Level 191.25mOD

Depth 4.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
5ES 9B	4.00 - 4.10 4.00 - 4.10			Firm dark grey slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone, sandstone and concrete. (MG) (MGR)	4.10	187.15	
11B 6ES	4.30 - 4.40 4.30 - 4.40			Firm bluish grey mottled yellow slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse limestone. Frequent decomposing carbonaceous pockets (up to 60mm) and rootlets. (MG) (MGR)	4.50	186.75	
				Trial pit Completed at 4.50m			

Equipment: Tracked 360° 22 tonne excavator Bearing from North: 210 degrees Shoring used: 0.00-4.50m

Pit width x length: 0.80m x 2.50m Sidewall stability: Stable

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1077
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	4.50	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP602

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 22 October 2020 Easting 394019.8

Scale 1:25

End Date 22 October 2020 Northing 215571.6 Ground Level 274.40mOD

Depth 1.30 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1D	0.10 - 0.20			Very soft brown slightly sandy gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. (TOP)	0.30	274.10	
1ES	0.10 - 0.20						
2B	0.20 - 0.30						
2ES	0.20 - 0.30						
3D	0.20 - 0.30			Soft light brown slightly sandy very gravelly CLAY with a high limestone cobble content. (HDD) (HEAD)	0.50	273.90	
4B	0.50 - 0.60						
				Fractured orangish brown and light greyish brown LIMESTONE excavated as angular irregular COBBLES with much orangish brown clayey very sandy angular and subangular fine to coarse gravel. (IOG) (SALS)			
5LB	1.00 - 1.30						
6D	1.20 - 1.30						
Trial pit Completed at 1.30m					1.30	273.10	

Equipment: JCB 3CX mechanical excavator
 Pit width x length: 1.00m x 2.20m Sidewall stability: Stabl
 Remarks: Trial pit refused at 1.30m on limestone bedrock.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1219
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.30	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				EC

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP603

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 April 2020

Easting 394052.1

Scale 1:25

End Date 27 April 2020

Northing 215276.3 Ground Level 257.40mOD

Depth 2.20 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20	H 32		Vegetation over friable dark grey CLAY. Frequent roots (up to 10mm diam) and rootlets. (TOP)	0.15	257.25	
2B 2ES	0.30 - 0.40 0.30 - 0.40		Soft light brown slightly gravelly CLAY. Gravel is angular and subangular fine limestone. (SLIP) (SLIP)				
3B 4ES	1.00 - 1.10 1.00 - 1.50		Firm light greyish brown slightly gravelly CLAY. Gravel is angular to subrounded fine and medium limestone. (FEF) (FE) 1.50m: Spalling of north face exposing two shear surfaces: 45deg/190deg and 70deg/190deg undulating smooth polished.				
4B	2.00 - 2.20		Trial pit Completed at 2.20m				

Equipment: Kobelco 5 tonne excavator Bearing from North: 280 degrees
 Pit width x length: 0.60m x 2.50m Sidewall stability: Sidewalls collapsed 1.50-2.20 along shear surfaces in Northern end of pit.
 Remarks: Trial pit terminated at 2.20m due to sidewall instability.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	2.20	Arisings		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP605

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 April 2020

Easting 394103.4

Scale 1:25

End Date 27 April 2020

Northing 215220.7 Ground Level 250.20mOD

Depth 2.20 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20			Grass over soft dark brown slightly sandy gravelly silty CLAY. Gravel is subangular and subrounded fine to coarse limestone. Frequent roots (up to 10mm diam) and rootlets. (TOP)			
2B 2ES	0.30 - 0.40 0.30 - 0.40			Soft light brown slightly sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. Rare roots (up to 10mm diam) and rootlets. (SLIP) (SLIP)	0.30	249.90	
3B 3ES	0.50 - 0.60 0.50 - 0.60						
4ES	1.00 - 1.10			Firm dark brown slightly sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. (SLIP) (SLIP)	0.80	249.40	
4B	1.50 - 1.60			Light orangish brown clayey sandy angular and subangular fine to coarse limestone GRAVEL. (FEF) (FE)	1.30	248.90	
5B	2.00 - 2.10			1.80 - 2.20m: With a high angular and subangular limestone cobble content.			
Trial pit Completed at 2.20m					2.20	248.00	

Equipment: Kobelco 5 tonne excavator Bearing from North: 300 degrees
 Pit width x length: 0.60m x 2.50m Sidewall stability: Stable
 Remarks: Trial pit refused at 2.20m on limestone rock.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	2.20	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP606

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 May 2020 Easting 393848.8

Scale 1:25

End Date 28 May 2020 Northing 215240.1 Ground Level 276.45mOD

Depth 1.30 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend					
1LB 1ES 2D	0.00 - 0.20 0.10 - 0.20 0.10 - 0.20	H 28		Grass over soft dark brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse limestone. Frequent rootlets. (TOP)	0.25	276.20						
2ES 3LB 4D 3ES 5B 6D	0.30 - 0.40 0.30 - 0.40 0.30 - 0.50 0.50 - 0.60 0.50 - 0.60 0.50 - 0.70			Firm brown and light brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse limestone. (HDD) (HEAD)								
4ES 7B 8D	1.00 - 1.10 1.00 - 1.10 1.00 - 1.20			H 60				Very weak thinly bedded white ooidal LIMESTONE excavated as angular irregular cobbles sized fragments with much angular fine to coarse gravel. (GOG)	1.20	275.25		
								1.30	275.15			
Trial pit Completed at 1.30m												

Equipment: JCB 3CX Bearing from North: 90 degrees

Pit width x length: 0.80m x 3.00m Sidewall stability: Stable

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1143
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.30	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP612

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 25 September 2019 Easting 393437.4

Scale 1:25

End Date 25 September 2019 Northing 215277.0 Ground Level 288.35mOD

Depth 2.10 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend		
1ES	0.10	H 55		Stubble over soft dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)					
1LB	0.20 - 0.30					0.30	288.05		
2D	0.20 - 0.30								
2ES	0.30				Firm light brown slightly gravelly sandy CLAY with a high subangular oolitic limestone cobble content. Frequent rootlets. (HDD) (HEAD)				
3B	0.40 - 0.60								
3ES	0.50				0.50 - 0.60m: Becoming very sandy. Centre of north face: Soft light greenish grey mottled orange clay.		0.60	287.75	
4D	0.50								
5B	0.75 - 0.95				Soft to firm light greenish grey mottled light brown slightly sandy CLAY with a low subangular irregular limestone cobble content. Frequent pockets (up to 20mm) of white silt. Rare fibrous rootlets. (HDD) (HEAD)				
6D	0.75 - 0.95								
7B	1.20 - 1.40				Stiff fissured light grey locally mottled light orange CLAY locally tending to gravelly clay. Gravel is angular fine and medium mudstone lithorelicts. Fissures are subhorizontal and randomly orientated extremely closely spaced undulating smooth frequently polished. (FEF) (FE)		1.00	287.35	
8D	1.20 - 1.40			1.20m: Localised dark orange staining.					
				1.70 - 1.90m: Sloping limestone obstruction at west end of pit.					
				1.90m: Crystalline limestone boulder (350x300x150mm) at east end of pit					
				Trial pit Completed at 2.10m	2.10	286.25			

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 90 degrees

Pit width x length: 1.70m x 2.70m Sidewall stability: Stable

Remarks: Trial pit terminated at 2.10m due to practical refusal.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	2.10	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP613

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 25 September 2019 Easting 393331.9

Scale 1:25

End Date 25 September 2019 Northing 215219.1 Ground Level 292.35mOD

Depth 1.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 3LB 2ES	0.10 0.10 - 0.20 0.10 - 0.20 0.20 - 0.40 0.30			Stubble over firm dark greyish brown slightly sandy gravelly silty CLAY with low subangular limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP) 0.10m: Single coarse gravel sized brick fragment. 0.35 - 0.40m: High limestone cobble content.	0.40	291.95	
4B	0.60 - 0.80			Medium strong thinly bedded light grey oolitic LIMESTONE. Bedding fractures are horizontal closely spaced (50/70/120mm). Vertical fractures are randomly orientated. Fractures are planar and undulating rough stained orangish brown with up to 50mm penetrative discolouration, rarely with up to 5mm calcite precipitation. (IOG) (ASLS) 0.40m: Flat limestone surface.	1.00	291.35	
				Trial pit Completed at 1.00m			

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 180 degrees

Pit width x length: 1.70m x 2.80m Sidewall stability: Stable

Remarks: Trial pit terminated at 1.00m due to practical refusal.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.00	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP614

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 25 September 2019 Easting 393166.1

Scale 1:25

End Date 25 September 2019 Northing 215181.1 Ground Level 293.25mOD

Depth 1.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend	
1ES	0.10			Stubble over soft becoming firm brown slightly sandy slightly gravelly silty CLAY with a low limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)				
1B	0.20 - 0.30							
2D	0.20 - 0.30			0.30 - 0.50m: High angular tabular limestone cobble content. Frequent pockets (up to 100m) of light brown medium and coarse sand.				
2ES	0.30							
3ES	0.50			Firm light brown slightly sandy slightly gravelly silty CLAY with a high subangular limestone cobble content. Gravel is angular and subangular fine to coarse limestone. Rare rootlets. (HDD) (HEAD)	0.50	292.75		
3LB	0.50 - 0.70							
4D	0.50 - 0.70			0.70 - 0.80m: Frequent pockets (up to 80mm) and thick laminae of soft brown clay.				
				Weak and medium strong light grey and light brown oolitic locally fossiliferous LIMESTONE. Bedding fractures are subhorizontal closely spaced undulating rough frequently infilled (up to 5mm) with brown clay. Vertical fractures striking 250-280deg and randomly orientated undulating rough. Excavated as angular tabular and irregular cobbles with some slightly sandy slightly gravelly clay. (IOG) (ASLS)	0.80	292.45		
5B	1.00 - 1.20							
					1.50	291.75		
				Trial pit Completed at 1.50m				

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 240 degrees

Pit width x length: 1.60m x 3.10m Sidewall stability: Stable

Remarks: Trial pit terminated at 1.50m due to practical refusal.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	1.50	Arising		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP615

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 25 September 2019 Easting 393095.4

Scale 1:25

End Date 25 September 2019 Northing 215119.0 Ground Level 294.05mOD

Depth 1.40 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES 1LB 2D 2ES	0.10 0.20 - 0.40 0.20 - 0.40 0.30			Stubble over soft dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)			
3B 3ES	0.50 0.50 - 0.70			Light brown angular irregular limestone COBBLES with much firm light brown slightly gravelly sandy clay. Gravel is angular and subangular fine to coarse limestone. Rare rootlets. (HDD) (HEAD)	0.40	293.65	
4B	0.70 - 1.00			Weak thinly bedded light brown oolitic and fossiliferous LIMESTONE with closely spaced thin beds of light brown sandy clay. Bedding fractures are subhorizontal very closely and closely spaced (10/50/80mm) undulating rough. Limestone excavated as tabular cobble sized fragments. (IOG) (ASLS)	0.70	293.35	
5B	1.20 - 1.40			Medium strong grey oolitic LIMESTONE excavated as angular 'blocky' cobbles with much light brown slightly sandy slightly gravelly clay. Gravel is angular fine to coarse limestone. (IOG) (ASLS)	1.20	292.85	
Trial pit Completed at 1.40m					1.40	292.65	

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 180 degrees
 Pit width x length: 1.50m x 3.20m Sidewall stability: Stable
 Remarks: Trial pit terminated at 1.40m due to practical refusal.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1118
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.40	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP618

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 April 2020

Easting 394049.9

Scale 1:25

End Date 27 April 2020

Northing 215001.0 Ground Level 279.40mOD

Depth 1.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10 - 0.20			Grass over friable light brown slightly sandy slightly gravelly SILT. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP) Light brown angular irregular limestone COBBLES with much light brown sandy gravelly silt. Gravel is angular and subangular fine to coarse limestone. Rare rootlets. (GOG) (HMB)	0.10	279.30	
1B	0.20 - 0.30						
2ES	0.30 - 0.40			Weak thinly bedded light greyish brown micritic fossiliferous LIMESTONE with closely spaced thin beds of light brown sandy silt. Limestone excavated as angular and subangular cobbles. (GOG) (HMB)	0.50	278.90	
2B	0.50 - 0.60						
3ES	0.50 - 0.60			Trial pit Completed at 1.00m	1.00	278.40	
3B	0.90 - 1.00						
4ES	0.90 - 1.00						

Equipment: Kobelco 5 tonne excavator Bearing from North: 325 degrees
 Pit width x length: 0.60m x 2.50m Sidewall stability: Stable
 Remarks: Trial pit refused at 1.00m on limestone rock.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.00	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP619

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 April 2020

Easting 394100.2

Scale 1:25

End Date 27 April 2020

Northing 214893.5 Ground Level 281.45mOD

Depth 3.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10	H 51		Grass over friable dark brown slightly sandy slightly gravelly silty CLAY with a low subrounded limestone cobble content. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)	0.30	281.15	
1B 2ES	0.30 - 0.40 0.30 - 0.40			Firm light brown silty CLAY. Rare rootlets. (HDD) (HEAD)			
3ES	0.50 - 0.60						
2B 4ES	0.90 - 1.00 1.00 - 1.10	H 55		Firm light greyish brown locally mottled orangish brown slightly sandy gravelly silty CLAY. Gravel is angular and subangular tabular fine to coarse siltstone lithorelicts. (FEF) (FE)	0.80	280.65	
3B	1.90 - 2.00			1.80 - 2.00m: Fissured. Fissures are extremely closely spaced planar smooth.			
				Firm fissured orangish brown slightly gravelly silty CLAY. Gravel is angular and subangular tabular fine and medium siltstone lithorelicts. Fissures are extremely closely spaced planar smooth. (FEF) (FE)			
4B	2.50 - 2.60			Firm fissured orangish brown gravelly CLAY. Gravel is angular and subangular fine and medium siltstone lithorelicts. Fissures are extremely closely spaced undulating smooth infilled (up to 5mm) with calcite. (FEF) (FE)	2.50	278.95	
Trial pit Completed at 3.00m					3.00	278.45	

Equipment: Kobelco 5 tonne excavator Bearing from North: 315 degrees
 Pit width x length: 0.60m x 2.50m Sidewall stability: Stable
 Remarks: Trial pit completed at 3.00m at maximum reach of excavator.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	3.00	Arising		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP620

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 26 September 2019 Easting 394227.1

Scale 1:25

End Date 26 September 2019 Northing 214704.4 Ground Level 281.95mOD

Depth 2.20 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10			Stubble over soft dark greyish brown slightly sandy CLAY with rare subangular fine to coarse limestone gravel. Frequent rootlets. (TOP)			
1LB 2D 2ES 3ES	0.30 0.30 - 0.50 0.30 - 0.50 0.50	H 66 H 56		Firm light greyish brown slightly sandy CLAY with rare subangular fine to coarse limestone gravel. (HDD) (HEAD) 0.45m: Thinly laminated, possibly extremely closely fissured.	0.25 0.60	281.70 281.35	
3B 4D 4ES	0.80 - 1.00 0.80 - 1.00 1.00	H 93		Stiff light brown locally mottled light grey slightly sandy CLAY with frequent pockets (up to 100mm) of firm light grey silty clay. Rare subangular fine to coarse limestone gravel. Rare rootlets. (FEF) (FE)			
5B 6D	1.60 - 1.80 1.60 - 1.80			Firm friable extremely closely fissured light grey mottled light brown CLAY with rare thin laminae of coarse sand and rare subangular fine to coarse limestone gravel. (FEF) (FE)	1.50	280.45	
			▼	2.00 - 2.10m: Thin bed (100mm) of very weak bluish grey locally stained orange calcareous siltstone locally tending to bioclastic limestone. Recovered as cobble and boulder sized fragments (up to 350x250x100mm). <small>Trial pit Completed at 2.20m</small>	2.20	279.75	

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 30 degrees

Pit width x length: 1.70m x 3.00m Sidewall stability: Stable

Remarks: Trial pit terminated at 2.20m due to practical refusal.

Groundwater:

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks
2.10	2.10	20	Seepage

SUB LOCATION:
1118

Backfill details:

Depth Top (m)	Depth Base (m)	Material	Remarks
0.00	2.20	Arisings	

CONTRACT
35560
CHECKED
CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP621

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 26 September 2019 Easting 394280.2

Scale 1:25

End Date 26 September 2019 Northing 214615.4 Ground Level 279.60mOD

Depth 1.25 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10			Stubble over soft dark greyish brown slightly sandy CLAY with rare subangular fine to coarse limestone gravel. Rare rootlets. (TOP)	0.30	279.30	
1B	0.20 - 0.30			Very weak and weak thinly and very thinly bedded light brown and grey fossiliferous LIMESTONE with very closely and closely spaced very thin beds of soft light brown sandy clay. Excavated as angular tabular limestone cobbles with much light brown sandy clay. (FEF) (FE)			
2D	0.20 - 0.30						
2ES	0.30						
3B	0.60			1.00m: Light brown.	1.25		
3ES	0.60 - 0.80						
4D	0.60 - 0.80						
Trial pit Completed at 1.25m							

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 300 degrees

Pit width x length: 1.60m x 2.90m Sidewall stability: Stable

Remarks: Trial pit terminated at 1.25m due to practical refusal.

Groundwater:

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
1.00	1.00	20	Seepage	
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	1.25	Arisings		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP622

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 26 September 2019 Easting 394352.1

Scale 1:25

End Date 26 September 2019 Northing 214576.8 Ground Level 278.70mOD

Depth 0.75 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10	H 65	▼	Stubble over soft dark greyish brown slightly sandy CLAY. Rare subangular fine and medium limestone gravel. Frequent rootlets. (TOP)	0.30	278.40	
1B 2D 2ES	0.20 - 0.30 0.20 - 0.30 0.30			0.20m: Single angular coarse gravel sized red ceramic fragment.			
3B 3ES 4D	0.50 0.50 - 0.70 0.50 - 0.70			H 65	Soft to firm brown slightly sandy CLAY. Rare subrounded fine to coarse limestone gravel. Rare rootlets. (HDD) (HEAD) 0.40 - 0.50m: Frequent limestone cobbles at north east end of pit. 0.65m: Mottled yellow. 0.70m: Red ceramic land drain orientated 300deg.	0.75	277.95
Trial pit Completed at 0.75m							

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 30 degrees
 Pit width x length: 1.20m x 3.40m Sidewall stability: Stable
 Remarks: Trial pit terminated at 0.75m due to encountering ceramic land drain. Trial pit backfilled and reattempted 3.00m to south west (210deg) as TP622A.

Groundwater:				SUB LOCATION: 1118
Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	
0.70	0.70	20	Flow caused by damaged land drain	CONTRACT 35560
Backfill details:				
Depth Top (m)	Depth Base (m)	Material	Remarks	CHECKED CT
0.00	0.75	Arisings		

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP622A

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 26 September 2019 Easting 394350.0

Scale 1:25

End Date 26 September 2019 Northing 214574.7 Ground Level 278.70mOD

Depth 3.10 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES	0.10	H 52		Stubble over soft dark greyish brown slightly sandy CLAY with rare subangular tabular fine to coarse limestone gravel. Frequent rootlets. (TOP)	0.25	278.45	
1LB 2D 2ES 3ES	0.30 0.30 - 0.50 0.30 - 0.50 0.50			Soft becoming firm brown slightly sandy CLAY with rare subangular tabular fine to coarse gravel and cobbles of limestone. Rare rootlets. (HDD) (HEAD) 0.40 - 0.50m: South end of pit: Thick laminae of orange clayey silt. 0.50m: Rarely mottled orange. Frequent pockets (up to 50mm) of white silt.	0.70 0.80	278.00 277.90	
3B 4D 4ES	1.00 1.00 - 1.20 1.00 - 1.20			Weak very thinly bedded grey and pinkish grey SILTSTONE. Excavated as angular tabular cobble sized fragments. (FEF) (FE) Stiff fissured thickly laminated light grey mottled yellow and light brown locally slightly sandy slightly gravelly silty CLAY with very closely and closely spaced thick laminae and very thin beds of extremely weak and very weak calcareous siltstone and calcareous fine sandstone. Gravel is angular tabular fine to coarse mudstone lithorelicts. Fissures are subhorizontal and randomly orientated extremely closely spaced undulating rough frequently stained orange, purple and dark brown. (FEF) (FE)	2.50	276.20	
5B 6D	2.00 2.00 - 2.20			Extremely weak very thinly bedded bluish grey SILTSTONE. Bedding fractures are probably subhorizontal very closely spaced stained orangish brown. Excavated as clayey angular fine to coarse gravel with a high angular cobble content. (FEF) (FE)	3.10	275.60	
7B	2.60 - 2.80				Trial pit Completed at 3.10m		

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 30 degrees

Pit width x length: 1.60m x 3.40m Sidewall stability: Stable

Remarks: Trial pit terminated at 3.10m due to practical refusal.

Groundwater:

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks
2.90	2.90	20	Seepage

SUB LOCATION:
1118

Backfill details:

Depth Top (m)	Depth Base (m)	Material	Remarks
0.00	3.10	Arising	

CONTRACT
35560
CHECKED
CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP627

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 September 2019 Easting 394706.3

Scale 1:25

End Date 27 September 2019 Northing 213956.0 Ground Level 272.45mOD

Depth 1.25 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1ES 1LB 2D 3B	0.10 0.10 - 0.20 0.10 - 0.20 0.30 - 0.40			Turf over soft dark greyish brown slightly sandy slightly gravelly CLAY with a low limestone cobble content. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP) 0.20m: Brown. Gravelly.	0.25	272.20	
4B	0.70			Weak thinly bedded light grey and light brown oolitic locally fossiliferous LIMESTONE. Bedding fractures are 5-10deg/060deg very closely and closely spaced (20/50/100mm) undulating rough stained orangish brown with up to 50mm penetrative discolouration. Excavated as angular tabular cobble and boulder sized fragments. (GOG) (HMB) 0.70m: Bedding fractures frequently with (up to 5mm) light brown calcite precipitate. Frequent thin laminae of brown clay and clayey coarse sand.			
5B	1.00			1.20m: Light grey.	1.25	271.20	
Trial pit Completed at 1.25m							

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 100 degrees
 Pit width x length: 1.70m x 3.00m Sidewall stability: Stable
 Remarks: Subvertical fractures opening up in north face. Trial terminated at 1.25m due to practical refusal.
 Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.25	Arisings		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP628

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 27 September 2019 Easting 394729.3

Scale 1:25

End Date 27 September 2019 Northing 213847.2 Ground Level 271.45mOD

Depth 3.60 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend	
1ES	0.10	H 50		Turf over very soft dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse limestone. Frequent rootlets. (TOP)	0.25	271.20		
2ES 1LB 2D 3ES	0.30 0.40 - 0.60 0.40 - 0.60 0.50			Very soft becoming soft to firm light brown mottled light grey and yellowish brown CLAY. Frequent rootlets. (FEF) (FE) 0.50 - 0.80m: Locally mottled orange. Locally slightly sandy.				
3B 4D 4ES	1.00 1.00 - 1.10 1.00 - 1.10			H 47	Soft to firm extremely closely fissured thinly laminated grey CLAY. Fissure surfaces stained orangish brown. (FEF) (FE)	0.80		270.65
					1.80 - 2.00m: Thin bed (80-120mm) of extremely weak light brown calcareous siltstone. Surfaces are rough and irregular. Vertical fractures stained orange and brown. Recovered as cobble and boulder sized fragments.			
					5B 6D			
7B 8D	2.80 - 2.90 2.80 - 2.90	Stiff very thinly bedded very closely fissured light grey slightly sandy silty CLAY locally tending to extremely weak siltstone. Fissure surfaces rarely stained orangish brown. (FEF) (FE)						
9D	3.50			Trial pit Completed at 3.60m	3.60	267.85		

Equipment: Doosan DX62R 8 tonne excavator Bearing from North: 150 degrees

Pit width x length: 1.80m x 3.10m Sidewall stability: Stable

Remarks: Trial pit terminated at 3.60m, at limits of the excavator used.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1118
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	3.60	Arisings		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP634

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 April 2020 Easting 393969.6

Scale 1:25

End Date 28 April 2020 Northing 215614.7 Ground Level 275.05mOD

Depth 1.50 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20			Grass over dark brown slightly sandy gravelly silty CLAY. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	274.85	
2B 2ES	0.30 - 0.40 0.30 - 0.40			Light greyish brown irregular limestone COBBLES with much dark brown sandy gravelly silt. Gravel is angular and subangular fine to coarse limestone. Rare rootlets. (IOG) (SALS)	0.40	274.65	
3B 3ES	0.50 - 0.60 0.50 - 0.60			Light brown very clayey very gravelly fine to coarse SAND with a high limestone cobble content. Gravel is angular and subangular fine to coarse limestone. (IOG) (SALS)			
4B 4ES	1.00 - 1.10 1.00 - 1.10			Light greyish brown irregular limestone COBBLES with much dark brown sandy gravelly silt. Gravel is angular and subangular fine to coarse limestone. (IOG) (SALS)	1.00	274.05	
				1.10m: Intact echinoid fossil (Clypeus plotti) 80mm diam.	1.20	273.85	
5B	1.40 - 1.50			Medium strong thinly bedded greyish brown micritic LIMESTONE with closely spaced thin beds of orangish brown sandy silt. Limestone excavated as angular and subangular cobbles with much angular coarse gravel. (IOG) (SALS)	1.50	273.55	
Trial pit Completed at 1.50m							

Equipment: Kobelco 5 tonne excavator Bearing from North: 15 degrees

Pit width x length: 0.60m x 2.50m Sidewall stability: Stable

Remarks: Trial pit refused on limestone rock observed at base of pit.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	1.50	Arising		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP635

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 May 2020

Easting 393973.2

Scale 1:25

End Date 28 May 2020

Northing 215477.4 Ground Level 277.25mOD

Depth 3.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D 2ES 3B 4D 3ES 5LB 6D	0.10 - 0.20 0.10 - 0.20 0.10 - 0.20 0.30 - 0.40 0.30 - 0.40 0.30 - 0.40 0.50 - 0.60 0.50 - 0.60 0.50 - 0.70	H 58		Grass over firm brown and light brown CLAY. Frequent rootlets. (TOP)	0.40	276.85	
				Soft to firm light orangish brown CLAY. (HDD) (HEAD)			
4ES 7B 8D	0.90 - 1.10 0.90 - 1.10 0.90 - 1.10	H 43			1.20	276.05	
				Stiff light orangish brown and light grey slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine and medium limestone. (HDD) (HEAD)			
10D 9LB	1.50 - 1.70 1.50 - 1.70	H 75			2.90	274.35	
				Weak to medium strong light grey and white crystalline LIMESTONE. (GOG)			
11LB 12D	2.50 - 2.70 2.50 - 2.70	H 89			3.00	274.25	
				Trial pit Completed at 3.00m			

Equipment: JCB 3CX Bearing from North: 290 degrees
 Pit width x length: 0.80m x 3.30m Sidewall stability: Stable

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1143
Backfill details:				CONTRACT 35560
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	3.00	Arisings		CHECKED CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP636

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 May 2020

Easting 393975.6

Scale 1:25

End Date 28 May 2020

Northing 215366.4 Ground Level 278.10mOD

Depth 1.70 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.10 - 0.20	H 27		Grass over soft slightly sandy slightly gravelly silty CLAY. Gravel is angular to subrounded fine and medium limestone. Frequent rootlets. (TOP)	0.25	277.85	
	0.10 - 0.20		Very weak highly fractured very thinly bedded light brown LIMESTONE excavated as slightly sandy clayey angular to subrounded fine to coarse gravel. (GOG)				
	0.10 - 0.20		Weak thinly bedded white and light brown ooidal and bioclastic LIMESTONE. Bedding fractures are 15deg/080deg closely spaced undulating rough stained brown. (GOG)	1.30	276.80		
				Trial pit Completed at 1.70m	1.70	276.40	

Equipment: JCB 3CX Bearing from North: 60 degrees

Pit width x length: 0.80m x 3.00m Sidewall stability: Stable

Remarks: Trial pit refused at 1.70m on limestone bedrock.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1143
Backfill details:				CHECKED CT
Depth Top (m)	Depth Base (m)	Material	Remarks	
0.00	1.70	Arisings		

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP637

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 April 2020

Easting 394051.7

Scale 1:25

End Date 28 April 2020

Northing 215116.9 Ground Level 273.65mOD

Depth 2.00 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20			Grass over light brown sandy gravelly SILT. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	273.45	
2B 2ES	0.30 - 0.40 0.30 - 0.40			Light greyish brown irregular limestone COBBLES with much light greyish brown sandy gravelly silt. Gravel is angular and subangular fine to coarse limestone. (HDD) (HEAD)	0.40	273.25	
3B 3ES	0.50 - 0.60 0.50 - 0.60			Medium strong thinly bedded light greyish brown micritic locally fossiliferous LIMESTONE with closely spaced thin beds of light greyish brown sandy silt. Limestone excavated as angular and subangular coarse gravel and cobbles. (GOG)	0.90	272.75	
4B 4ES	1.00 - 1.10 1.00 - 1.10			Firm light brown locally mottled orangish brown sandy CLAY with rare shell fragments (up to 5mm diam.) (FEF) (FE)	1.60	272.05	
5B	1.90 - 2.00			Stiff (friable) light brown slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine and medium limestone. (FEF) (FE)	2.00	271.65	
Trial pit Completed at 2.00m							

Equipment: Kobelco 5 tonne excavator Bearing from North: 35 degrees

Pit width x length: 0.60m x 2.50m Sidewall stability: Stable

Remarks: Trial pit refused on limestone rock observed at base of pit.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION: 1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	2.00	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT

TRIAL PIT LOG



CLIENT HIGHWAYS ENGLAND

TP638

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Sheet 1 of 1

Start Date 28 April 2020

Easting 393996.5

Scale 1:25

End Date 28 April 2020

Northing 215193.1 Ground Level 272.95mOD

Depth 1.10 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES	0.10 - 0.20 0.10 - 0.20			Grass over light brown sandy gravelly SILT. Gravel is angular and subangular fine to coarse limestone. Frequent rootlets. (TOP)	0.20	272.75	
2B 2ES	0.30 - 0.40 0.30 - 0.40			Light orangish brown irregular limestone COBBLES with much light brown sandy gravelly silt. Gravel is angular and subangular fine to coarse limestone. (GOG)			
3B 3ES	0.50 - 0.60 0.50 - 0.60			Medium strong thinly bedded light greyish brown micritic LIMESTONE with closely spaced thin beds of light greyish brown sandy silt. Limestone excavated as angular and subangular cobbles. (GOG)	0.60	272.35	
4B 4ES	1.00 - 1.10 1.00 - 1.10			Trial pit Completed at 1.10m	1.10	271.85	

Equipment: Kobelco 5 tonne excavator Bearing from North: 40 degrees

Pit width x length: 0.60m x 2.50m Sidewall stability: Stable

Remarks: Trial pit refused on limestone rock.

Groundwater: Groundwater not encountered

Depth Strike (m)	Rose to (m)	Time to rise (min)	Remarks	SUB LOCATION:
				1158
Backfill details:				CONTRACT
Depth Top (m)	Depth Base (m)	Material	Remarks	35560
0.00	1.10	Arisings		CHECKED
EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS				CT



IN-SITU HAND VANE/POCKET PENETROMETER

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Depth (m)	Hand Vane Peak (kPa)	Average Hand Vane Peak (kPa)	Hand Vane Remoulded (kPa)	Average Hand Vane Remoulded (kPa)	Pocket Penetrometer (kPa)	Average Pocket Penetrometer (kPa)	Remarks
TP210	2.50	50 / 50 / 54	51					
TP211	0.20	86 / 62 / 73	74	20 / 14 / 16	17			
TP211	1.50	81 / 80 / 70	77	40 / 32 / 22	31			
TP603	0.30	35 / 34 / 28	32					
TP606	0.20	22 / 32 / 29	28	10 / 11 / 12	11			
TP606	1.00	74 / 60 / 45	60	12 / 12 / 10	11			
TP612	0.50	46 / 63 / 56	55	22 / 15 / 20	19			
TP619	0.35	50 / 58 / 46	51					
TP619	1.00	60 / 54 / 52	55					
TP620	0.30	62 / 72 / 65	66	32 / 42 / 40	38			
TP620	0.50	59 / 54 / 55	56	39 / 29 / 26	31			
TP620	0.70	106 / 78 / 94	93	28 / 30 / 26	28			
TP622	0.40	64 / 58 / 74	65	32 / 28 / 28	29			
TP622	0.60	62 / 64 / 68	65	28 / 32 / 28	29			
TP622A	0.60	54 / 45 / 57	52	25 / 20 / 27	24			
TP628	0.50	53 / 45 / 53	50	30 / 28 / 25	28			
TP628	0.80	56 / 46 / 40	47	27 / 22 / 20	23			
TP635	0.20	58 / 47 / 69	58	20 / 18 / 21	20			
TP635	1.00	44 / 40 / 44	43	22 / 21 / 22	22			
TP635	2.00	83 / 72 / 71	75	19 / 22 / 17	19			
TP635	2.60	91 / 91 / 85	89	21 / 17 / 20	19			
General Remarks:								
Hand vane and pocket penetrometer test results reported as undrained shear strength							CONTRACT 35560	CHECKED CT



APPENDIX B

SUBCONTRACTOR REPORTS



APPENDIX B

B1 DOWNHOLE GEOPHYSICS



**REPORT ON THE
GEOPHYSICAL LOGGING
OF
THREE BOREHOLES**

Prepared For:



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MAR 2019/GENG1901_ rpt/SO91

	Name	Date
Logged by:	D. Hingley M. Hand M. Kynaston	Various
Report by:	M. Kynaston	02.07.19
Checked by:	D. Hingley	09.07.19
Revised by:	J. Ainsworth	07.11.19

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1.0 INTRODUCTION	1
2.0 THE GEOPHYSICAL LOGGING METHODS	3
3.0 SITE DETAILS.....	6
4.0 PROCESSING AND PRESENTATION OF IMAGER RESULTS	7
5.0 BOREHOLE LOGGING CONSTRAINTS	8

LIST OF FIGURES

Figure 3.1	Location map showing site location highlighted by red circle. © Bing Maps 2019.
Figure 3.2	Aerial image showing approximate borehole positions. © Bing Maps 2019.

Appendix 1	Defect Classification
Appendix 2	Geophysical Logs

1.0 INTRODUCTION

At the request of Geotechnical Engineering Ltd., borehole imaging and geophysical logging was carried out in three boreholes for private land package 987 for the A417 project near Birdlip, Gloucestershire.

The following report details phase two works, carried out by European Geophysical Services between the 7th March and 13th June 2019.

The following logs were run:-

DSRC110 Logs	From (m)	To (m)
Optical Imager	1.5	34.0
Acoustic Imager	32.0	36.0
3 Arm Caliper	1.0	36.0
Natural Gamma	1.0	36.0
Focused Resistivity	32.0	36.0
Density (gamma-gamma)	2.0	32.0

1.0 INTRODUCTION

DSRC302 Logs	From (m)	To (m)
Optical Imager	1.0	29.0
Acoustic Imager	27.0	29.4
Natural Gamma	1.7	29.4
3 Armed Caliper	1.7	29.4
Density (gamma-gamma)	1.7	29.5

DSRC303 Logs	From (m)	To (m)
Optical Imager	1.5	31.7
Acoustic Imager	30.3	40.1
Temperature & Conductivity	27.0	40.1
Natural Gamma	0.0	40.1
Resistivity	29.0	40.1
Impellor Flowmeter	29.0	39.5
3 Armed Caliper	0.0	39.0
Density (gamma-gamma)	0.0	40.0

2.0 THE GEOPHYSICAL LOGGING METHODS

The Equipment and Field Procedure

A fully digital logging system with a 600m capacity motorised winch mounted in a 4x4 van was used.

All logging data was recorded digitally for reprocessing and archiving purposes.

The optical imager survey was carried out first to avoid the disturbance of the fluid by the geophysical logs which may affect water clarity.

Natural Gamma (Gam)

The tool measures the naturally occurring gamma radiation found in rocks and sediments. It is mainly used to detect the clays that contain potassium K^{40} , though the U^{238} series of elements and the Th^{232} series of elements also emit gamma radiation.

The higher the concentration of these clay minerals the greater the responses on the natural gamma log.

Acoustic Borehole Imager (ABI)

This tool scans the borehole wall through 360 degrees and records the acoustic reflection of the resulting signal in terms of amplitude and transit time (the travel time from the tool to the borehole wall). This technique requires a fluid filled borehole with a minimum of suspended solids, polymers or mud within the fluid column.

This sensitive technique responds to small diameter changes, rugosity and the acoustic nature of the borehole wall. It is primarily used for detecting fractures and other discontinuities. The resultant images are orientated (to magnetic North) 0° through 90° , 180° and 270° back to 0° .

The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is viewed on the way down the borehole to allow fine tuning of the acquisition parameters. The settings are then adjusted and the image recorded on the way up the borehole which ensures a constant line speed during acquisition.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore data within approximately one metre of magnetic steel casing is un-orientated.

2.0 THE GEOPHYSICAL LOGGING METHODS

Optical Borehole Imager (Optical)

A precision-machined prism and CCD camera assembly permits a high definition video image of the borehole wall to be captured in a variety of horizontal and vertical resolutions. The resulting image is digitised in the sonde for transmission to the surface acquisition system.

The image is then orientated to Magnetic North and displayed as an unwrapped image log. This enables a detailed structural interpretation to be made if required.

For the best results the optical imager should be run above the water level or in clean, clear fluid. The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is recorded on the way down the borehole to limit disturbance to the clarity of the water in the borehole by the logging tool.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore the recorded data within approximately one metre of magnetic steel casing is un-orientated. This is corrected manually during the post-processing stage.

Focused Resistivity Log (Deep and Shallow)

The Focused Resistivity tool uses Guard Electrodes to focus the current into the formation. This gives excellent vertical resolution and good penetration, especially in highly conductive borehole fluids where a Normal Resistivity Sonde would not be as effective.

The tool has two electrode spacing's to allow a deep and shallow depth of investigation.

The response of this log is a function of porosity, type of formation / mineralogy and its pore water quality. These logs aid in the identification of strata and quality of the pore water

Caliper (Cal)

This tool measures the mean diameter of the borehole. It is used to check the integrity of the borehole lining, and where the borehole is unlined to identify zones of washout, breakout or fissures.

2.0 THE GEOPHYSICAL LOGGING METHODS

Fluid Temperature (T)

There is a natural geothermal gradient of increasing temperature with depth. This gradient varies with the thermal conductivity of the geological formation and is modified by water flowing in, out or vertically through the borehole.

This log is used to determine flow patterns within the borehole and to identify flow zones.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Fluid Conductivity (EC or EC25)

The electrical conductivity (EC) of the water is related to its salinity and dissolved solids and is therefore a measure of the quality of the borehole water. The shape of the log trace can indicate zones of inflow.

Using data from the temperature log the electrical conductivity is corrected to 25°C (EC25).

This log is used to identify different zones of water quality.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Impeller Flowmeter (FV)

This log is used to determine any flow pattern within the borehole and identify flow zones. The tool uses an impeller and is normally run at a constant logging speed against the anticipated flow for the best response. The data is corrected for logging speed and a fluid velocity (FV) log is produced.

Gamma - Gamma (GGLS / GGHR)

These logs give qualitative information on the density of the formation and/or the material behind linings where installed. The logs are expressed in counts per second (cps) which are inversely related to density.

The sonde has two detectors at different spacing's from a source of gamma radiation. The logs from each detector respond to the apparent bulk density of the material surrounding the tool at a radius of investigation related to the spacing's. The Long Spaced (LS) has a spacing of 48cm and the High Resolution (HR) has a spacing of 24cm.

3.0 SITE DETAILS

Site
A417

OS Grid Ref: SO 9320 1556

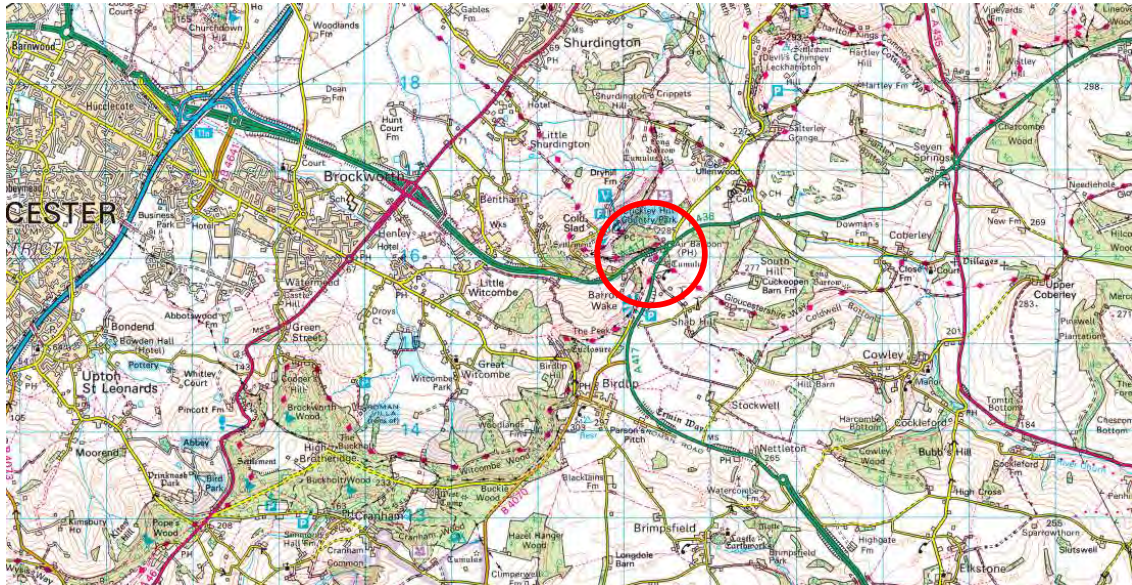


Figure 3.1 Location map showing site location highlighted by red circle. © Bing Maps 2019.



Figure 3.2 Aerial image showing approximate compound positions. © Bing Maps 2019.

4.0 PROCESSING AND PRESENTATION OF IMAGER RESULTS

Detailed logs of the imager data have been produced at a vertical scale of 1:10.

Constructional details and information on each borehole are given in the headers of each log.

All images have been referenced to Magnetic North.

The borehole's azimuth and tilt are plotted alongside the images.

The image of the borehole wall is presented in an unwrapped form with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structural features and discontinuities have been picked from the images in the form of colour coded sinusoidal projections - see Appendix 1 for details. This 'Discontinuities' log is also presented with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structure picking is not a definitive analysis of all the features within a borehole. Only the discontinuities that have a linear dip and direction are 'picked' and used in the analysis of the discontinuities. Features that do not have a regular sinusoidal shape do not have a linear dip and direction, 'best fit' picking of these features is done if approximately 80% coverage of the sinusoid can be achieved. Below this percentage the inaccuracy of the picking is too great and if included in any structural analysis may adversely skew the results. Vughs, solution holes, and angular break outs are examples of features not picked.

The apparent azimuth and apparent dip (i.e. relative to the borehole's azimuth and tilt) of the discontinuities are calculated using the diameter of the borehole and the geometric parameters of the sinusoids overlaid on the discontinuities. The final processing stage is to correct these apparent values to true azimuth (in relation to Magnetic North) and true dip (from horizontal) by correcting for the borehole's azimuth and tilt.

The final results are presented as a 'tadpole' plot (Discontinuities - True°). The horizontal position of the tadpole's head gives the defect's true dip angle and its tail points in the direction of the defect's azimuth. These logs are presented with a horizontal scale in degrees. By convention the top of the page is North (Magnetic) and the right hand edge of the paper is East.

The true structural data has been presented in digital format as an excel file (xls).

5.0 BOREHOLE LOGGING CONSTRAINTS

- **Vehicle access restrictions**
None
 - **Tool access restrictions**
None
 - **Borehole conditions / risk to equipment**
 - **DSRC110** Borehole collapsed from 60m to 36.2m. Insufficient fluid filled interval for fluid logs. No Density log below 32.0m, due to borehole stability concerns – see caliper log. No optical image possible below water level due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC302** – Insufficient fluid filled interval for fluid logs or resistivity. No optical image possible below water level due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC303** – Logged in stages. . No optical image possible below water level due to cloudy borehole fluid. Acoustic image used instead.
 - **Lack of fluid filled column / cloudy fluid**
See above.
 - **Time constraint**
Onsite working hours prohibited working past 1700.
 - **Borehole construction / casing**
All boreholes cased to stable ground.
-

Appendix 1

Discontinuity Classification.

Discontinuity	Colour	Classification Parameters
Major Fracture or Fissure	Blue	An open break in the formation, that is <u>continuous</u> across the entire image.
Minor Fracture or Fissure	Turquoise	A thin or closed break in the formation, that is <u>continuous or discontinuous</u> across the image.
Vein	Green	That may be <u>continuous or discontinuous</u> across the entire image.
Fabric	Red	Defines a feature generally metamorphic, igneous or sedimentary in origin that may be <u>continuous or discontinuous</u> across the image, such as bedding and cross-bedding, schistosity or gneissosity.
Intrusions	Purple	Intrusive features such as dykes and sills, generally <u>continuous</u> across the image
Unknown	Black	Faint features which can not be classified.

Appendix 2

Geophysical Logs



EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC110**

Composite

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393441E; 216054N**

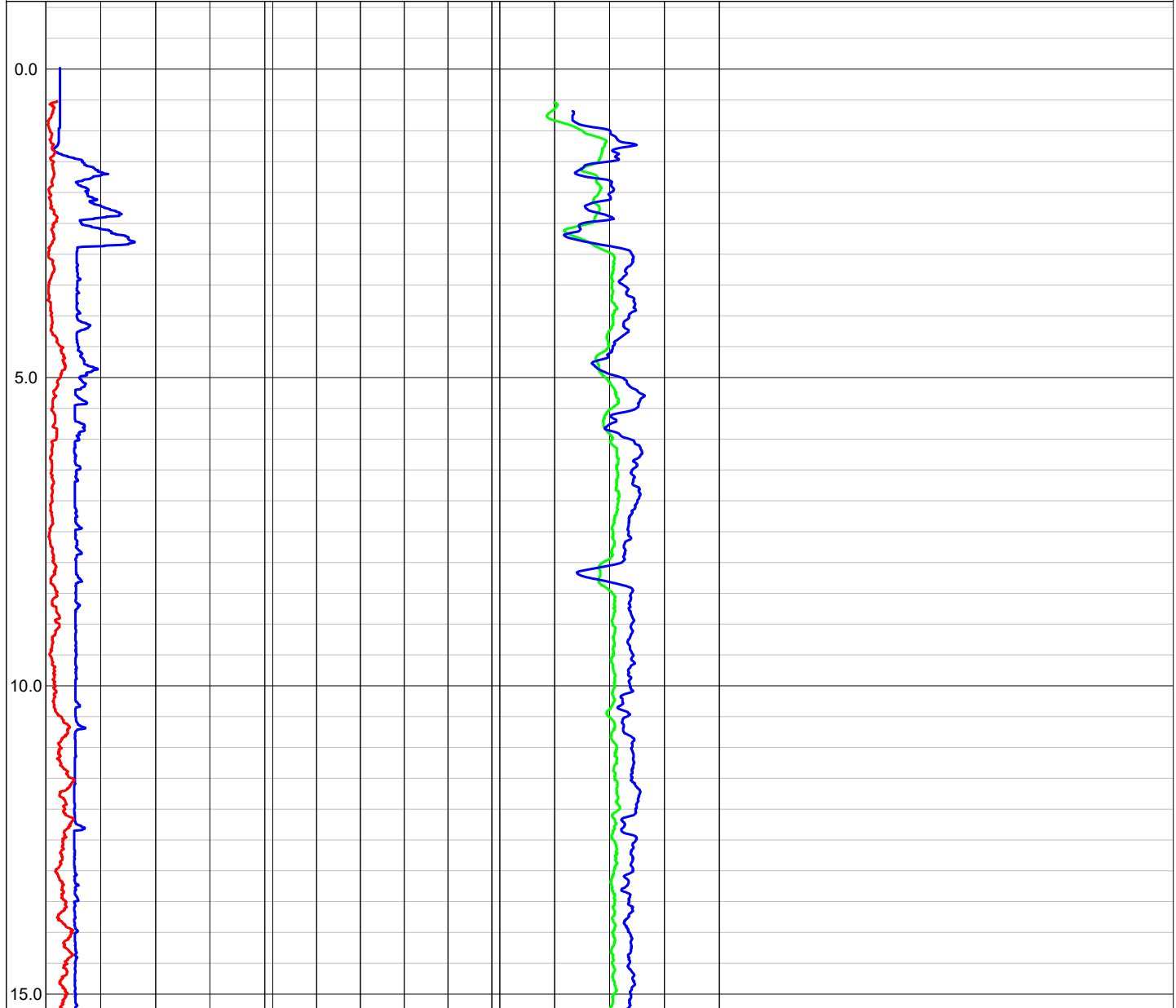
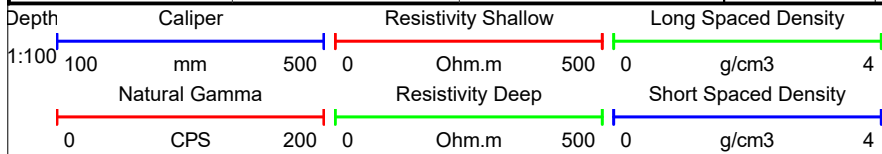
Elevation: **240.011m**

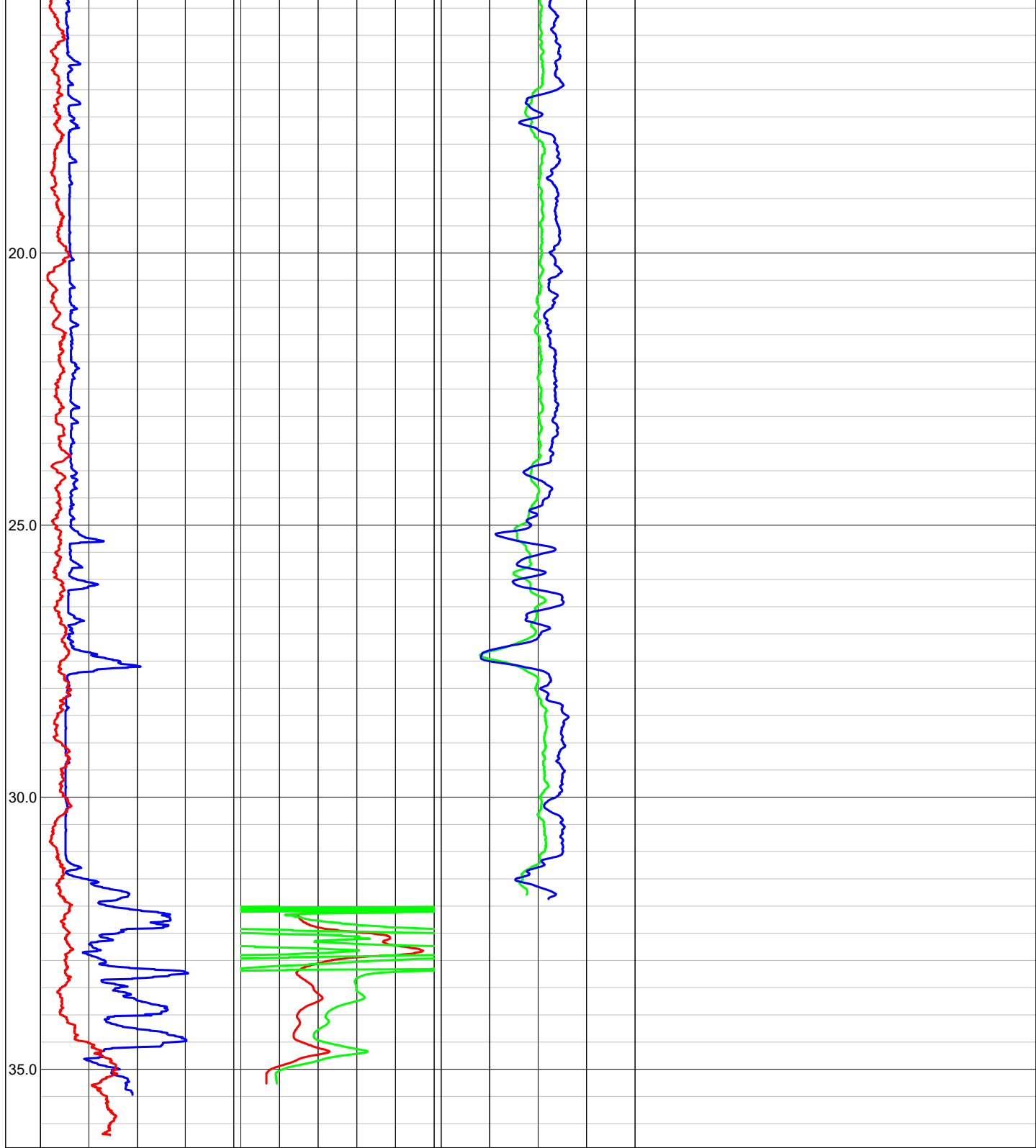
Drilled Depth: (m)	60.0*	Date:	03.04.2019
Logged Depth: (m)	36.2	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks: Borehole collapsed to 36.2m. Fluid logs not run due to insufficient fluid filled interval, also fluid column disturbed as a result of blockage clearing attempt.	
Logged Interval: (m)	0 - 36.2		
Fluid Level: (m)	32.1		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	1.37	60*	Steel	150	-1.1	1.37







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC110**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393441E; 216054N**

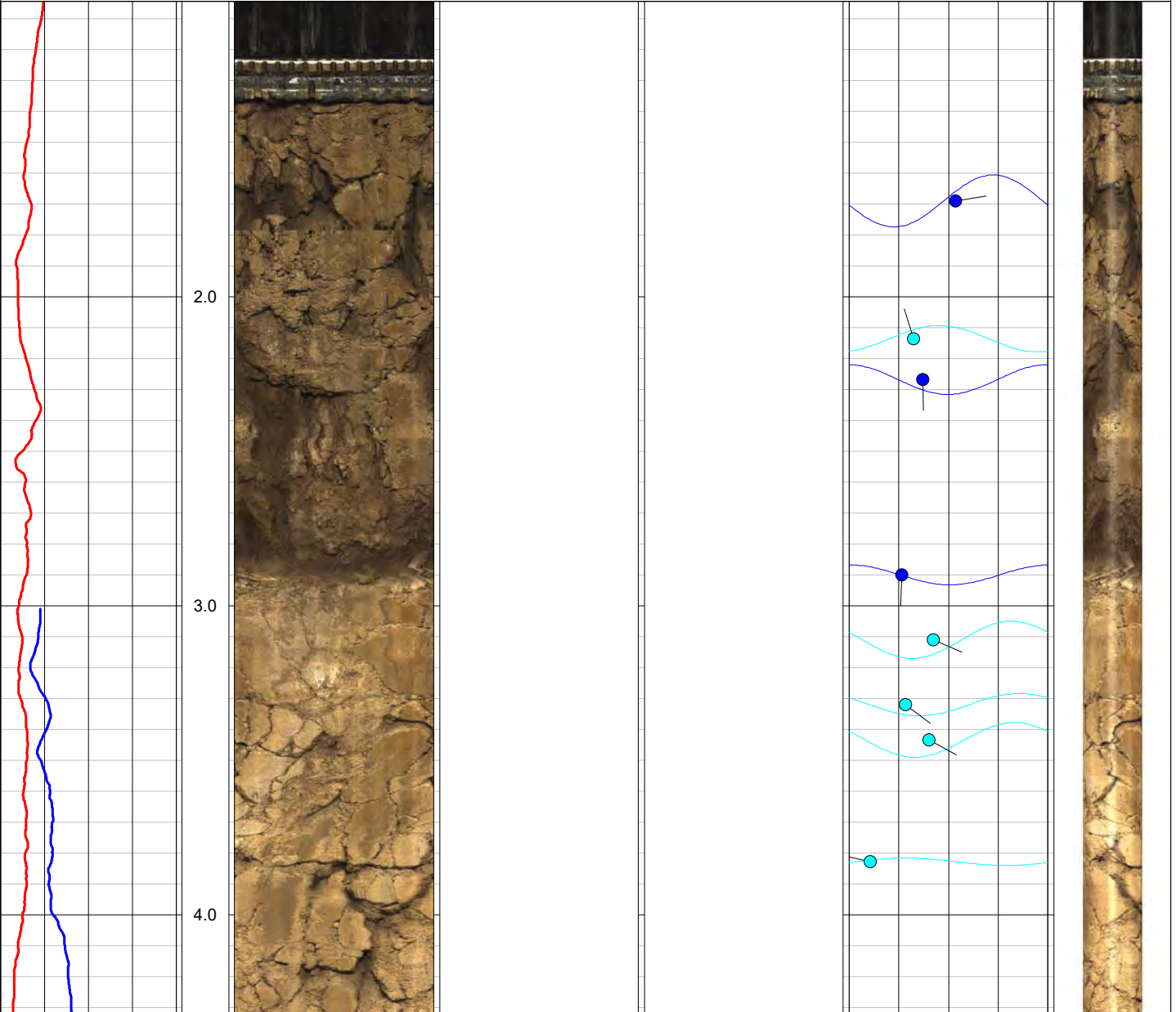
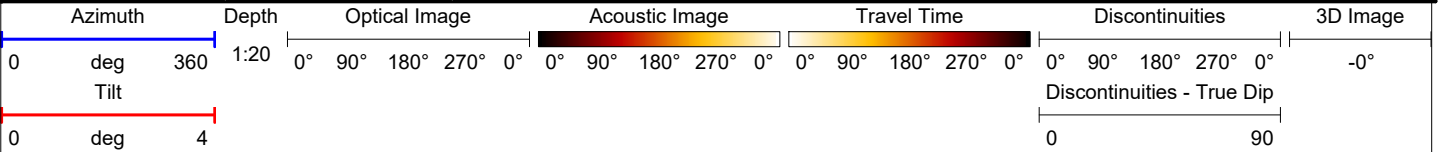
Elevation: **240.011m**

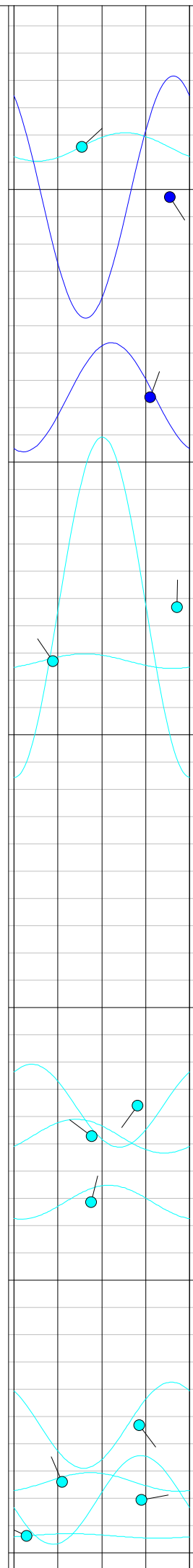
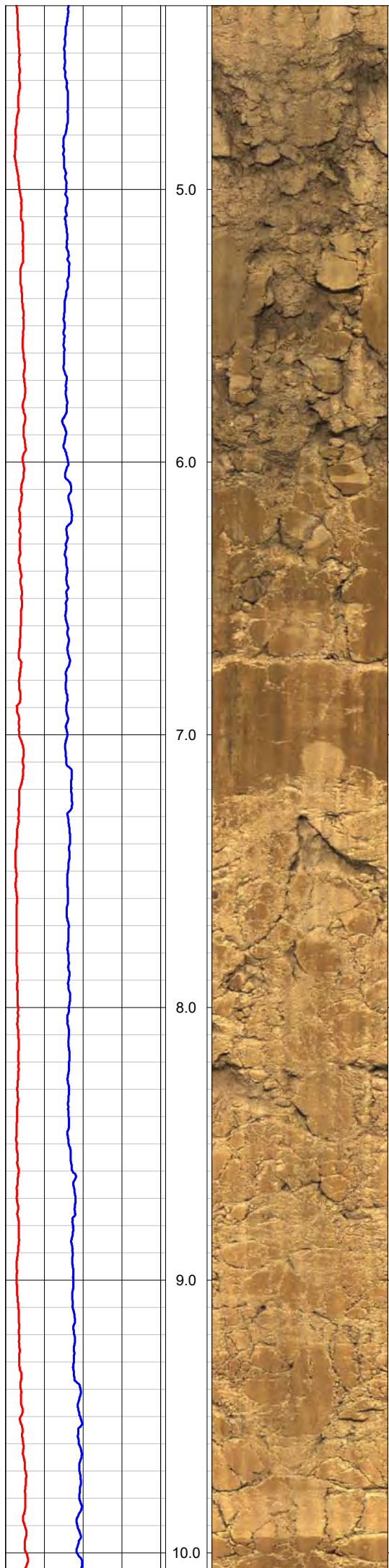
Drilled Depth: (m)	60.0*	Date:	03.04.2019
Logged Depth: (m)	36.2	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks: Borehole collapsed to 36.2m.	
Logged Interval: (m)	1.37 - 36.2		
Fluid Level: (m)	32.1		

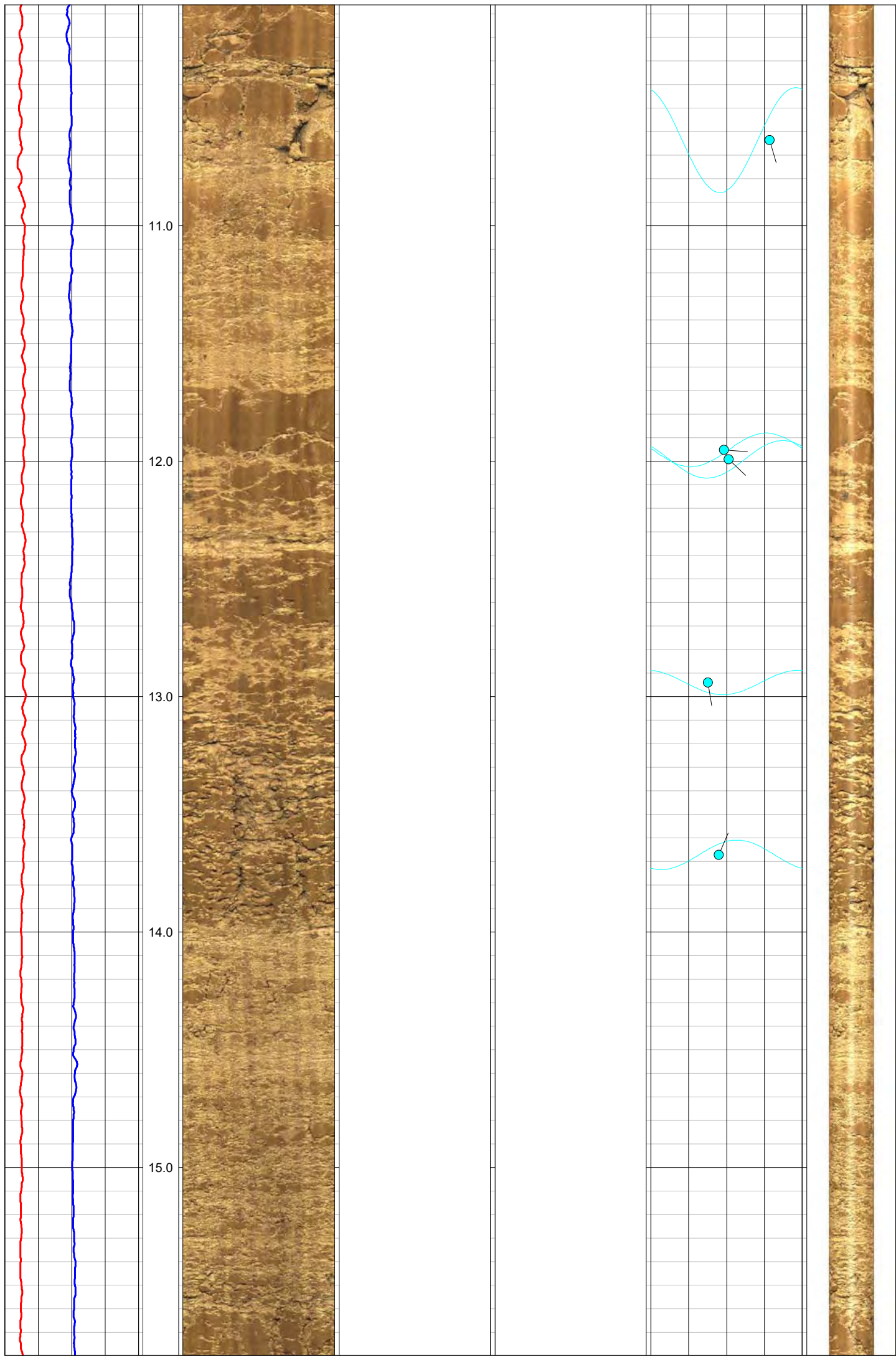
BOREHOLE RECORD

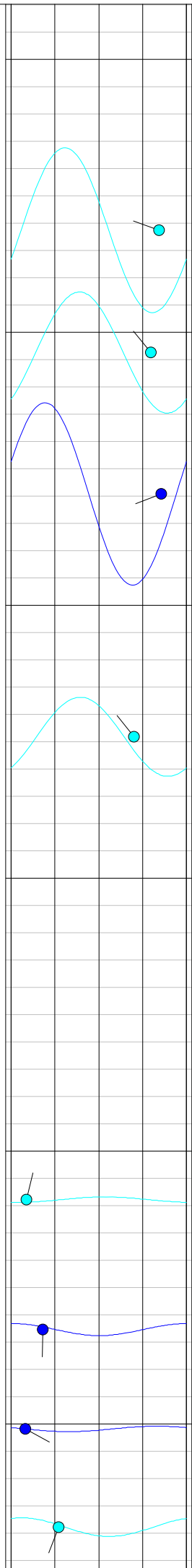
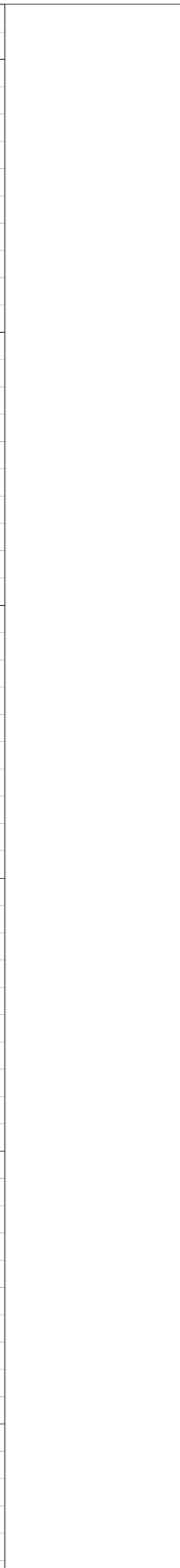
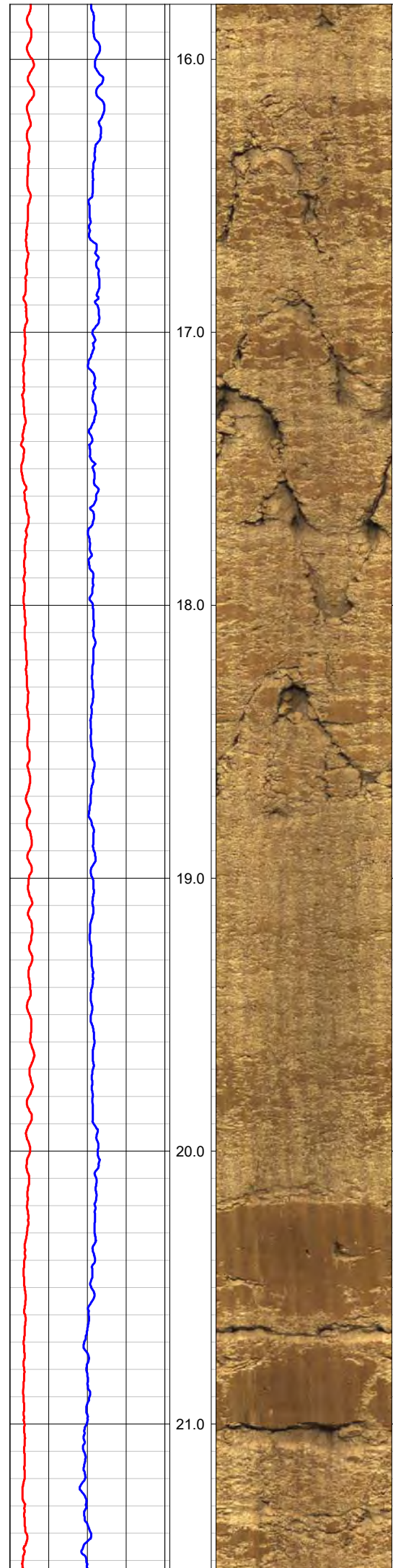
CASING RECORD

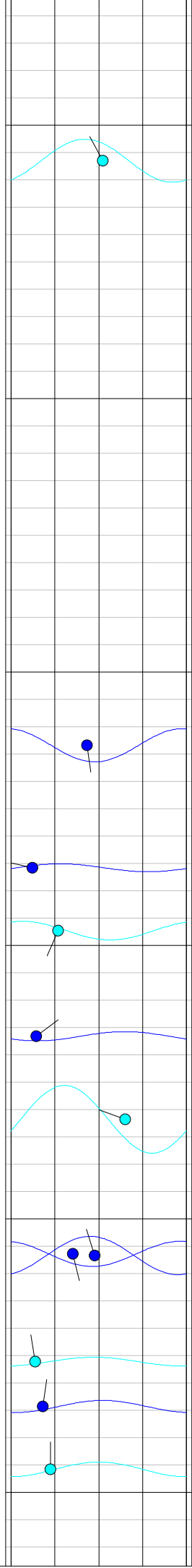
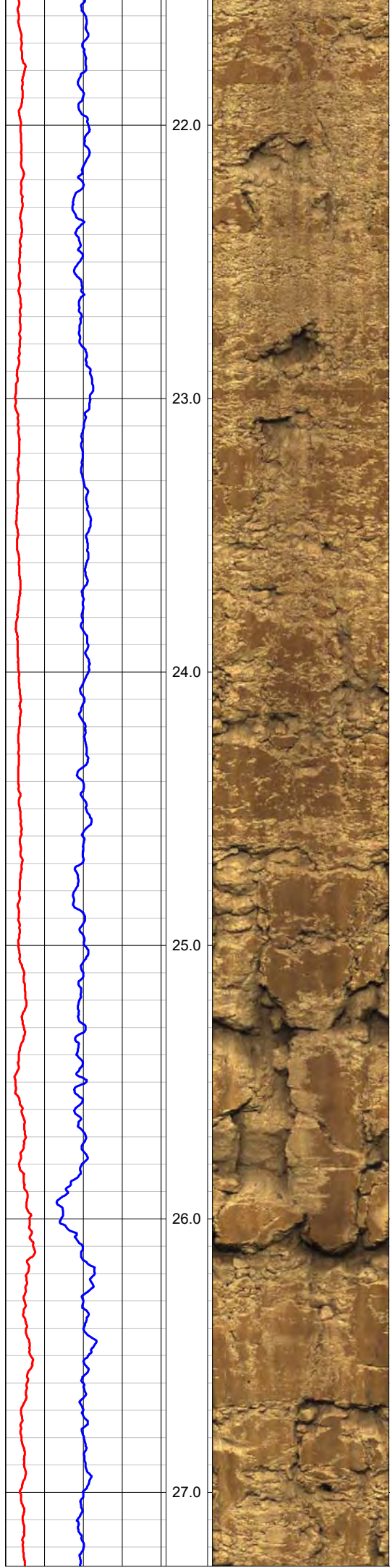
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	1.37	60*	Steel	150	-1.1	1.37

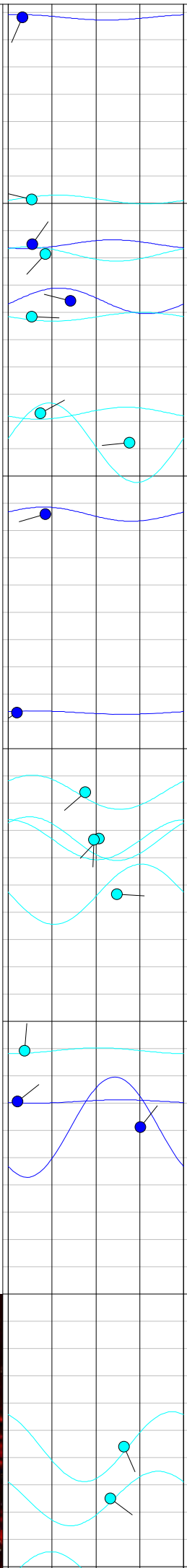
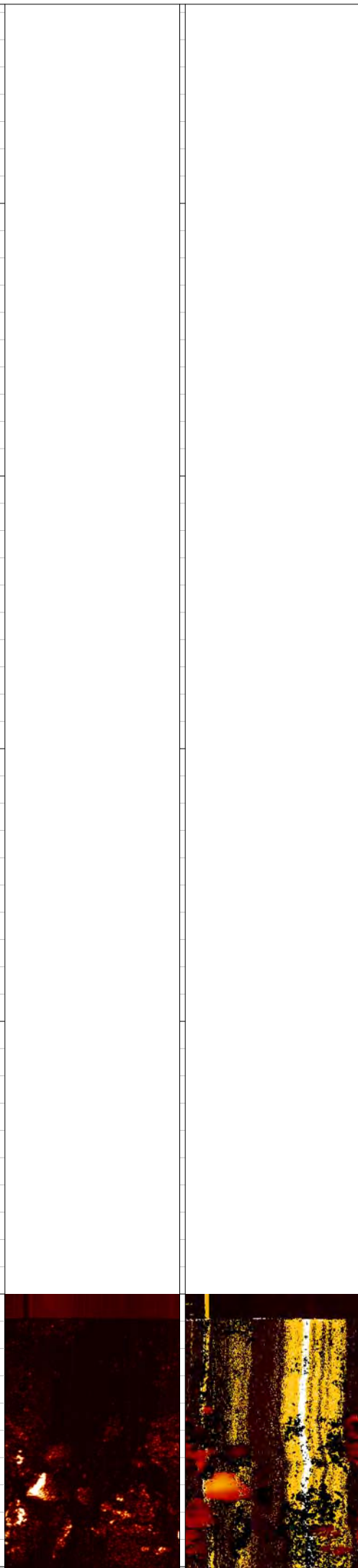
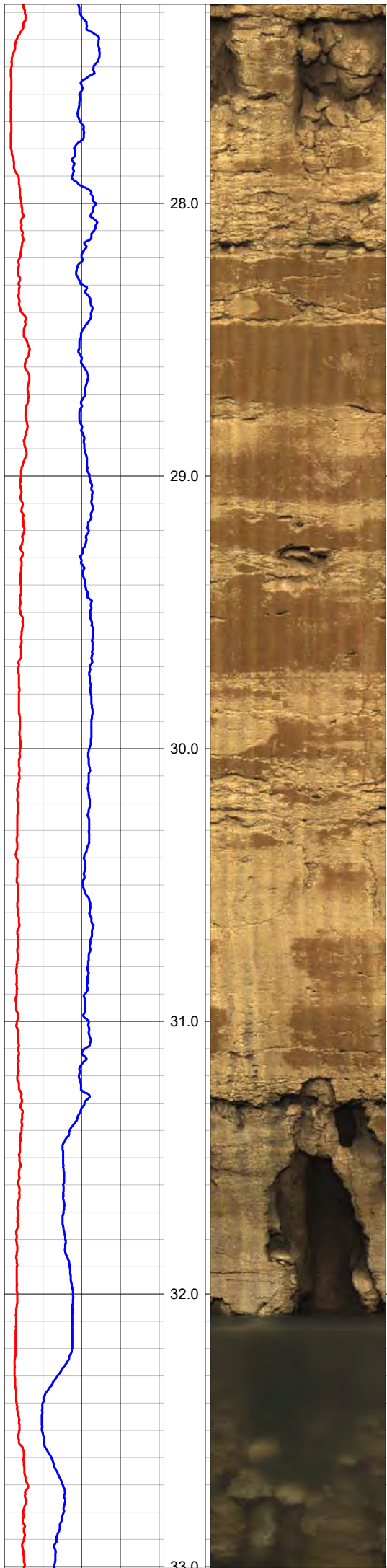


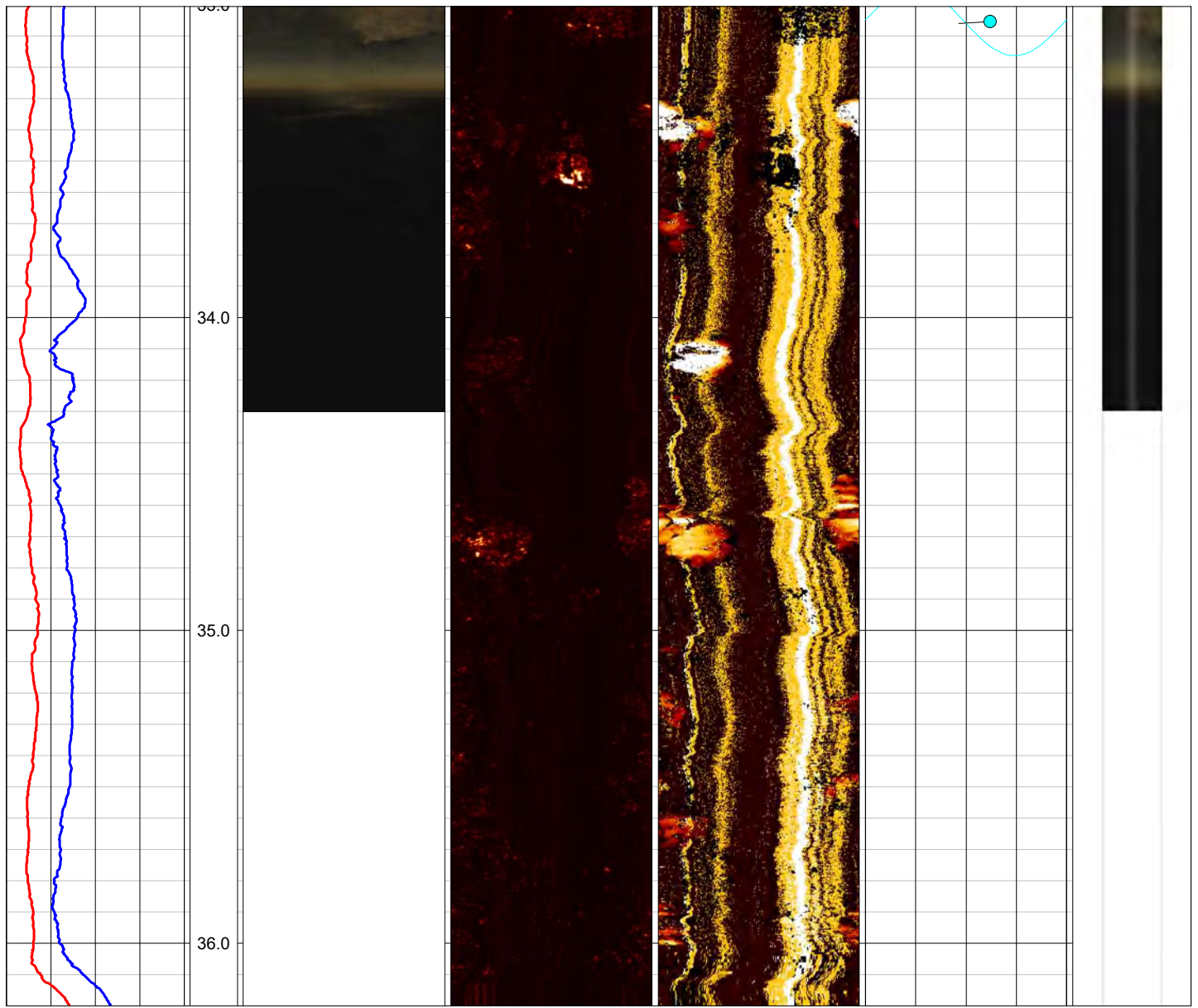














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC302**

Composite

Location: **A417 Birdlip**

Area: **Gloucestershire**

Grid Ref: **393328.6E; 216017.5N**

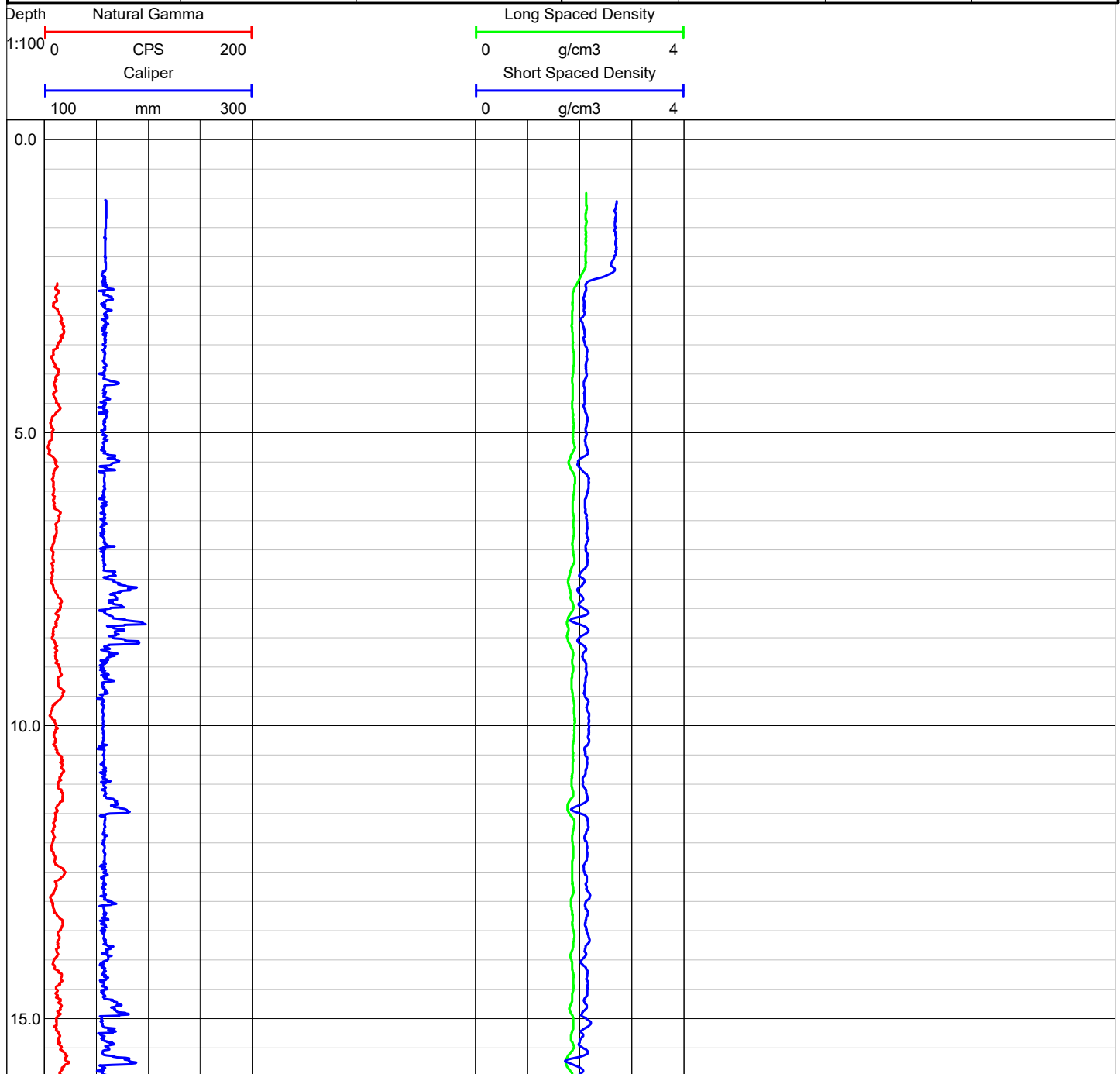
Elevation: **234.5094m**

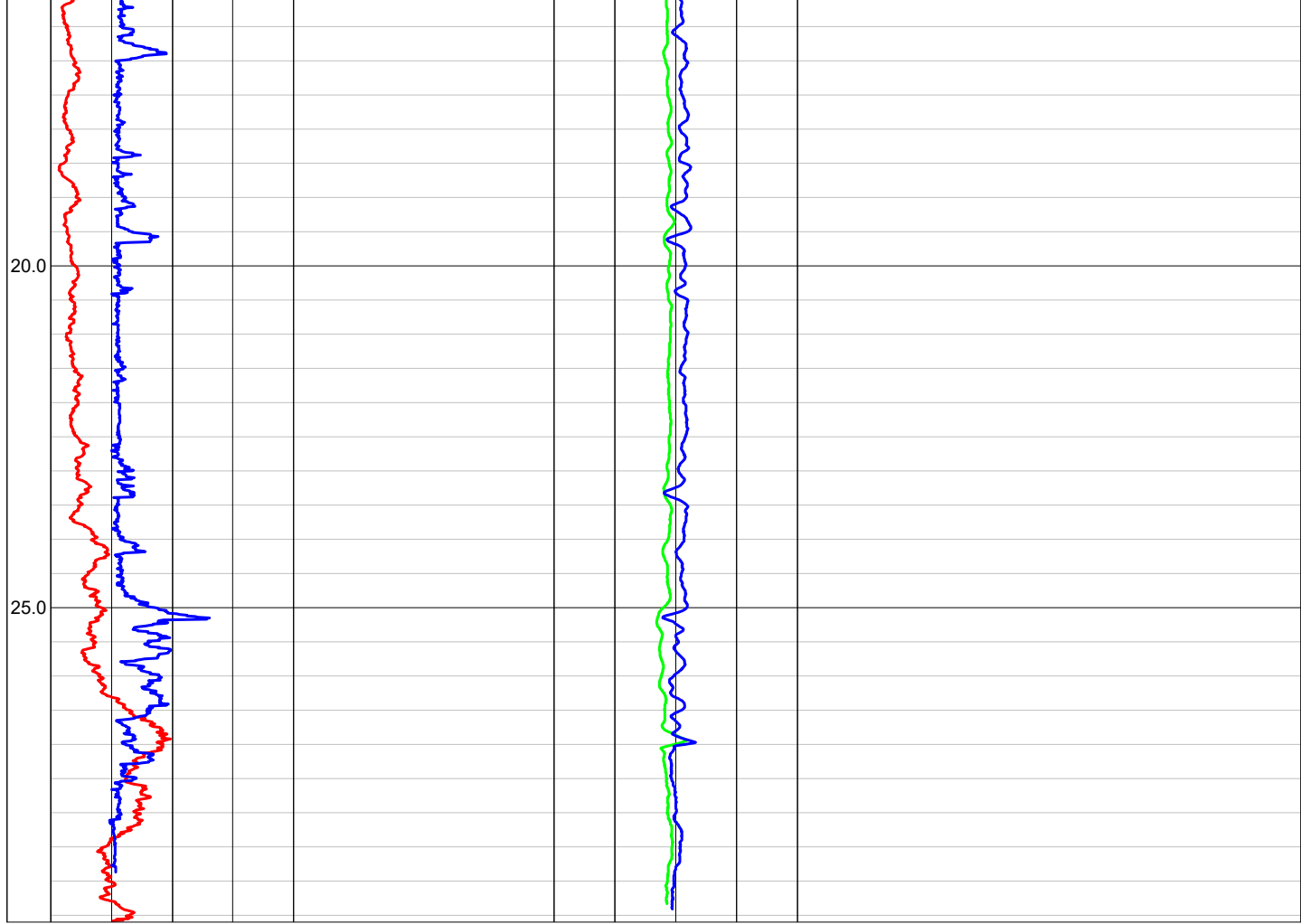
Drilled Depth: (m)	35.0	Date:	07.03.19
Logged Depth: (m)	29.4	Recorded By:	R. Powell
Logging Datum:	Ground level	Remarks: BH collapsed after casing removed. Insufficient fluid filled interval for fluid logs or resistivity.	
Logged Interval: (m)	0 - 29.4		
Fluid Level: (m)	27.1		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	2.4	35.0	Steel	150	0.0	2.4







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC302**

Image

Location: **A417 Birdlip**

Area: **Gloucestershire**

Grid Ref: **393328.6E; 216017.5N**

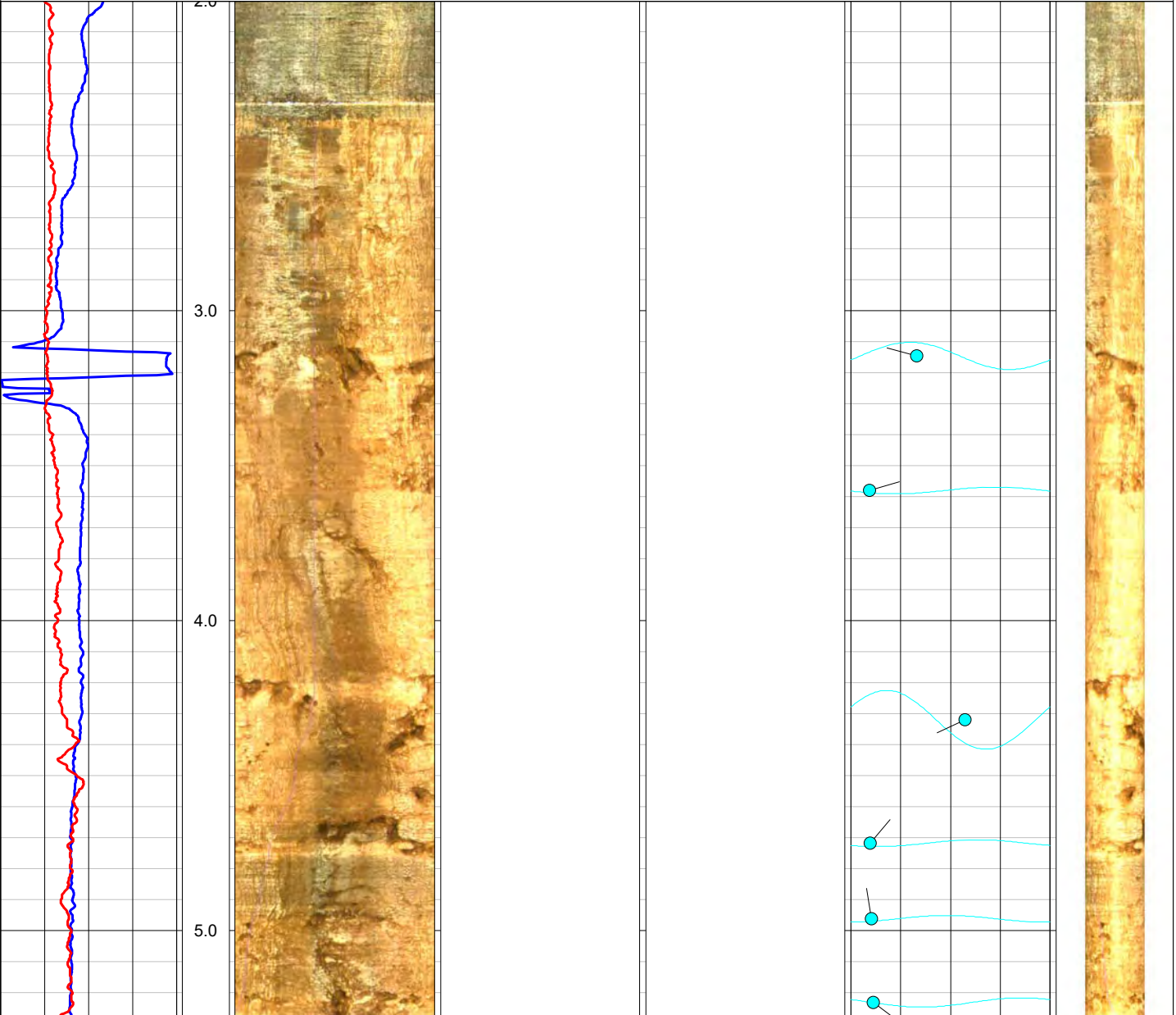
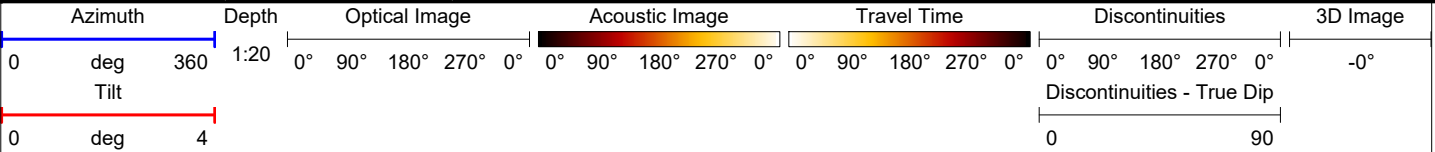
Elevation: **234.5094m**

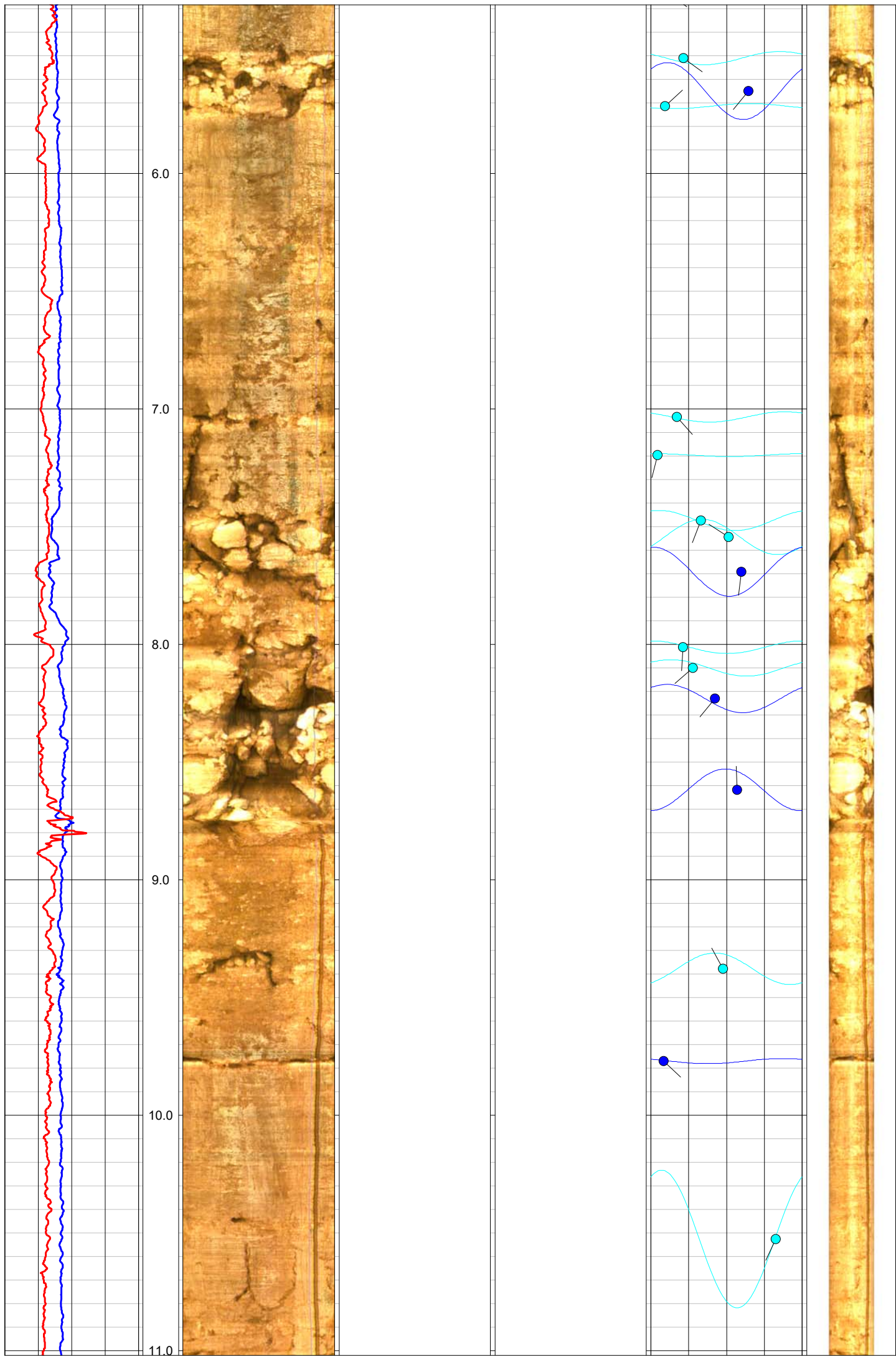
Drilled Depth: (m)	35.0	Date:	07.03.19
Logged Depth: (m)	29.4	Recorded By:	R. Powell
Logging Datum:	Ground level	Remarks: Fluid column cloudy - acoustic image used. BH collapsed after casing removed	
Logged Interval: (m)	2.4 - 29.4		
Fluid Level: (m)	27.1		

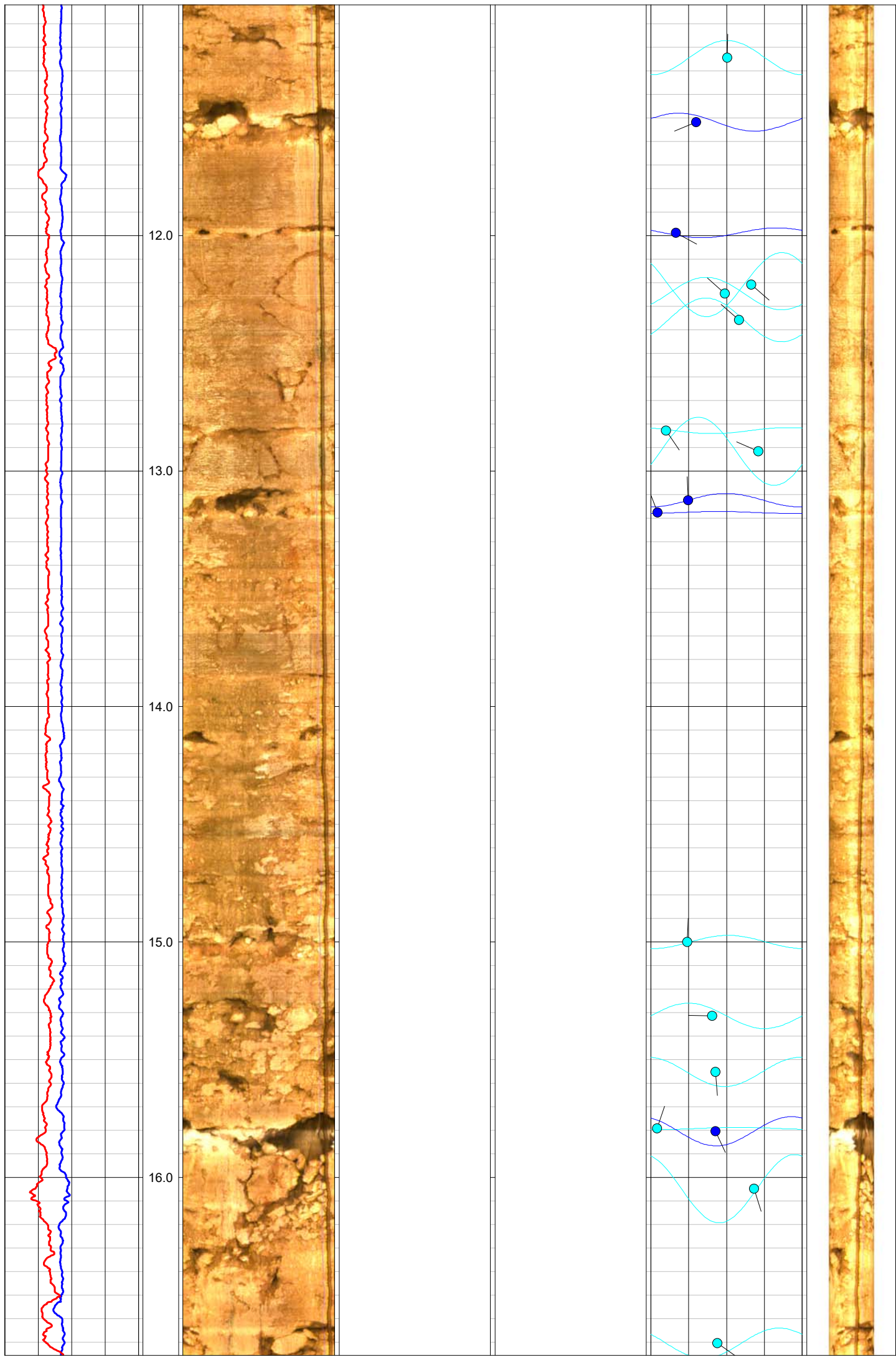
BOREHOLE RECORD

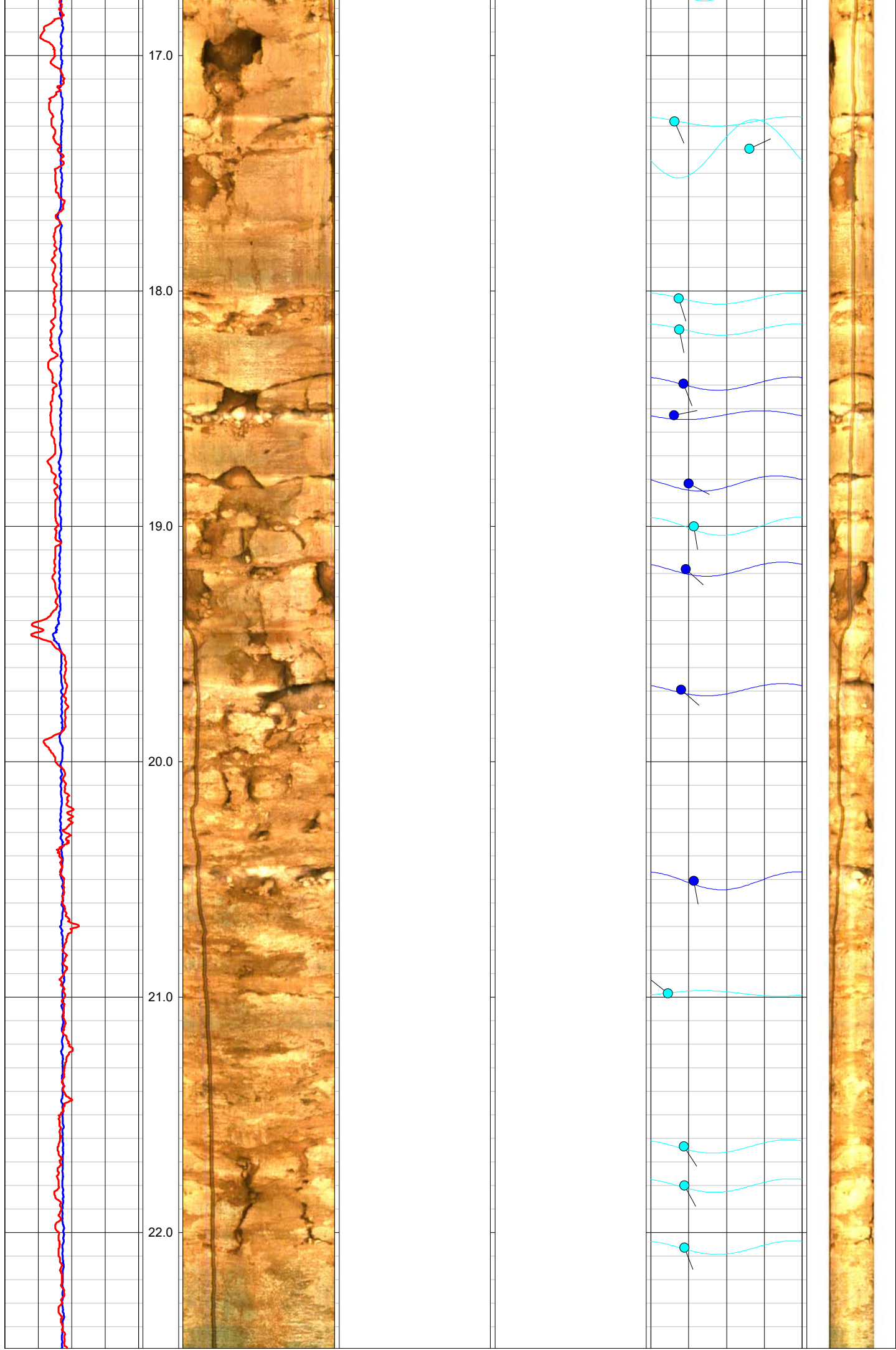
CASING RECORD

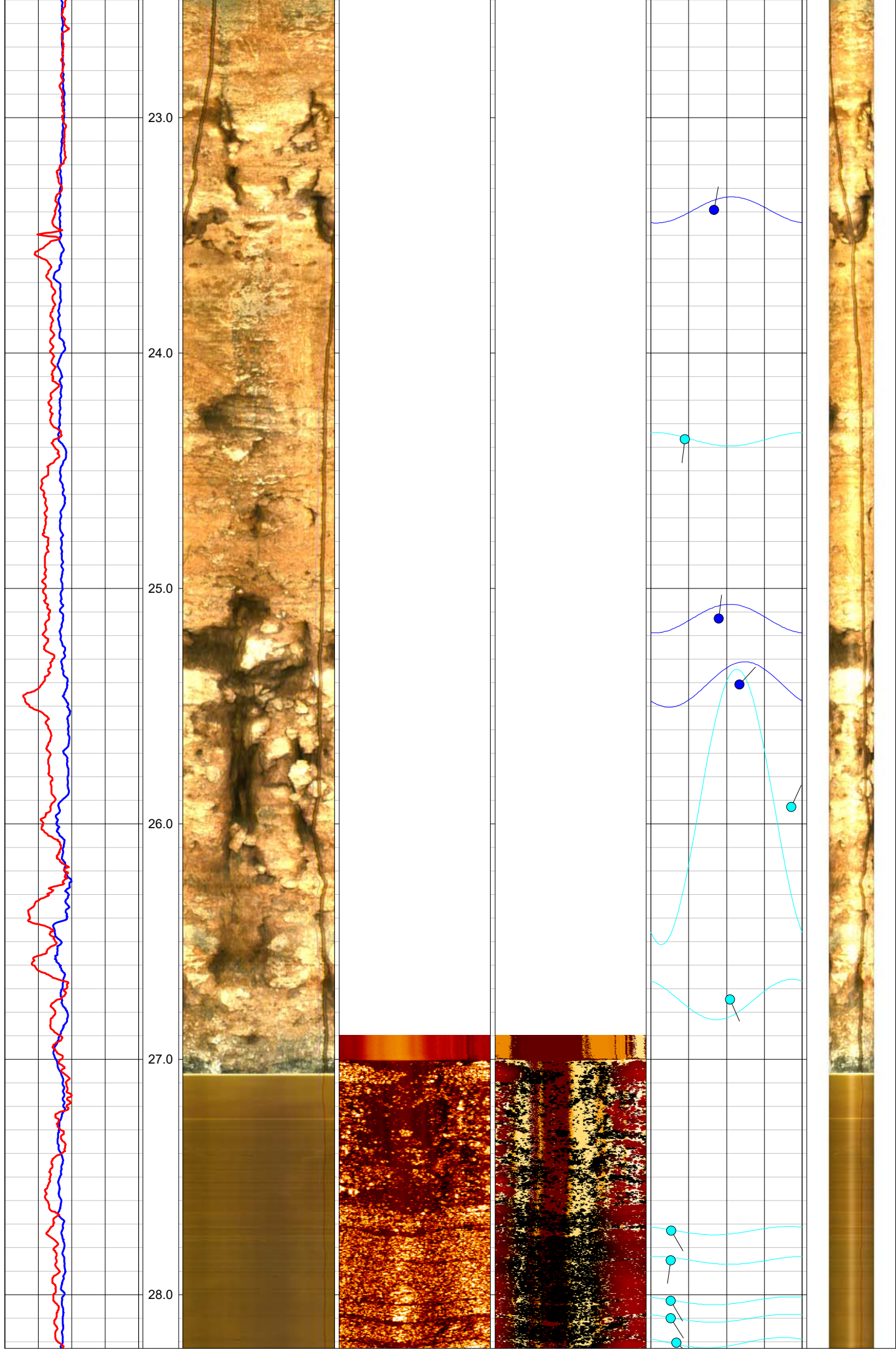
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	2.4	35.0	Steel	150	0.0	2.4

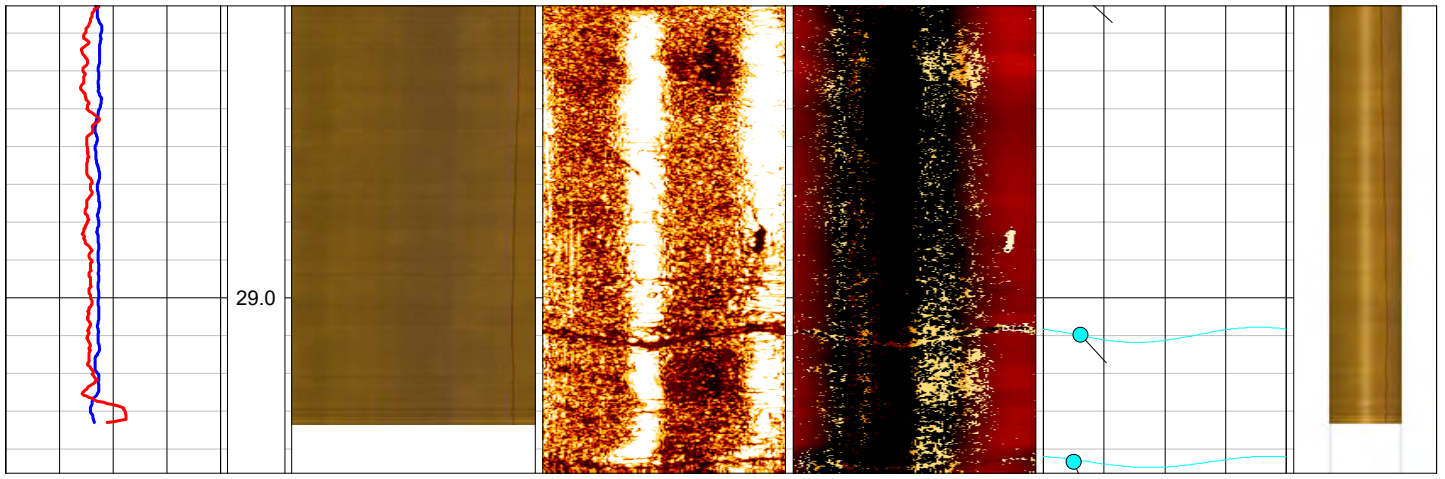














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC303**

Composite

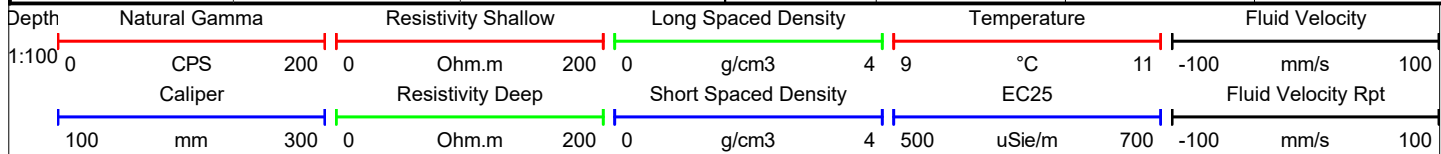
Location: **A417** Area: **Birdlip, Gloucestershire** Grid Ref: **393382.8E; 216045.2N** Elevation: **236.2488m**

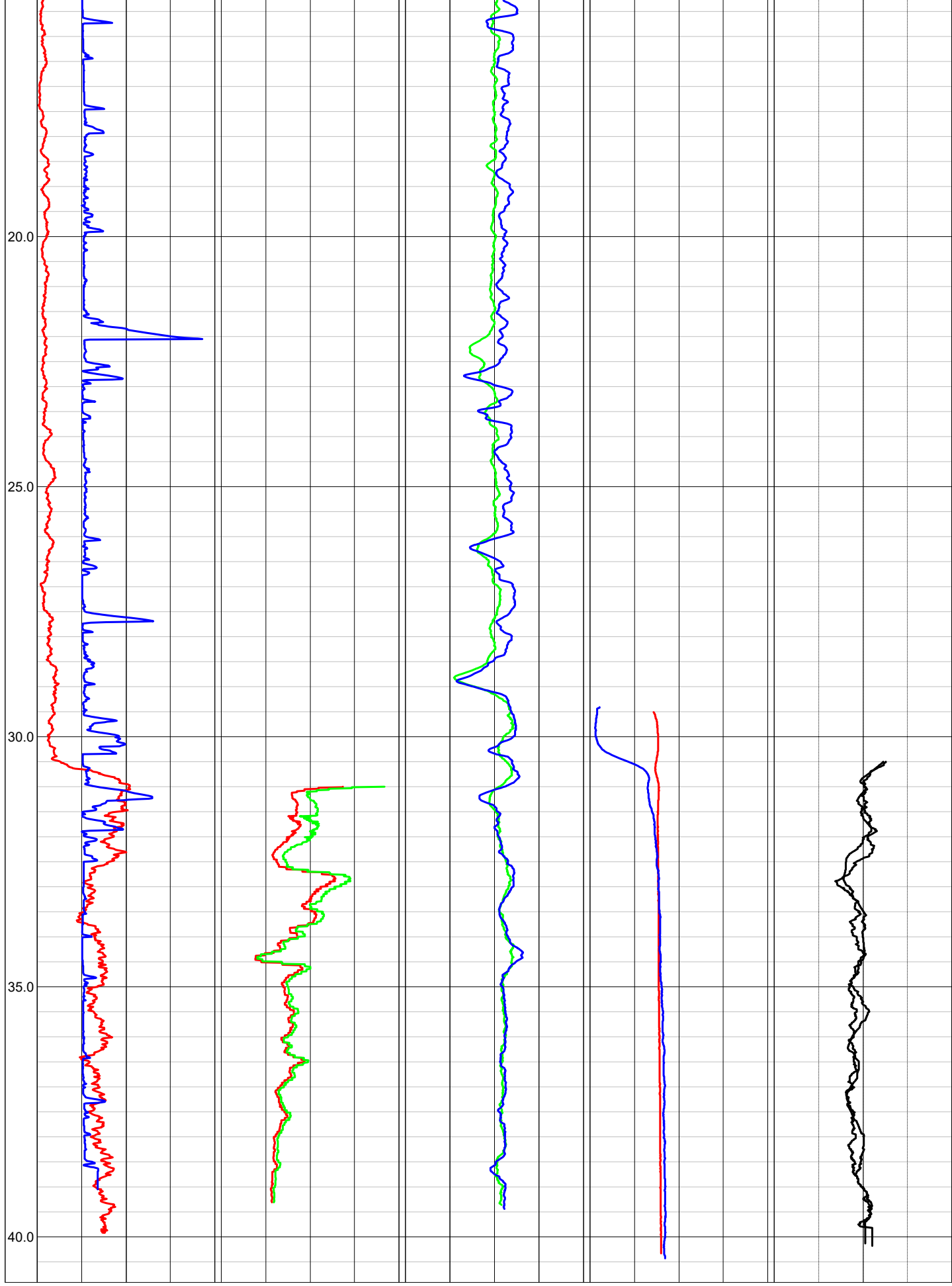
Drilled Depth: (m)	41.5*	Date:	13th March 2019
Logged Depth: (m)	40.1	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Logging in stages.	
Logged Interval: (m)	0.0 (30.2) - 40.1		
Fluid Level: (m)	29.1		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
	0.0	41.5	Geobor	127	(-1.0) -0.5	(30.2) 2.0







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC303**

Image

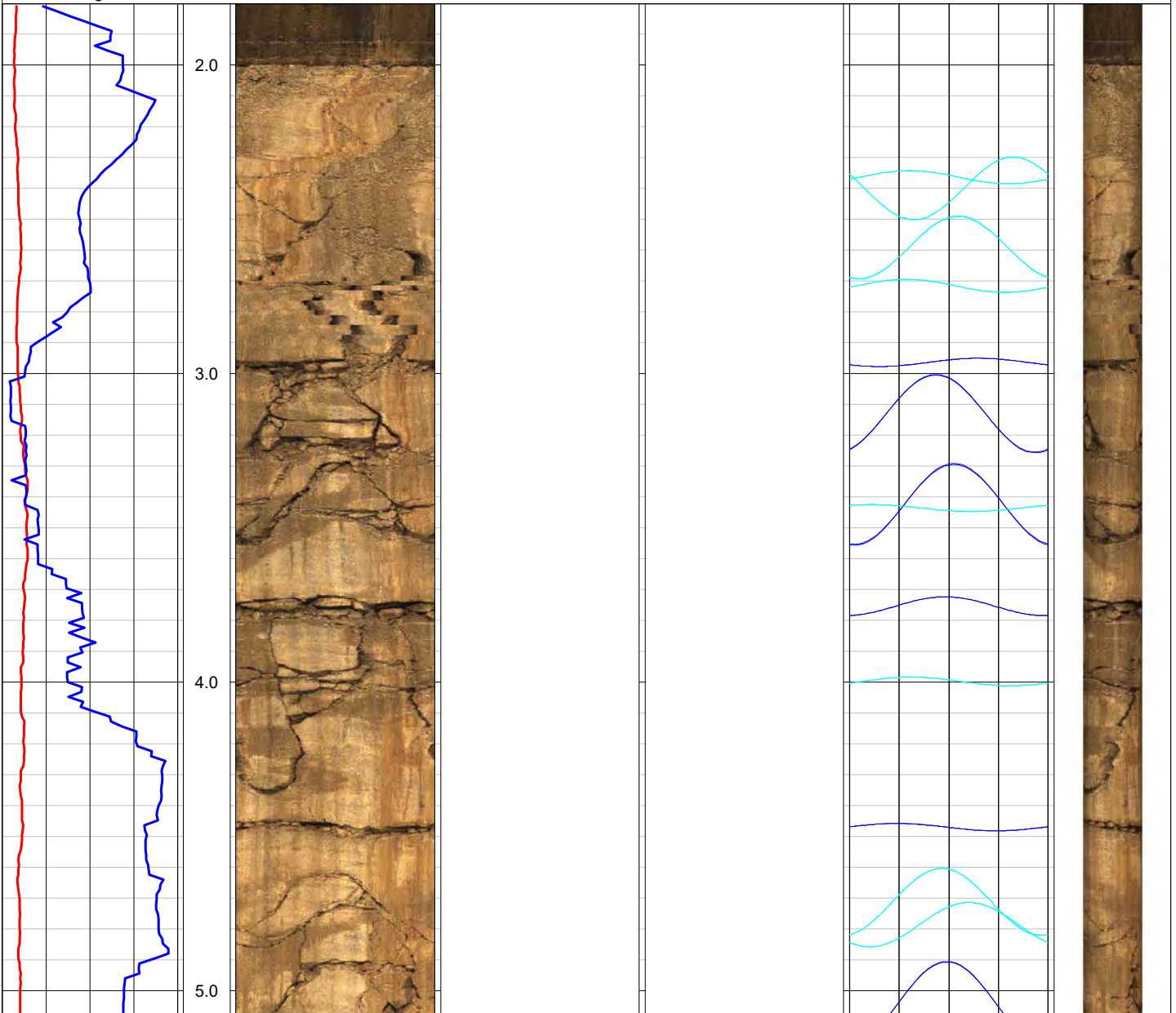
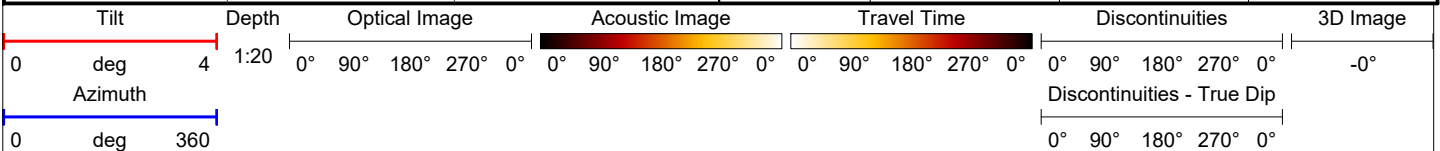
Location: **A417** Area: **Birdlip, Gloucestershire** Grid Ref: **393382.8E; 216045.2N** Elevation: **236.2488m**

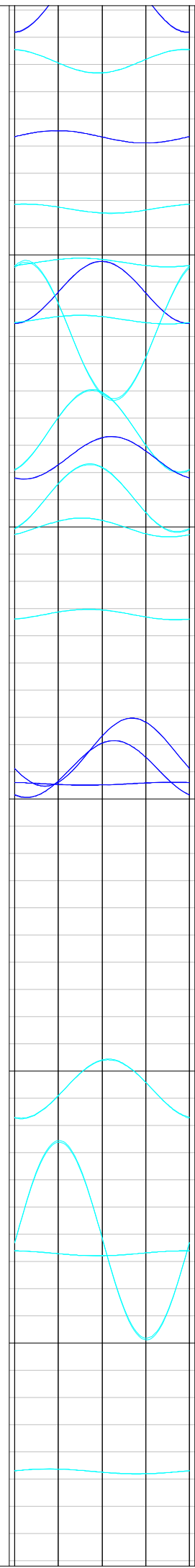
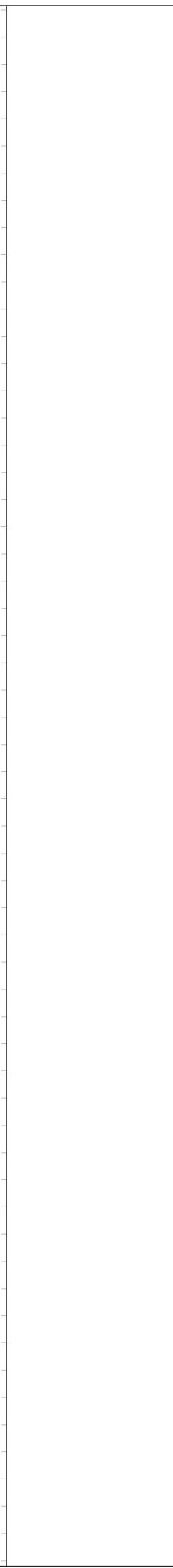
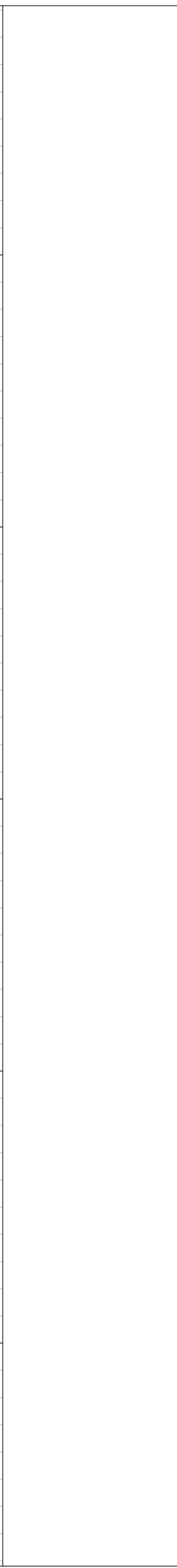
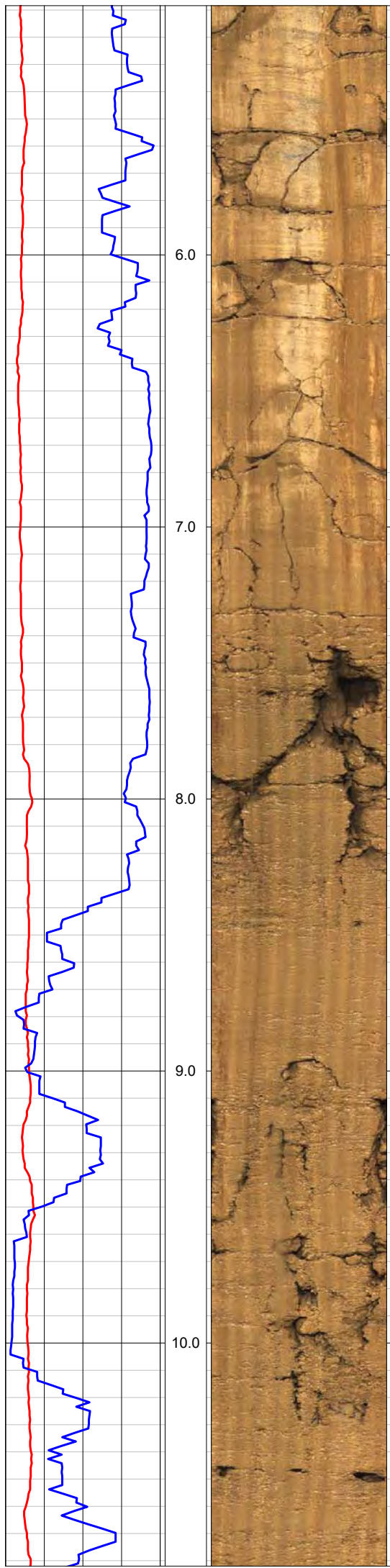
Drilled Depth: (m)	41.5*	Date:	13th March 2019
Logged Depth: (m)	40.1	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: Logging in stages.	
Logged Interval: (m)	2.0 (30.2) - 40.1		
Fluid Level: (m)	29.1		

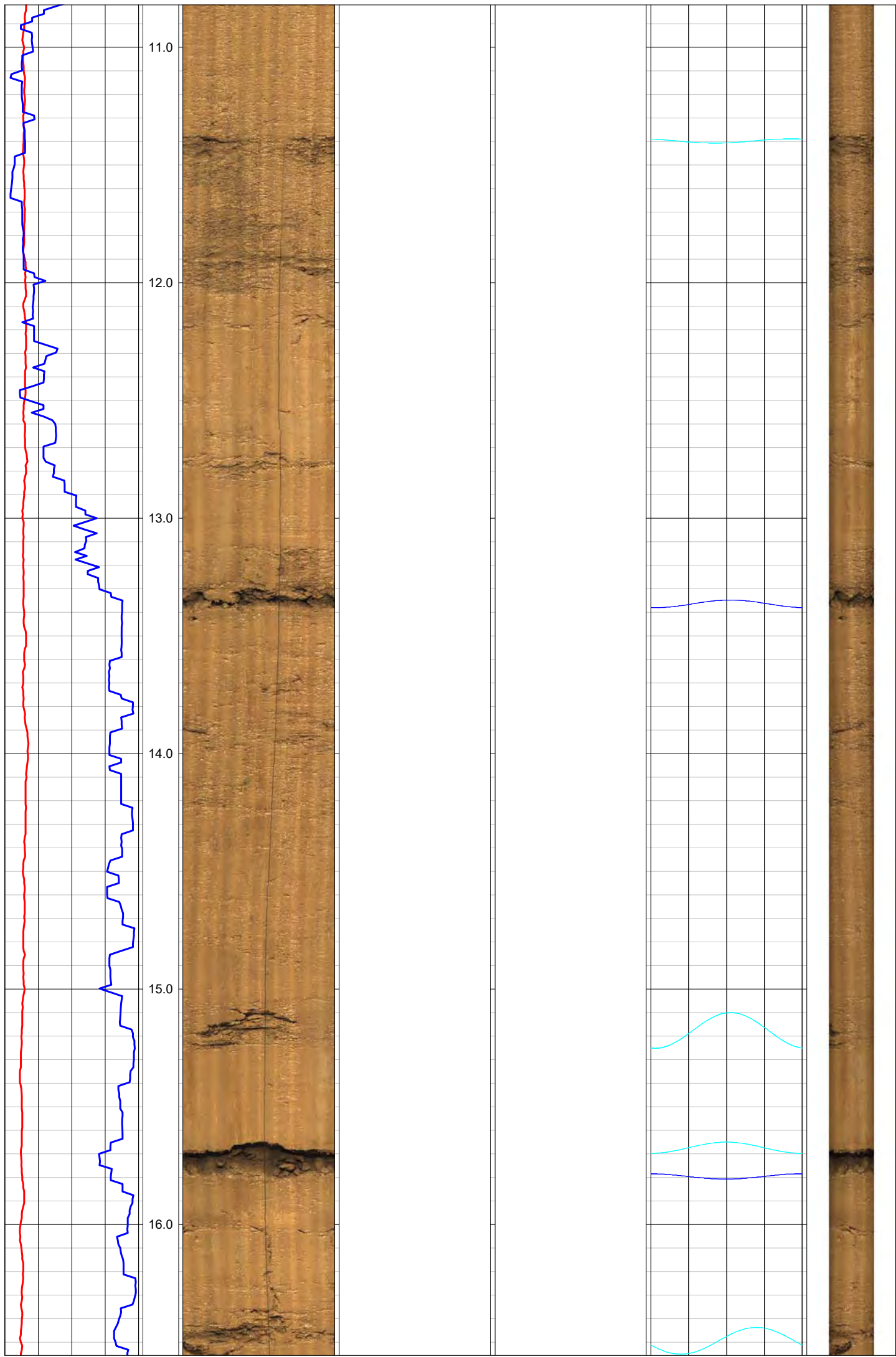
BOREHOLE RECORD

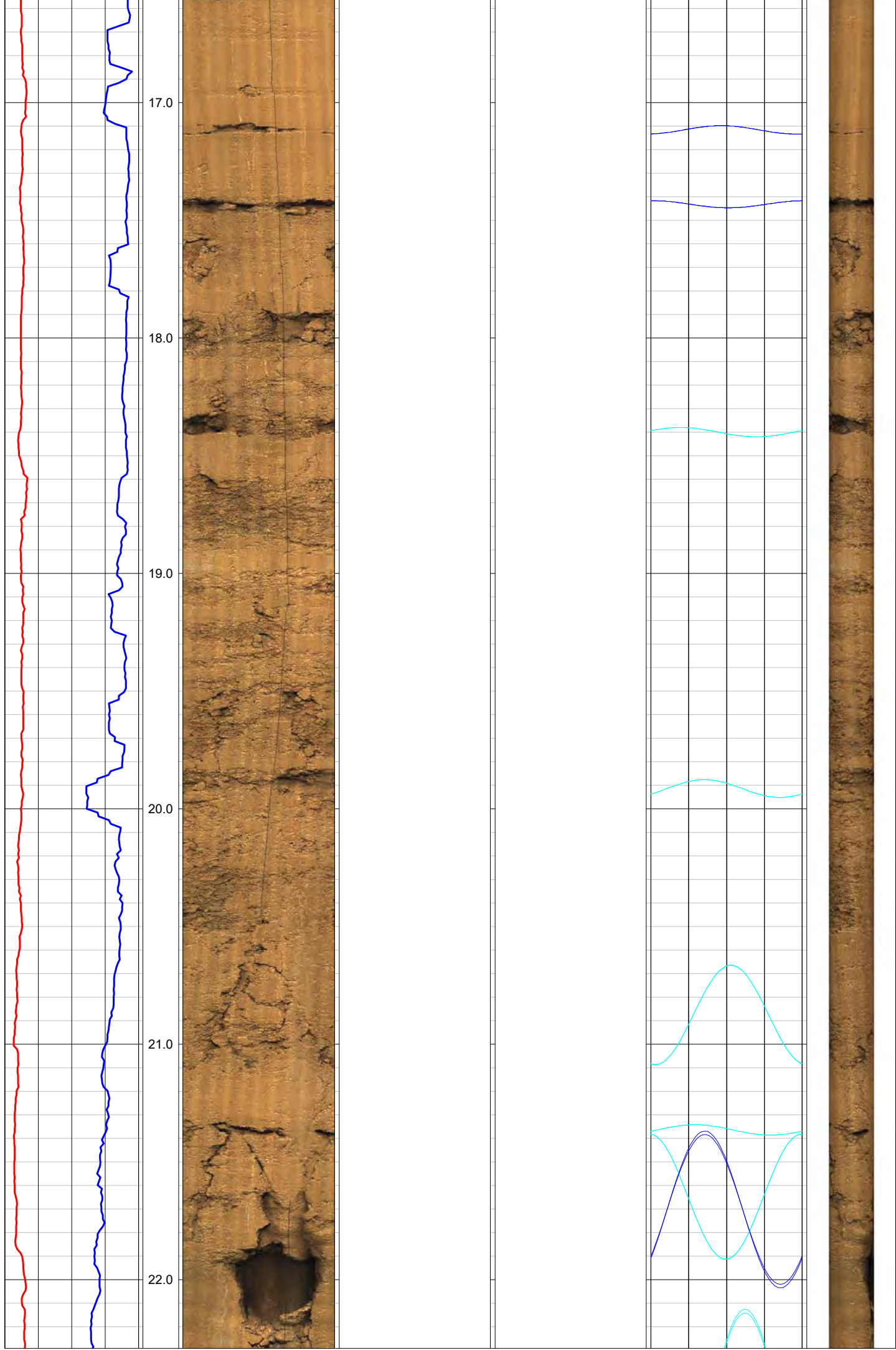
CASING RECORD

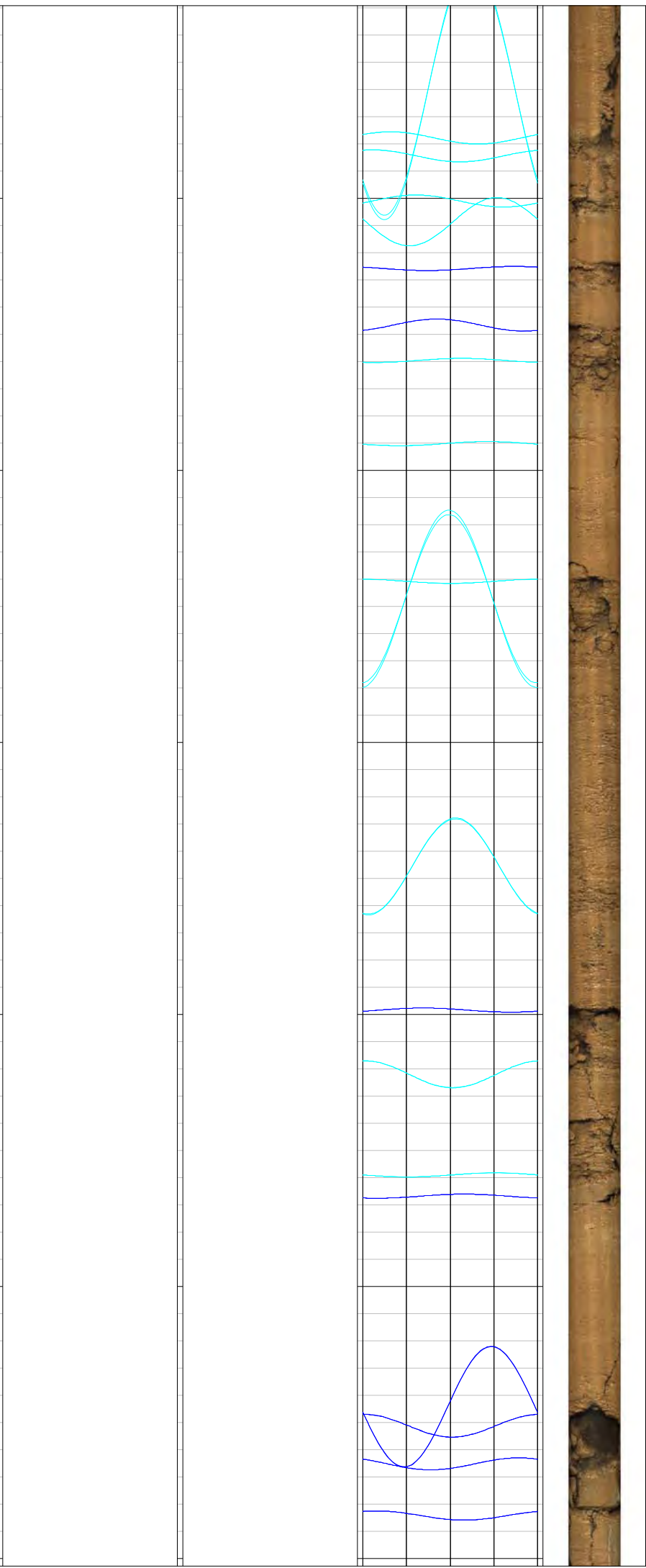
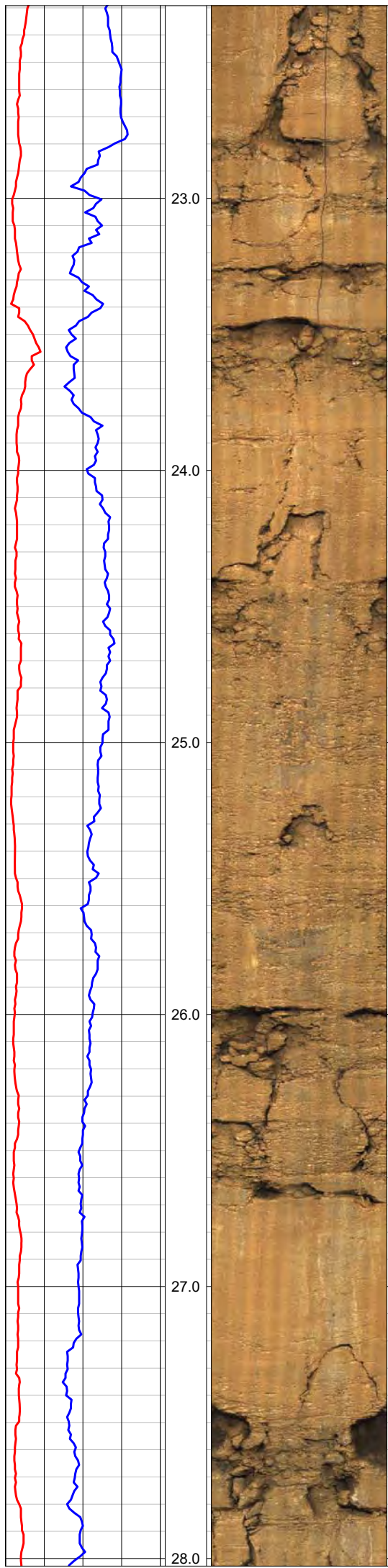
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
	0.0	41.5	Geobor	127	(-1.0) -0.5	(30.2) 2.0

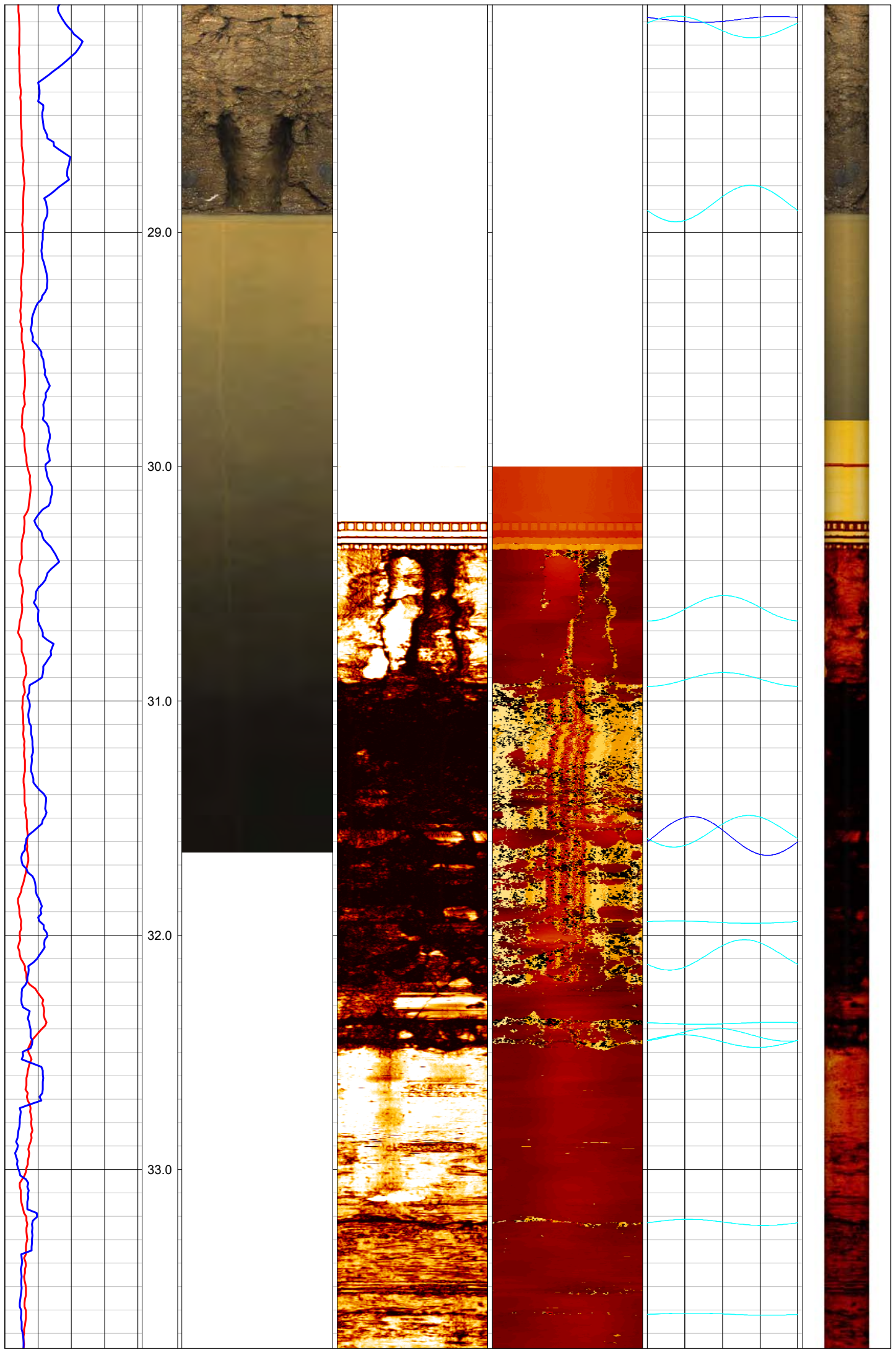


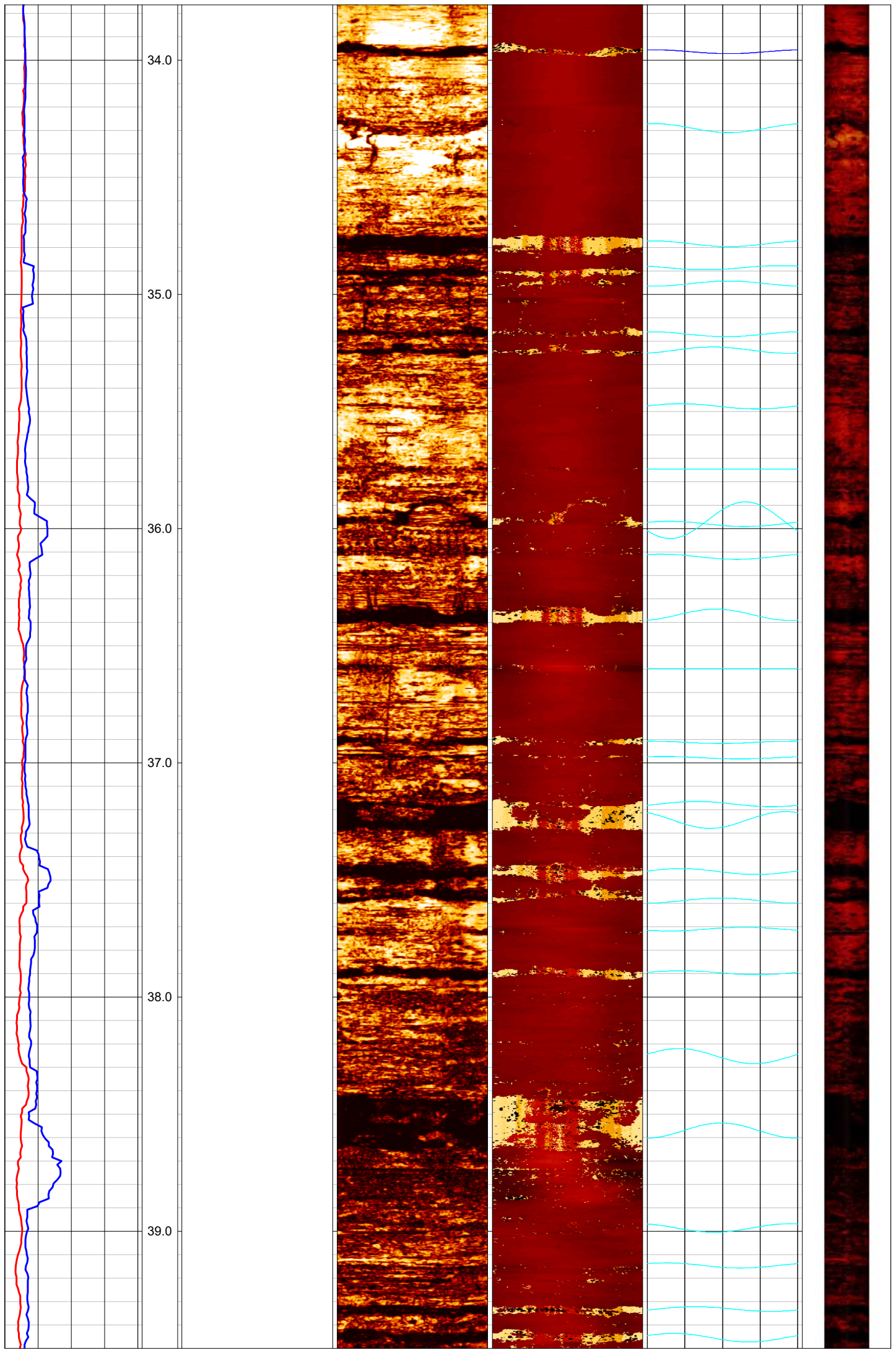


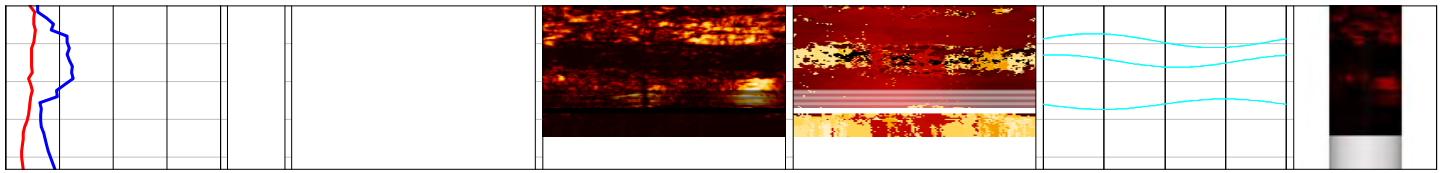














**REPORT ON THE
GEOPHYSICAL LOGGING
OF
SIX BOREHOLES
AT
THE A417 – 25205 CRICKLEY HILL TRACTORS
BIRDLIP**

Prepared For:



GEOTECHNICAL ENGINEERING LTD
Centurion House,
Olympus Park,
Quedgeley,
Gloucester
GL2 4NF

MAR 2019/GENG1901_ rpt/SO91

	Name	Date
Logged by:	D. Hingley M. Hand M. Kynaston	Various
Report by:	M. Kynaston	02.07.19
Checked by:	D. Hingley	09.07.19
Revised by:	J. Ainsworth	07.11.19

CONTENTS

2.0 THE GEOPHYSICAL LOGGING METHODS	4
3.0 SITE DETAILS.....	7
4.0 PROCESSING AND PRESENTATION OF IMAGER RESULTS	8
5.0 BOREHOLE LOGGING CONSTRAINTS	9

LIST OF FIGURES

Figure 3.1	Location map showing site location highlighted by red circle. © Bing Maps 2019.
Figure 3.2	Aerial image showing approximate borehole positions. © Bing Maps 2019.

Appendix 1	Defect Classification
Appendix 2	Geophysical Logs

1.0 INTRODUCTION

At the request of Geotechnical Engineering Ltd., borehole imaging and geophysical logging was carried out in six boreholes for phase 2 35205 Crickley Hill Tractors for the A417 project near Birdlip, Gloucestershire.

The following report details phase two works, carried out by European Geophysical Services between the 7th March and 13th June 2019.

The following logs were run:-

CP208 Logs	From (m)	To (m)
Optical Imager	3.0	20.0
Acoustic Imager	10.1	19.7
Natural Gamma	0.5	19.7
3 Arm Caliper	0.5	19.7
Density (gamma-gamma)	0.5	19.7
Focused Resistivity	10.1	18.8
Temperature & Conductivity	3.6	19.0

CP209 Logs	From (m)	To (m)
Acoustic Imager	11.0	34.7
Natural Gamma	1.0	34.8
3 Arm Caliper	1.0	34.8
Temperature & Conductivity	10.00	35.0
Focused Resistivity	10.00	32.8
Density (gamma-gamma)	0.0	34.7
Impellor Flowmeter	10.00	34.3

DSRC107 Logs	From (m)	To (m)
Acoustic Imager	6.4	29.8
Temperature & Conductivity	6.0	29.7
Focused Resistivity	6.0	29.7
Impellor Flowmeter	6.0	29.7
Natural Gamma	1.0	29.7
3 Arm Caliper	1.0	29.7
Density (gamma-gamma)	2.0	29.8

DSRC108 Logs	From (m)	To (m)
Acoustic Imager	5.3	48.2
Density (gamma-gamma)	2.0	48.1
Natural Gamma	3.0	48.2
Temperature & Conductivity	3.0	48.2
Focused Resistivity	3.0	48.2

DSRC207 Logs	From (m)	To (m)
Acoustic Imager	10.0	38.7
Temperature & Conductivity	1.5	38.6
Natural Gamma	1.5	38.6
3 Arm Caliper	1.5	38.5
Resistivity	1.65	38.0
Density (gamma-gamma)	0.8	39.0

DSRC224 Logs	From (m)	To (m)
Optical Imager	0.0	14.6
Acoustic Imager	1.5	77.0
Temperature & Conductivity	4.5	75.7
Impellor Flowmeter	4.5	49.0
Resistivity	2.4	75.7
3 Armed Caliper	1.0	75.7
Natural Gamma	1.0	75.7
Density (gamma-gamma)	1.0	75.7

2.0 THE GEOPHYSICAL LOGGING METHODS

The Equipment and Field Procedure

A fully digital logging system with a 600m capacity motorised winch mounted in a 4x4 van was used.

All logging data was recorded digitally for reprocessing and archiving purposes.

The optical imager survey was carried out first to avoid the disturbance of the fluid by the geophysical logs which may affect water clarity.

Natural Gamma (Gam)

The tool measures the naturally occurring gamma radiation found in rocks and sediments. It is mainly used to detect the clays that contain potassium K^{40} , though the U^{238} series of elements and the Th^{232} series of elements also emit gamma radiation.

The higher the concentration of these clay minerals the greater the responses on the natural gamma log.

Acoustic Borehole Imager (ABI)

This tool scans the borehole wall through 360 degrees and records the acoustic reflection of the resulting signal in terms of amplitude and transit time (the travel time from the tool to the borehole wall). This technique requires a fluid filled borehole with a minimum of suspended solids, polymers or mud within the fluid column.

This sensitive technique responds to small diameter changes, rugosity and the acoustic nature of the borehole wall. It is primarily used for detecting fractures and other discontinuities. The resultant images are orientated (to magnetic North) 0° through 90° , 180° and 270° back to 0° .

The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is viewed on the way down the borehole to allow fine tuning of the acquisition parameters. The settings are then adjusted and the image recorded on the way up the borehole which ensures a constant line speed during acquisition.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore data within approximately one metre of magnetic steel casing is un-orientated.

2.0 THE GEOPHYSICAL LOGGING METHODS

Optical Borehole Imager (Optical)

A precision-machined prism and CCD camera assembly permits a high definition video image of the borehole wall to be captured in a variety of horizontal and vertical resolutions. The resulting image is digitised in the sonde for transmission to the surface acquisition system.

The image is then orientated to Magnetic North and displayed as an unwrapped image log. This enables a detailed structural interpretation to be made if required.

For the best results the optical imager should be run above the water level or in clean, clear fluid. The logging tool is centralised during data acquisition by two sets of bow springs. The bow springs are adjusted to a variety of borehole diameters prior to acquisition. The image is recorded on the way down the borehole to limit disturbance to the clarity of the water in the borehole by the logging tool.

Images and associated data are viewed in real time during the data acquisition.

The orientation system employs a flux gate magnetometer and therefore the recorded data within approximately one metre of magnetic steel casing is un-orientated. This is corrected manually during the post-processing stage.

Focused Resistivity Log (Deep and Shallow)

The Focused Resistivity tool uses Guard Electrodes to focus the current into the formation. This gives excellent vertical resolution and good penetration, especially in highly conductive borehole fluids where a Normal Resistivity Sonde would not be as effective.

The tool has two electrode spacing's to allow a deep and shallow depth of investigation.

The response of this log is a function of porosity, type of formation / mineralogy and its pore water quality. These logs aid in the identification of strata and quality of the pore water

Caliper (Cal)

This tool measures the mean diameter of the borehole. It is used to check the integrity of the borehole lining, and where the borehole is unlined to identify zones of washout, breakout or fissures.

2.0 THE GEOPHYSICAL LOGGING METHODS

Fluid Temperature (T)

There is a natural geothermal gradient of increasing temperature with depth. This gradient varies with the thermal conductivity of the geological formation and is modified by water flowing in, out or vertically through the borehole.

This log is used to determine flow patterns within the borehole and to identify flow zones.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Fluid Conductivity (EC or EC25)

The electrical conductivity (EC) of the water is related to its salinity and dissolved solids and is therefore a measure of the quality of the borehole water. The shape of the log trace can indicate zones of inflow.

Using data from the temperature log the electrical conductivity is corrected to 25°C (EC25).

This log is used to identify different zones of water quality.

Differential logs are produced over a one metre spacing, these are an interpretative aid to detect gradient changes.

Impeller Flowmeter (FV)

This log is used to determine any flow pattern within the borehole and identify flow zones. The tool uses an impeller and is normally run at a constant logging speed against the anticipated flow for the best response. The data is corrected for logging speed and a fluid velocity (FV) log is produced.

Gamma - Gamma (GGLS / GGHR)

These logs give qualitative information on the density of the formation and/or the material behind linings where installed. The logs are expressed in counts per second (cps) which are inversely related to density.

The sonde has two detectors at different spacing's from a source of gamma radiation. The logs from each detector respond to the apparent bulk density of the material surrounding the tool at a radius of investigation related to the spacing's. The Long Spaced (LS) has a spacing of 48cm and the High Resolution (HR) has a spacing of 24cm.

3.0 SITE DETAILS

Site
A417 Birdlip

OS Grid Ref: SO 9320 1556

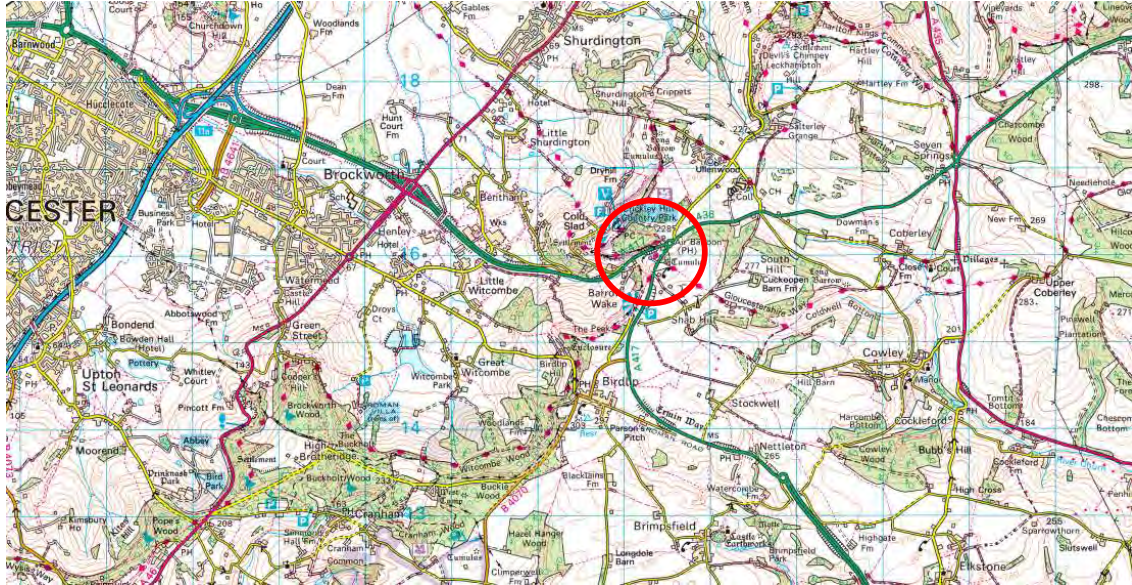


Figure 3.1 Location map showing site location highlighted by red circle. © Bing Maps 2019.



Figure 3.2 Aerial image showing approximate compound positions. © Bing Maps 2019.

4.0 PROCESSING AND PRESENTATION OF IMAGER RESULTS

Detailed logs of the imager data have been produced at a vertical scale of 1:10.

Constructional details and information on each borehole are given in the headers of each log.

All images have been referenced to Magnetic North.

The borehole's azimuth and tilt are plotted alongside the images.

The image of the borehole wall is presented in an unwrapped form with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structural features and discontinuities have been picked from the images in the form of colour coded sinusoidal projections - see Appendix 1 for details. This 'Discontinuities' log is also presented with a horizontal scale marked 0° - North, through 90° - East, 180° - South, 270° - West, back to North.

Structure picking is not a definitive analysis of all the features within a borehole. Only the discontinuities that have a linear dip and direction are 'picked' and used in the analysis of the discontinuities. Features that do not have a regular sinusoidal shape do not have a linear dip and direction, 'best fit' picking of these features is done if approximately 80% coverage of the sinusoid can be achieved. Below this percentage the inaccuracy of the picking is too great and if included in any structural analysis may adversely skew the results. Vughs, solution holes, and angular break outs are examples of features not picked.

The apparent azimuth and apparent dip (i.e. relative to the borehole's azimuth and tilt) of the discontinuities are calculated using the diameter of the borehole and the geometric parameters of the sinusoids overlaid on the discontinuities. The final processing stage is to correct these apparent values to true azimuth (in relation to Magnetic North) and true dip (from horizontal) by correcting for the borehole's azimuth and tilt.

The final results are presented as a 'tadpole' plot (Discontinuities - True°). The horizontal position of the tadpole's head gives the defect's true dip angle and its tail points in the direction of the defect's azimuth. These logs are presented with a horizontal scale in degrees. By convention the top of the page is North (Magnetic) and the right hand edge of the paper is East.

The true structural data has been presented in digital format as an excel file (xls).

5.0 BOREHOLE LOGGING CONSTRAINTS

- **Vehicle access restrictions**
None
 - **Tool access restrictions**
None
 - **Borehole conditions / risk to equipment**
 - **CP208** – Fluid flow log not possible due to suspended sediment in fluid column.
 - **CP209** – No optical image possible due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC107** – No optical image possible due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC108** Fluid flow log not possible due to suspended sediment in fluid column. No optical image possible due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC207** - Fluid flow log not possible due to suspended sediment in fluid column. No optical image possible due to cloudy borehole fluid. Acoustic image used instead.
 - **DSRC224** – Logged in stages as stability concerns. Initially blocked at 50.4m on 17.05.2019. Second visit on 21.05.2019 BH cleared, however fluid flow log not possible due to suspended sediment in fluid column on second visit.
 - **Lack of fluid filled column / cloudy fluid**
See above.
 - **Time constraint**
Onsite working hours prohibited working past 1700.
 - **Borehole construction / casing**
All boreholes cased to stable ground.
-

Appendix 1

Discontinuity Classification.

Discontinuity	Colour	Classification Parameters
Major Fracture or Fissure	Blue	An open break in the formation, that is <u>continuous</u> across the entire image.
Minor Fracture or Fissure	Turquoise	A thin or closed break in the formation, that is <u>continuous or discontinuous</u> across the image.
Vein	Green	That may be <u>continuous or discontinuous</u> across the entire image.
Fabric	Red	Defines a feature generally metamorphic, igneous or sedimentary in origin that may be <u>continuous or discontinuous</u> across the image, such as bedding and cross-bedding, schistosity or gneissosity.
Intrusions	Purple	Intrusive features such as dykes and sills, generally <u>continuous</u> across the image
Unknown	Black	Faint features which can not be classified.

Appendix 2

Geophysical Logs



EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **CP208**

Image

Location: **A417 Birdlip**

Area: **Gloucestershire**

Grid Ref: **392684E; 215581N**

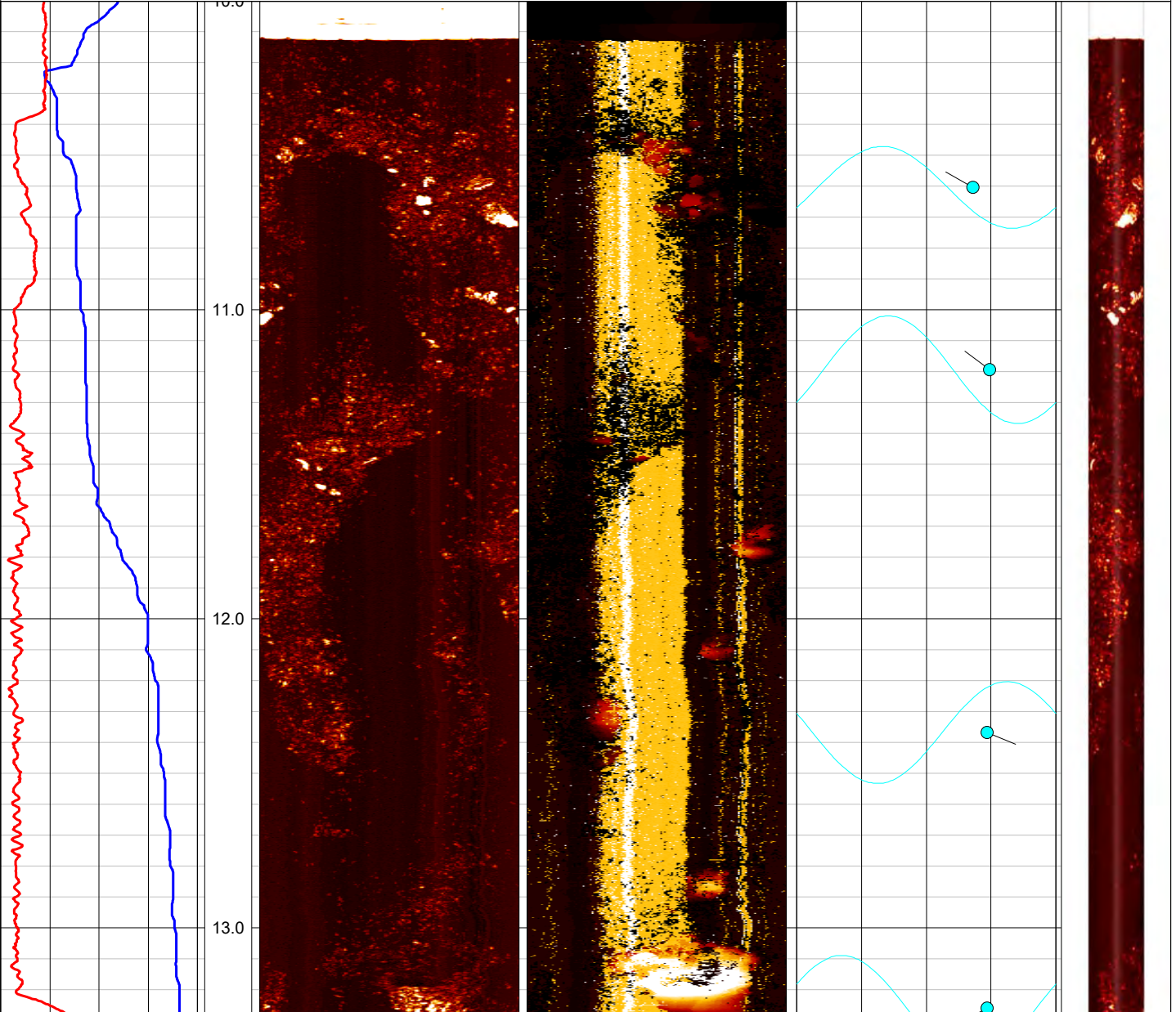
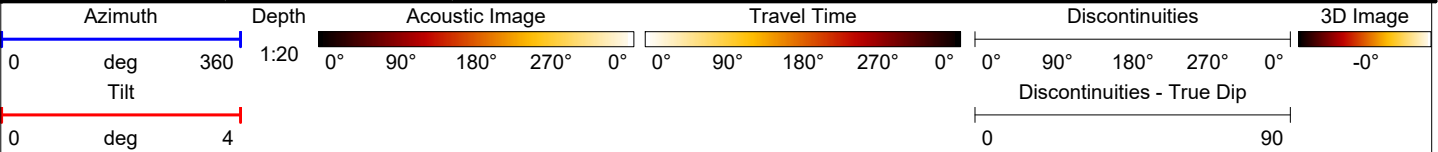
Elevation: **175.35m**

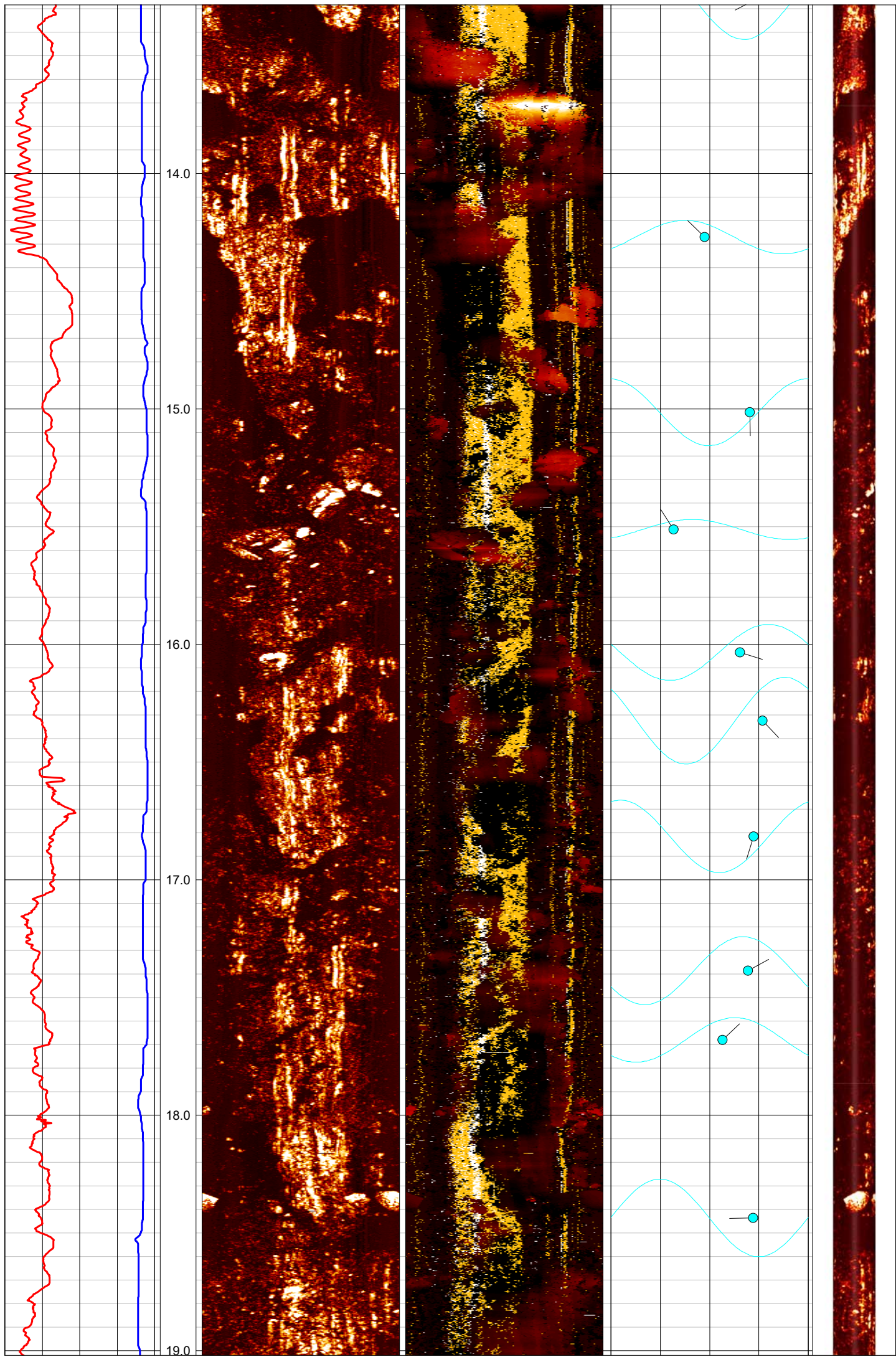
Drilled Depth: (m)	25.0	Date:	13.06.2019
Logged Depth: (m)	19.8	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks: Borehole has collapsed to 19.8m.	
Logged Interval: (m)	10.2 - 19.8		
Fluid Level: (m)	3.6		

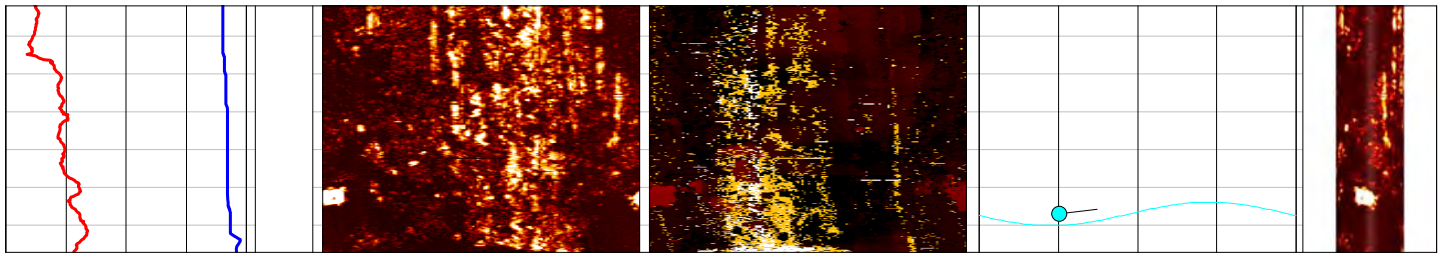
BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	10.2	25	Steel	155	-0.52	10.2









EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **CP208**

Composite

Location: **A417 Birdlip**

Area: **Gloucestershire**

Grid Ref: **392684E; 215581N**

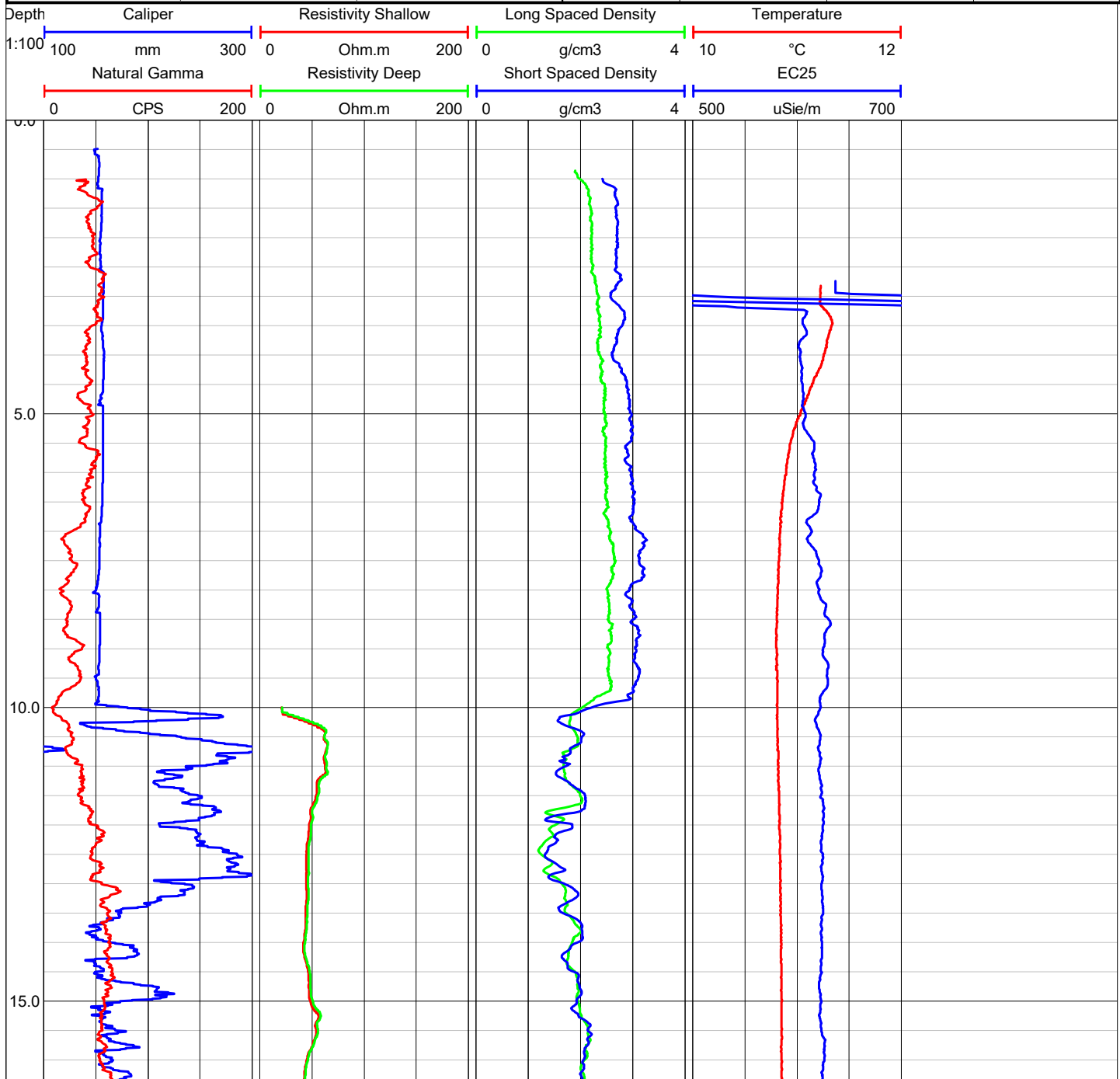
Elevation: **175.35m**

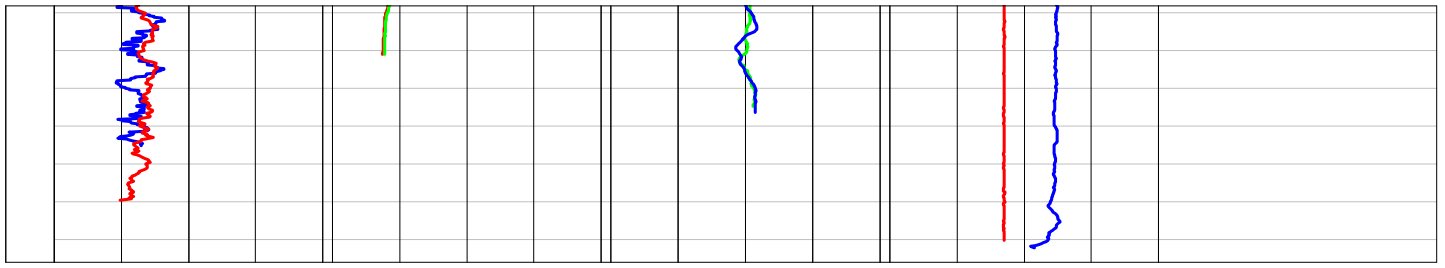
Drilled Depth: (m)	25	Date:	13.06.2019
Logged Depth: (m)	19.8	Recorded By:	M. Hand
Logging Datum:	Ground Level	Remarks: Borehole collapsed to 18m. Fluid turbidity too high to run flowmeter.	
Logged Interval: (m)	0.5 - 19.8		
Fluid Level: (m)	3.6		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	10.2	25	Steel	155	-0.52	10.2







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **CP209**

Composite

Location: **A417, Birdlip**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392737E; 215425N**

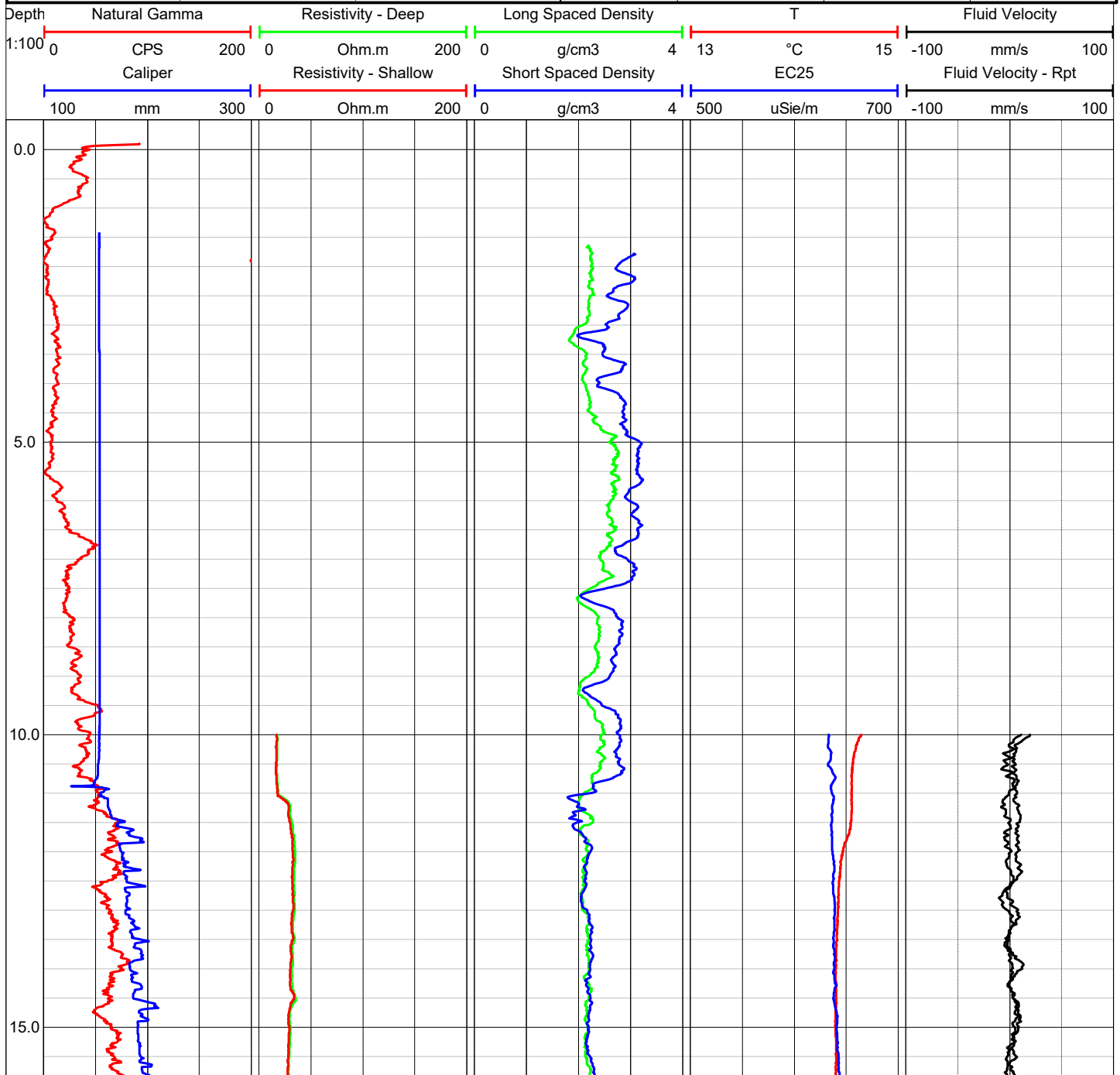
Elevation: **203.00m**

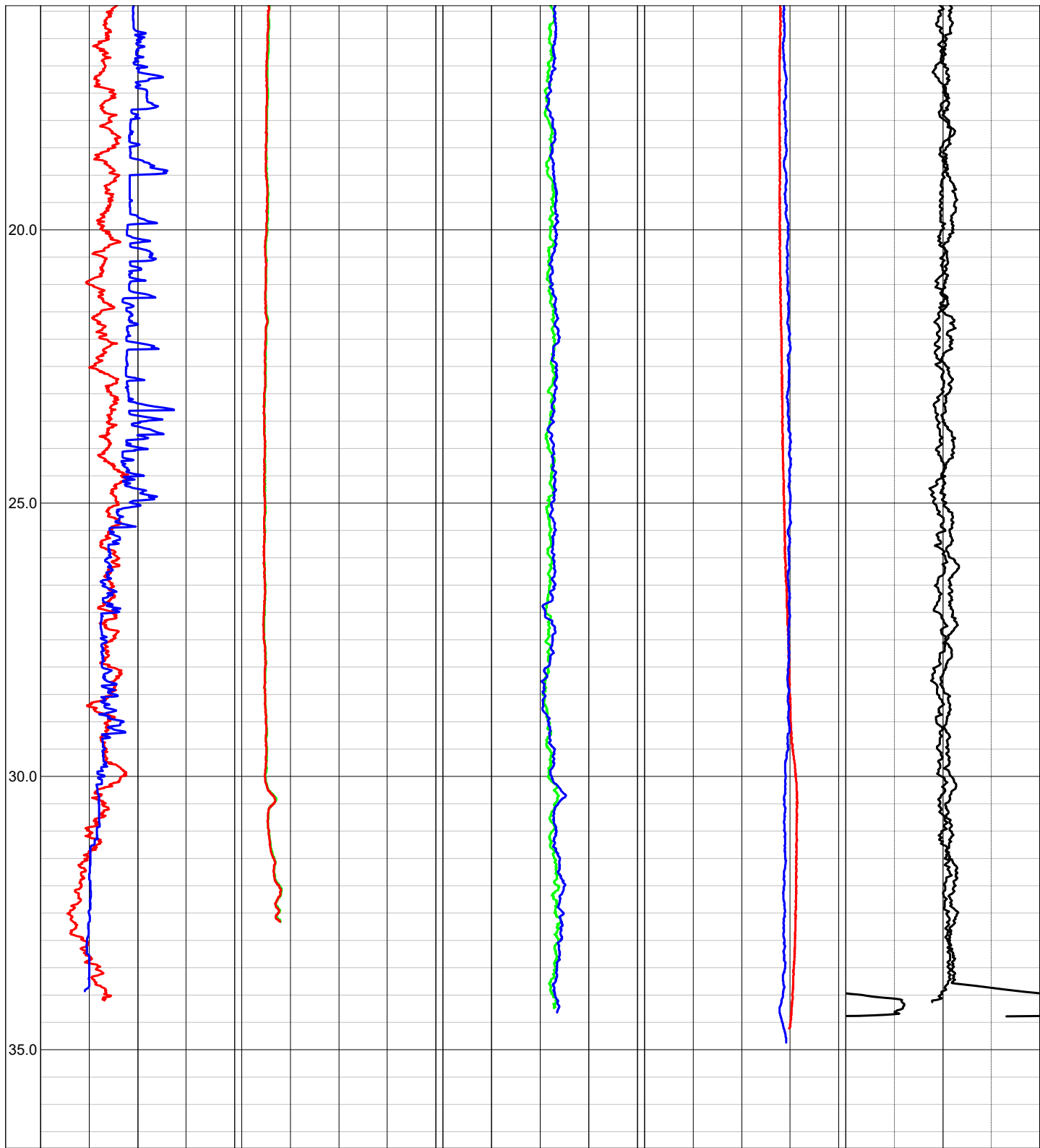
Drilled Depth: (m)	35.0	Date:	28.05.2019
Logged Depth: (m)	34.7	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks:	
Logged Interval: (m)	0 - 34.7		
Fluid Level: (m)	4m		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	11.05	35.0	Steel	150	-0.2	11.05







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **CP209**

Image

Location: **A417, Birdlip**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392737E; 215425N**

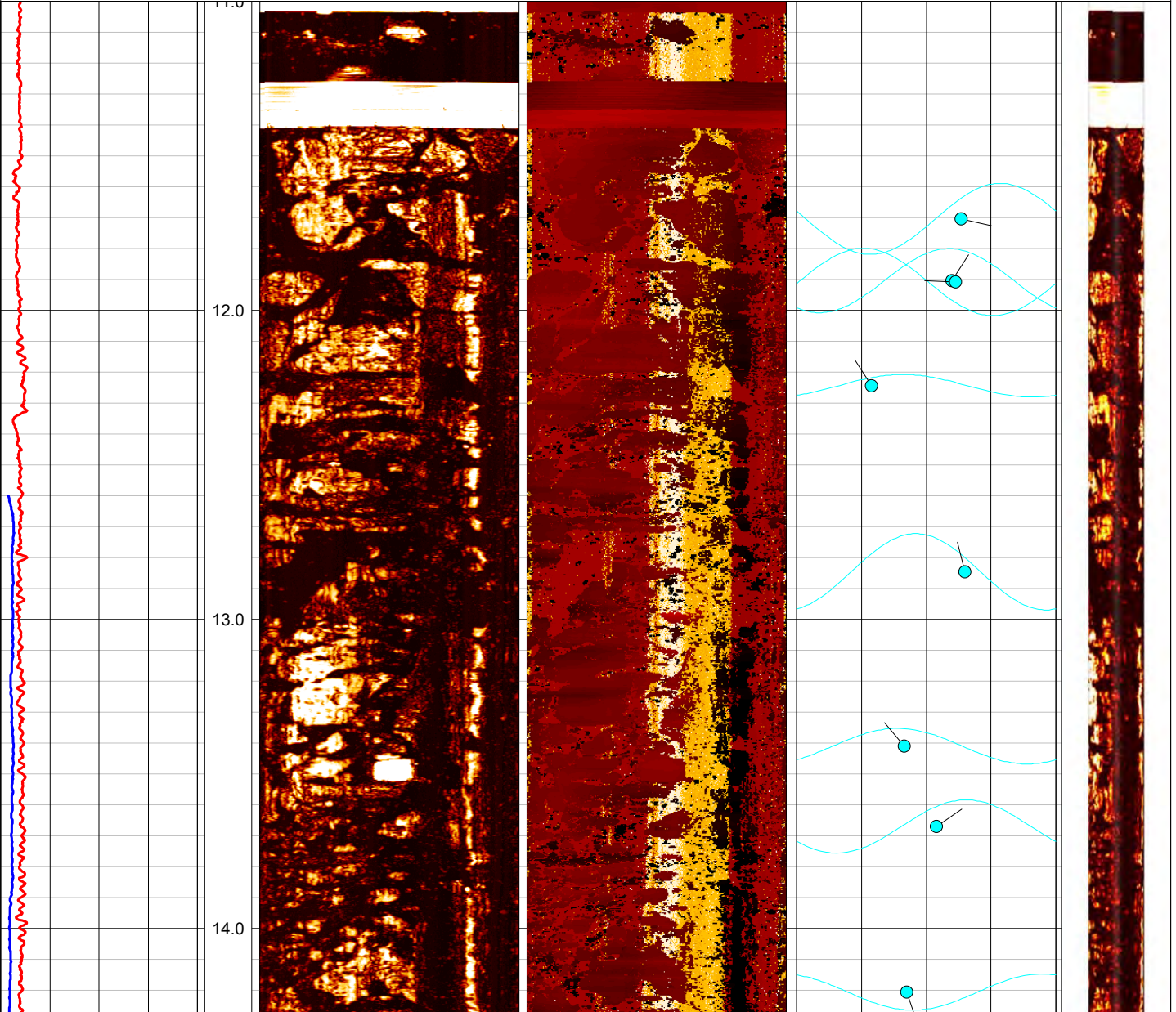
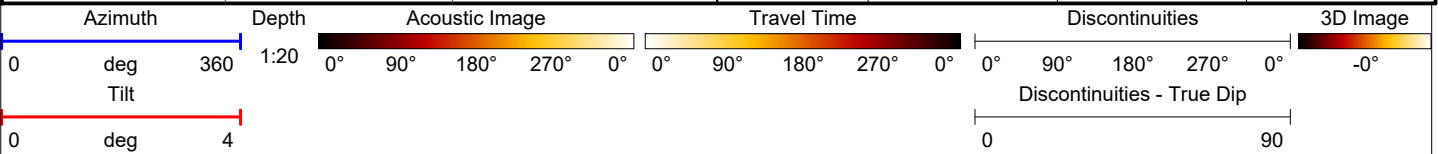
Elevation: **203.00m**

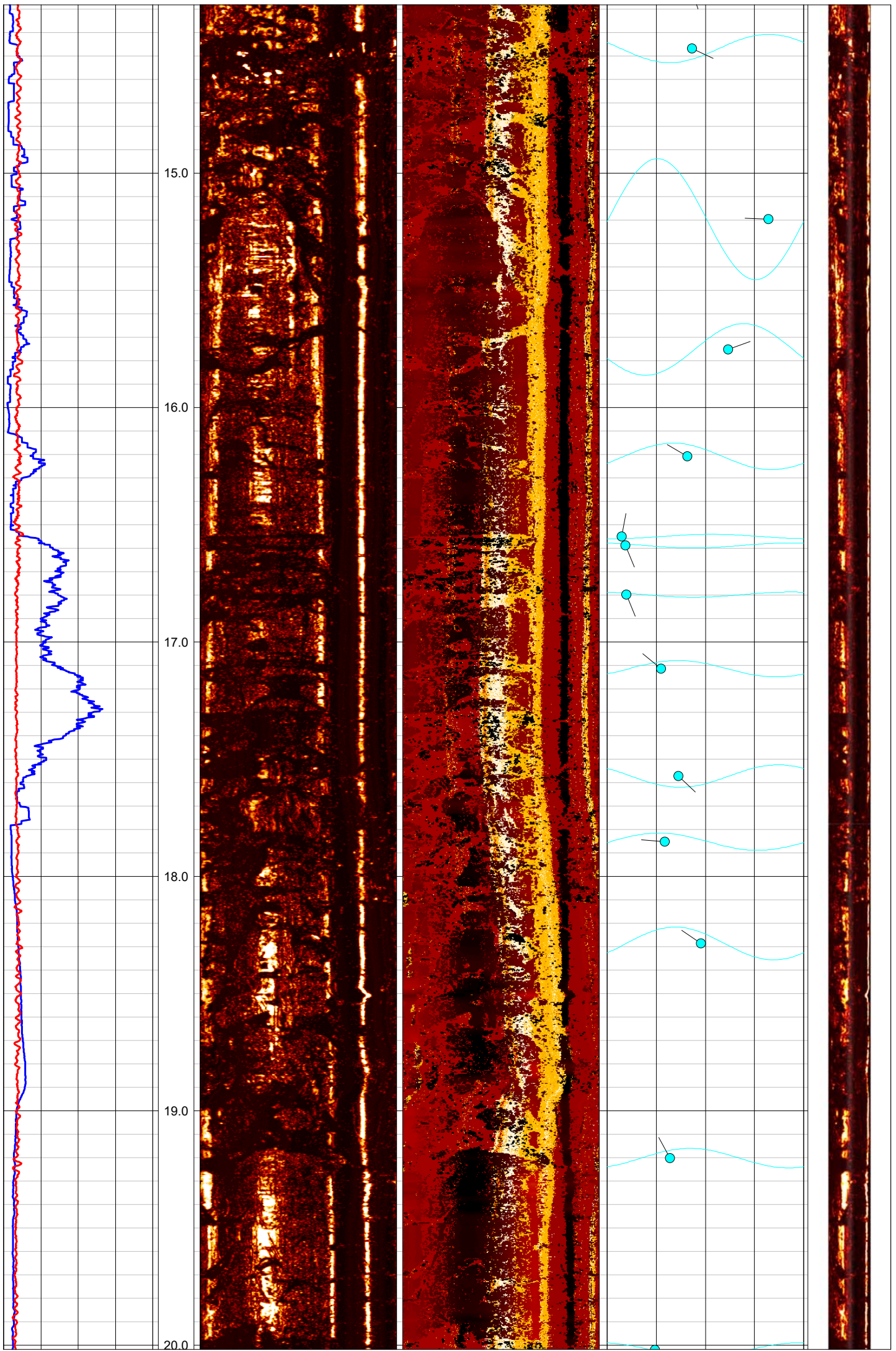
Drilled Depth: (m)	35.0	Date:	28.05.2019
Logged Depth: (m)	34.7	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks: Borehole fluid cloudy - used Acoustic imager.	
Logged Interval: (m)	11.0 - 34.7		
Fluid Level: (m)	4m		

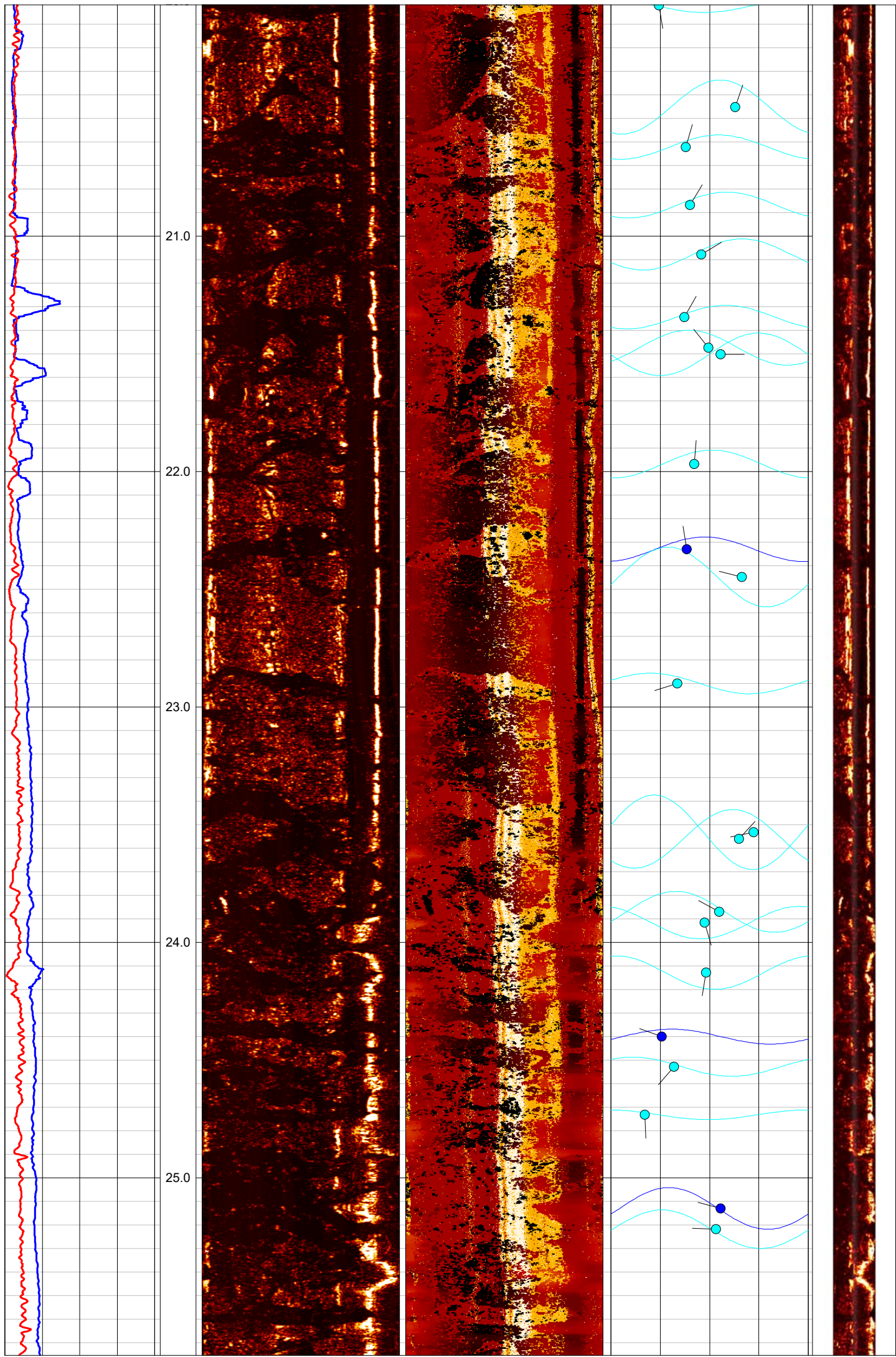
BOREHOLE RECORD

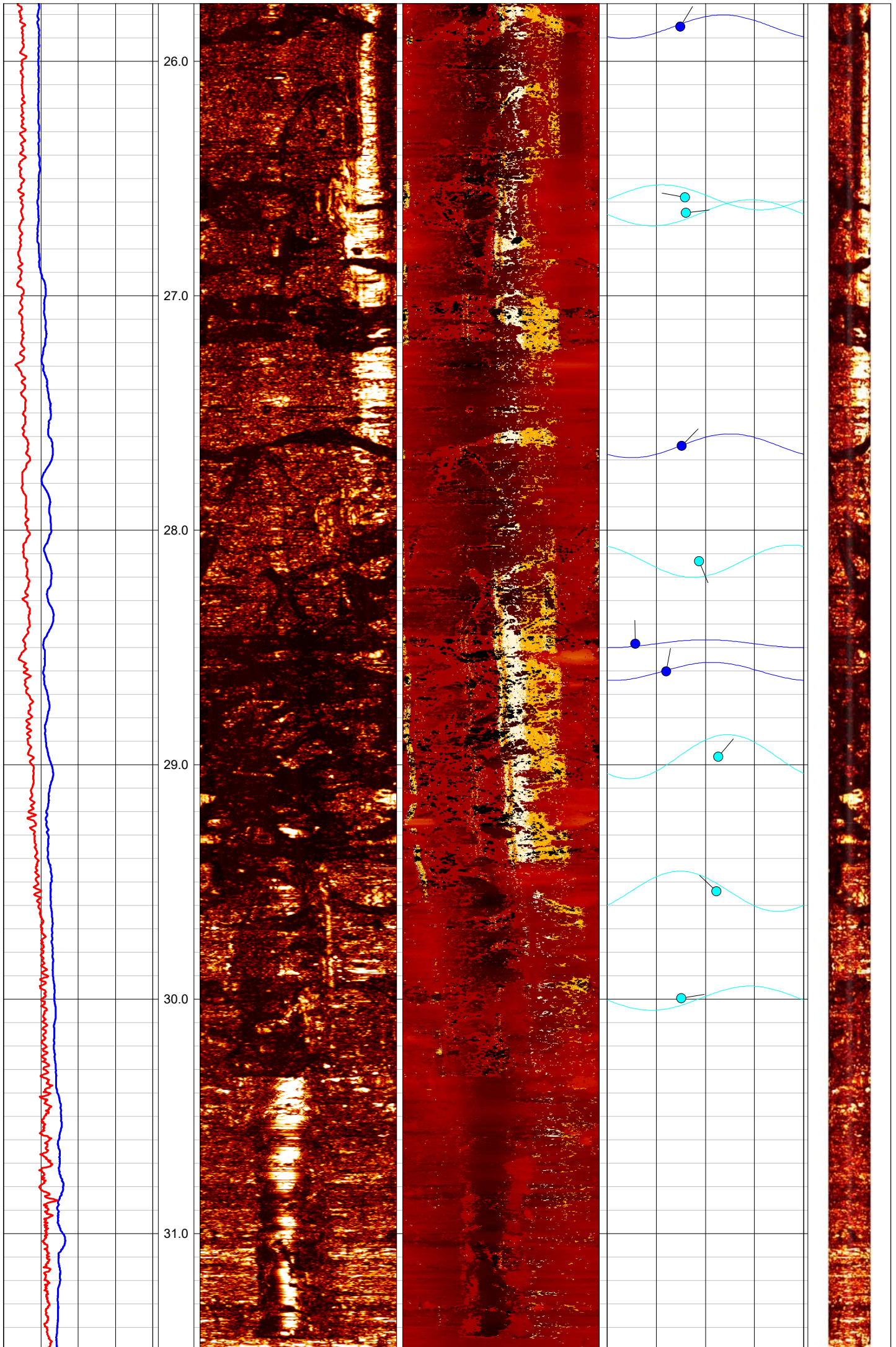
CASING RECORD

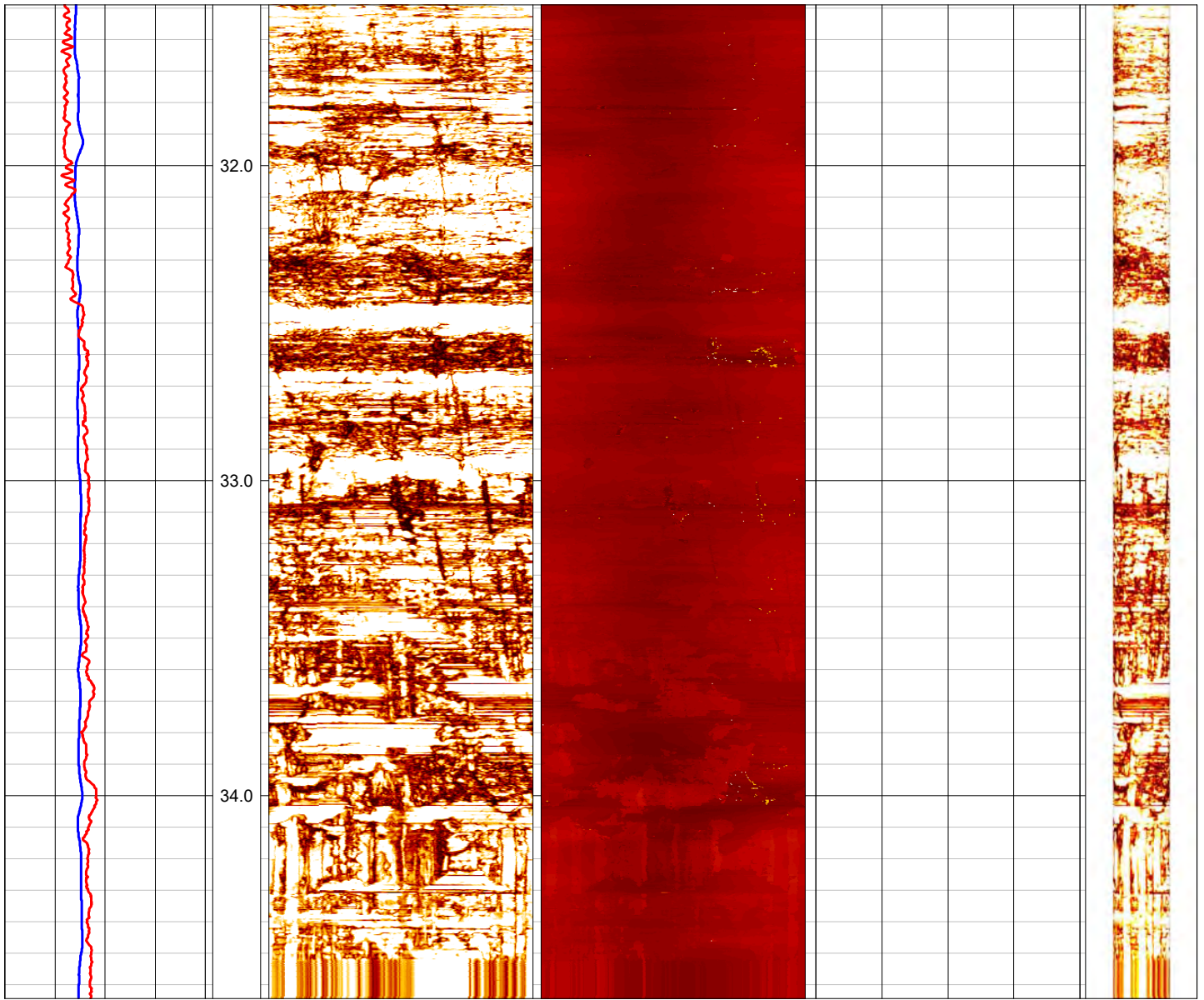
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	11.05	35.0	Steel	150	-0.2	11.05













EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DS-RC107**

Composite

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393057E; 215838N**

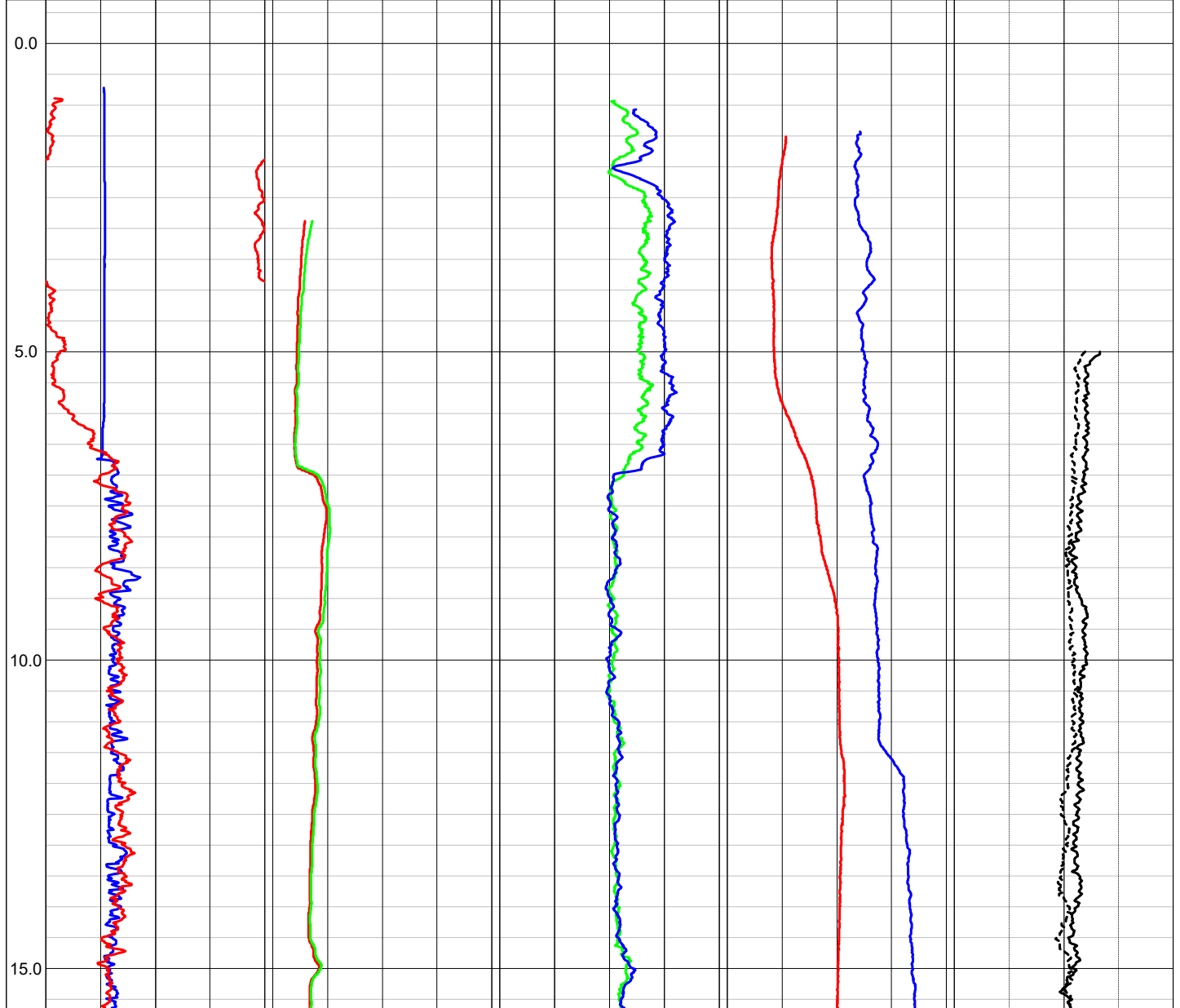
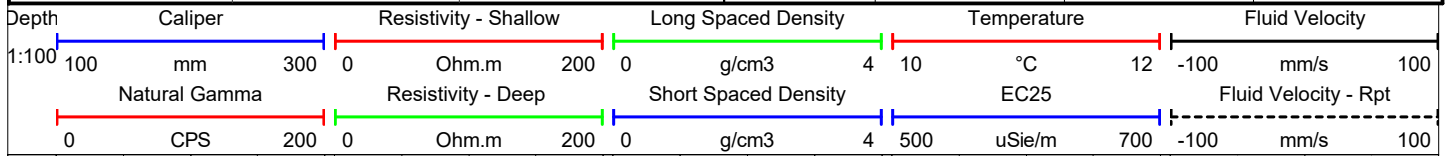
Elevation: **191.90m**

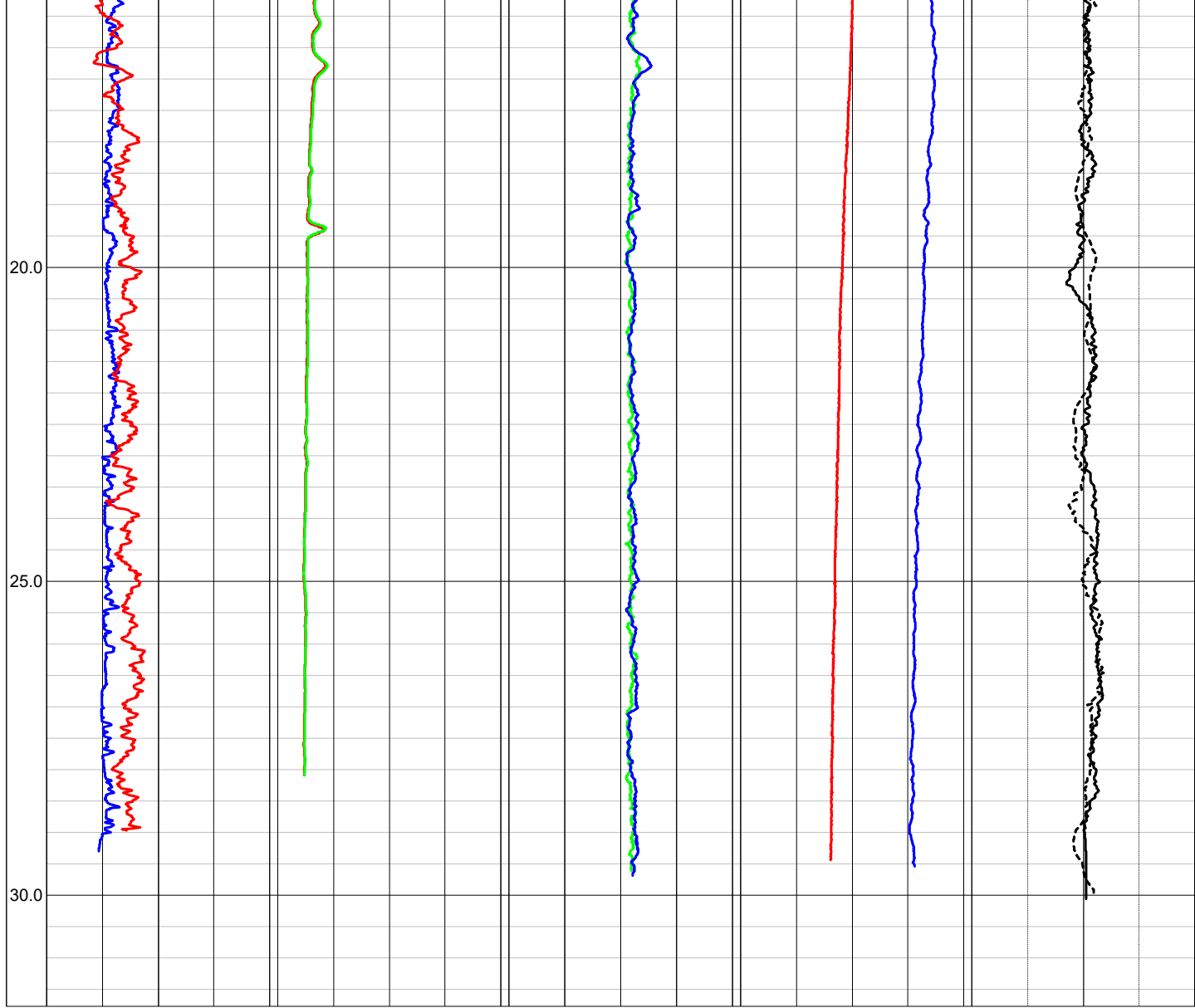
Drilled Depth: (m)	30.0	Date:	02.05.2019
Logged Depth: (m)	30.0	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks:	
Logged Interval: (m)	1.0 - 30.0		
Fluid Level: (m)	2.0		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	6.85	30.0	Steel	150	-0.6	6.85







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DS-RC107**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **393057E; 215838N**

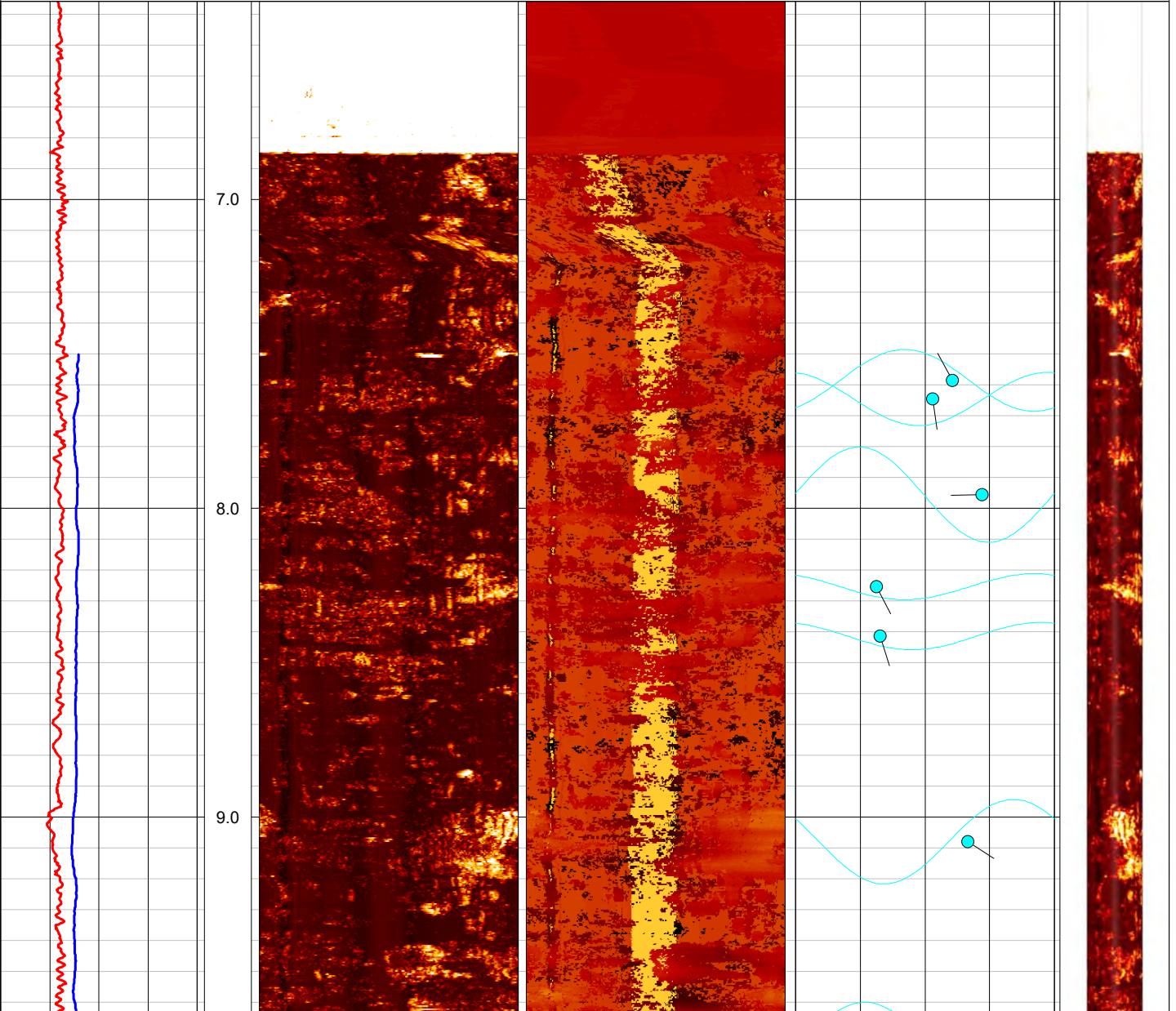
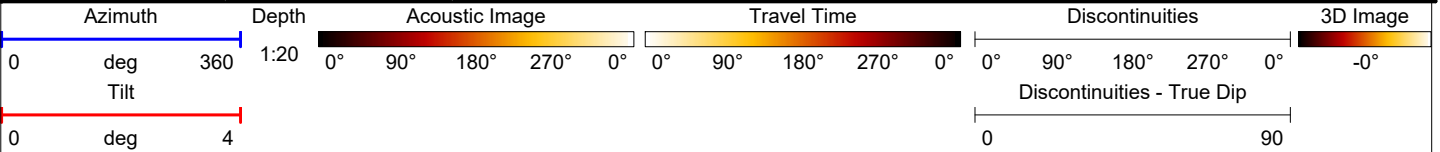
Elevation: **191.90m**

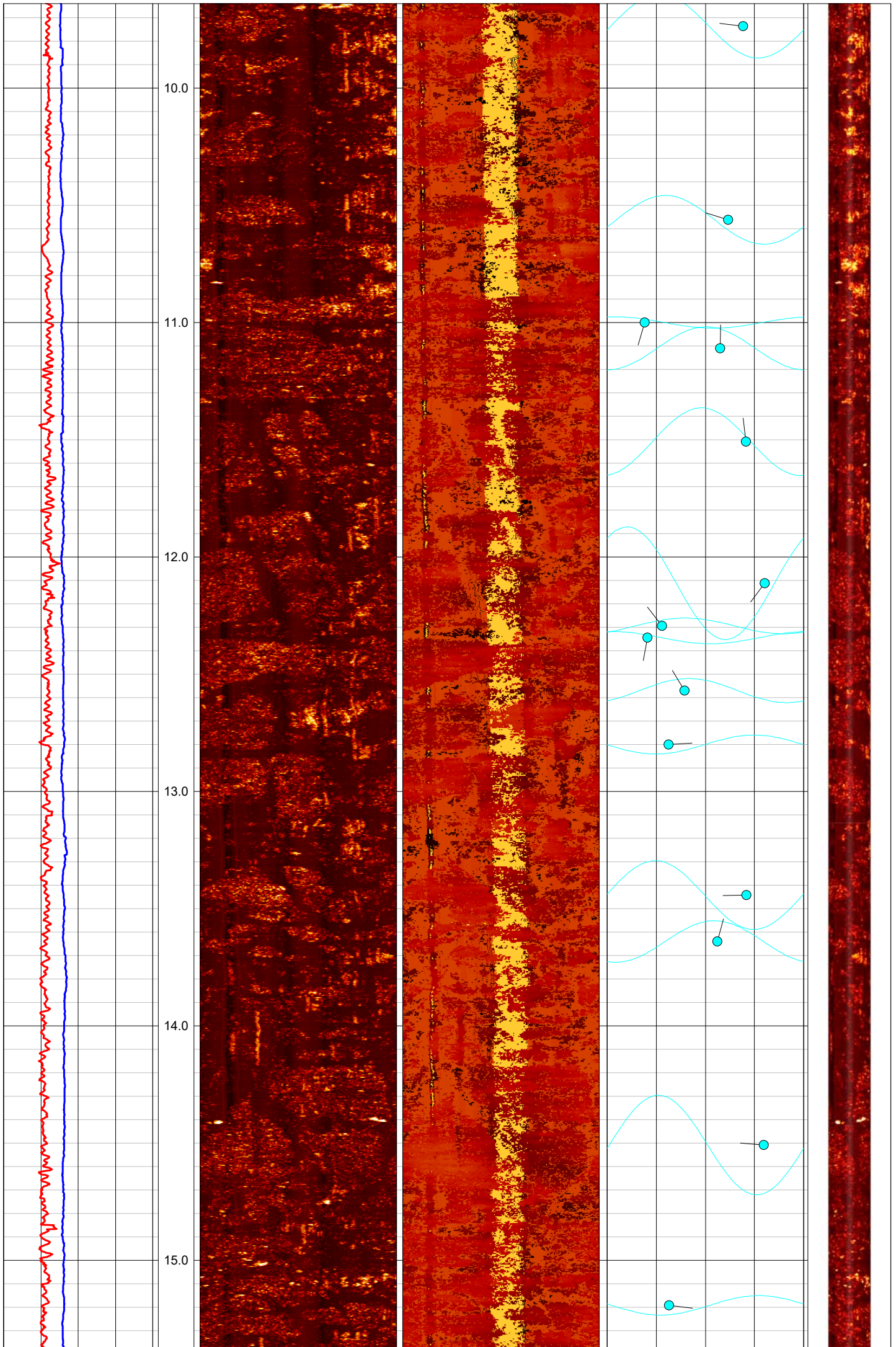
Drilled Depth: (m)	30.0	Date:	02.05.2019
Logged Depth: (m)	30.0	Recorded By:	Myles Kynaston
Logging Datum:	Ground Level	Remarks: Fluid clarity low. No optical image possible.	
Logged Interval: (m)	6.85 - 30.0		
Fluid Level: (m)	2.0		

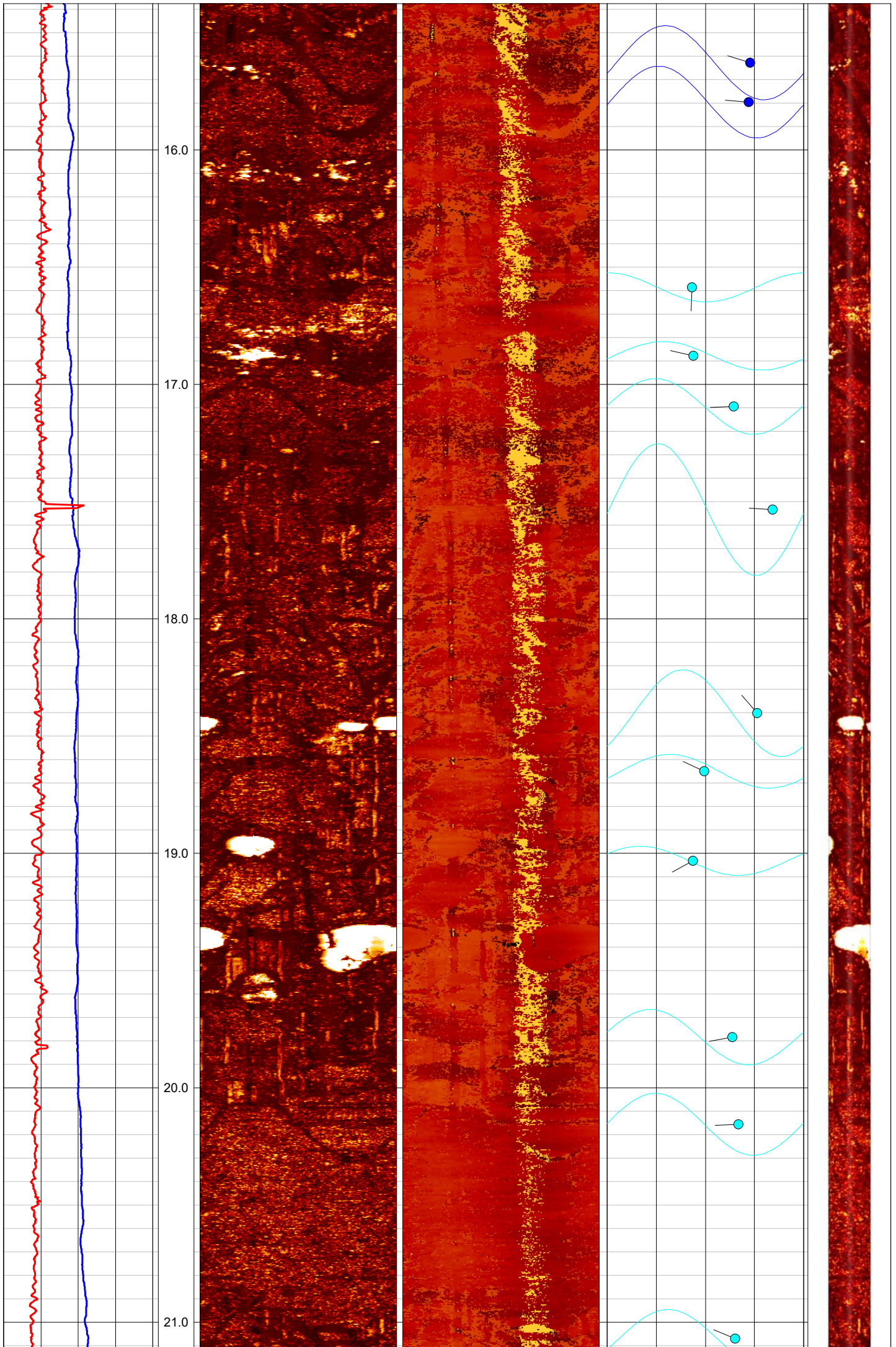
BOREHOLE RECORD

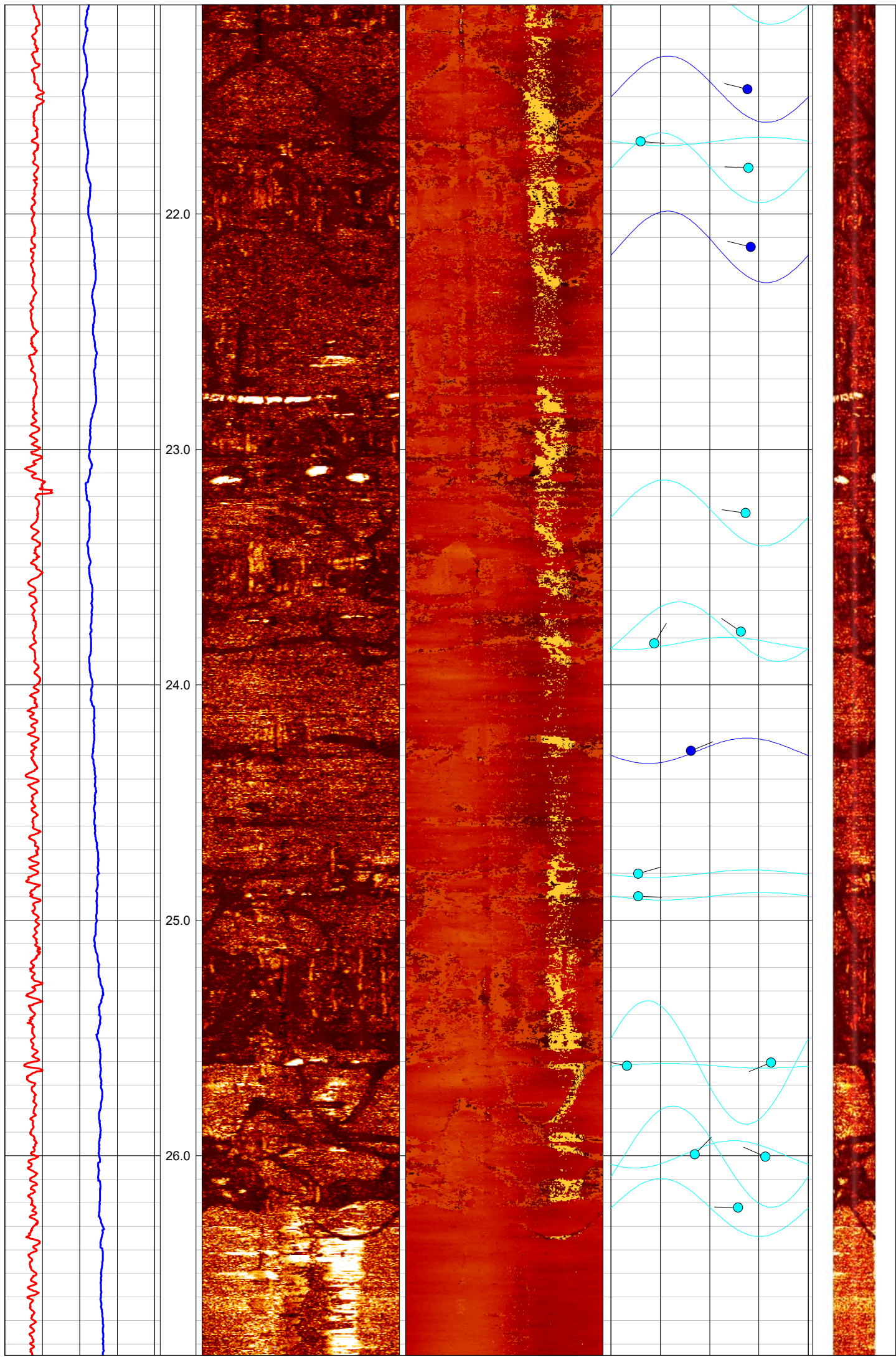
CASING RECORD

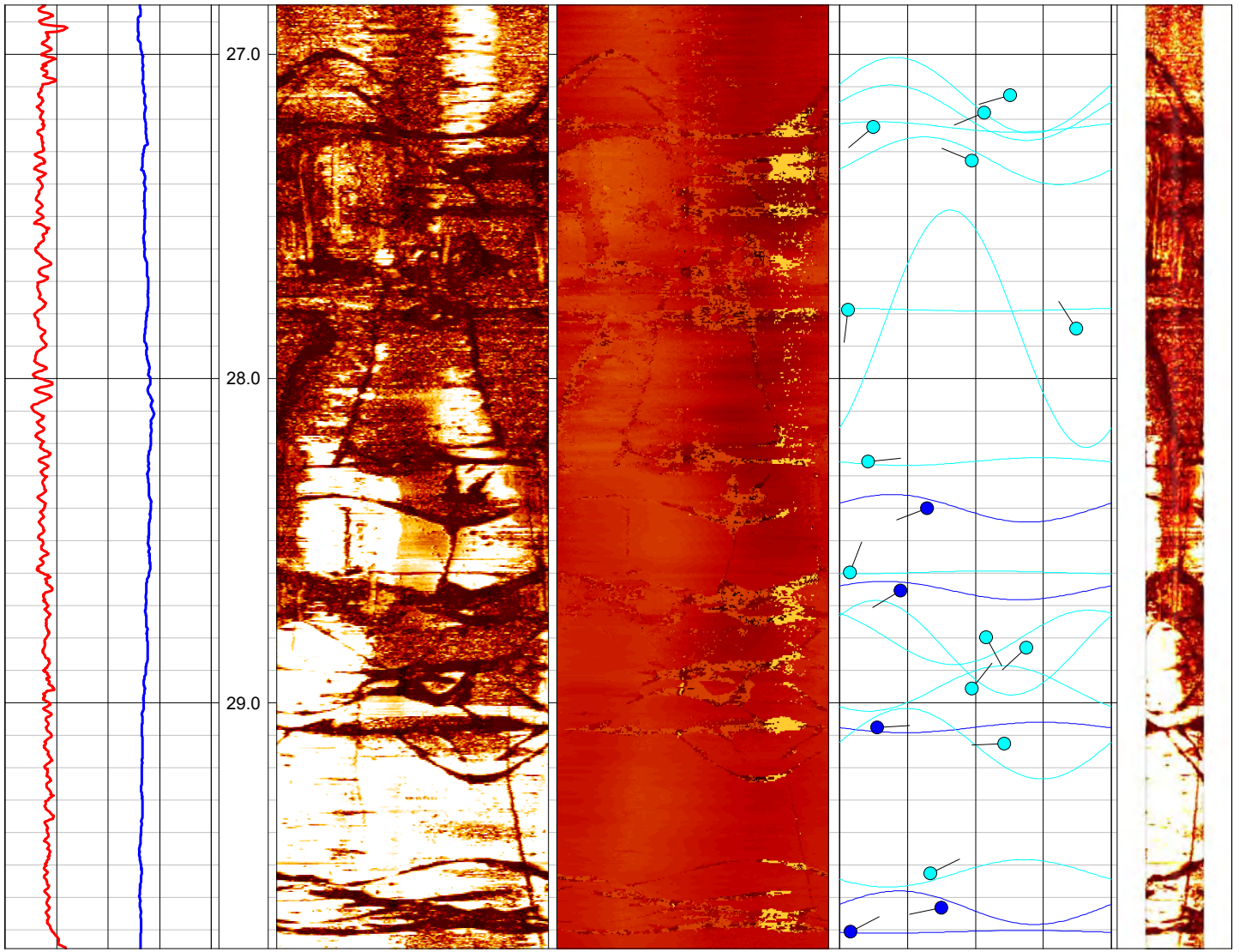
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	6.85	30.0	Steel	150	-0.6	6.85













EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC108**

Composite

Location: **Birdlip A417**

Area: **Gloucestershire**

Grid Ref: **393083E; 215863N**

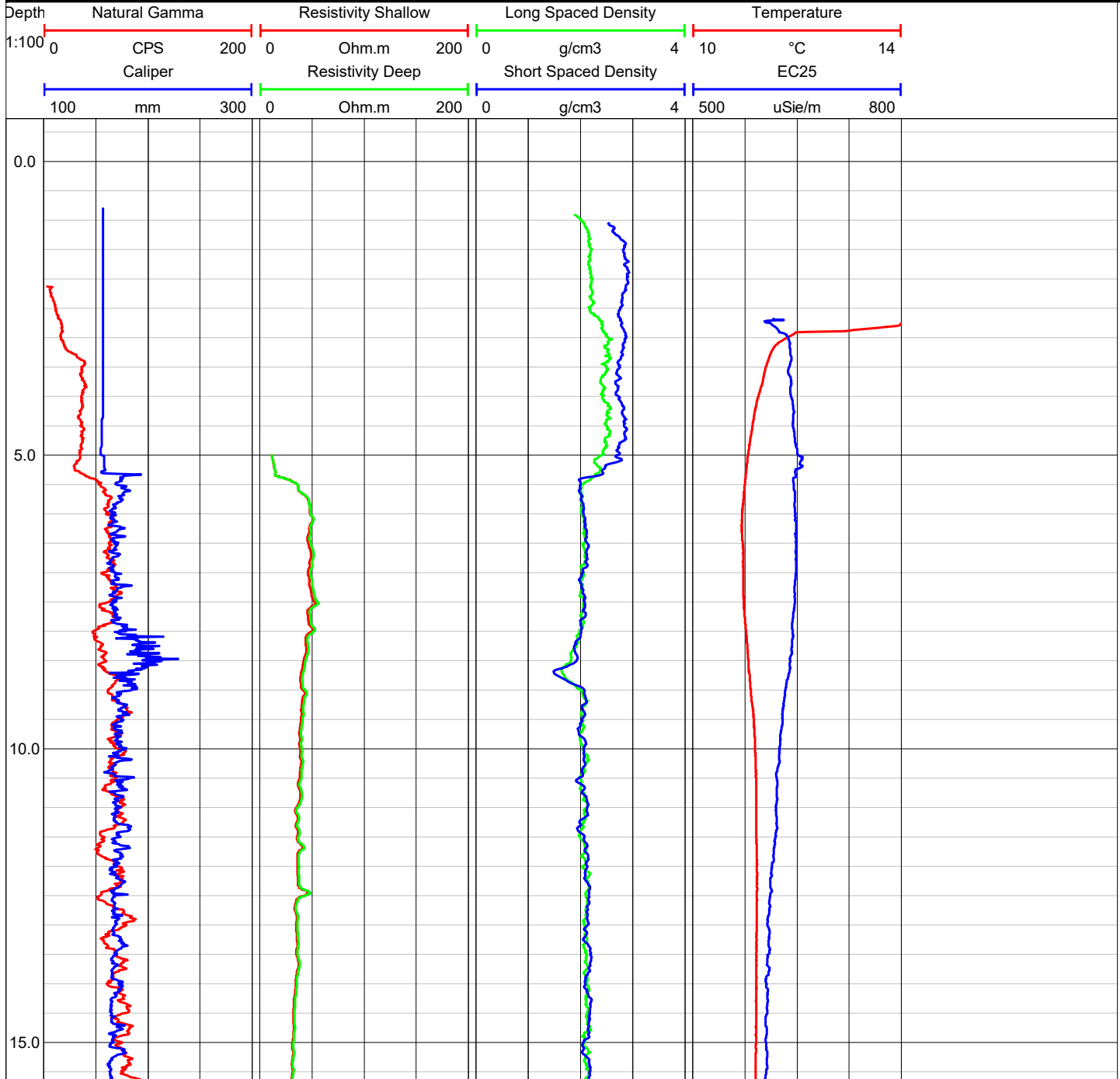
Elevation: **193.60m**

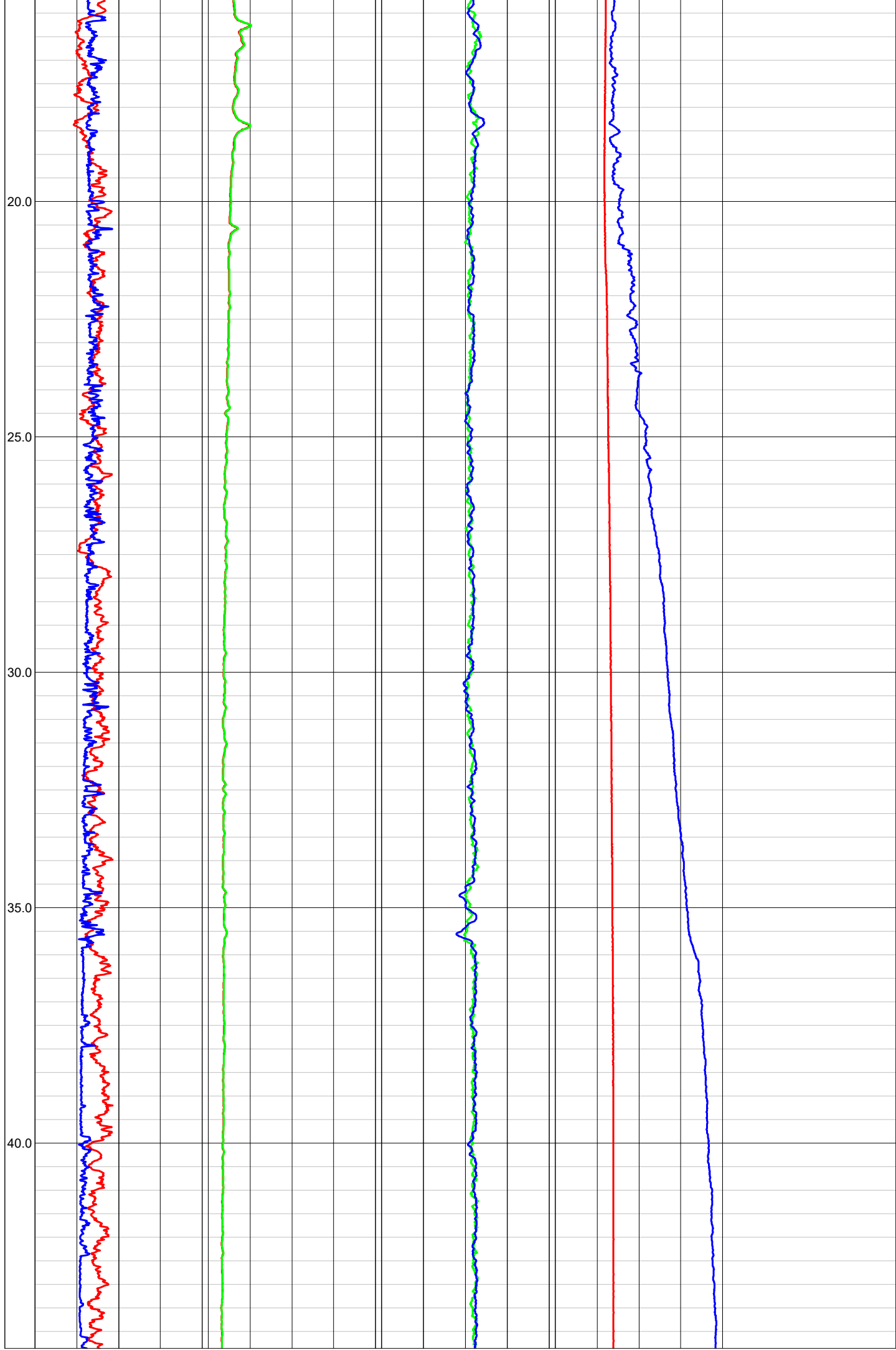
Drilled Depth: (m)	50.0	Date:	24.04.19
Logged Depth: (m)	48.2	Recorded By:	M Magill
Logging Datum:	Ground Level	Remarks: Flow logs not possible due to high volume of suspended sediment clogging impeller.	
Logged Interval: (m)	0 - 48.2		
Fluid Level: (m)	~2.0		

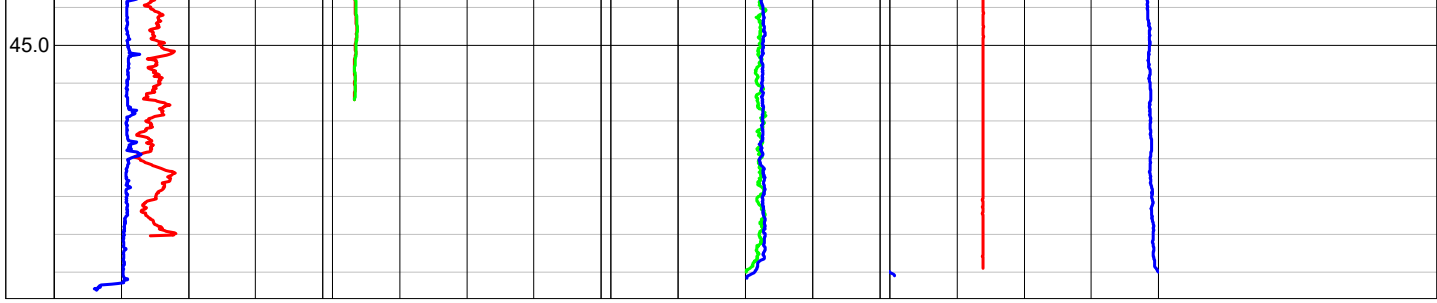
BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
148	5.3	48.2	Steel	150	-0.7	5.3









EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC108**

Image

Location: **A417 Birdlip**

Area: **Gloucestershire**

Grid Ref: **393083E; 215863N**

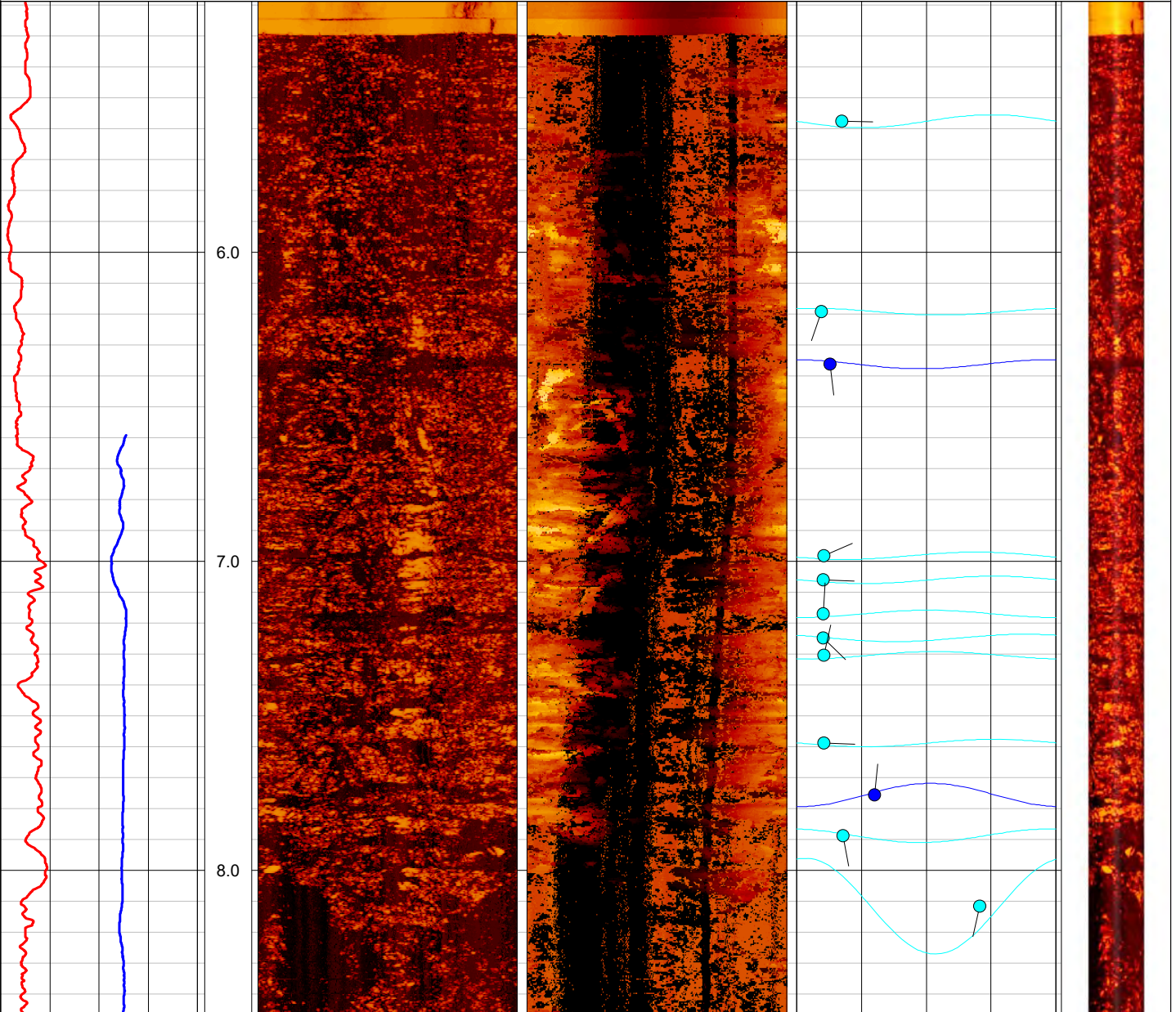
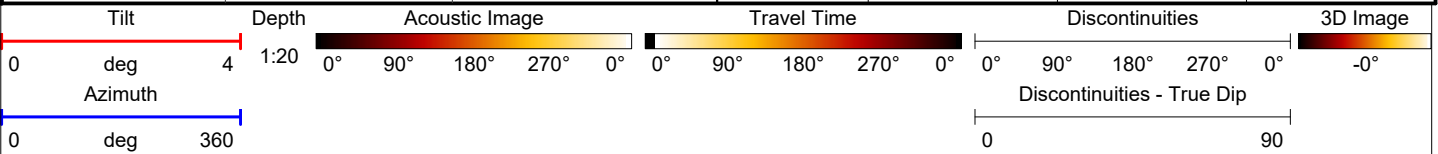
Elevation: **193.60m**

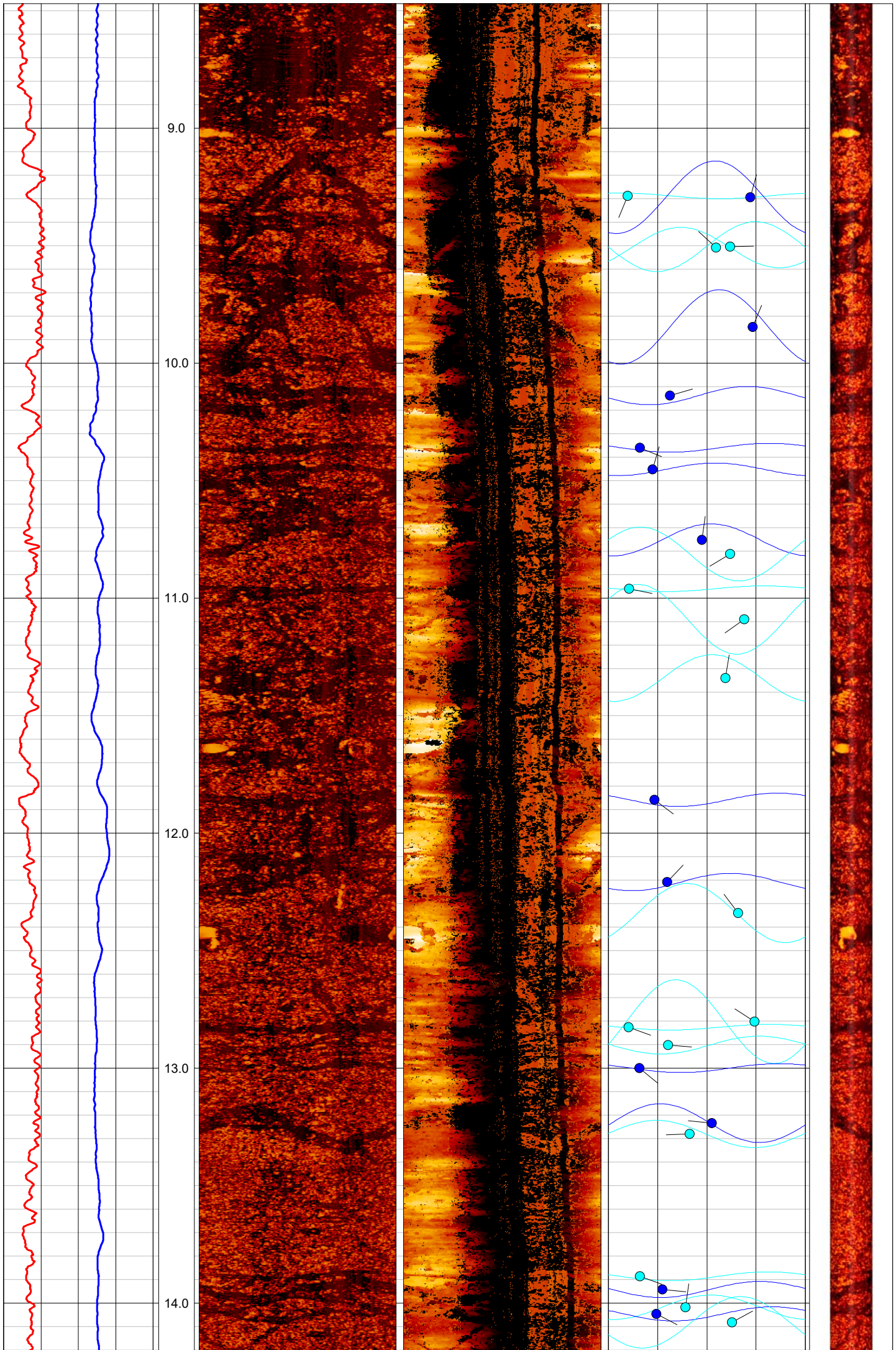
Drilled Depth: (m)	50.0	Date:	24.04.19
Logged Depth: (m)	48.2	Recorded By:	M Magill
Logging Datum:	Ground Level	Remarks: Borehole fluid cloudy - used acoustic imager in place of optical.	
Logged Interval: (m)	5.3 - 48.2		
Fluid Level: (m)	~2.0		

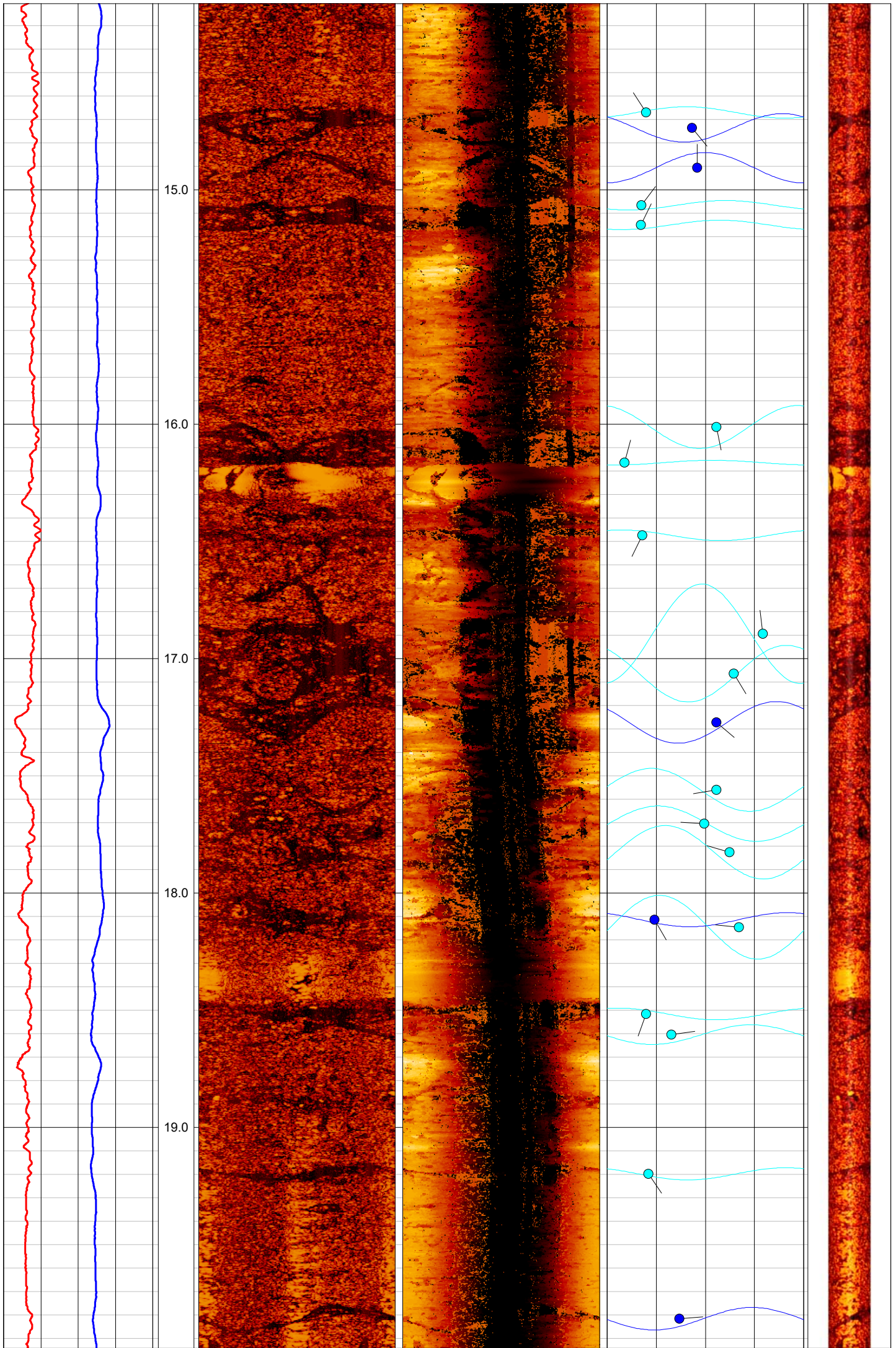
BOREHOLE RECORD

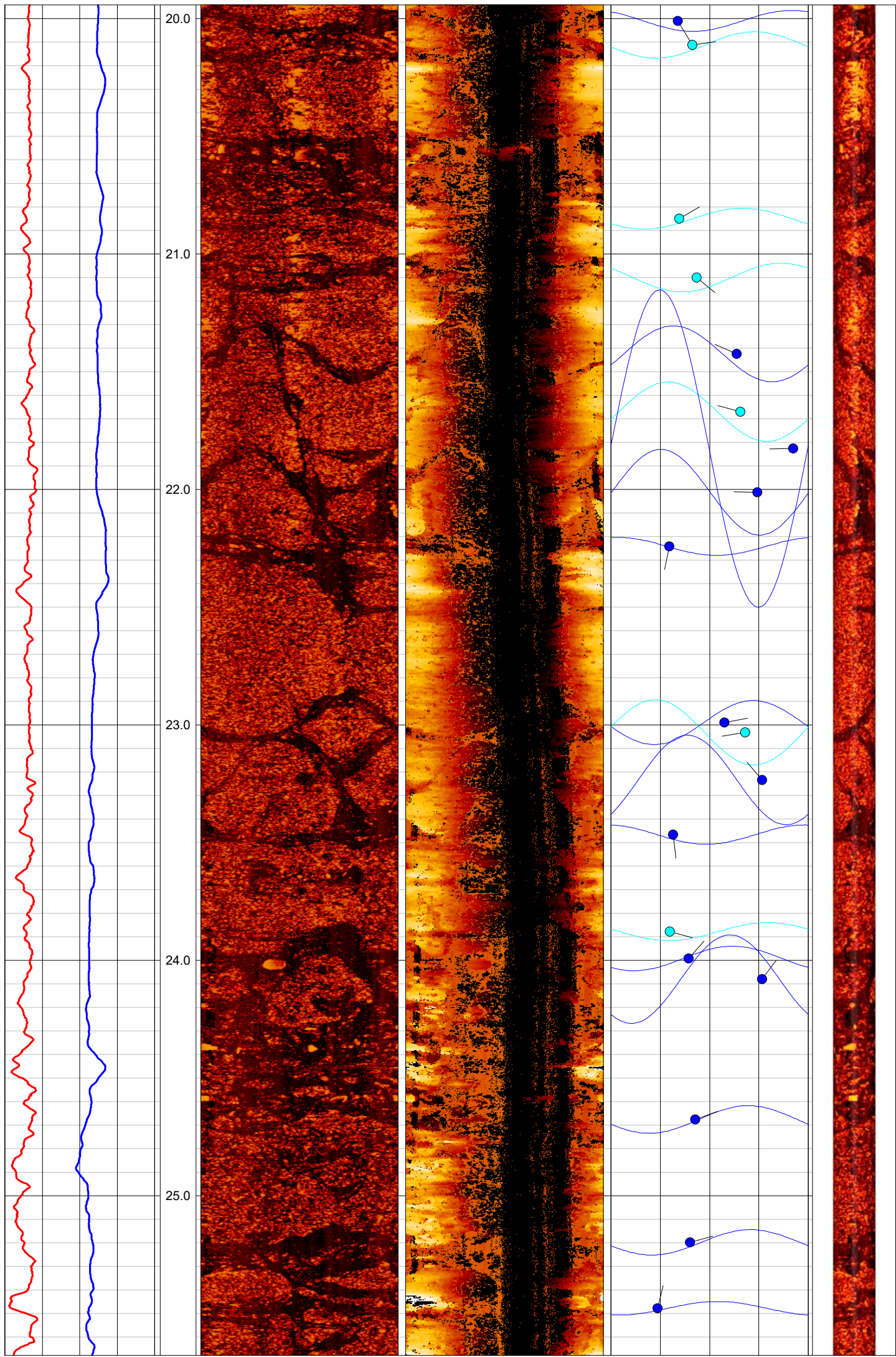
CASING RECORD

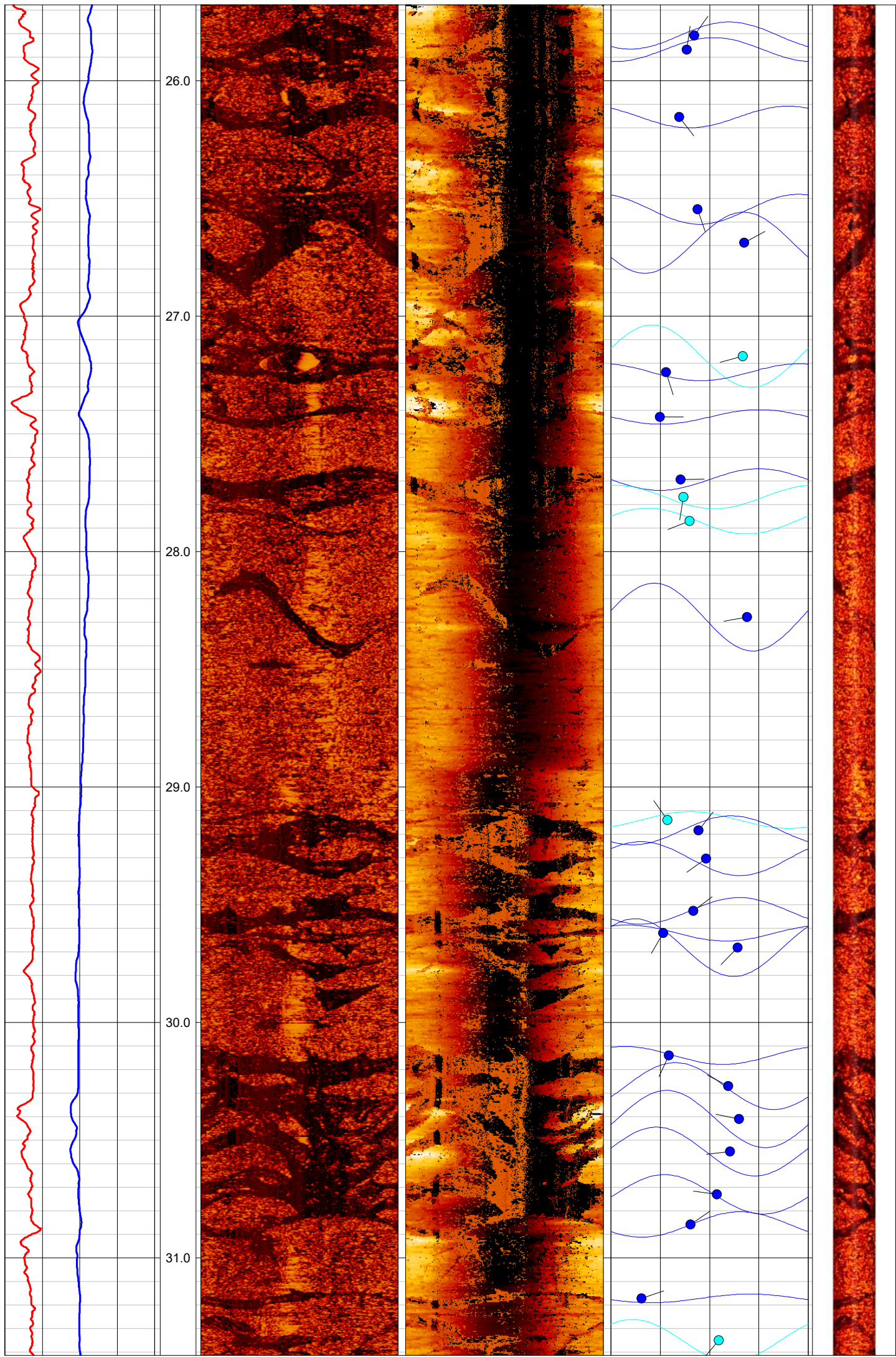
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
148	5.3	48.2	Steel	150	-0.7	5.3

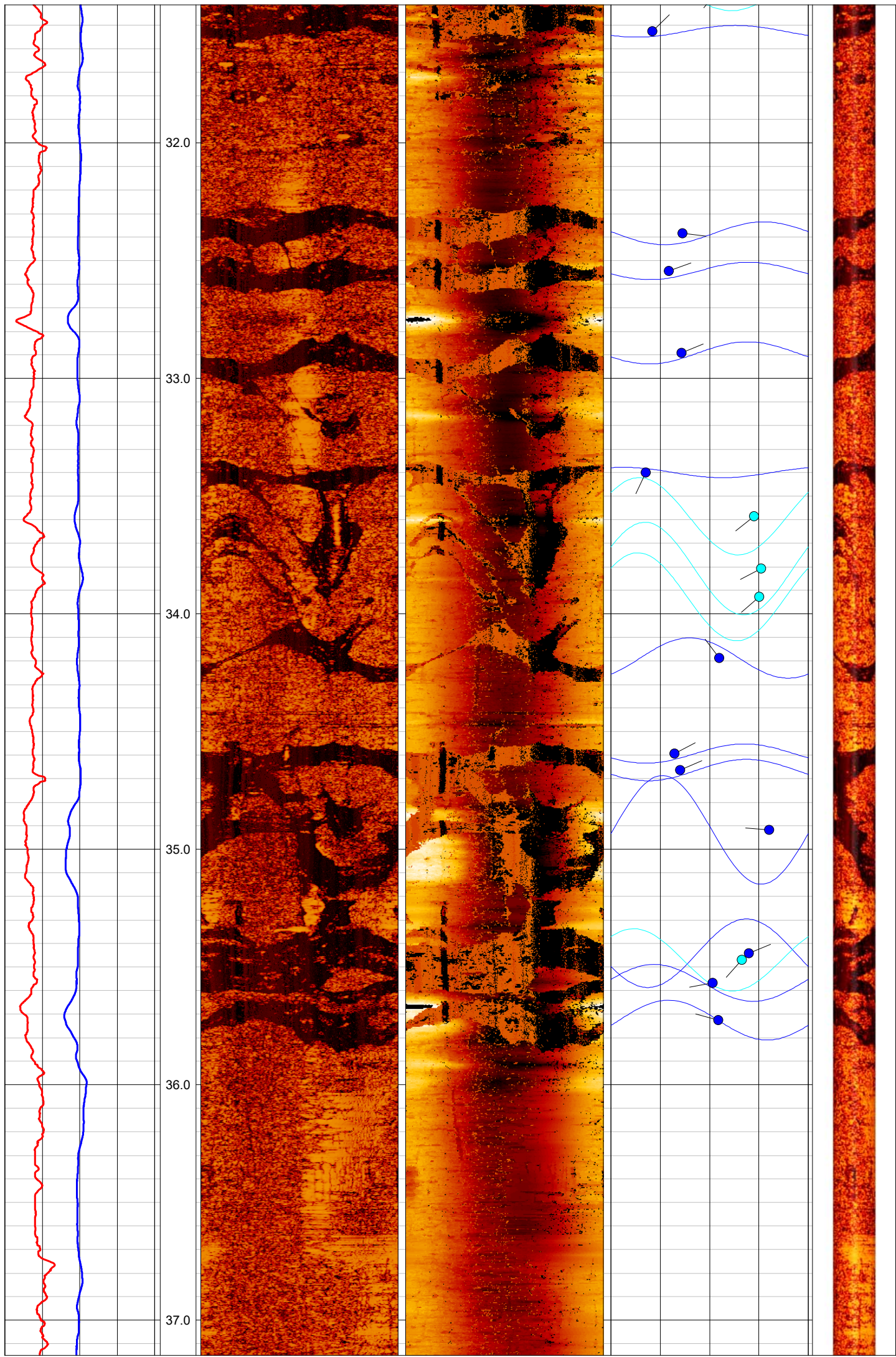


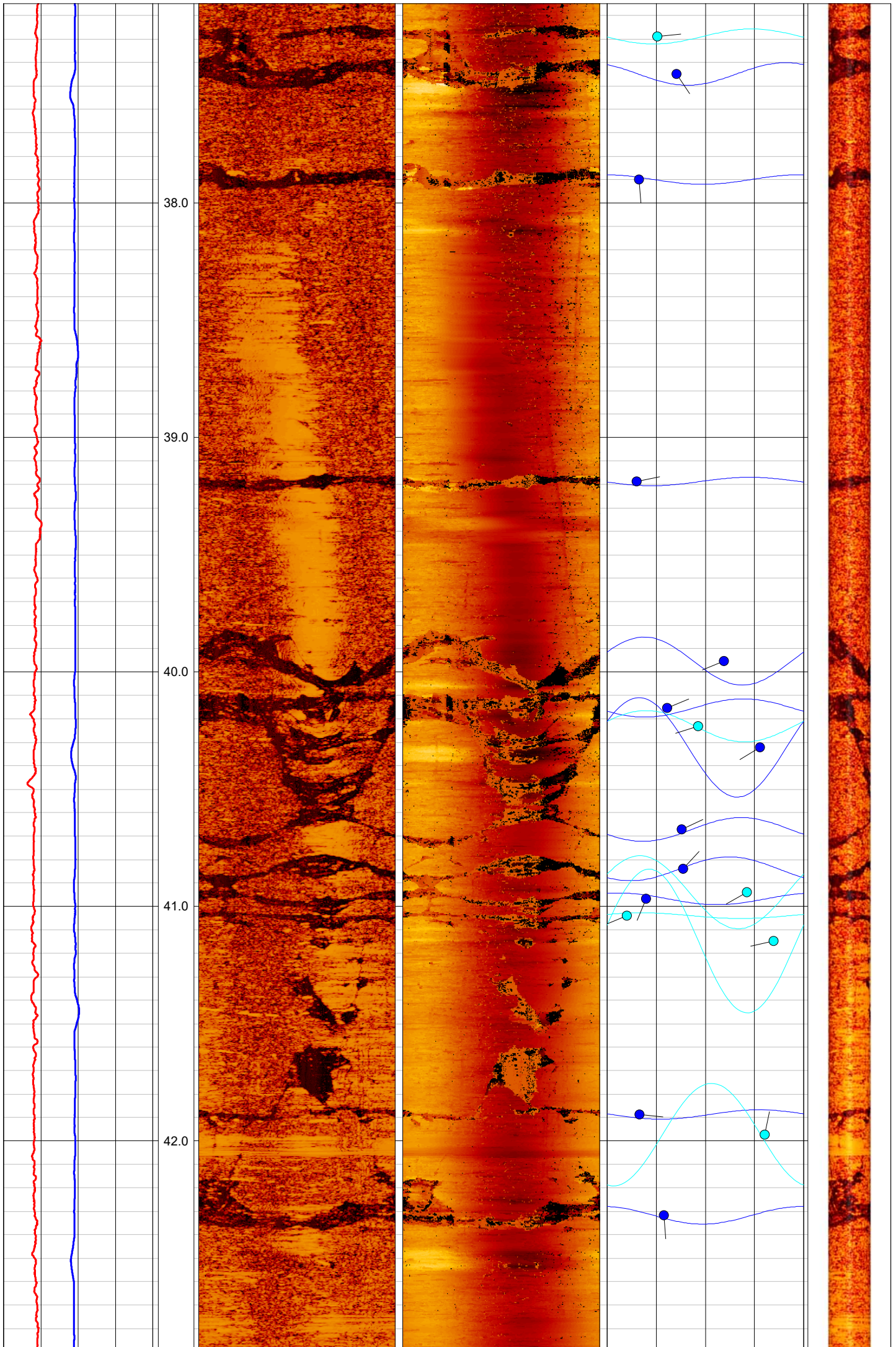


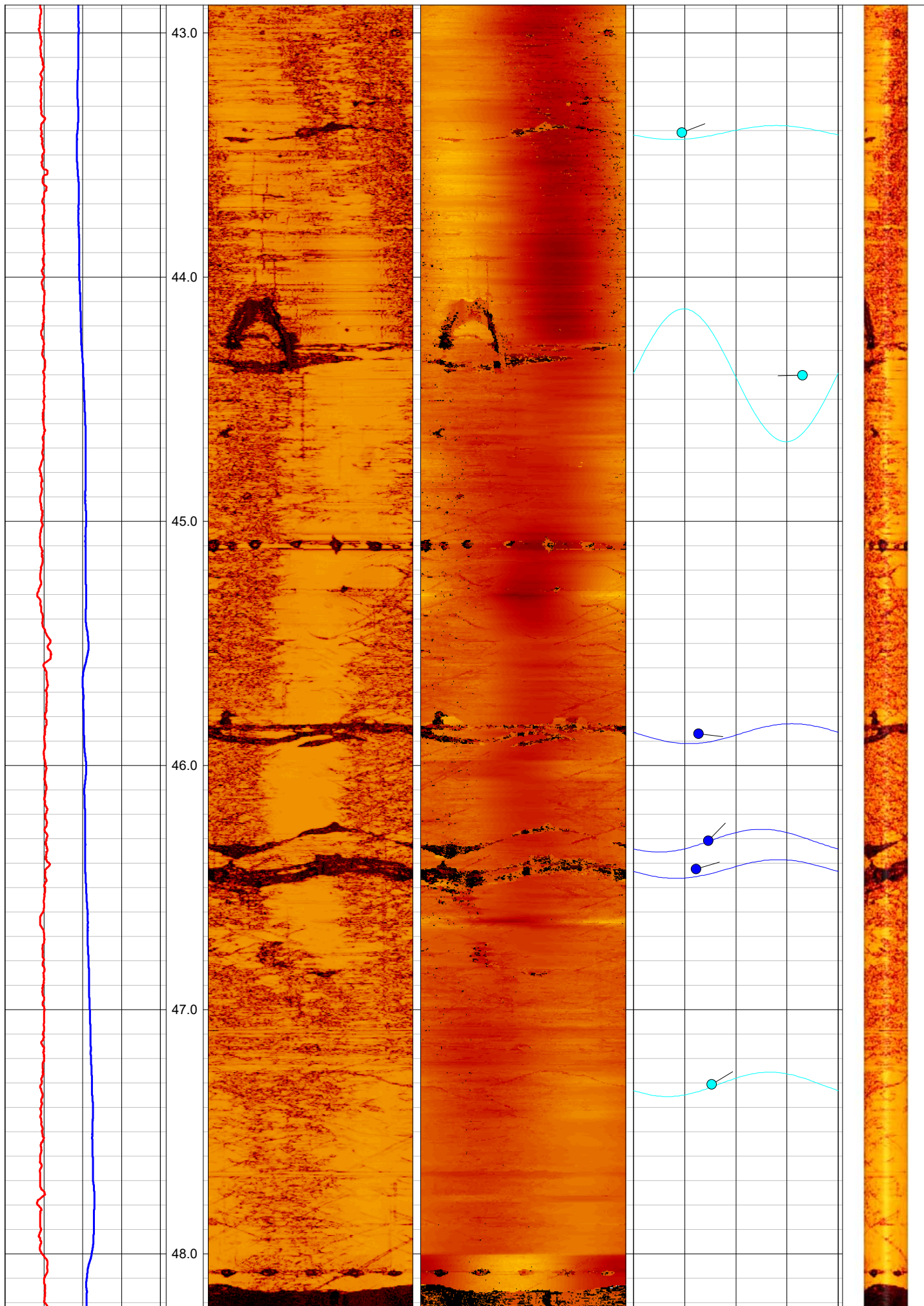














EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC207**

Composite

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392681E; 215603N**

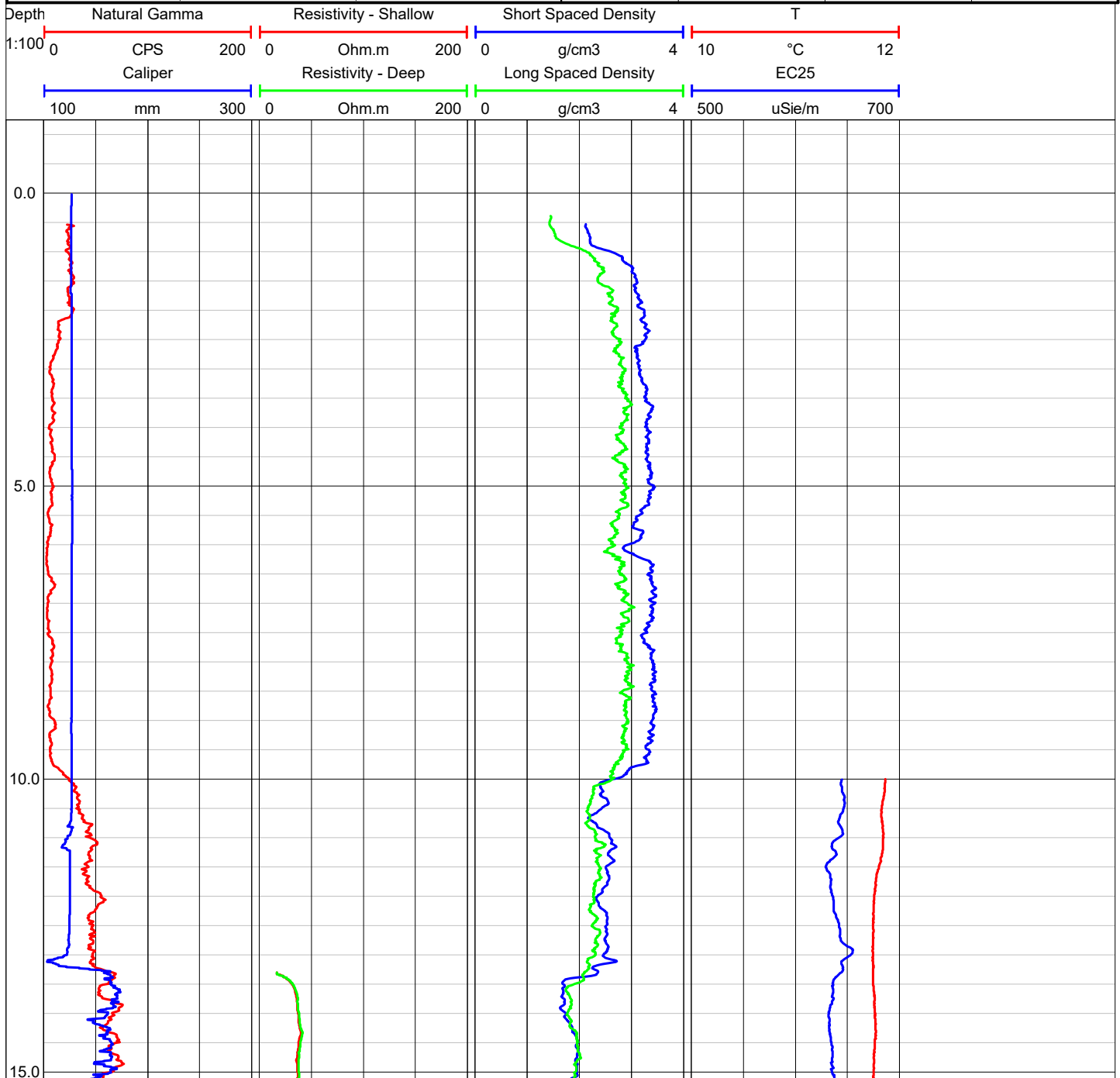
Elevation: **173.30m**

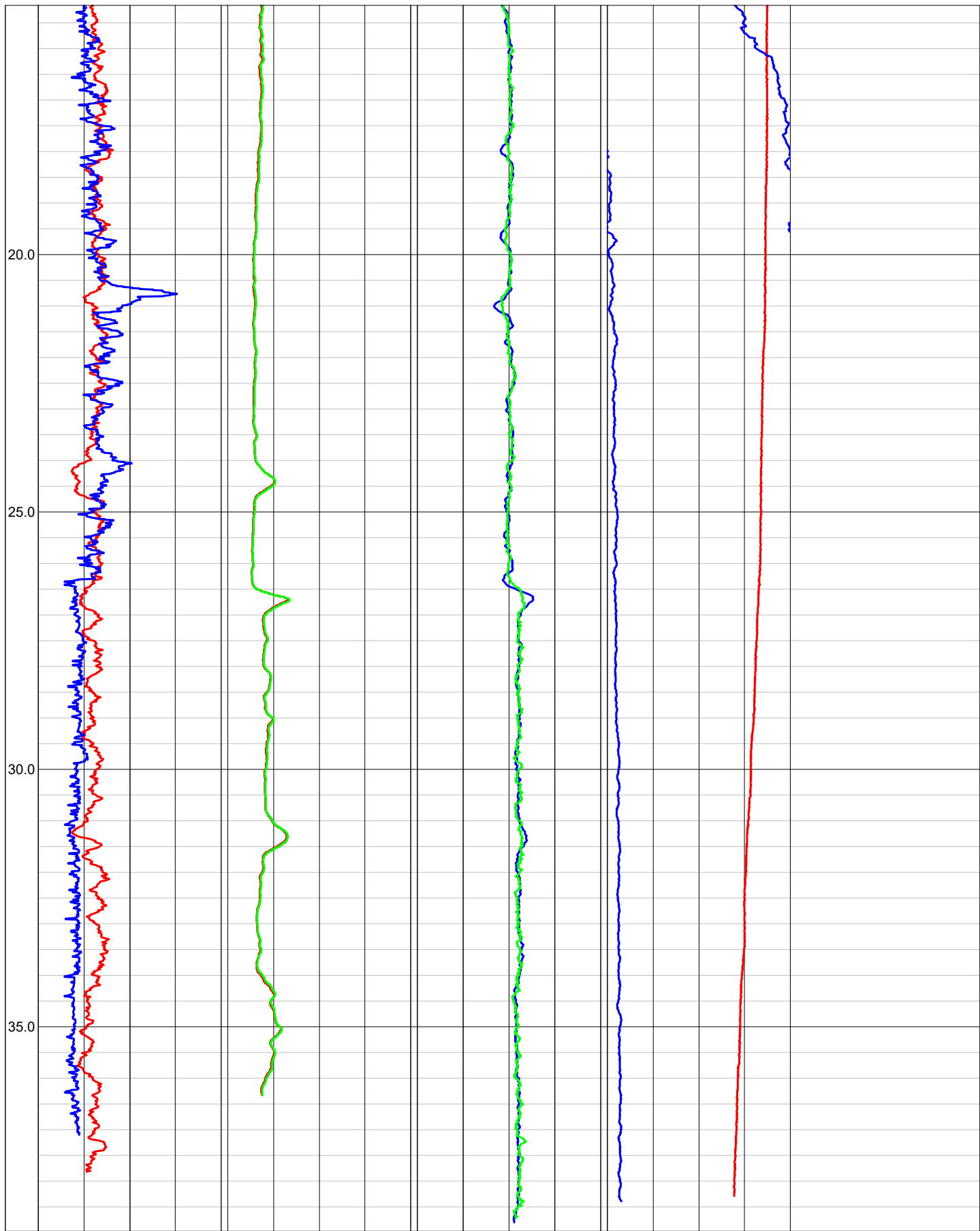
Drilled Depth: (m)	40.5	Date:	06.06.19
Logged Depth: (m)	38.7	Recorded By:	R. Powell
Logging Datum:	Ground Level	Remarks: Borehole silted up/infilled to 38.5m. No visibility on optical run - thick, silty borehole fluid. Unsuitable for flow logging - flowhead jamming with debris.	
Logged Interval: (m)	1 - 38.7		
Fluid Level: (m)	1.7		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	5.0	40.5	Steel	150	0.0	13.3







EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC207**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392681E; 215603N**

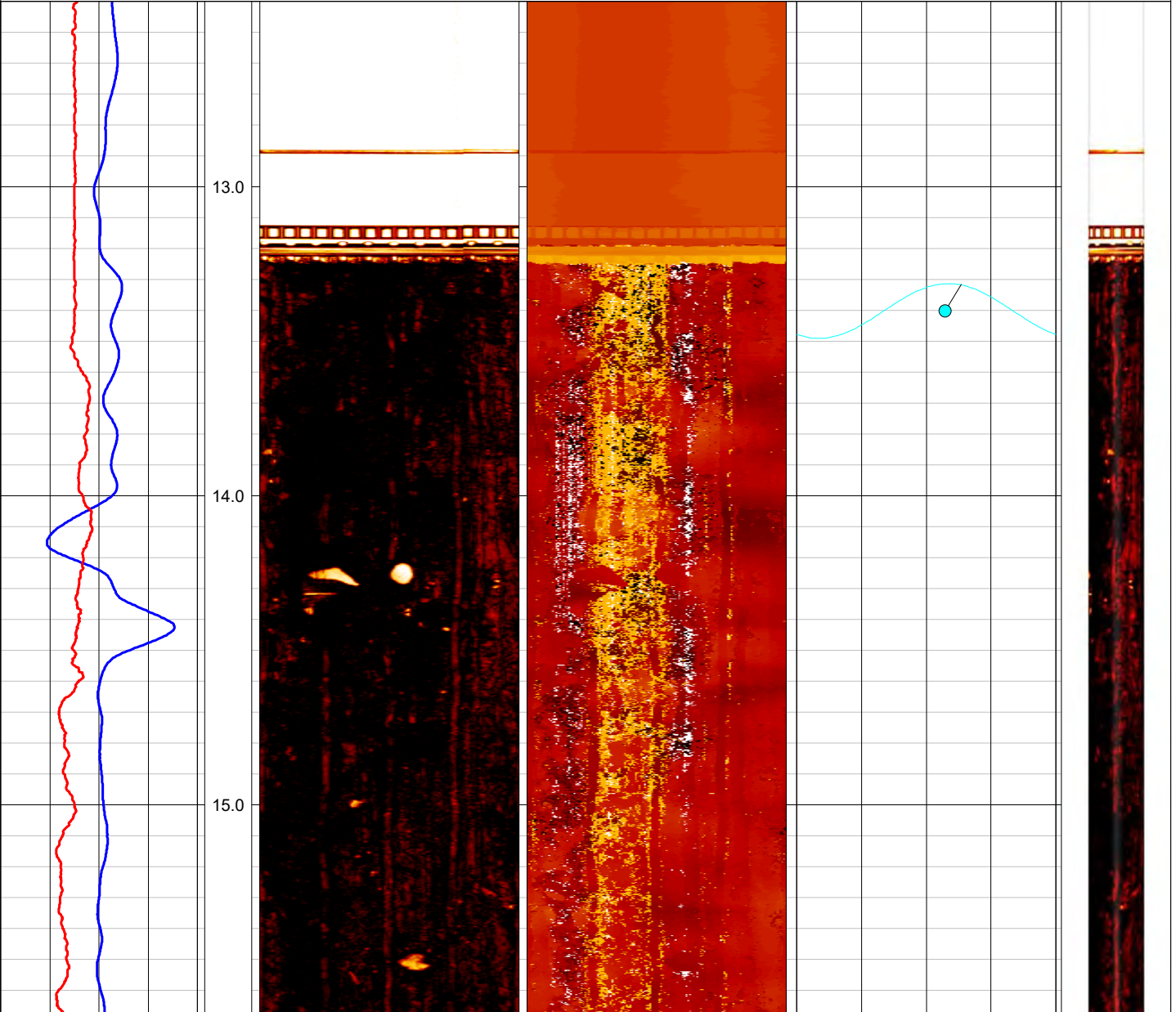
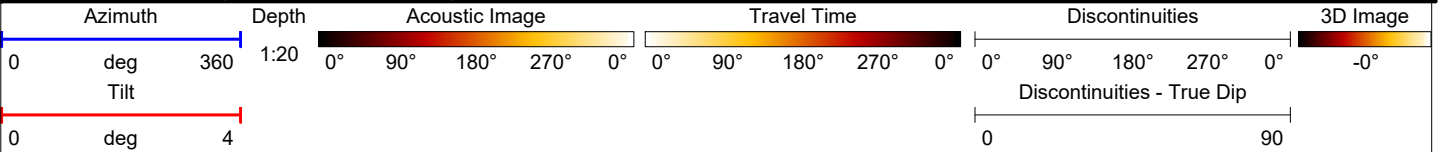
Elevation: **173.30m**

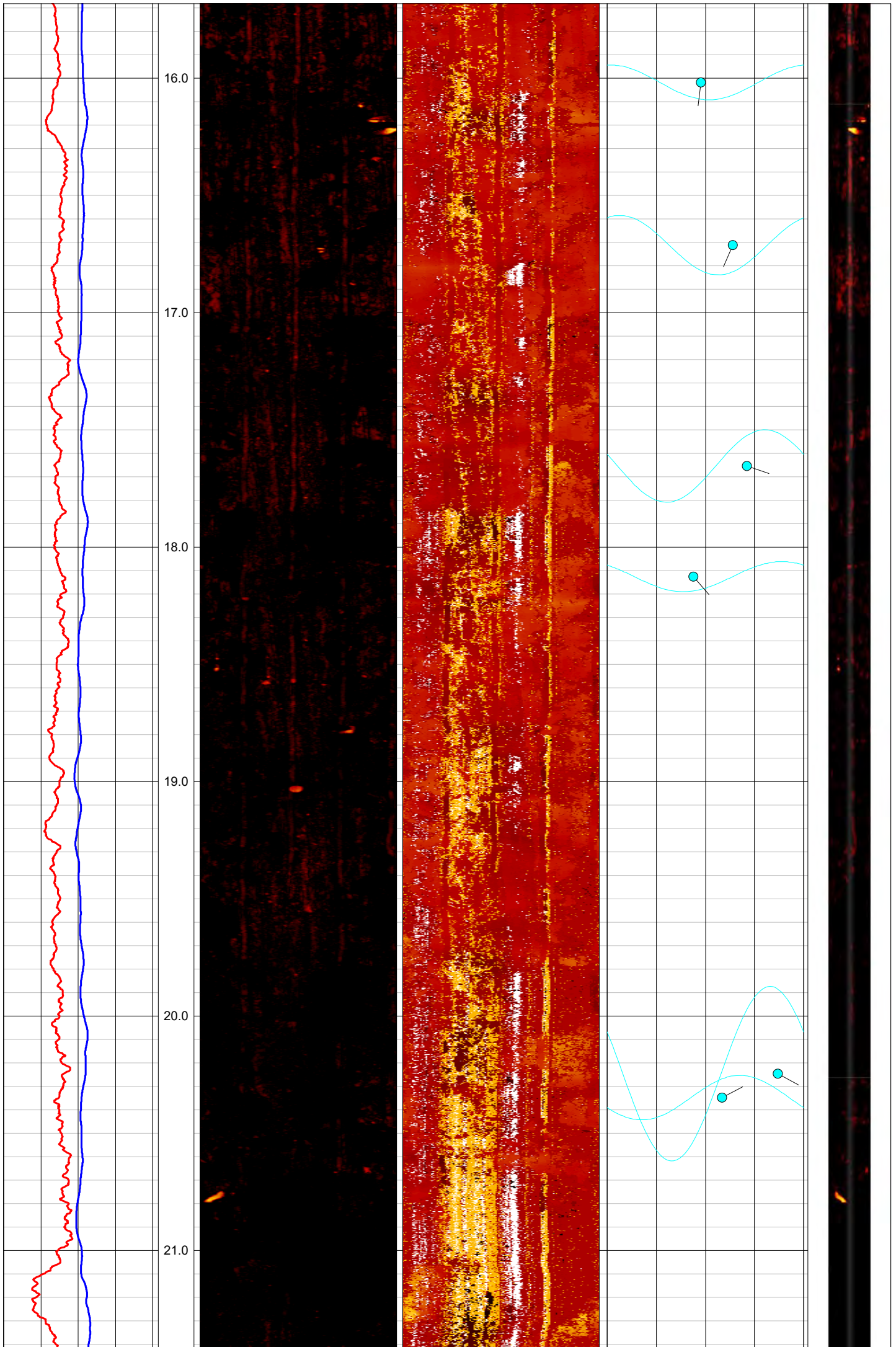
Drilled Depth: (m)	40.5	Date:	06.06.19
Logged Depth: (m)	38.7	Recorded By:	R. Powell
Logging Datum:	Ground Level	Remarks: Borehole silted up/infilled to 38.5m. No visibility on optical run - thick, silty borehole fluid.	
Logged Interval: (m)	13.3 - 38.7		
Fluid Level: (m)	1.7		

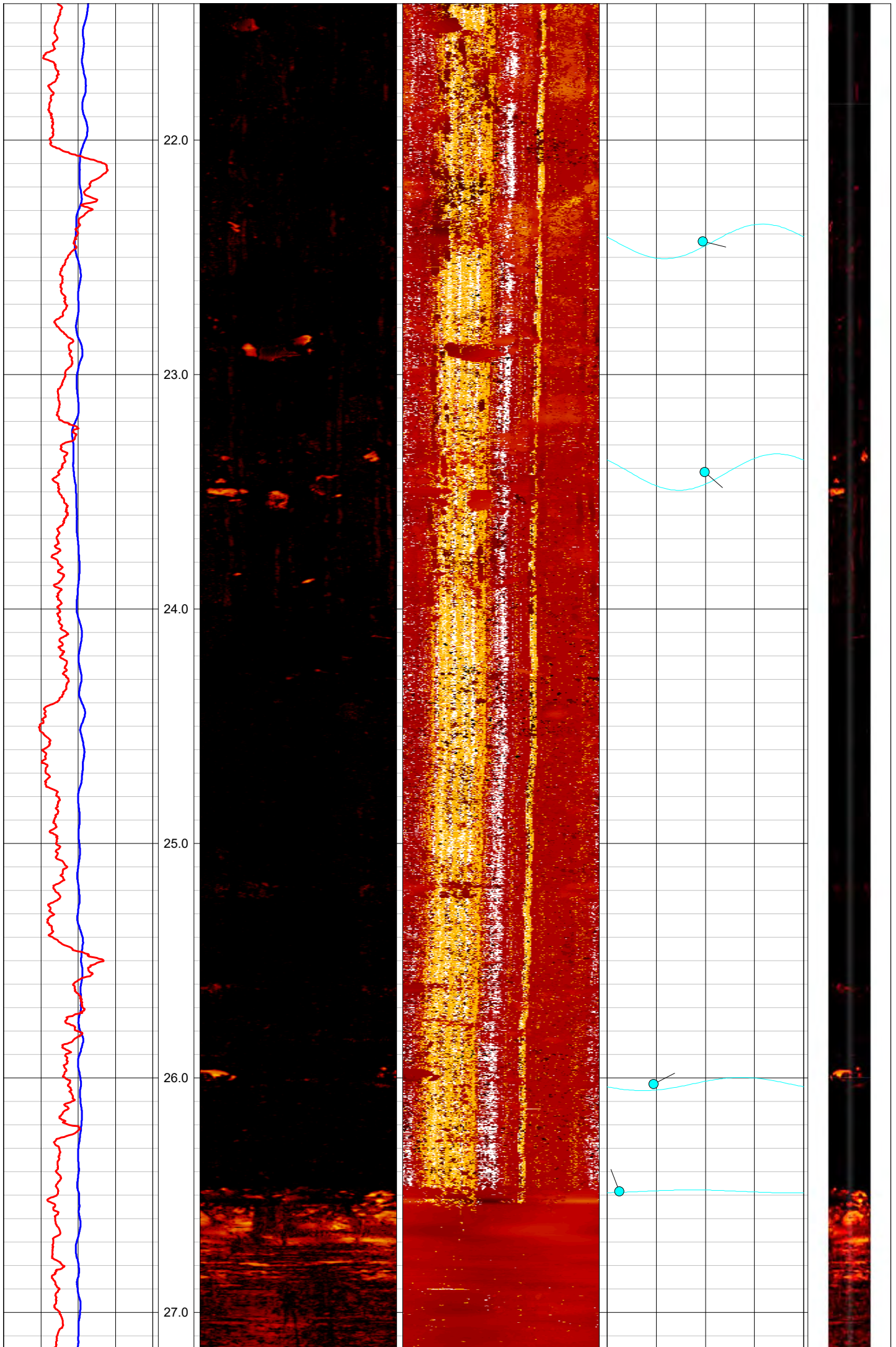
BOREHOLE RECORD

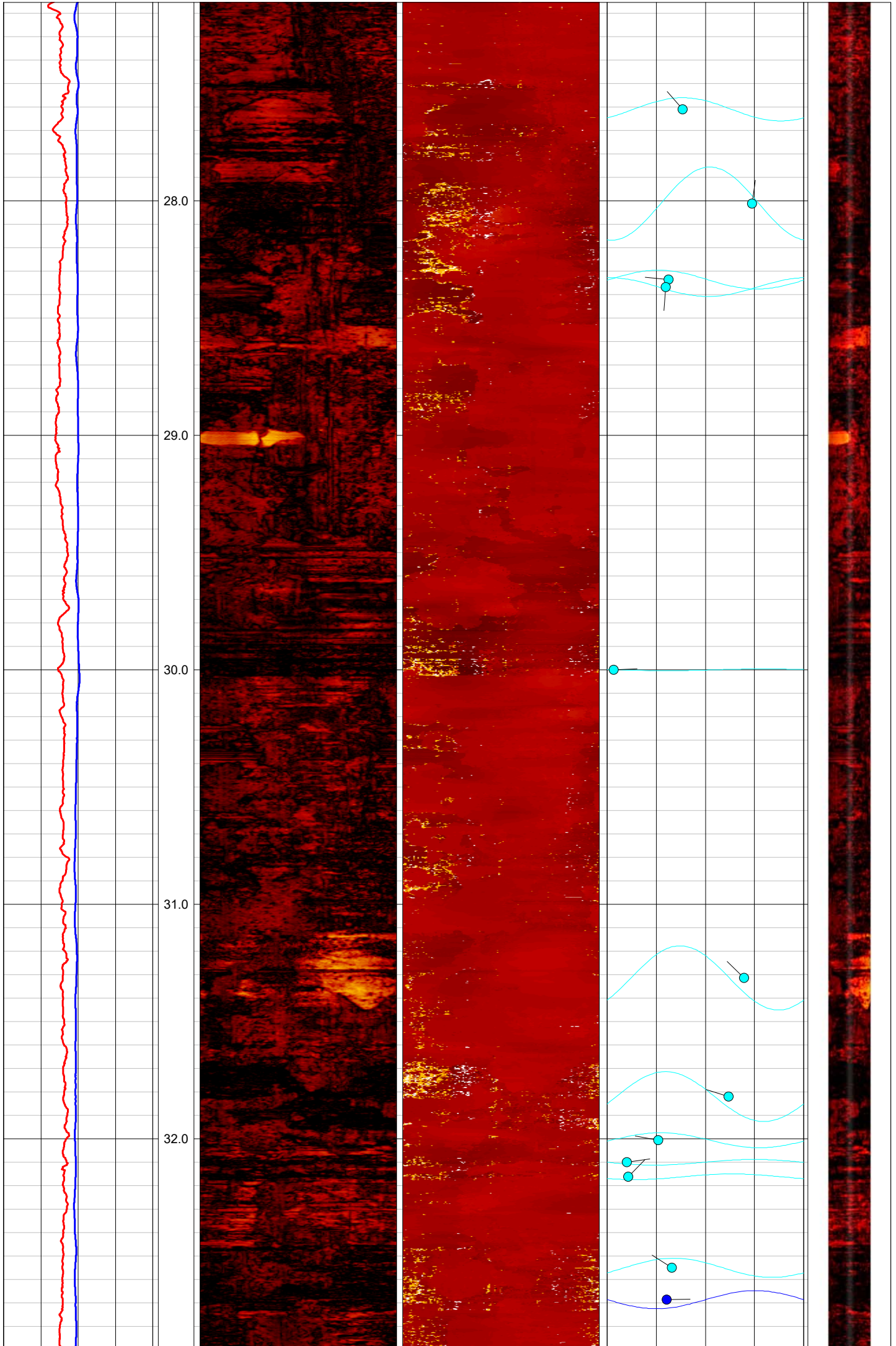
CASING RECORD

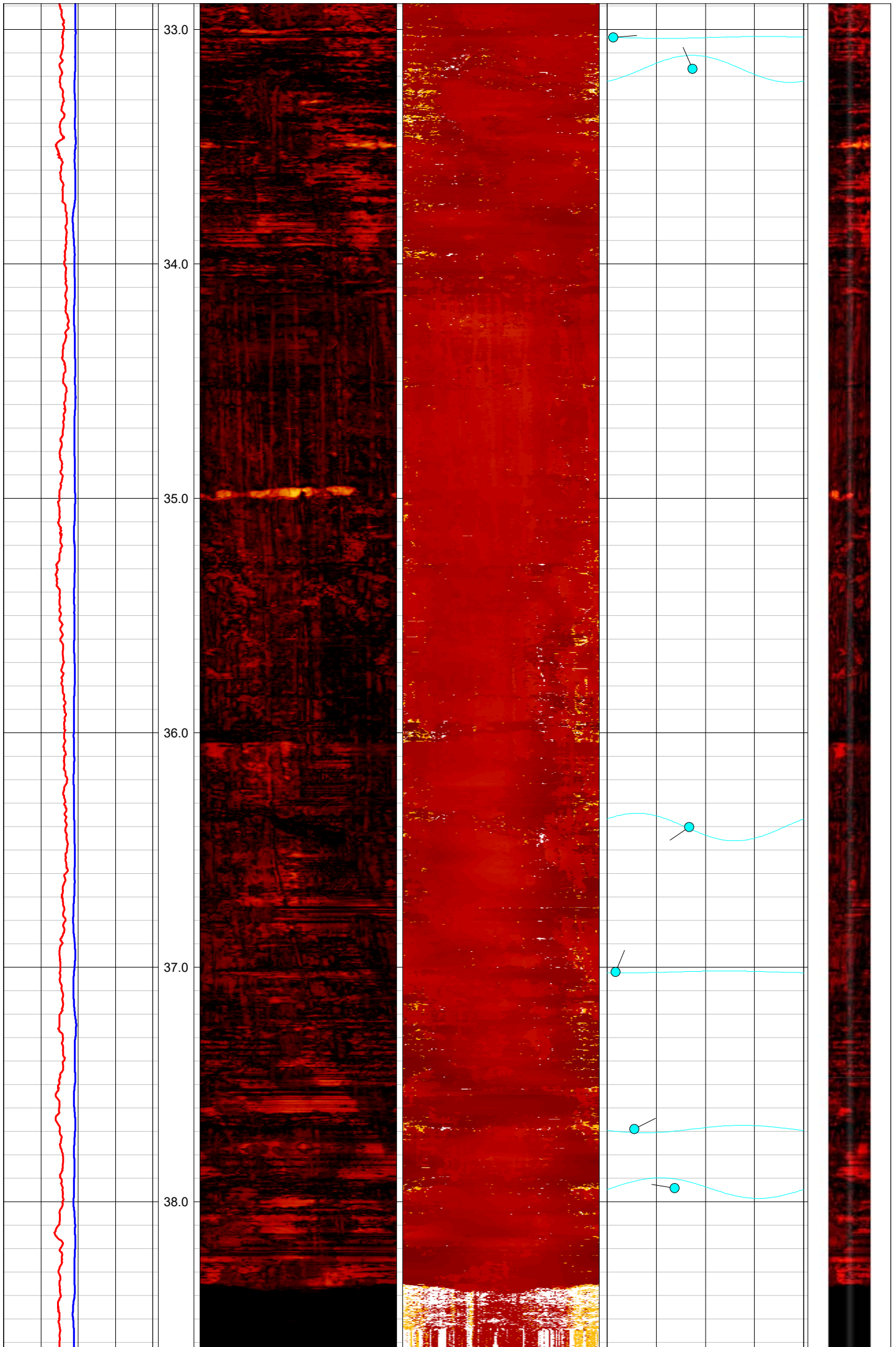
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
150	5.0	40.5	Steel	150	0.0	13.3















EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC224**

Composite

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392857E; 215346N**

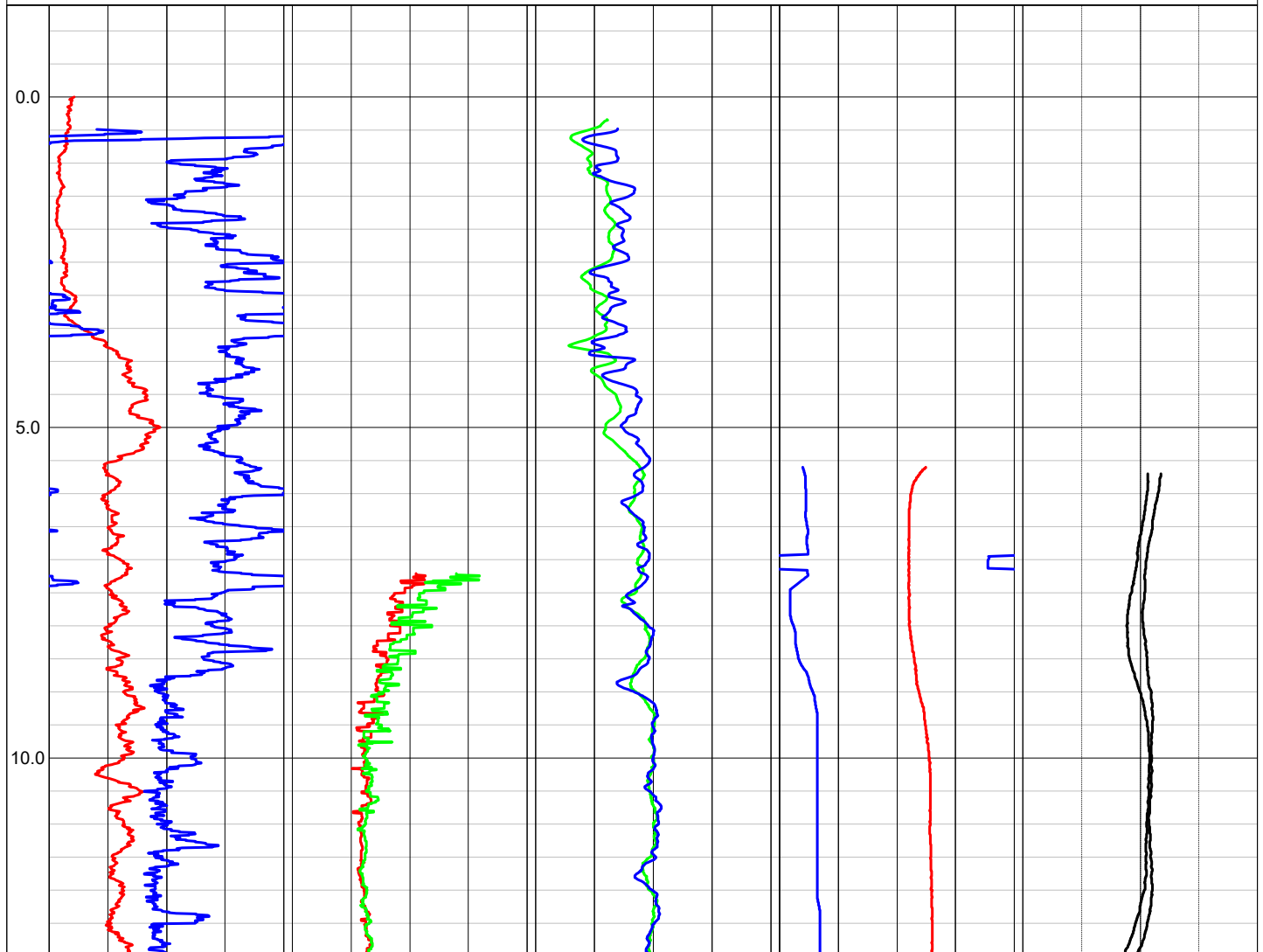
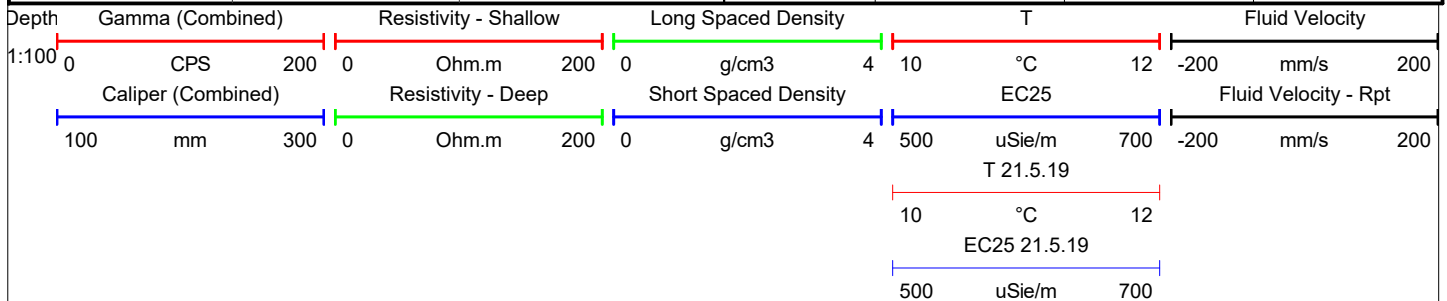
Elevation: **226.85m**

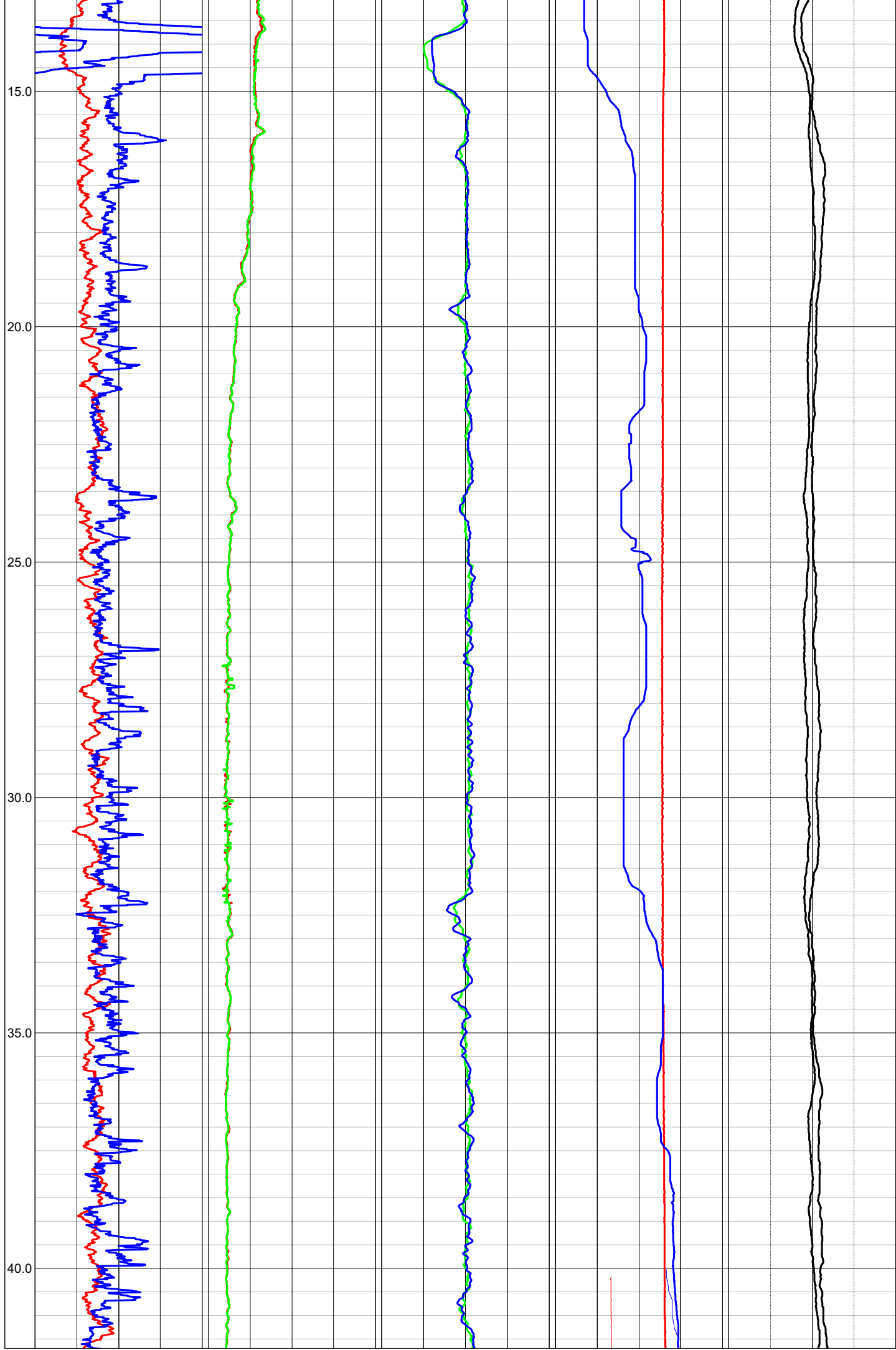
Drilled Depth: (m)	80.0*	Date:	17th & 21st May 2019
Logged Depth: (m)	50.4 (75.7)	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: 1st Visit: Hole blocked @ 50.4m. High amount of suspended sediment in water column. 2nd Visit: High amount of suspended sediment in borehole; unable to run impellor flowmeter.	
Logged Interval: (m)	0.0 - 50.4 (75.7)		
Fluid Level: (m)	5.7		

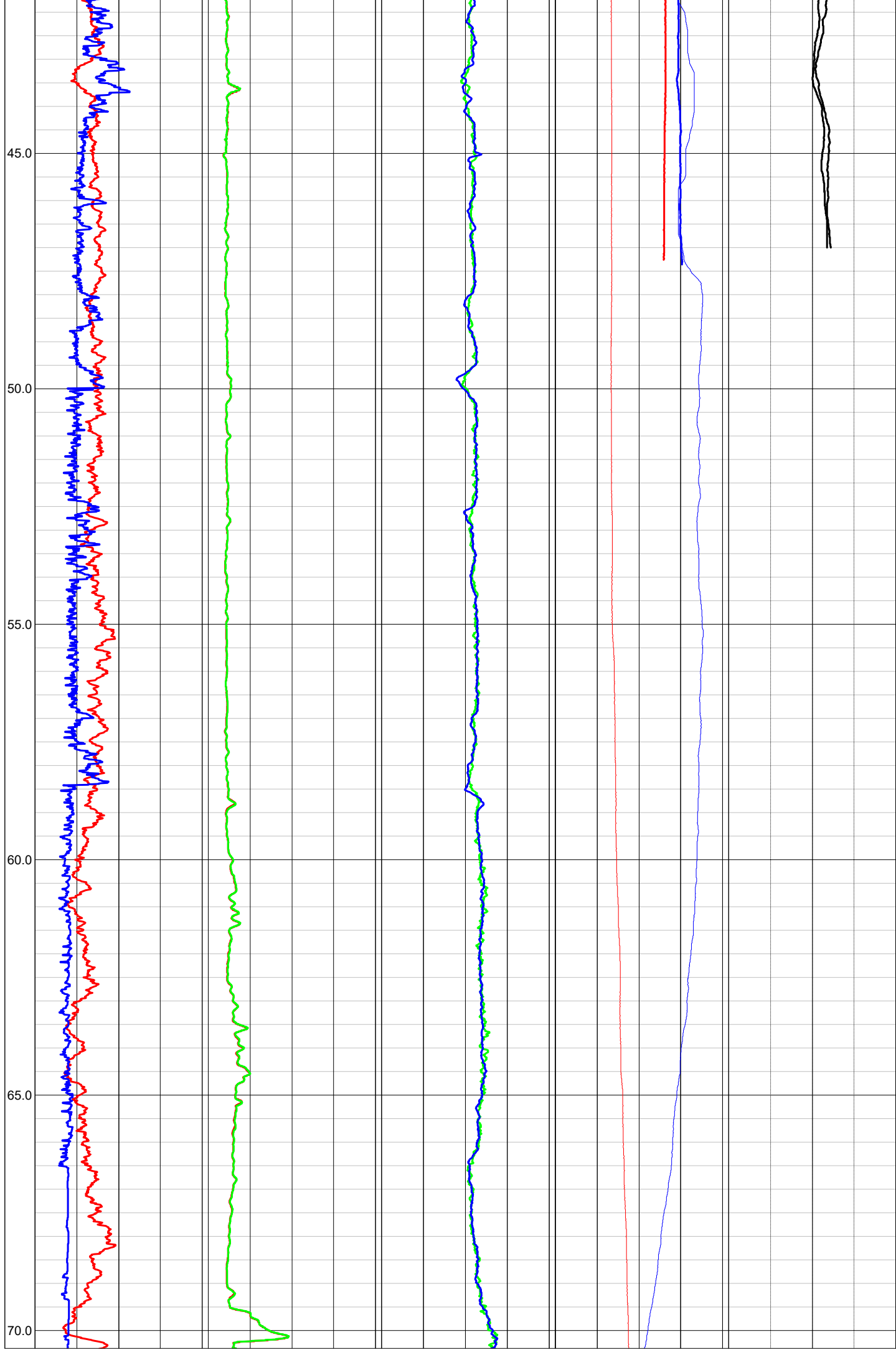
BOREHOLE RECORD

CASING RECORD

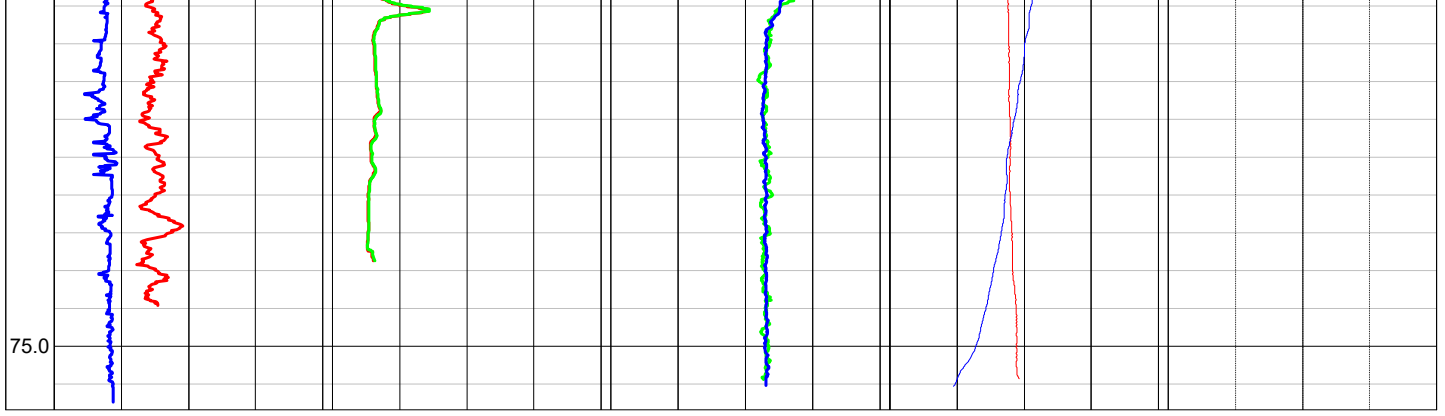
Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	0.0	80.0	Steel	150	-1.0	45.0







75.0





EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type:

Borehole: **DSRC224**

Image

Location: **A417**

Area: **Birdlip, Gloucestershire**

Grid Ref: **392857E; 215346N**

Elevation: **226.85m**

Drilled Depth: (m)	80.0*	Date:	17th & 21st May 2019
Logged Depth: (m)	50.4 (75.7)	Recorded By:	Dave Hingley
Logging Datum:	Ground Level	Remarks: 1st Visit: Hole blocked @ 50.4m. Borehole cleared to 75.7m. High amount of suspended sediment in water column. 2nd Visit: High amount of suspended sediment in borehole; unable to run impellor flowmeter.	
Logged Interval: (m)	0.0 - 50.4 (75.7)		
Fluid Level: (m)	5.7		

BOREHOLE RECORD

CASING RECORD

Bit: (mm)	From: (m)	To: (m)	Type	Size: (mm)	From: (m)	To: (m)
146	0.0	80.0	Steel	150	-1.0	45.0

