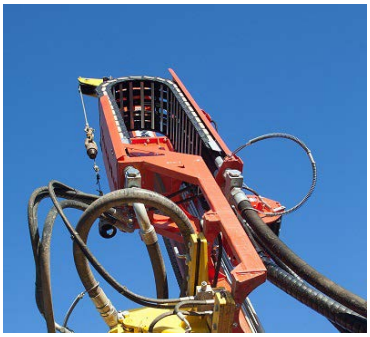
REPORT NO: D8044/IR

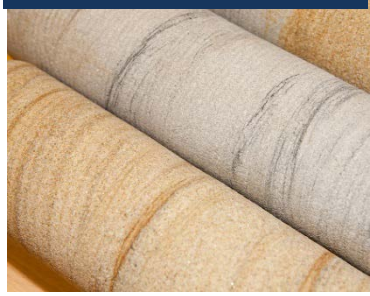
GEOENVIRONMENTAL APPRAISAL FOR LAND AT

International Advanced Manufacturing Park Phase 1

PREPARED FOR:

SUNDERLAND CITY COUNCIL.





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Contract No.	D8044/IR
Job Name	International Advanced Manufacturing Park Phase 1

REPORT REVISIONS

Revision No.	Issue Date	Details
D8044/IR/01	07.02.18	Geoenvironmental Report

VERIFICATION

Revision No.	Issue Date		Written By	Checked By	Verified By
D8044/IR/01	07.02.18	**Initials**	KJ	AIL	AIL
		Signature			

INTERNATIONAL ADVENCED MANUFACTURING PARK, PHASE 1, SUNDERLAND – EXECUTIVE SUMMARY

SUMMARY OF GEOENVIRONMENTAL ISSUES

Issue	Remarks
Grid Reference	433587,559064
Proposed Development	Commercial units.
Former Uses	Agricultural land.
Present Uses	Agricultural land.
Made Ground	Up to 3m in the southeast of the site.
Natural Ground	Firm and stiff clays, with areas of lamination. Discontinuous strata of soft clays were encountered across the site at depths between 2.3m and 12.6m bgl, with thicknesses ranging from 0.9m to 8.6m bgl.
Contamination	No significant contamination identified during this investigation, speciated PAH testing is recommended.
Hazardous Gas	A gas risk assessment will be provided on completion of the monitoring period.
Mining & Quarrying	No evidence has been found to suggest the site is underlain by coal workings as shallow depth (<30m bgl). No evidence has been found to suggest the site is affected by quarrying.
Foundation Solution	Shallow foundations may be possible for lightly loaded structures. A piled foundation solution should be considered for larger loads, and where deep made ground is encountered.
Groundwater & Excavations	Groundwater was encountered at depths of between 4.9m and 18.0m bgl in the boreholes. Groundwater monitoring has been carried out following the completion of fieldwork, and standing water has been recorded at depths from 0.33m bgl
Flooding	Not within an indicative flood plain.
Drainage	An inferred infiltration rate has been calculated ranging from 3.52×10^{-7}m/s to 5.33×10^{-7}m/s.
Highways	A CBR of at least 3% should be achievable within natural clay, dried to within optimum moisture content.
Remediation and Preparatory Works	Local levelling of site / retaining wall construction.
Further Work	A plot specific site investigation is recommended, in order to finalise foundation options.

The executive summary is intended as a synopsis only. Further detail and limitations of the assessment is provided within the main body of the Report

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APPENDIX A - Drawings

Drawing Number	**Drawing Title**
D8044/01	Site Location Plan
D8044/02	Exploratory Hole Location Plan
D8044/03	Conceptual Site Model
D8044/04	Site area plan
D8044/AA’	Cross-section AA’
D8044/BB’	Cross-section BB’

APPENDIX B - Exploratory Hole Records

APPENDIX C - Chemical Testing Results

APPENDIX D - Geotechnical Testing Results (Including Soakaway Test Results)

APPENDIX E - Gas Monitoring Results

APPENDIX F - Dunelm Conditions of Offer, Notes on Limitations & Basis for Contract

1 INTRODUCTION

1.1 SCOPE OF INVESTIGATION

Dunelm Geotechnical and Environmental Limited (Dunelm) carried out a Geoenvironmental Appraisal of land at International Advanced Manufacturing Park (IAMP), Phase 1, Sunderland on behalf of Sunderland City Council.

It is proposed to develop the site with industrial units. The site is part of a larger development plan, and this report covers the first phase of the site to be developed.

Dunelm have previously produced a Factual Report (Ref D8044) dated January 2018. Reference should be made to this report for details of the exploratory holes advanced across the wider area, incorporating the investigation undertaken for this first phase of development.

WSP Parsons Brinkerhoff have previously produced a Geotechnical Desk Study Constraints Report dated March 2016. Reference should be made to this report for details of the site's history and environmental setting. A summary of the main findings of the desk study report is provided in Section 4.

The objectives of this exploratory phase of investigation were as follows:

- To determine the ground conditions beneath the site.
- To assess risks from ground contamination.
- To provide recommendations for foundations.

This report may be regarded as providing a d Generic Quantitative Risk Assessment in accordance with the Environment Agency's guidance document Model Procedures for the Management of Land Contamination (Contaminated Land Report 11, 2004).

This report is for the exclusive use of Sunderland City Council and their agents. No third party may rely upon, or reproduce, the contents of this report without the written approval of Dunelm.

This report is based on the data obtained from the exploratory holes and from the subsequent tests carried out. There is always a possibility of variation in the ground conditions between boreholes. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of the findings is conjectural and given for guidance only, and confirmation of intermediate ground conditions should be considered if deemed necessary. Dunelm's Standard Conditions and Notes on Limitations are included in Appendix F.

2 SITE RECONNAISSANCE

2.1 GENERAL

The centre of the site is located at OS Grid Ref 433587,559064. The site is situated approximately 6km northwest of Sunderland city centre. The site location is shown in Drawing Number D8044/01 in Appendix A to this report.

This report covers the first phase of development within the wider site area. The site area covered by this report is shown on drawing D8044/04 in Appendix A.

2.2 TOPOGRAPHY AND SITE FEATURES IN PHASE 1 AREA

The site has a gentle slope from the northern boundary towards to the south.

The site is currently used for agricultural uses, and is predominantly open fields covered in rough grass or short crops.

The site boundaries currently comprise timber fences and hedgerows, with occasional mature trees.

The River Don is located along the northwestern boundary of the site.

The A1290 boundaries the site to the southeast.

3 GEOLOGICAL SETTING

3.1 INFORMATION SOURCES

The geological setting of the site was determined through reference to the following:

- British Geological Survey (BGS) 1: 50,000 scale sheet No 21 Sunderland.
- 1:10,000 scale sheet NZ35NW
- BGS borehole logs.

3.2 GEOLOGY

The site is shown to be underlain by drift deposits comprising Upper (Pelaw) Clay deposits.

The solid geology underlying the site comprises Middle Coal Measures strata of the Carboniferous Period, with Upper Coal Measures in the northeast corner of the site. The strata dip towards the east.

The geological plan shows the site to be underlain by the Top Hebburn Fell seam which is shown to outcrop to the southwest of the site and dip to the east beneath the site. The thickness of the seam is up to 0.81m.

BGS historical borehole logs are available for the site. BGS borehole NZ35NW1586 located in the east of the site at NGR 433672, 559354 recorded made ground to a depth of 1.65m bgl, overlying stiff clay, laminated from 5.6m bgl, to a depth of >10m bgl. BGS borehole NZ35NW1585 located in the east of the site at NGR 433942,559463 recorded made ground to a depth of 1.60m bgl, overlying stiff clay, laminated from 7.1m bgl, to a depth of >10m bgl.

An un-named fault is shown adjacent to the southwest corner of the site, with a downthrow to the northeast. In addition, the Claxheugh Fault is located adjacent to the northeast corner of the site with a downthrow to the southwest.

4 PREVIOUS INVESTIGATION

Dunelm have examined the following reports: Sunderland IAMP Geotechnical Desk Study Constraints Report produced by WSP Parsons Brinkerhoff dated March 2016, covering the area of the larger development plan. A summary of the information relating to the Phase 1 area of investigation is shown in the Table below together with the main findings.

Summary of Desk Study Findings

Item	Main findings
Current and recent site uses (at time of report)	The site has remained predominantly agricultural fields since the earliest published maps. The 'Pontop & South Shields' (PSS) railway line crossed the south-eastern corner of the site until prior to 1977, following the route of the modern-day A1290. The River Don is located along the northwestern site boundary. Overhead power lines are present through the north of the site from 1975. A search for further information revealed that the aerodrome present south of the site was RAF Usworth and has been present since 1916, despite not being shown on historic maps.
UXO Risk	Due to the location of the RAF site to the south of the site, a detailed UXO desk study was recommended.
Waste	There are no recorded historical landfill sites within 250m of the Phase 1 site area.
Radon	BGS advise that no radon protection measures are required for new dwellings or extensions.
Geology	Expected sequence: Made ground (clay fill) is anticipated across most of the site. Natural superficial soils at the site

	comprise Upper (Pelaw) Clay. Solid geology is anticipated to be Coal Measures Strata, depth to rock head is noted to be variable.
Mining	The Coal Authority Mining Report indicates that the site is in the likely zone of influence from workings in 8 seams of coal at 190m to 570m depth. Geological maps and memoirs indicate unrecorded workings of shallow coal may be present underlying the site in the Top Hebburn Fell seam.
Hydrology	The River Don is located along the northwestern boundary of the site, and there is a risk of surface water flooding in this area.
Discharge consents	There are multiple sewage discharge consents affecting the site.
Hydrogeology	Solid strata beneath the site are classified as a Secondary (A) Aquifer. The site does not lie within a source protection zone.
Surrounding land uses	Predominantly agricultural land uses, with residential and industrial land uses in recent years.
Gas	Potential sources of gas include possible shallow mine workings.

5 SITE WORKS AND LABORATORY TESTING

5.1 CONCEPTUAL SITE MODEL

A preliminary conceptual site model, including an assessment of potential pollutant linkages, has been determined based on the desk study information and is presented in the Geotechnical Desk Study Constraints report.

The site has been occupied previously and it is possible that contamination is present associated with the site's previous use as agricultural land, and adjacent railway sidings.

The main receptors include future site users.

5.2 SUMMARY OF INVESTIGATION

The ground investigation strategy was designed by AECOM.

The exploratory holes listed below were advanced between July and September 2017. Records for each of the exploratory holes noted are included in Appendix B and the locations are shown on Drawing Number D8044/02 in Appendix A.

Number	Exploratory Hole Label	Method	Depth Range (m)
14	BH17, BH24-BH25, BH28, BH31, BH38-BH40, BH45-BH49, BH50.	Cable Percussive Boring with Rotary Core Drilling	11.85-31.20
2	BH16, BH16A	Cable Percussive Boring	9.00-15.30
1	BH16B	Rotary Open Hole Boring with Rotary Core Drilling	22.30
18	CPT14-CPT16, CPT19, CPT22, CPT27, CPT28, CPT28A, CPT28B CPT29, CPT30, CPT31, CPT31A, CPT31B, CPT31C, CPT32, CPT32B, CPT33.	Cone Penetration Testing	3.29-16.79
6	TP10, TP13, TP16, TP16A, TP19, TP25.	Machine Excavated Trial Pit	1.00-4.70
4	TPS-01 to TPS-04	Machine Excavated Trial Pit with Soakaway Testing	2.00-2.10
	CPTM-04 to CPTM-09	Hand excavated trial pits with Magnetometer UXO clearance	1.2 deepened with magnetometer clearance

Multiple attempts were required for BH16, CPT04, CPT28, CPT31 and TP16 due to obstructions being encountered. On completion all exploratory positions were backfilled immediately in accordance with instructions from AECOM, except where described below.

Guidance contained in the following Standards has been followed during the investigation work as appropriate: BS5930:2015 incorporating Amendment 1, BS10175:2011+A1:2013; BS1377:1990; BS EN ISO 14688:2004 + A1:2013 and BS EN ISO 14689:2003.

5.3 CHEMICAL TESTING

Appropriate samples were delivered to a suitably accredited laboratory with a schedule of testing drawn up by AECOM. The laboratory test results are presented in Appendix C to this report and discussed in Section 8.

5.4 GEOTECHNICAL TESTING

Samples of natural soil were delivered to a geotechnical laboratory with a schedule of testing drawn up by AECOM. The geotechnical laboratory test results are presented in Appendix D to this report. Material properties assessed using the results are considered further in the following Section.

6 GROUND CONDITIONS & MATERIAL PROPERTIES

6.1 GENERAL

Strata encountered were generally similar beneath all parts of the site. Ground conditions are described in the following sections. Two cross-sections have been produced, southwest to northeast trending section A to A', and northwest to southeast trending section B to B'; these are included in Appendix B.

6.2 TOPSOIL

Topsoil up to 0.6m thick was encountered across the site. The topsoil was generally free of debris. However, fragments of brick were encountered in BH38, BH47, CPT29, CPT28, CPTM4, CPTM6, TP10 and TP16A and fragments of clay tiles TP25.

6.3 MADE GROUND

Made ground was encountered in BH28 to a depth of 3.0m bgl, BH31 to a depth of 1.7m bgl in the southeast of the site. The made ground generally consisted of reworked clays with fragments of brick.

6.4 BURIED OBSTRUCTIONS

Buried obstructions were not encountered during this investigation, but may be present elsewhere on site. In addition, there is a risk of UXO, and associated obstructions may be present across the site.

6.5 NATURAL SOILS

The natural soils at the site were found to vary considerably in description and geotechnical properties.

In general the soils comprised firm and stiff, occasionally laminated, clays to depths of at least 19m bgl. However, it is noted that softened clays were also encountered as discontinuous layers across the site varying in thickness from 0.9m to 8.6m and encountered at depths of between 2.3m to 12.6m bgl.

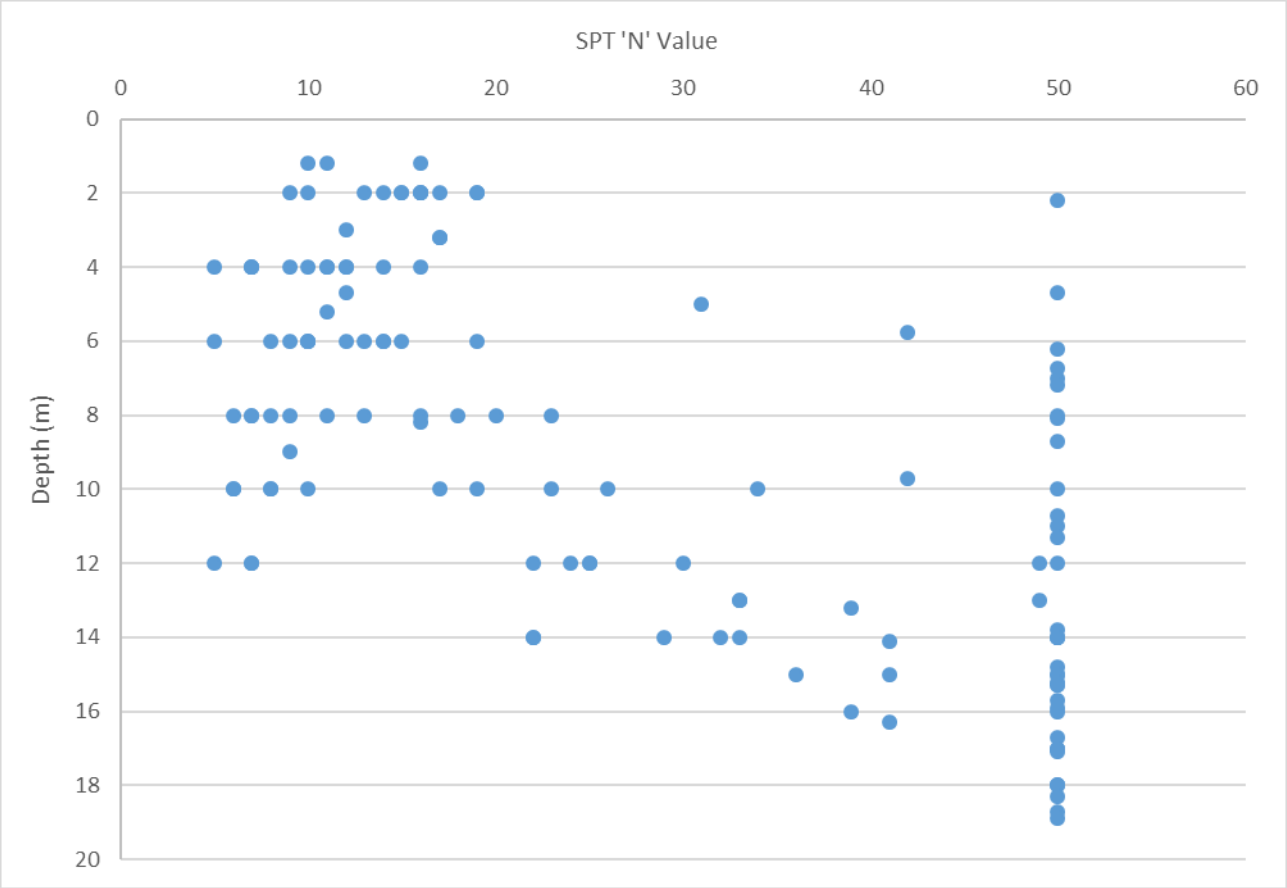
In addition, strata of medium dense and dense sand was encountered in BH16, 16B and 17 in the northeast corner of the site, at depths between 7m and 16m bgl, typically 1-2m thick.

SPT 'N' values within the firm and stiff clays ranged from 10 to >50, with the majority of values between 12 and 18, confirming the generally firm and stiff nature of the deposits. Wherever high SPT 'N' values were encountered, it is considered this could represent a possible cobble/boulder.

Where soft deposits were encountered, SPT'N' values for between 5 and 10 were recorded, confirming their soft nature.

SPT 'N' values within the granular deposits of 13 and 39 were recorded, confirming them as generally medium dense and dense.

In general, the strength of the soils increases with depth, with exception of the discontinuous softened layers. A summary of the SPT 'N' values against depth is plotted on the graph below.



Firm and Stiff Clays (locally softened layers)

Particle size distribution tests within the firm and stiff clays confirm the material is generally a silty, slightly sandy, slightly gravelly clay and silt.

Moisture content values within the firm and stiff clays ranged from 7.6% to 41%, together with plasticity index values between 9 and 53 suggest the clay is of variable low to high plasticity and low to high volume change potential, based on the modified plasticity index.

Quick Undrained Triaxial test results recorded shear strength values ranging from 30kPa to 176kPa, suggesting the clay is of variable low to very high strength, with the majority of values showing the clay to be of medium and high strength. This is consistent with the visual descriptions. Where low shear strength values (<40kPa) were recorded, these were within the softened clays or from samples taken within firm and stiff clays where the localised laminated nature caused the sample to fail early and as such is not representative of the deposit as a whole.

Consistency index values also confirm the clay to be of variable strength, from locally very soft, to very stiff.

One dimensional consolidation tests suggest the clay has a coefficient of volume compressibility value for effective overburden pressure plus 100kPa of between 0.046m^2/MN and 0.21m^2/MN, suggesting the clay is of variable very low to medium compressibility.

Dry density/moisture content relationship indicates the maximum dry density ranges from 1.66Mg/m^3 to 2.56Mg/m^3 with the optimum moisture ranging from 9.1% to 21%.

6.5.1 CORRELATED CPT PARAMETERS IN SOIL

CPT data was collected by IN SITU Site Investigation from locations as specified by AECOM. Ground conditions and parameters summarised below have been correlated with ground conditions extrapolated from nearby exploratory hole locations. The results are included in Appendix D.

Shear Strength and Relative Density, s_u and D_r

Values of relative density in cohesionless soils and shear strength in cohesive soils were taken from the IN SITU CPT logs. To estimate undrained shear strength, IN SITU used the classical approach of:

$$c_u = \frac{q_n}{N_{kt}}$$

Where c_u is the estimated undrained shear strength calculated from corrected cone resistance, q_n, and the correlation factor N_{kt}, assumed as 15, 17 and 20 to provide upper, median and lower shear strength estimates.

Undrained shear strengths generally increased with depth, and are consistent with the laboratory derived shear strengths, with shear strengths in the cohesive deposits ranging from ~40kPa to >150kPa, with the majority of the deposits interpreted at firm. The CPT data recorded areas of soft deposits, but soft deposits were noted to be limited to occasional isolated thin bands.

For relative density, the classic approach of Jamiolkowski et al. (2001) will be considered. Based on the results, granular deposits were found to be generally medium dense in nature. This agrees with the findings of the borehole data.

6.6 ROCK HEAD

Sandstone, mudstone and siltstone rock was encountered in rotary cored boreholes at depths of between 5.8m and 19.0m bgl across the site.

Point load tests within the rock gives derived UCS values between 0.46MPa for the weak mudstone and 148MPa for the strong sandstone. UCS tests within the rock give derived values between 6.01MPa and 32.2MPa for the mudstone and 24.9MPa to 44.3MPa for the sandstone were recorded. A UCS design value of 0.6MPa can be used for the weathered mudstone rock head, based on the above results and the engineers' description as weak and very weak. A UCS design value of 10MPa can be used for the weathered sandstone rock head, based on the above results and the engineers' description as generally medium strong.

6.7 EXCAVATION STABILITY

During excavation of the trial pits, the side walls were observed to be generally stable, becoming unstable in granular deposits.

6.8 GROUNDWATER

Groundwater was encountered at depths of between 4.9m and 18.0m bgl in the boreholes. Groundwater monitoring has been carried out following the completion of fieldwork, and the groundwater levels recorded are shown in Appendix E. Standing water has been recorded at depths from 0.33m bgl.

6.9 HYDROCARBON CONTAMINATION

No visual or olfactory evidence of hydrocarbon contamination was noted during the investigation.

6.10 CONCRETE IN AGGRESSIVE GROUND

To enable buried concrete to be designed to resist sulfate attack, samples of made ground and natural strata from depths corresponding to the anticipated foundation depth have been tested for water-soluble sulfate

and pH.

The maximum water-soluble sulfate concentration is 393mg/l and the lowest recorded pH value is 6.1. Total potential sulfate values of <0.24% have been recorded.

Based on the above results, Design Sulfate Class DS-1 and ACEC Classification AC-2z would be appropriate for buried concrete at the site, as groundwater is assumed to be mobile.

6.11 SOAKAWAY TESTS

Soakaway tests have been carried out in TPS-01 to TPS-04 within the natural clay in general accordance with the methods outlined in BRE Digest 365. The tests in MBH2 failed, as the water did not fully soakaway. Where possible, an in inferred infiltration rate has been calculated ranging from $3.52x10^{-2}$m/s to $5.33x10^{-2}$m/s. The results are included in Appendix D.

7 MINING

7.1 SCOPE OF MINING INVESTIGATION

The desk study report indicates that the site may be affected by unrecorded shallow workings in the Top Hebburn Fell seam. Therefore, 17 rotary cored boreholes were advanced at the site.

The results of the mining investigation are discussed below.

7.2 RESULTS

The strata encountered in the rotary boreholes are shown in the table below.

PH	Depth to Rockhead /m	Depth of borehole	Depth to Coal /m	Thickness of Coal /m	Remarks
BH16B	16.53	22.3	NA		No coal encountered
BH17	17.0	24.2	NA		No coal encountered
BH24	16.25	21.5	NA		No coal encountered
BH25	16.2	22.9	NA		No coal encountered
BH28	14.0	28.85	18.98	0.07	Coal too thin to be worked
BH28	14.0	28.85	19.35	0.1	Coal too thin to be worked
BH28	14.0	28.85	25.07	0.13	Coal too thin to be worked
BH31	19.0	24.7	NA		No coal encountered
BH38	14.7	21.6	NA		No coal encountered
BH39	10.9	16.75	NA		No coal encountered
BH40	5.8	11.85	NA		No coal encountered
BH45	13.6	19.10	NA		No coal encountered
BH46	7.9	30.6	NA		No coal encountered
BH47	14.8	20.7	NA		No coal encountered
BH48	18.0	23.5	NA		No coal encountered
BH49	6.0	30.3	6.7	0.05	Coal too thin to be worked
BH50	11.4	31.2	NA		No coal encountered

The coal encountered in the boreholes is considered to represent discontinuous pockets of coal. It is considered that the Top Hebburn Fell seam is at a depth of >31.2m bgl. Given the depth to rock head (5.8m to 19.0m bgl), there is considered sufficient rock cover to mitigate against workings in the Top Hebburn Fell seam, should they be present, at a depth of >31.2m below the site, and with a thickness of up to 0.81m.

8 CHEMICAL TESTING RESULTS

8.1 SELECTION OF CHEMICAL TESTING

This section represents the 'Hazard Identification' process required in accordance with CLR11.

Contaminants identified in association with the former site uses have been discussed in Geotechnical Desk Study Constraints Report.

Significant thicknesses of made ground were encountered in the southeast of the site up to 3.0m bgl.

Chemical testing, as scheduled by AECOM, has been undertaken taking into account potential contaminants identified and evidence of contamination recorded during the ground investigation.

Laboratory test certificates are presented in Appendix C to this report. The test results are presented in the following sections.

8.2 GENERIC ASSESSMENT CRITERIA FOR INORGANIC CONTAMINATION

Generic Assessment Criteria (GAC) appropriate to current UK practice for the assessment of inorganic contamination are shown in the table below. These criteria are dependent on the nature of the proposed development. In addition, some contaminants depend on other soil parameters as shown.

GENERIC ASSESSMENT CRITERIA FOR HUMAN HEALTH

All values in mg/kg	Residential (based on 6% SOM)	Residential without homegrown produce (based on 6% SOM)	Commercial (based on 6% SOM)	Allotments (based on 6% SOM)	Public Open space (resi) (based on 6% SOM)
Arsenic	37	40	640	43	79
Boron	290	11,000	240,000	45	21,000
Barium	NA	1,300**	22,000**	NA	NA
Cadmium	11	85	190	1.9	120
Chromium (Total)	910	910	8,600	18,000	1,500
Chromium (VI)	6	6	33	1.8	7.7
Copper	2,400	7,100	68,000	520	12,000
Lead	200*	310*	2,330*	80*	No SSV
Mercury	40	56	1,100	19	120
Nickel	130	180	980	53	230
Selenium	250	430	12,000	88	1,100
Zinc	3,700	40,000	730,000	620	81,000

Soil Screening Values from The LQM/CIEH S4ULs for human Health Risk Assessment (2015). *taken from DEFRA C4SL database. **taken from EIC / AGS / CL:AIRE Generic Assessment Criteria

GENERIC ASSESSMENT CRITERIA FOR PHYTOTOXIC EFFECTS ON PLANTS

Contaminant	Maximum Permissible Concentration from MAFF *The Soil Code* (1998) (mg/kg)
Copper (soil pH 5.0-5.5)	80
Copper (soil pH 5.5-6.0)	100
Copper (soil pH 6.0-7.0)	135
Copper (soil pH >7.0 & $CaCO_3$ > 5%)	200
Zinc (soil pH 5.0-7.0)	200
Zinc (soil pH >7.0 & $CaCO_3$ > 5%)	300

8.3 TOPSOIL

A summary of the results of inorganic testing on topsoil samples is shown in the table below.

INORGANIC TEST RESULTS- TOPSOIL

Contaminant	Units	No. of topsoil samples tested	No. of samples exceeding GAC	Generic Assessment Criteria	Max concentration above GAC
pH	-	9	0	5-11	-
Arsenic	mg/kg	9	0	640	-
Boron	mg/kg	9	0	240,000	-
Barium**	mg/kg	9	0	22,000	-
Cadmium	mg/kg	9	0	190	-
Chromium (Total)	mg/kg	9	0	8,600	-
Chromium (VI)	mg/kg	9	0	33	-
Lead*	mg/kg	9	0	2,330	-
Mercury	mg/kg	9	0	1,100	-
Nickel	mg/kg	9	0	980	-
Selenium	mg/kg	9	0	12,000	-
Copper (GAC from MAFF)	mg/kg	9	0	135	-
Zinc (GAC from MAFF)	mg/kg	9	0	200	-
Asbestos	-	9	0	Present	-

Soil Screening Values from The LQM/CIEH S4ULs for human Health Risk Assessment (2015). *taken from DEFRA C4SL database.

Based on the above results, the topsoil has not been found to contain significantly elevated concentrations of the inorganic determinants tested.

8.4 MADE GROUND (INORGANIC CONTAMINANTS)

A summary of the results of inorganic testing on made ground samples is shown in the table below.

INORGANIC TEST RESULTS – MADE GROUND

Contaminant	Units	No. of made ground samples tested	No. of samples exceeding GAC	Generic Assessment Criteria	Max concentration above GAC
pH	-	2	0	5-11	-
Arsenic	mg/kg	2	0	640	-
Boron	mg/kg	2	0	240,000	-
Barium**	mg/kg	2	0	22,000	-
Cadmium	mg/kg	2	0	190	-
Chromium (Total)	mg/kg	2	0	8,600	-
Chromium VI	mg/kg	2	0	33	-
Lead*	mg/kg	2	0	2,330	-
Mercury	mg/kg	2	0	1,100	-
Nickel	mg/kg	2	0	980	-
Selenium	mg/kg	2	0	12,000	-
Copper	mg/kg	2	0	68,000	-
Zinc	mg/kg	2	0	730,000	-
Asbestos	-	2	0	Present	-

Soil Screening Values from The LQM/CIEH S4ULs for human Health Risk Assessment (2015). *Taken from DEFRA C4SL database.
**taken from EIC / AGS / CL:AIRE Generic Assessment Criteria

8.5 ASBESTOS TESTING

Asbestos was not detected in the samples where tested.

8.6 CALORIFIC VALUE TESTING

Results from Calorific Value (CV) testing on made ground ranged from 0.258MJ/kg to 2.92MJ/kg with an average of 1.4MJ/kg. ICRCL Document 61/84 *Notes on the fire hazards of contaminated land* (July 1986) comments as follows: "materials whose CVs exceed 10 MJ/kg are almost certainly combustible, while those with values below 2 MJ/kg are unlikely to burn".

Since recorded calorific values are towards the lower end of the range noted in the ICRCL guidance, combustion of the made ground is not considered likely.

8.7 ORGANIC CONTAMINATION

The selection of hydrocarbon (organic) testing was based on the conceptual model and the assessment of potential contamination sources presented in earlier sections of this report.

Samples of made ground and topsoil were tested for the following:

- Benzene, toluene, ethylbenzene and xylenes (BTEX compounds).
- Methyl tertiary butyl ether (MTBE).
- 13 petroleum hydrocarbon fractions based on the methodology of the United States Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG).

A summary of the results of the BTEX testing is shown in the table below.

SUMAMRY OF BTEX RESULTS

Sample Location & depth (m)	Material	Contaminant Concentrations (SGV shown below in brackets) mg/kg			
		Benzene	Toluene	Ethyl Benzene	Xylenes [1]
		(0.33)	(610)	(350)	(230)
BH24 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH28 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH28 0.5	Made ground	<1.0	<1.0	<1.0	<1.0
BH31 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH31 0.7	Made ground	<1.0	<1.0	<1.0	<1.0
BH38 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH45 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH46 0.2	Topsoil	<1.0	<1.0	<1.0	<1.0
BH47 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
BH48 0.1	Topsoil	<1.0	<1.0	<1.0	<1.0
TP10 0.2	Topsoil	<1.0	<1.0	<1.0	<1.0

All figures are Environment Agency Soil Guideline Values (SGVs).

[1] Lowest value used of SGVs for *o*-xylene, *m*- xylene and *p*-xylene.

The results show that no significant BTEX concentrations have been recorded during this investigation.

All the samples tested for MTBE recorded values below the laboratory detection limit.

Results for the 13 petroleum hydrocarbon fractions are presented in the table below together with appropriate generic assessment criteria.

SUMMARY OF RESULTS FOR PETROLEUM HYDROCARBON FRACTIONS

	Aromatic fractions							Aliphatic fractions					
EC bands	**5-7**	**7-8**	**8-10**	**10-12**	**12-16**	**16-21**	**21-35**	**5-6**	**6-8**	**8-10**	**10-12**	**12-16**	**16-35**
GAC (residential with plant uptake) mg/kg	70	130	34	74	140	260	1,100	42	100	27	130	1,100	65,000
GAC (residential without plant uptake) mg/kg	370	860	47	250	1,800	1,900	1,900	42	100	27	130	1,100	65,000
GAC (allot) mg/kg	13	22	8.6	13	23	46	370	730	2,300	320	2,200	11,000	260,000
GAC (comm) mg/kg	26,000	56,000	3,500	16,000	36,000	28,000	28,000	3,200	7,800	2,000	9,700	59,000	1,600,000
GAC (Public Open Space)	56,000	56,000	5,000	5,000	5,000	3,800	3,800	570,000	600,000	13,000	13,000	13,000	250,000
Sample location & depth (m bgl)	**Recorded concentrations (mg/kg) -** exceedances in **bold**												
BH24 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	13	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH28 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH28 0.5	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH31 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	16	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH31 0.7	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH38 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH45 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH46 0.2	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
BH47 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	17	<0.001	<0.001	<0.001	<1.0	<2.0	<20
BH48 0.1	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16
TP10 0.2	<0.001	<0.001	<0.001	<1.0	<2.0	<10	<10	<0.001	<0.001	<0.001	<1.0	<2.0	<16

Soil Screening Values from the LQM/CIEH S4ULs for Human Health Risk Assessment (2015) for a 1% SOM soil, for a commercial after use.

The above assessment of the 13 petroleum hydrocarbon fractions indicates that no significant TPH concentrations have been recorded during this investigation.

Appropriate samples were tested for soil organic matter Fraction of Organic Carbon and the results ranged from2.0% to 6.4% in the topsoil and 1.8% to 4.3% in the made ground.

An assessment of selected PAH compounds has been undertaken, based on total PAH values recorded. The Generic Assessment Criteria (GAC) from the LQM guidance for speciated PAH are shown below.

GENERIC ASSESSMENT CRITERIA FOR POLYCYCLIC AROMATIC HYDROCARBONS

Contaminant	**Generic Assessment Criteria** (mg/kg)				
	Resi with plant uptake	**Residential without home grown produce**	**Allot ments**	**Comm / industrial**	**Public Open Space**
Napthalene	2.3	2.3	4.1	190	4,900
Acenaphthylene	170	2,900	28	83,000	15,000
Acenaphthene	210	3,000	34	84,000	15,000
Fluorene	170	2,800	27	63,000	9,900
Phenanthrene	95	1,300	15	22,000	3,100
Anthracene	2400	31,000	380	520,000	74,000

Fluoranthene	280	1,500	52	23,000	3,100
Pyrene	620	3,700	110	54,000	7,400
Benzo(a)anthracene	7.2	11	2.9	170	29
Chrysene	15	30	4.1	350	57
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1
Benzo(k)fluoranthene	77	110	37	1,200	190
Benzo(a)pyrene	2.2	3.2	0.97	35	5.7
Indeno(1,2,3,-cd)pyrene	27	45	9.5	500	82
Dibenz(a,h)anthracene	0.24	0.31	0.14	3.5	0.57
Benzo(g,h,i)perylene	320	360	290	3,900	640

Soil Screening Values from the LQM/CIEH S4ULs for Human Health Risk Assessment (2015) for 1% SOM soil.

Total PAH values were recorded for the made ground of <0.9mg/kg in BH31 at 0.7m bgl and 3.8mg/kg in BH28 at 0.5m bgl. Should the PAH encountered in BH28 at 0.5m bgl represent Dibenz(a,h)anthracene, then the made ground would be considered to contain significantly elevated PAH contamination and this would require further consideration. Further testing, including speciated PAH, is recommended to confirm the nature of the total PAH recorded.

Total PAH values were recorded in the topsoil ranging from <0.9mg/kg to 2.9mg/kg. Therefore, based on the total PAH values, the topsoil has not been found to contain significantly elevated PAH contamination.

Samples of topsoil and made ground were tested for selected polycyclic aromatic hydrocarbon (PAH) compounds.

An assessment of selected PAH compounds was not scheduled by AECOM, but would be recommended during the second phase of investigation.

Samples of topsoil and made ground were tested for phenol. The results indicate that no samples had concentration above the LQM/CIEH S4ULs (760 mg/kg).

9 ASSESSMENT OF CONTAMINATION RISKS

9.1 SUMMARY OF CONTAMINATION SOURCES

TOPSOIL

Topsoil up to 0.6m thick is present across the site. Testing has indicated that this material does not contain elevated concentrations of the determinands tested.

MADE GROUND

The southeast of the site is underlain by a layer of cohesive made ground up to 3m thick.

Testing has indicated that this made ground does not contain elevated concentrations of inorganic contaminants.

HYDROCARBON CONTAMINATION

No significant hydrocarbon contamination was encountered during this investigation. However, PAH testing of the soils is recommended.

9.2 HAZARD ASSESSMENT

No sources of contamination have been encountered during this investigation to based on the results to date and consequently no unacceptable risks have been identified; the revised conceptual site model is included in Appendix A.

Although asbestos and other contamination was absent from the soil samples in the exploratory holes, the

possibility exists that asbestos and other contamination may lie presently undetected at the site. It is therefore advised that a 'watching brief' is undertaken during the construction works and advice sought if asbestos or other contamination is found or suspected.

The above conclusions should be revised on completion of additional speciated PAH testing.

9.3 WASTE CLASSIFICATION

Waste Acceptance Criteria testing was carried out on samples of selected materials and the results are included in Appendix C. These test results should not be regarded as being representative of materials on site for landfill export purposes since preparatory and excavation works often result in mixing of different types of materials. It is therefore recommended that WAC testing from individual stockpiles is carried out immediately prior to transport to landfill sites.

The procedures to be followed in carrying out the assessment of potentially hazardous waste are set out in the following document:

- *Waste Classification: Guidance on the classification and assessment of waste (1st Edition 2015). Technical Guidance WM3, Environment Agency, 2015.*

9.4 WASTE ACCEPTANCE CRITERIA

In view of the above results samples of topsoil and made ground have been found to be non-hazardous.

Waste Acceptance Criteria testing was carried out on two samples of made ground and six samples of topsoil and the results are included in Appendix C. The result shows that the samples tested may be suitable for disposal at an inert landfill. However, loss on ignition values >10% were recorded in both the topsoil and the made ground, which may not be acceptable to an inert landfill, and the adopting landfill should be consulted. In addition, due to the nature of topsoil characteristically having a high organic matter content, the topsoil may not be accepted at an inert landfill, but could still be disposed of as non-hazardous.

The waste classification should be confirmed with the individual landfill accepting the waste prior to disposal. These test results should not be regarded as being representative of materials on site for landfill export purposes since preparatory and excavation works often result in mixing of different types of materials. In addition, further testing of individual stockpiles, including asbestos quantification, is recommended prior to transport to landfill sites.

It should be noted that the above conclusions relate to the specific samples tested during this investigation, and therefore, material excavated during re-development will not necessarily have the same classification. It is recommended that waste materials varying from the samples tested and intended to be removed from site are tested individually to determine the classification of the waste.

10 HAZARDOUS GAS

10.1 HAZARD IDENTIFICATION

The site is not in an area susceptible to radon emissions and as such no radon protection measures are required for new dwellings at the site.

Desk study information has indicated that the site could be affected by potential sources of gas including possible gas from abandoned mineworkings, however, the mining investigation has not encountered mine workings at shallow depth (<30m bgl).

Given the above, gas monitoring wells were installed in one borehole in this area of the site during the fieldwork. Details of the monitoring installations are shown on the exploratory hole records in Appendix E.

Three visits have been carried out to record methane and carbon dioxide concentrations and borehole flow rates in accordance with current guidance.

10.2 RESULTS AND DISCUSSION

No methane was detected. Carbon dioxide concentrations of up to 0.1% v/v were recorded.

Once the monitoring period is complete, the complete set of monitoring results will be provided together with a gas risk assessment report with recommendations for gas protection measures for new structures. It is essential that the monitoring wells are protected from damage during re-development works such as site clearance or demolition.

11 FOUNDATIONS AND GEOTECHNICAL ISSUES

11.1 INTRODUCTION

The proposed development is understood to consist of industrial units.

Ground conditions encountered during this investigation comprised topsoil up to 0.6m thick overlying made ground up to 3.0m thick in the southeast of the site consisting of reworked clays. The natural soils at the site consisted of generally firm and stiff, occasionally laminated, clays to depths of at least 19m bgl.

Soft deposits were encountered in BH24, 25, 31, 38, 40, 45 and 48 at depths between 2.3m and 12.6m bgl, with thicknesses ranging from 0.9m in BH25, up to 8.6m in BH31 at 3.5m bgl.

In addition, strata of medium dense and dense sand was encountered in BH16, 16B and 17 in the northeast corner of the site, at depths between 7m and 16m bgl, typically 1-2m thick.

Sandstone, mudstone and siltstone rock was encountered in rotary cored boreholes at depths of between 5.8m and 19.0m bgl across the site.

11.2 MINING

No evidence has been found to indicate that the site is underlain by coal workings at shallow depth.

No evidence has been found to indicate that the site has been affected by quarrying.

11.3 RETAINING WALLS

In view of the site topography, new development may involve the construction of small retaining walls. Guidelines in BS 8002 have been adopted to assist in determining geotechnical parameters for the natural clay soils.

For the design of retaining walls the following design parameters should be appropriate.

Material Type	Ø'	C'
Soft and/or laminated clay	22	0
Firm natural clay	26-28	0
Medium dense granular deposits	32	0

11.4 FOUNDATIONS

Due to the heterogeneous nature of the made ground, unacceptable total and differential settlements may occur if foundations are placed on made ground or soft deposits. Therefore, foundations should be taken through made ground and soft deposits onto underlying natural ground of adequate bearing capacity.

It is considered that strip or pad foundations may be suitable for lightly loaded structures at the site.

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-2z.

Where interbedded soft clays are present at relatively shallow depth, a safe bearing capacity of 60kN/m² has been determined for strip or pad foundations up to 2m wide founding on the natural firm clay at depths of around 1.0m bgl. At this width of foundation and bearing pressure settlements should be less than 25mm.

Based on plasticity index results, cohesive soils at the site have found to be of variable plasticity, therefore should be regarded as being of high volume change potential. Foundations should therefore be placed at a minimum depth of 1.0m below original or finished ground level, whichever is the lower. However, foundations may need to be deepened to found on natural ground of adequate bearing capacity.

Foundations near existing or proposed trees should be deepened and provided with appropriate heave precautions in accordance with NHBC Standards Chapter 4.2.

Overdeepened foundations should be stepped in accordance with current guidance.

Foundations should be taken below a line drawn up at 45° from the base of existing or proposed services or foundations.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

If the founding stratum is found to be variable, and particularly if it is found to consist both of clay and sand, the foundations should be reinforced to limit differential settlement.

It may be possible to achieve larger loads for shallow foundations; further investigation would be recommended on a plot by plot basis, to further delineate the extent of soft deposits and made ground.

Should shallow foundations not be suitable for larger loads, or for structures in the southeast of the site where made ground was encountered to 3.0m bgl, a piled foundation solution should be considered.

The nature and thickness of the deposits is such that piles should be end bearing on sandstone, mudstone or siltstone rock head. However the variable ground conditions at the site include compressible soils which may give rise to negative skin friction and a competent piling contractor should take this into account during the design; this may result in increased pile length. Piles should not come into influence distance of worked seams. Should pile length penetrate deeper than 20m bgl, further mining investigation may be required.

Cobbles and/or boulders could be present, which may represent a potential obstruction to piling.

Given the considerable variability of the natural ground both laterally and vertically, a detailed foundation schedule should be considered for the proposed development, once column loads have been finalised. The foundation schedule should provide plot-specific recommendations of foundation type together with the minimum founding depth, taking into account relevant factors including tree influence, founding strata, and weather a shallow foundation solution or piled foundation solution should be considered, based on column loads. Further investigation is recommended on a plot specific basis, to delineate the extent of soft deposits, and better characterise the soil profile.

Further advice should be sought from Dunelm if unexpected ground conditions are encountered during redevelopment.

11.5 FLOOR SLABS

In accordance with NHBC guidelines, suspended floor slabs should be adopted where made ground exceeds 0.6m in thickness.

Alternatively, in order to utilise ground bearing slabs, made ground could be removed from beneath the footprint of the buildings and a blanket of compacted granular fill placed in accordance with an engineering specification

subject to regulatory approval and validation.

Where significantly desiccated soil is present, or where foundation depths are to be increased to more than 1.5m due to the presence of trees, a suspended ground floor slab construction should be adopted. The suspended slab should have a minimum void height in accordance with NHBC Standards Chapter 4.2.

Given the depth of made ground in the southeast, and the presence of soft/loose deposits, a piled slab may be required in this area, or for larger loads.

11.6 BURIED OBSTRUCTIONS

Buried obstructions were not encountered during this investigation, but may be present elsewhere on site. In addition, there is a risk of UXO, and associated obstructions may be present across the site.

11.7 EXCAVATIONS

Observations made during the fieldwork and post siteworks monitoring indicate that groundwater flows would be anticipated in shallow excavations from 0.33m bgl. However, the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

Based on the results of this investigation the water table has been found to be relatively near the surface. It would therefore be prudent to allow for dewatering of the ground during the construction works.

Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97.

It is recommended that an adequate drainage system for surface water be installed by a competent contractor in order to prevent surface water ponding or collecting during and post construction, which may in turn lead to deterioration of the founding stratum.

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant although breaking out of obstructions should be anticipated.

12 EARTHWORKS

12.1 INTRODUCTION

Given the nature of the topography of the site, it is likely that earthworks operations will be undertaken on site, including;

- Excavation and stockpiling of cut material from the site
- Re-engineering of site generated materials to areas of the development

12.2 EARTHWORKS SPECIFICATION AND SITE VALIDATION

All earthworks required for the site development works are to be undertaken in accordance with an earthworks specification, this includes all site won materials and use of all imported materials.

All suitable excavation arisings generated by excavation of the ground shall be re-used as fill onsite where possible. These materials shall be assessed and validated for geotechnical works in accordance with an earthworks specification.

The validation of imported materials and identification and validation of contaminants within the site won materials will be required. Earthworks required for the site development works are to be undertaken in accordance with an earthworks specification, this includes all site won materials and use of all imported materials.

12.3 SITE WON MATERIALS

Materials excavated from the site are expected to include:

- Cohesive made ground (small quantity)
- Natural cohesive material

12.4 NATURAL SOILS

The natural soils at the site consisted of soft, firm and stiff clays to a depth of between 5.8m and 19.0m bgl.

Earthworks testing was carried out on the cohesive deposits. The results are included in Appendix D. The results show that the cohesive material from this location would be classified as a 2A wet cohesive fill in line with the Specification for Highways Works.

Dry density/moisture content relationship indicates the maximum dry density ranges from 1.66Mg/m^3 to 2.56Mg/m^3 with the optimum moisture ranging from 9.1% to 21%. The received moisture content for the samples tested ranged from 16% to 21%; one of the tests (TP25) is within 5% of the optimum moisture content. In all other locations, the clay would need drying to within 5% of the optimum moisture content before re-use.

Shear strength tests from hand vane results on samples with a moisture content within the optimum range recorded values of between 50kN/m² and >120kN/m^2 indicating the material should be suitable for re-use when dried.

12.5 GROUNDWATER

Groundwater has been recorded at a depth from0.33m bgl in monitoring visits post site works.

12.6 ASSESSMENT OF MATERIALS

Laboratory testing has indicated that the cohesive material would be classified as Class 2A (wet cohesive material), however, the classification of the clay may vary at different times of the year. The moisture content generally falls above the range PL-4 to 1.2PL, so it is likely the clay may require drying. Once the moisture is at acceptable limits (9.1-22.8%, with the maximum moisture content value being based on the average results of 1.2 times the plastic limit, and 0.5 times the liquid limit; the minimum moisture content value being based on the dry density/moisture content value tests). The re-use will be dependent upon the moisture content, onsite assessment/validation and weather conditions. At times of inclement weather, materials are likely to deteriorate quickly and achieving a lower moisture content may be difficult without the use of cement or lime stabilisation. Based on the acceptable moisture limits of 9.1-22.8% and the Moisture Condition Value (MCV) test results, it is recommended that MCVs between 10% and 21% are achieved for the re-used clay.

12.7 VALIDATION AND AUDIT PROCEDURE

The contractor shall appoint a suitably qualified engineer who will be responsible for auditing site earthworks operations. The responsibilities of the engineer will be as detailed in the following sections.

The engineer will be responsible for ensuring that the earthworks on site are carried out in accordance with the method statement.

The contractor will liaise with the regulatory and statutory authorities on environmental matters, as required, to ensure their satisfaction with the site works, and compliance with all planning consent conditions, licensing etc requirements.

The engineer will inspect the excavated and stockpiled material, and the cut and prepared ground surfaces, as stated in the method statement, to provide a visual assessment of the materials encountered.

The engineer will carry out the necessary sampling and laboratory analyses of material handled during the work in order to ensure compliance with the method statement.

The engineer will arrange insitu and laboratory testing, if unknown relic underground structures and tanks

are encountered.

The engineer will review documentary records to be provided by the contractor of the reclamation procedures carried out. This documentary evidence will include:

- Site diary of works.
- Plans and records of depths, lateral extent and nature of any contaminated materials encountered.
- Plans and records of in-situ and laboratory testing carried out.
- Plans and records of the re-use of site excavated fill materials reinstated on site.
- Plans and records of any 'imported' fill materials reinstated onsite.
- Plans and records of the natural soil arisings reinstated on site.
- Documentation for all wastes disposed of to landfill.
- Plans and records of any 'contaminated' fill materials reinstated on site.
- Plans and records of the lateral extent and thicknesses of the cover materials installed in landscaped areas.
- Documentation of all licences, consents, permits etc issued by the Statutory and regulatory authorities, and evidence of compliance with any requirement of the above.

12.8 ROAD PAVEMENT DESIGN

Remoulded CBR tests have been carried out on samples at moisture contents included in the dry density/moisture content relationship testing. CBR value of >3% should be assumed for highway construction within natural clays, dried to within optimum moisture content limits (10%-21%). Based on visual inspection and the results of plasticity index testing, a CBR value of 1% should be assumed for clays in their natural condition.

APPENDIX A

Drawings

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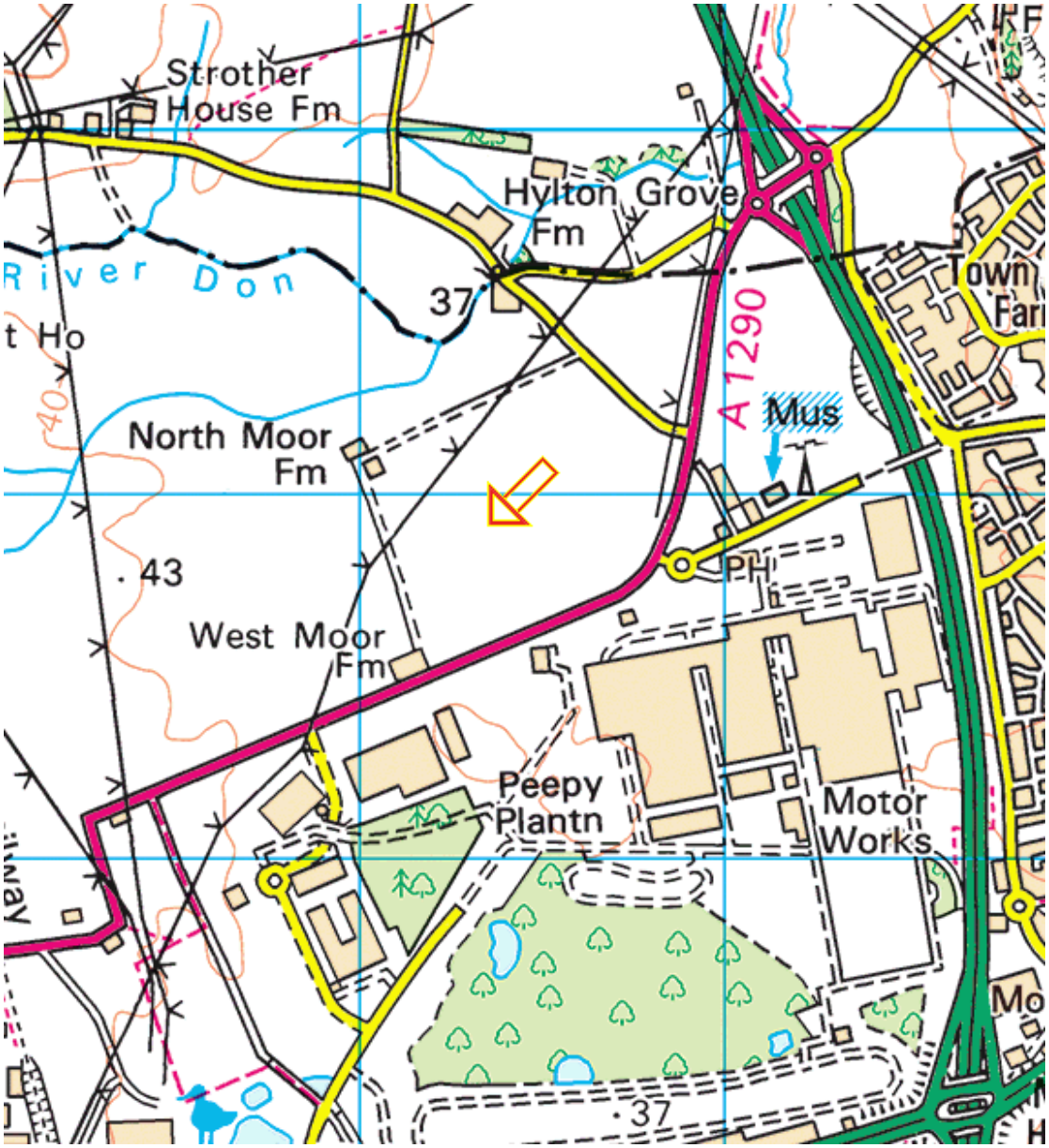

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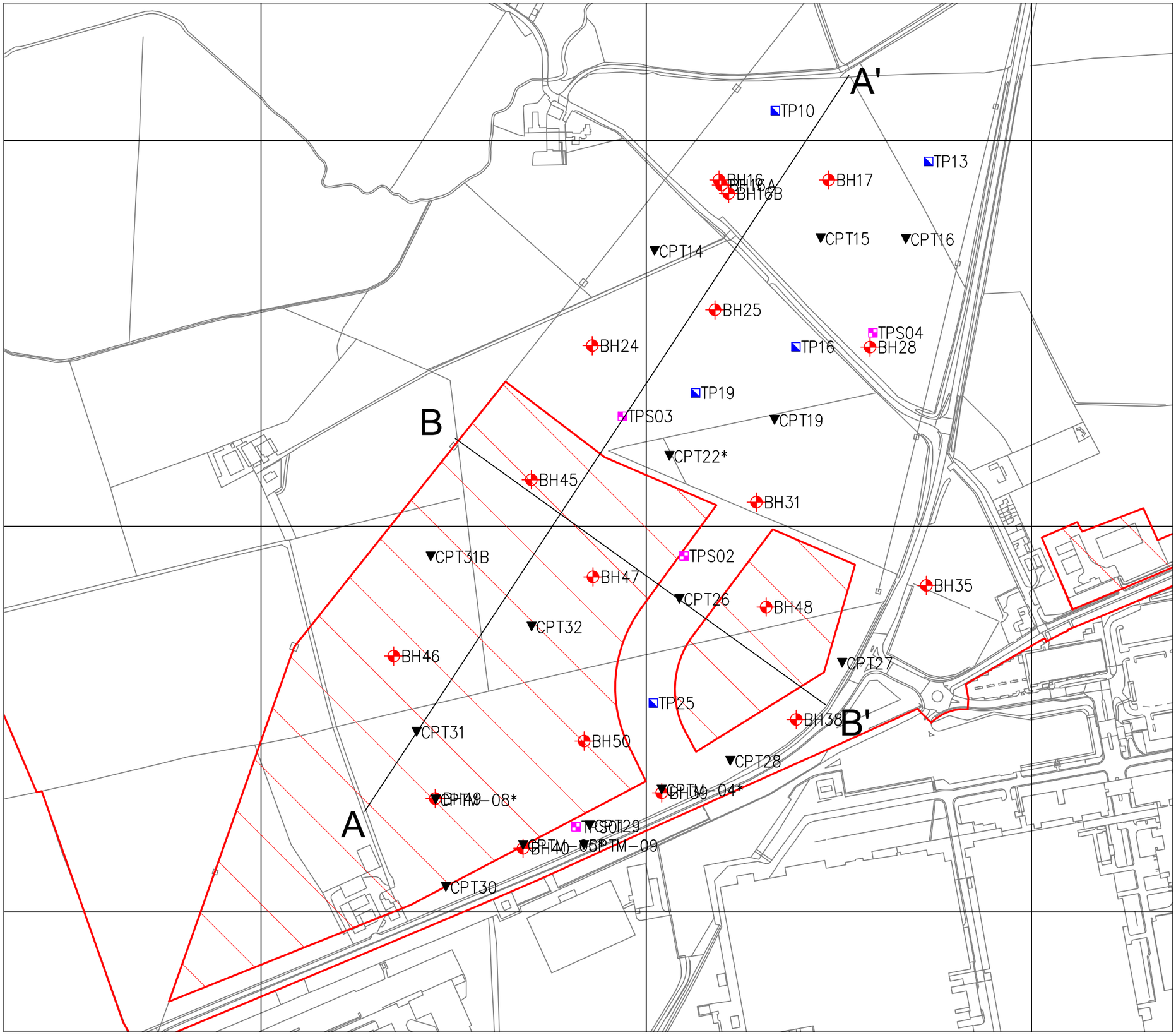
DUNELM GEOTECHNICAL & ENVIRONMENTAL	**Contract:** **IAMP Phase 1**			**Contract No:** **D8044**
	Client: **Sunderland City Council**			
TEL: 0191 378 3151 **FAX: 0191 378 3157**	**Drawing Title:** **Site Location Plan**			
Drawing No: **D8044/01**	**Date:** **February 2018**	**Scale:** **NTS**	**Status:** **Final**	**Drawn by:** **KJ**



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NOT TO SCALE: Contractor to check all dimensions on site before commencement of any works. No dimensions to be scaled from this drawing.

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NOTES:

- BH — Location of Cable Percussive Borehole
- CPT — Location of Cone Penetration Test
- RC — Location of Road Core
- TP — Location of Machine Excavated Trial Pit
- TPS — Location of Machine Excavated Soakaway Test

CLIENT:

SUNDERLAND CITY COUNCIL

PROJECT TITLE:

IAMP - PRELIMINARY GROUND INVESTIGATION

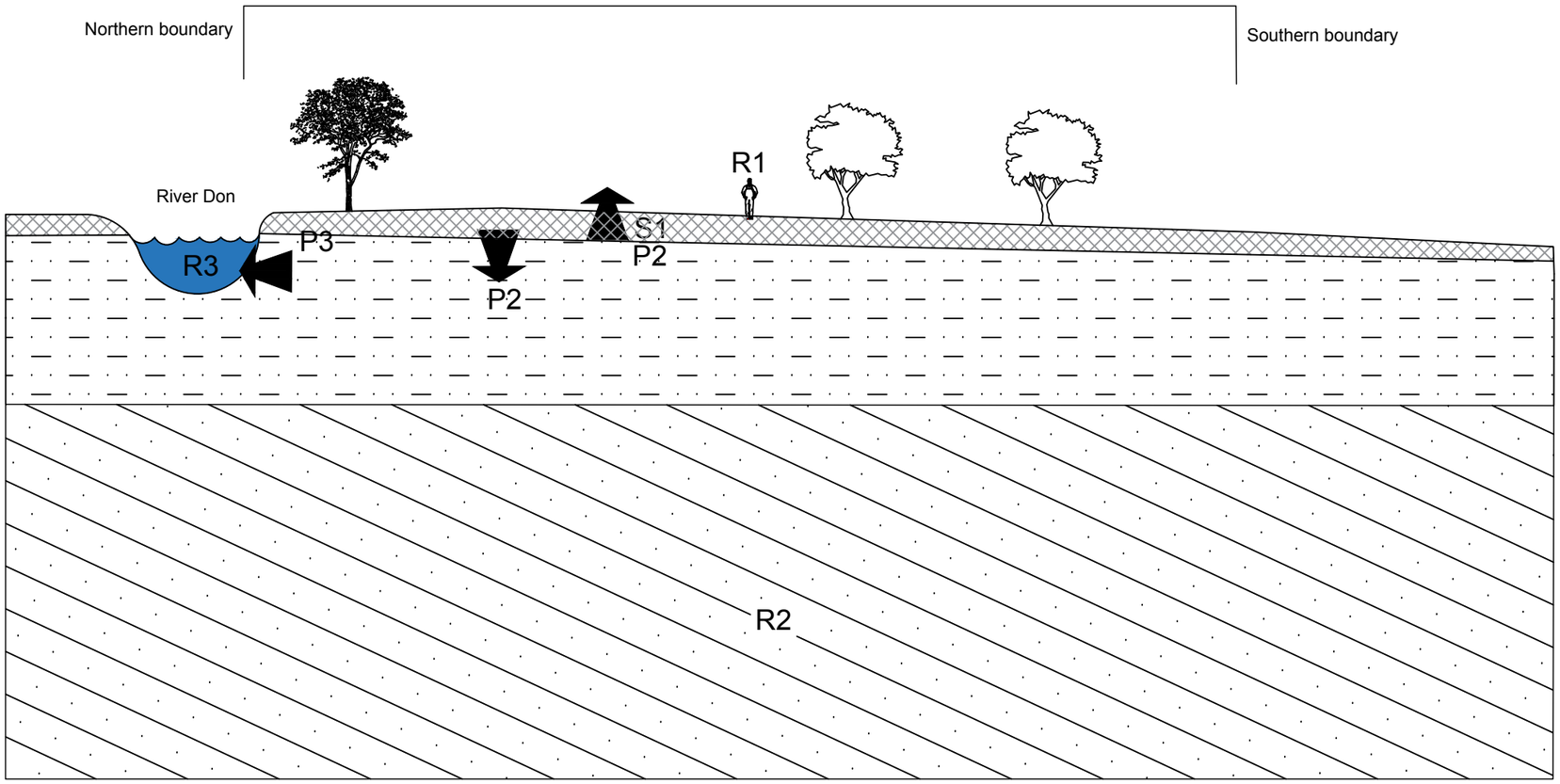
DRAWING TITLE:

Exploratory Hole Location Plan

DRAWING NUMBER:

D8044/02

Cross Section Through the Site (Approximately West to East)



Ground Conditions Summary

TOPSOIL/MADE GROUND

PELAW (UPPER) CLAY DEPOSITS

COAL MEASURES

Pollutant Linkages

SOURCE	1. Possible contamination within the made ground, if encountered during further investigation phases.
PATHWAY	1. Inhalation or ingestion of determinants within made ground. 2. Migration of contamination into underlying natural deposits. 3. Migration of contaminants into surface water feature.
RECEPTOR	1. Human Health 2. Secondary (A) Aquifer 3. River Don

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CLIENT:

Sunderland City Coincil

PROJECT TITLE:

IAMP Phase 1

DRAWING TITLE:

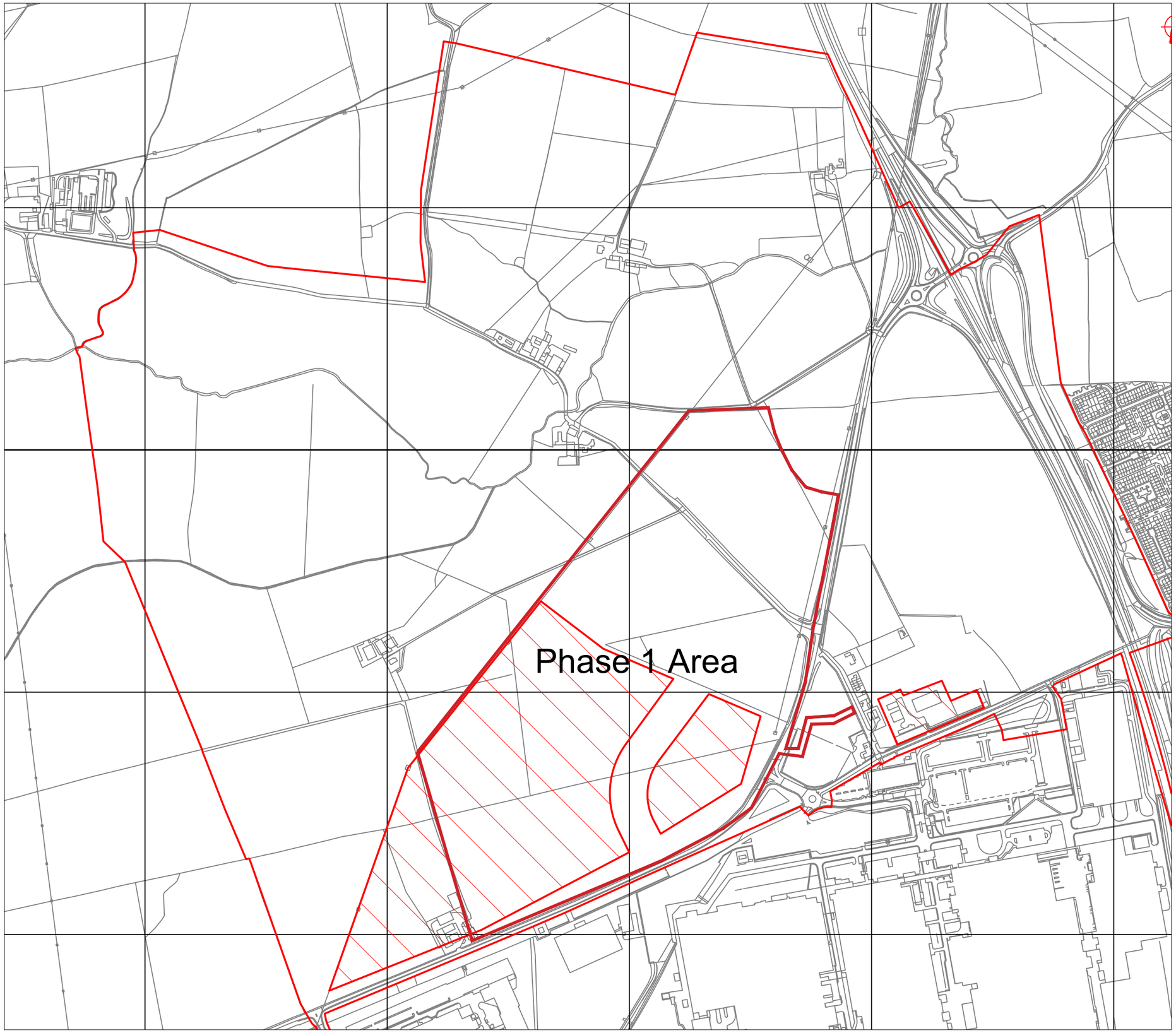
Conceptual Site Model

DRAWING NUMBER:

D8044/03

DATE:

February 2018



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CLIENT:

SUNDERLAND CITY COUNCIL

PROJECT TITLE:

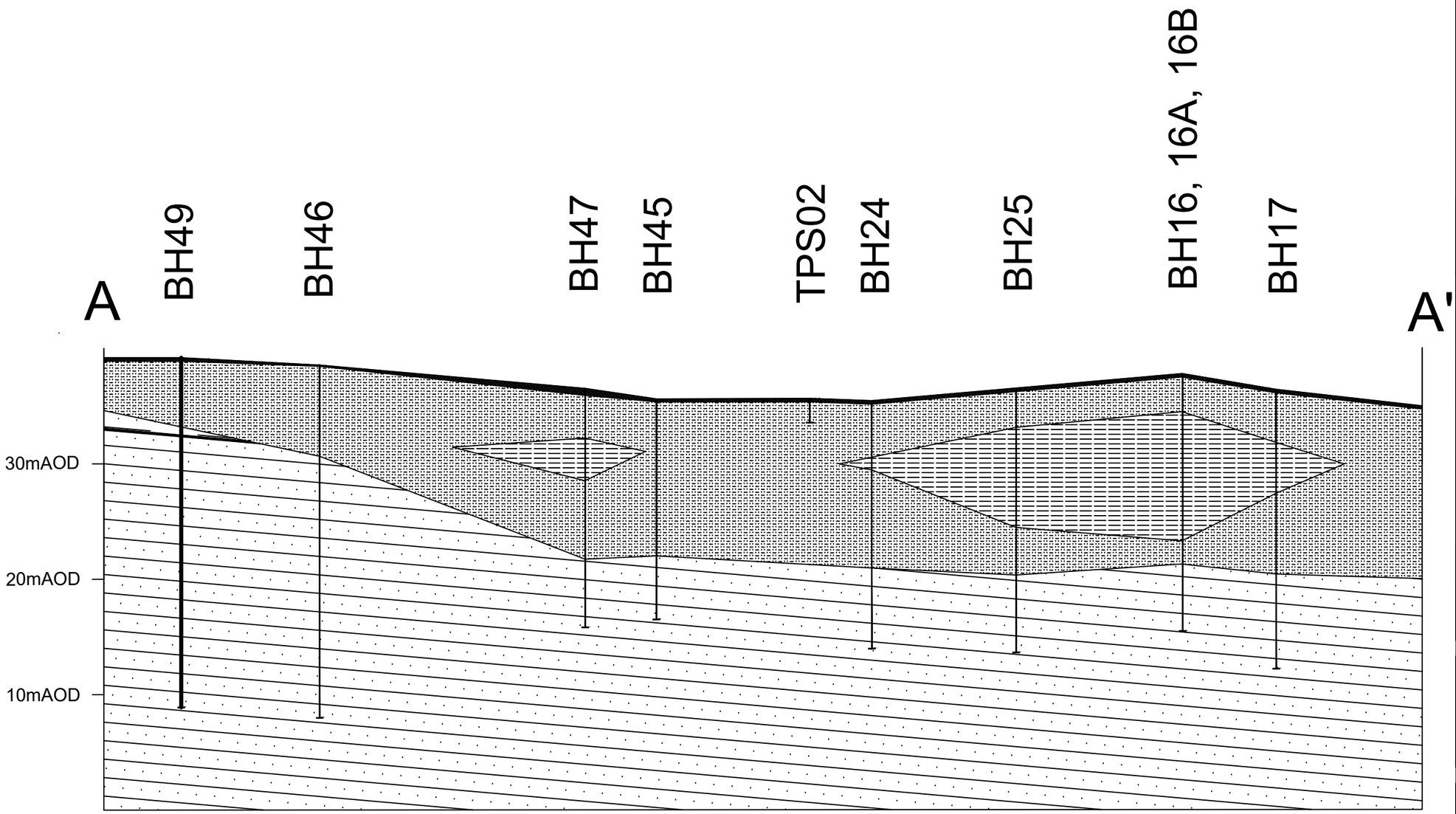
IAMP - PRELIMINARY GROUND INVESTIGATION

DRAWING TITLE:

Phase 1 Area

DRAWING NUMBER:

D8044/04



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Key

- Topsoil
- Cohesive deposits
- Laminated cohesive deposits
- Coal Measures
- Coal seam

CLIENT:

SUNDERLAND CITY COUNCIL

PROJECT TITLE:

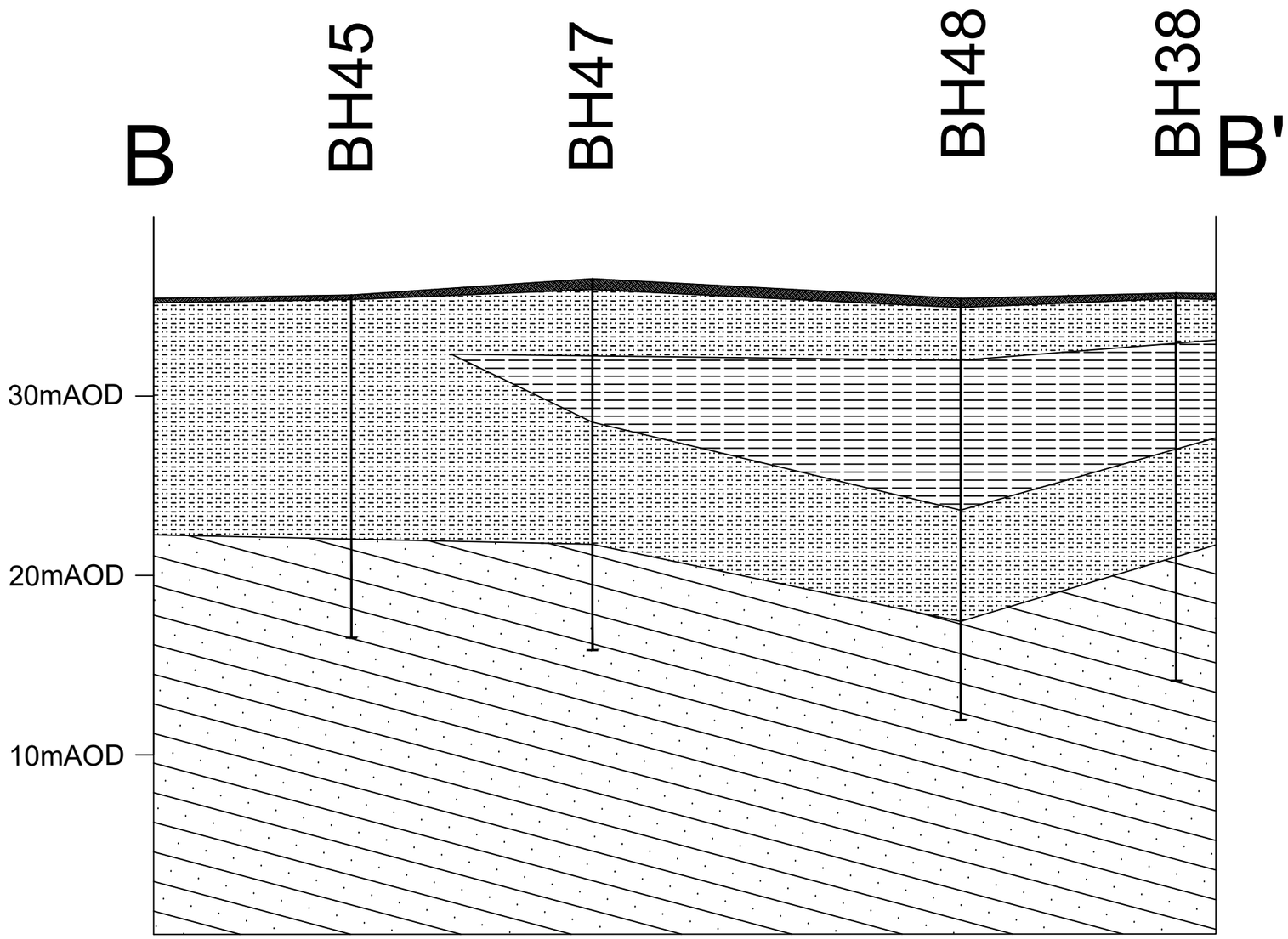
IAMP - PRELIMINARY GROUND INVESTIGATION

DRAWING TITLE:

Cross-section AA'

DRAWING NUMBER:

D8044/AA'



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Key

- Topsoil
- Cohesive deposits
- Laminated cohesive deposits
- Coal Measures
- Coal seam

CLIENT:

SUNDERLAND CITY COUNCIL

PROJECT TITLE:

IAMP - PRELIMINARY GROUND INVESTIGATION

DRAWING TITLE:

Cross-section BB'

DRAWING NUMBER:

D8044/BB'

APPENDIX B

Exploratory Hole Records

INFORMATION GENERALLY RELATING TO ALL EXPLORATORY HOLE RECORDS

GENERAL

Borehole/Trial Pit No
The exploratory hole identity number used throughout the report.

Site
The ground investigation project name.

Client
Client's name responsible for funding the ground investigation project.

Ground Level and Location
The precise ground level in meters above Ordnance Datum at the exploratory hole location from which the reduced level for each stratigraphic boundary is calculated. The exploratory hole position is given as either national grid-coordinates or local grid as specified.

ABBREVIATIONS

Samples

B Bulk disturbed sample generally representative of the soil type for cohesive and fine granular soils.

D Small disturbed tub sample normally taken at intermediate depth between other sampling or testing operations. The sample is stored in an airtight container.

BRE Sample taken for electrochemical testing

ES Sample of potentially contaminated materials.

U 100mm diameter undisturbed thick walled sample (OS-TK/W)

UT 100mm diameter undisturbed thin walled sample (OS-T/W)

UF An attempted but failed 100mm undisturbed sample.

W Water sample.

In-situ Testing

CBR California Bearing Ratio mould sample or test.

SPT Standard Penetration Test (SPT) using the split barrel sampler (shoe). The corresponding 'N' value is given in the test result column.

Rock Quality and Core Recovery

TCR Total core recovery - The length of the recovered core expressed as a percentage of the length of core run.

SCR Solid Core Recovery - The sum length of all core pieces (measured along the centre of the core), expressed as a percentage of the length core run.

RQD Rock Quality Designation- The sum length of all core pieces that are 100mm or longer (measured along the centre of the core), expressed as a percentage of the length of core run.

FI Fracture Index- The number of fractures per 1000mm length of solid core.

NI Non-intact- The material recovered in a non-intact state.

NR No recovery from the core run.

AZCL Assessed Zone of Core Loss.

COBBLE CONTENT

Low <10%, medium 10 – 20%, high >20%

Exploratory Hole Log Legend

BOREHOLE LEGEND:

TOPSOIL

MADE GROUND

SILT

CLAY

SAND

GRAVEL

PEAT

MUDSTONE

SILTSTONE

SANDSTONE

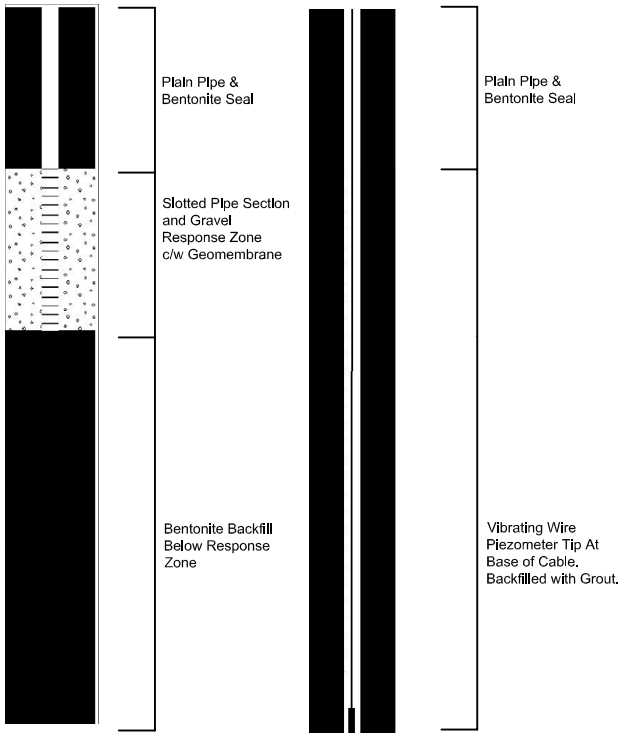
LIMESTONE

CHALK

COAL

BENTONITE/ GROUT

MONITORING INSTALLATION LEGEND:



NB Where strata consists of material of more than one soil or rock type the legends are appropriately combined.

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BOREHOLE RECORD

Borehole BH16

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.83 | Scale 1:50
Easting: 433585.00 | Northing: 559449.20

Client: Sunderland City Council | Driller: SK | Logged By: ST | Sheet 1 of 2

Method: Cable Percussive Drilling | Checked By: JH | Dates: 31/07/2017 - 01/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D ES	0.10 0.10			Firm dark brown slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium of coal and sandstone.	(0.30) 0.30	37.53
B D ES	0.50 - 1.00 0.50 0.50			Stiff, brown sandy gravelly CLAY of intermediate plasticity. Gravel is angular to subrounded, fine to coarse of coal, sandstone and siltstone.		
			1			
UT	1.20 - 1.65	100 blows				
D	1.70				(3.00)	
B D SPT (S)	2.00 - 2.50 2.00 2.00 - 2.45	N=19 (3,4/4,5,4,6)	2 (2.00) Dry			
D UT	3.00 3.00 - 3.45	80 blows	3			
D	3.50			Firm thinly laminated brown silty CLAY with silty partings. Light brown and grey silt dustings/partings on laminae surfaces.	3.30	34.53
B D SPT (S)	4.00 - 4.50 4.00 4.00 - 4.45	N=14 (2,3/3,3,4,4)	4 (3.00) Dry			
D UT	5.00 5.00 - 5.45	60 blows	5	*5.00m: Clay of low plasticity.*	(3.70)	
D	5.50					
B D SPT (S)	6.00 - 6.50 6.00 6.00 - 6.45	N=15 (3,4/4,3,4,4)	6			
D UT	7.00 7.00 - 7.45	60 blows	7 01/08/2017 0800 (7.00) Damp 31/07/2017 1700 (7.00) Damp	Brown clayey fine to medium SAND.	7.00 (0.50)	30.83
D	7.50			Brown sandy SILT. Sand is fine to medium.	7.50 (0.50)	30.33
B D SPT (S)	8.00 - 8.50 8.00 8.00 - 8.45	N=13 (2,2/3,3,4,3)	8	Medium dense brown clayey fine to medium SAND.	8.00 (1.00)	29.83
B D UF	9.00 - 9.50 9.00 9.00 - 9.45	70 blows	9	Firm thinly laminated brown silty CLAY with silty partings. Light brown and grey silt dusting/partings on laminae surfaces.	9.00	28.83
B	10.00 - 10.50		10			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
	4.50	4.9	20	6.00
13.10	13.00	12.1	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
15.00	15.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
150	15.30

Hole Diameter

Diameter (mm)	Depth (m)
200	11.50
150	15.30

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH16

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.83 — Scale 1:50

Easting: 433585.00 — Northing: 559449.20

Client: Sunderland City Council — Driller: SK — Logged By: ST — Sheet 2 of 2

Method: Cable Percussive Drilling — Checked By: JH — Dates: 31/07/2017 - 01/08/2017

SAMPLE DETAILS			(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	Insitu Testing						
D SPT (S)	10.00 10.00 - 10.45	N=23 (3,3/4,6,6,7)		Firm thinly laminated brown silty CLAY with silty partings. Light brown and grey silt dusting/partings on laminae surfaces.				
D UT	11.00 11.00 - 11.45	80 blows	11	*11.00m: Soft clay of intermediate plasticity.*				
D	11.50				(5.50)			
B D SPT (S)	12.00 - 12.50 12.00 12.00 - 12.45	N=24 (4,4/5,6,6,7)	12					
D UF	13.00 13.00 - 13.45	50 blows	13					
D	13.50							
B D SPT (S)	14.00 - 14.50 14.00 14.00 - 14.45	N=22 (3,5/4,5,7,6)	14 (14.00) 3.90	*14.00m: Clay of low plasticity.*				
				Very stiff grey gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone. (Possible weathered rockhead).	14.50	23.33		
SPT (S)	15.00 - 15.33	N=50+ (10,11/14,26,10 for 30mm)	15 (15.00) 1.80		(0.80)			
SPT (C)	15.30 - 15.39	N=50+ (25 for 60mm/50 for 30mm)	01/08/2017 1700 (15.30) 3.60 (15.30) 3.60	End of Borehole at 15.30 m	15.30	22.53		
			16					
			17					
			18					
			19					
			20					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
	4.50	4.9	20	6.00
13.10	13.00	12.1	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
15.00	15.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
150	15.30

Hole Diameter

Diameter (mm)	Depth (m)
200	11.50
150	15.30

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH16A

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.80 | Scale 1:50
Easting: 433584.90 | Northing: 559449.50

Client: Sunderland City Council | Driller: SP | Logged By: SP | Sheet 1 of 1

Method: Rotary Open Hole Drilling | Checked By: JH | Dates: 17/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
							0.00 - 9.00 100 % Water	TOPSOIL.	(0.20) 0.20	37.60		
								Firm brown CLAY. (Driller's Description).	(1.00)			
								Firm brown CLAY cobbles. (Driller's Description).	1.20	36.60		
									(7.80)			
								End of Borehole at 9.00 m	9.00	28.80		

Ground Water (m)					Chiselling / Hard Strata			Casing Depths		Hole Diameter	
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)	From (m)	To (m)	Time (hr)	Diameter (mm)	Depth (m)	Diameter (mm)	Depth (m)
								121	9.00	121	9.00

Log last updated 08/02/2018

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.
3. Borehole terminated at 9.00m due to flush returns coming up BH16.

BOREHOLE RECORD

Borehole BH16B

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.02 — Scale 1:50

Easting: 433585.20 — Northing: 559453.71

Client: Sunderland City Council — Driller: SP — Logged By: AH — Sheet 1 of 3

Method: Rotary Open Hole with Rotary Core Drilling — Checked By: JH — Dates: 17/08/2017 - 21/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
								TOPSOIL.	(0.20) 0.20	37.82		
								Firm brown CLAY. (Driller's Description).	(1.00)			
							1.20 - 22.30 100 % Water	Firm to stiff brown CLAY. (Driller's Description).	1.20	36.82		
									(10.90)			

1 2 3 4 5 6 7 8 9 10

Continued on next sheet

Ground Water (m)					Chiselling / Hard Strata			Casing Depths		Hole Diameter	
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)	From (m)	To (m)	Time (hr)	Diameter (mm)	Depth (m)	Diameter (mm)	Depth (m)
								121	19.30	121	22.30

Log last updated 08/02/2018

General Remarks

1. Hand dug inspection pit to 1.20m.

BOREHOLE RECORD

Borehole BH16B

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.02 — Scale 1:50

Easting: 433585.20 — Northing: 559453.71

Client: Sunderland City Council — Driller: SP — Logged By: AH — Sheet 2 of 3

Method: Rotary Open Hole with Rotary Core Drilling — Checked By: JH — Dates: 17/08/2017 - 21/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
							11	Firm to stiff brown CLAY. (Driller's Description).				
							12		12.10	25.92		
								Silty SAND. (Driller's Description).				
							13					
									(3.20)			
							14					
							15					
	15.30 - 16.80								15.30	22.72		
			33	18	18	AZCL	16	Grey brown sandy CLAY. ASSESSED ZONE OF CORE LOSS. Description taken from cuttings.	(1.23)			
						N/A						
						4		Weak, locally extremely weak, distinctly weathered, orange brown, locally dark grey, fine to medium grained SANDSTONE. Fractures are closely spaced subhorizontal, planar, smooth.	16.53	21.49		
	16.80 - 18.30					A...	17		(0.92)			
						NI		*17.30 - 17.40m: Dark brown silty fine to coarse sand.*				
			86	40	35	10		*17.40 - 17.45m: Dark brown sandy clay.*	17.45	20.57		
C	17.80 - 18.10							Weak, partially weathered, dark grey fine to medium grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean.				
C	18.10 - 18.30						18	*17.75m: Weak.*				
	18.30 - 19.30					3		*17.85 - 18.05m: Orange staining.*	(1.60)			
			100	72	73							
							19		19.05	18.97		
						40		Extremely weak, partially weathered orange dark grey MUDSTONE. Fractures are very closely spaced, subhorizontal, planar and clean.	(0.35)			
	19.30 - 20.80					NI		*19.05 - 19.20m: 40 to 60 degree planar, smooth with orange staining.*	19.40	18.62		
			100	86	20	25	20	Extremely weak to very weak, partially weathered, dark grey MUDSTONE thinly interbedded with dark grey siltstone. Fractures are very closely to closely spaced, subhorizontal, planar, smooth and clean.				

Continued on next sheet

Ground Water (m)					Chiselling / Hard Strata			Casing Depths		Hole Diameter	
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)	From (m)	To (m)	Time (hr)	Diameter (mm)	Depth (m)	Diameter (mm)	Depth (m)
								121	19.30	121	22.30

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH16B

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.02 | Scale 1:50

Easting: 433585.20 | Northing: 559453.71

Client: Sunderland City Council | Driller: SP | Logged By: AH | Sheet 3 of 3

Method: Rotary Open Hole with Rotary Core Drilling | Checked By: JH | Dates: 17/08/2017 - 21/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
	20.80 - 22.30		86	73	66	9 25 5 20 10	21 22 23 24 25 26 27 28 29 30	Extremely weak to very weak, partially weathered, dark grey MUDSTONE thinly interbedded with dark grey siltstone. Fractures are very closely to closely spaced, subhorizontal, planar, smooth and clean. *19.60 - 19.65m: Subvertical, planar, smooth clean fracture.* *19.80 - 19.85m: 40 to 60 degree planar, smooth, clean fracture.* *19.90 - 20.00m: 45 degree, planar, smooth fracture.* *20.10 - 20.25m: 45 degree, planar, smooth fracture.* *20.40 - 20.50m: Subvertical planar, smooth clean fracture.* *20.42 - 20.60m: Very closely spaced, 45 to 60 degree, planar, smooth fractures.* *20.60 - 20.95m: Subvertical, planar, clean fracture.*	(2.90)			
								End of Borehole at 22.30 m	22.30	15.72		

Ground Water (m)					Chiselling / Hard Strata			Casing Depths		Hole Diameter	
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)	From (m)	To (m)	Time (hr)	Diameter (mm)	Depth (m)	Diameter (mm)	Depth (m)
								121	19.30	121	22.30

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH17

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.46 — Scale 1:50

Easting: 433736.59 — Northing: 559451.89

Client: Sunderland City Council — Driller: SK/DC — Logged By: ST/BC — Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 01/08/2017 - 09/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D ES	0.10 0.10			Firm dark brown slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium of coal and sandstone.	(0.30) 0.30	36.16
B D ES	0.50 - 1.00 0.50 0.50			Stiff dark brown slightly sandy, slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to medium of coal and sandstone.		
			1			
UT	1.20 - 1.65	100 blows				
D	1.70					
B D SPT (S)	2.00 - 2.50 2.00 2.00 - 2.45	N=16 (2,4/4,3,4,5)	2 02/08/2017 0800 (2.00) Dry (2.00) Dry		(4.30)	
D UT	3.00 3.00 - 3.45	70 blows	3			
D	3.50			*3.50m: Becomes firm.*		
B D SPT (S)	4.00 - 4.50 4.00 4.00 - 4.45	N=12 (2,3/3,3,3,3)	4 (3.00) Dry			
				Firm thinly laminated brown silty CLAY of intermediate plasticity, with silty partings. Light brown and grey silt dusting/ partings on laminae surfaces.	4.60	31.86
D UT	5.00 5.00 - 5.45	70 blows	5			
D	5.50					
B D SPT (S)	6.00 - 6.50 6.00 6.00 - 6.45	N=14 (3,4/3,3,4,4)	6 (3.00) Dry		(4.40)	
D UT	7.00 7.00 - 7.45	80 blows	7	*7.00m: Clay of high plasticity.*		
D	7.50					
B D SPT (S)	8.00 - 8.50 8.00 8.00 - 8.45	N=16 (3,3/4,5,4,3)	8 (3.00) Dry			
D UT	9.00 9.00 - 9.45	75 blows	9	Firm, brown, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is angular to subangular, fine of sandstone and coal.	9.00	27.46
D	9.50					
B	10.00 - 10.50		10 (3.00) Dry			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
16.30		14.2	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
17.00	17.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	17.00
140	21.00

Hole Diameter

Diameter (mm)	Depth (m)
200	17.30
140	24.20

General Remarks

1. Hand dug inspection pit to 1.20m.
2. Water added between 16.50 and 17.30m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH17

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.46 — Scale 1:50

Easting: 433736.59 — Northing: 559451.89

Client: Sunderland City Council — Driller: SK/DC — Logged By: ST/BC — Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 01/08/2017 - 09/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.45	N=17 (3,4/3,4,4,6)
D	11.00	
UT	11.00 - 11.45	80 blows
D	11.50	
B	12.00 - 12.50	
D	12.00	
SPT (S)	12.00 - 12.45	N=25 (4,5/5,6,6,8)
D	13.00	
UT	13.00	110 blows
D	13.50	
B	14.00 - 14.50	
D	14.00	
SPT (S)	14.00 - 14.45	N=22 (3,4/5,5,6,6)
B	15.00 - 15.50	
D	15.00	
UT	15.00	100 blows
B	16.00 - 16.50	
D	16.00	
SPT (S)	16.00 - 16.45	N=39 (4,6/7,7,10,15)
B	17.00 - 17.30	
D	17.00	
SPT (S)	17.00 - 17.18	N=50+ (21,4 for 15mm/39,11 for 17mm)
	17.30 - 17.90	
C	17.60 - 17.85	
	17.90 - 18.70	
C	18.30 - 18.45	
	18.70 - 19.30	
C	19.15 - 19.25	
	19.30 - 20.05	

TCR%	SCR%	RQD%	FI
100	50	50	NI
100	100	91	1
100	27	27	NI
100	100	100	1

(Casing) Groundwater: 11; 12 (3.00) Dry; 13; 14 (14.00) Dry; 15; 16 (16.00) Dry; 17 (17.00) 1.90; 18; 19; 20

02/08/2017 1700 (17.00) 1.90

17.30 - 18.70 85 % Mud

18.70 - 19.30 15 % Mud

19.30 - 20.05 10 % Mud

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Firm, brown, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is angular to subangular, fine of sandstone and coal.	(6.00)	
Firm brown silty CLAY of intermediate plasticity.	15.00 (1.00)	21.46
Dense brown silty fine to medium SAND.	16.00 (1.00)	20.46
Grey SILTSTONE. Recovered as gravel size fragments.	17.00 (0.30)	19.46
Medium strong, partially weathered, light grey fine to coarse grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean. *17.30 - 17.60m: Frequent randomly orientated interlocking fractures.* *18.30m: Weak* *18.70 - 19.14m: Frequent randomly orientated interlocking fractures.*	17.30 (3.40)	19.16

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
16.30		14.2	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
17.00	17.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	17.00
140	21.00

Hole Diameter

Diameter (mm)	Depth (m)
200	17.30
140	24.20

General Remarks

1. Hand dug inspection pit to 1.20m.
2. Water added between 16.50 and 17.30m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH17

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.46 — Scale 1:50

Easting: 433736.59 — Northing: 559451.89

Client: Sunderland City Council — Driller: SK/DC — Logged By: ST/BC — Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 01/08/2017 - 09/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
	20.05 - 21.00					
C	20.40 - 20.50		100	100	100	NI AZCL
	21.00 - 22.00		70	63	63	
	22.00 - 23.50					1
C	22.50 - 22.65		100	100	100	
	23.50 - 24.70		96	96	96	A 1 1

(Casing) Groundwater: 20.05 - 21.00 85 % Mud; 21.00 - 24.20 100 % Mud

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
20.63 - 20.70m: Frequent randomly orientated interlocking fractures. AZCL.	20.70	15.76
	(0.30)	
Weak, partially weathered, light grey fine grained SANDSTONE. *21.26m: Fracture is 10 degree, planar, smooth, undulose and clean.* *22.29m: Fracture is 14 degree, planar, smooth, undulose and clean.*	21.00	15.46
	(2.46)	
Very weak to weak, unweathered, dark grey MUDSTONE. Coal fragments noted within mudstone. AZCL. Very weak to weak, unweathered, dark grey MUDSTONE. *23.55 - 23.87m: Coal fragment noted within mudstone.*	23.46	13.00
	(0.04)	12.96
	23.50	12.91
	(0.05)	
	23.55	
	(0.65)	
End of Borehole at 24.20 m	24.20	12.26

Legend / Well/Backfill

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
16.30				

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
17.00	17.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	17.00
140	21.00

Hole Diameter

Diameter (mm)	Depth (m)
200	17.30
140	24.20

General Remarks

1. Hand dug inspection pit to 1.20m.
2. Water added between 16.50 and 17.30m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH24

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.48 | Scale 1:50
Easting: 433429.81 | Northing: 559234.30

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 01/08/2017 - 16/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.10			Dark brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, limestone and mudstone.	(0.30)	
ES	0.10				0.30	35.18
D	0.40			Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and limestone.		
ES	0.40					
B	0.50 - 1.00					
BRE	0.50				(0.90)	
			1			
UT	1.20 - 1.65	18 blows		Stiff, dark brown slightly sandy slightly gravelly silty CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, limestone and coal.	1.20	34.28
ES	1.50					
D	1.65					
BRE	1.90					
B	2.00 - 2.45		2 (1.80) Dry			
D	2.00					
SPT (S)	2.00 - 2.45	N=15 (2,3/4,4,3,4)				
BRE	2.50					
UT	3.00 - 3.45	22 blows	3			
D	3.45					
BRE	3.70				(4.80)	
B	4.00 - 4.45		4 (3.90) Dry	*4.00m: Soft.*		
D	4.00					
SPT (S)	4.00 - 4.45	N=7 (1,1/2,1,2,2)				
BRE	4.50					
UT	5.00 - 5.45	28 blows	5	*Occasional thinly laminated bands noted from 4.90m.*		
D	5.45					
BRE	5.70					
D	5.80					
B	6.00 - 6.45		6 (5.90) Dry	Stiff dark brown, silty, sandy CLAY of low plasticity. Sand is fine to coarse.	6.00	29.48
D	6.00				(0.30)	
SPT (S)	6.00 - 6.45	N=12 (1,2/2,3,3,4)		Firm dark brown, silty, slightly sandy laminated CLAY of high plasticity. Sand is fine to coarse.	6.30	29.18
BRE	6.50					
UT	7.00 - 7.45	12 blows	7			
D	7.45				(2.10)	
BRE	7.70					
B	8.00 - 8.45		8 (8.00) Dry	*8.00m: Soft.*		
D	8.00					
SPT (S)	8.00 - 8.45	N=8 (2,2/2,2,2,2)				
BRE	8.50			Very soft dark brown silty, slightly sandy CLAY of high plasticity. Sand is fine to coarse.	8.40	27.08
UT	9.00 - 9.45	12 blows	9			
D	9.45					
BRE	9.70		01/08/2017 1700 (8.90) Dry 02/08/2017 0800			
B	10.00 - 10.45		10 (8.90) 2.60			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.10	00:45
15.60	15.90	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	5.90
150	13.50
140	16.50

Hole Diameter

Diameter (mm)	Depth (m)
200	5.90
150	16.80
121	21.50

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater observed.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH24

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.48 — Scale 1:50

Easting: 433429.81 — Northing: 559234.30

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 01/08/2017 - 16/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.45	N=8 (2,2/2,2,2,2)
BRE	10.50	
D	10.70	
B	11.00 - 11.65	
UF	11.00 - 11.65	3 blows
BRE	11.70	
B	12.00 - 12.45	
D	12.00	
SPT (S)	12.00 - 12.45	N=5 (1,2/1,1,1,2)
BRE	12.50	
D	12.70	
B	13.00 - 13.45	
D	13.00	
SPT (S)	13.00 - 13.45	N=33 (3,5/7,8,9,9)
BRE	13.50	
B	14.10 - 14.55	
D	14.10	
SPT (S)	14.10 - 14.55	N=41 (5,5/8,10,11,12)
BRE	14.60	
B	15.00 - 15.45	
D	15.00	
SPT (S)	15.00 - 15.45	N=36 (8,15/10,9,8,9)
BRE	15.50	
D	15.90	
SPT (S)	15.90 - 16.20	N=50+ (13,12 for 50mm/20,19,11 for 25mm)
	16.00 - 17.00	
	17.00 - 18.50	
	18.50 - 20.00	
C	18.95 - 19.05	
C	19.45 - 19.60	
	20.00 - 21.50	

TCR%	SCR%	RQD%	FI
100	85	0	40
87	87	13	A…
			6
			40
100	100	53	10
			40
			20
			40
			5

(Casing) Groundwater: (9.90) 9.70; (11.80) 11.70; (12.90) Dry; (13.50) Dry; 16.00 - 21.50 (13.50) Dry 95 % Water 02/08/2017 1700 (13.50) Dry

STRATA RECORD Description

Very soft dark brown silty, slightly sandy CLAY of high plasticity. Sand is fine to coarse.

(4.30)

Stiff greyish brown slightly sandy slightly gravelly CLAY of low plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.

(1.80)

Dense light grey clayey GRAVEL. Gravel is subangular to angular, fine to coarse of siltstone. (Weathered SILTSTONE).

(1.75)

Extremely weak, partially weathered, dark grey MUDSTONE. Fractures are extremely closely spaced, subhorizontal, planar, smooth and clean.

16.68 - 16.71m: Extremely weak black carbonaceous mudstone.

(0.95)

Very weak, locally extremely weak, partially weathered, dark grey MUDSTONE. Fractures are closely spaced, subhorizontal, planar, smooth and clean.

17.28 - 17.42m: Subvertical, planar, smooth clean fracture.

17.65 - 17.75m: Orange ironstone.

17.65 - 17.95m: Subvertical, planar, smooth, clean fracture.

18.40 - 18.45m: Very weak, black carbonaceous mudstone.

(3.40)

Continued on next sheet

Depth (m)	Level (m AOD)
12.70	22.78
14.50	20.98
16.25	19.23
17.20	18.28

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.10	00:45
15.60	15.90	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	5.90
150	13.50
140	16.50

Hole Diameter

Diameter (mm)	Depth (m)
200	5.90
150	16.80
121	21.50

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater observed.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH24

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.48 | Scale 1:50

Easting: 433429.81 | Northing: 559234.30

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 01/08/2017 - 16/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
						40						
			100	100	40	12		*20.50 - 20.58m: 40 to 60 degree planar, smooth, clean fracture.* Very weak to weak, partially weathered, dark grey MUDSTONE. Fractures are closely spaced, subhorizontal, planar, smooth and clean. Occasional thin laminae of sandstone.	20.60	14.88		
									(0.40)			
						6	21	Weak, partially weathered, dark grey SILTSTONE. Fractures are closely spaced, planar, smooth.	21.00	14.48		
									(0.30)			
								Very weak, partially weathered, dark grey MUDSTONE. Fractures are extremely closely to very closely spaced, subhorizontal, planar and smooth.	21.30	14.18		
									(0.20)			
								End of Borehole at 21.50 m	21.50	13.98		
							22					
							23					
							24					
							25					
							26					
							27					
							28					
							29					
							30					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.10	00:45
15.60	15.90	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	5.90
150	13.50
140	16.50

Hole Diameter

Diameter (mm)	Depth (m)
200	5.90
150	16.80
121	21.50

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater observed.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH25

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.57 — Scale 1:50

Easting: 433589.11 — Northing: 559280.69

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 31/07/2017 - 15/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.10			Dark brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	(0.30)	
ES	0.10				0.30	36.27
D	0.40			Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, limestone and coal.	(0.60)	
ES	0.40					
B	0.50 - 1.00				0.90	35.67
			1	Stiff dark brown slightly sandy slightly gravelly CLAY of high plasticity. Gravel is angular, fine to coarse of sandstone, mudstone and coal.		
UT	1.20 - 1.65	18 blows				
ES	1.50					
D	1.65					
BRE	1.90					
B	2.00 - 2.45		2 (1.80) Dry			
D	2.00				(2.50)	
SPT (S)	2.00 - 2.45	N=19 (3,4/4,4,5,6)				
BRE	2.50					
UT	3.00 - 3.45	18 blows	3	*3.00m: Clay of intermediate plasticity.*		
D	3.45			Firm thinly laminated slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone and limestone.	3.40	33.17
BRE	3.70					
B	4.00 - 4.45		4 (3.90) Dry			
D	4.00					
SPT (S)	4.00 - 4.45	N=11 (2,2/2,3,3,3)				
BRE	4.50					
UT	5.00 - 5.45	22 blows	5	*5.00m: Clay of intermediate plasticity.*		
D	5.45					
BRE	5.70					
B	6.00 - 6.45		6 (5.90) Dry			
D	6.00					
SPT (S)	6.00 - 6.45	N=10 (1,1/2,2,3,3)				
BRE	6.50					
U	7.00 - 7.45	10 blows	7	*7.00m: Clay of high plasticity.*	(7.60)	
D	7.45					
BRE	7.70					
B	8.00 - 8.45		8 (7.80) Dry			
D	8.00					
SPT (S)	8.00 - 8.45	N=11 (2,2/2,3,3,3)				
BRE	8.50					
U	9.00 - 9.45	18 blows	9			
D	9.45					
BRE	9.70					
B	10.00 - 10.45		10 (9.90) Dry			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
16.80	17.10	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	10.90
150	12.90
140	17.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.90
150	17.10
116	22.90

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH25

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.57 — Scale 1:50

Easting: 433589.11 — Northing: 559280.69

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 31/07/2017 - 15/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.45	N=8 (2,2/2,2,2,2)
BRE	10.50	
B	11.00 - 11.65	
UF	11.00 - 11.45	2 blows
BRE	11.70	
D	11.90	
B	12.00 - 12.65	
UF	12.00 - 12.45	58 blows
BRE	12.70	
B	13.00 - 13.45	
D	13.00	
SPT (S)	13.00 - 13.45	N=33 (5,5/6,8,9,10)
BRE	13.50	
U	14.00 - 14.45	49 blows
D	14.45	
BRE	14.70	
B	15.00 - 15.45	
D	15.00	
SPT (S)	15.00 - 15.45	N=41 (5,6/8,9,12,12)
BRE	15.50	
U	16.00 - 16.45	63 blows
D	16.45	
BRE	16.70	
B	17.10	
SPT (S)	17.10 - 17.33	N=50+ (25,-1 for 30mm/26,24 for 50mm)
SPT (S)	17.10 - 17.33	N=50+ (25,-1 for 30mm/26,24 for 50mm)
	17.10 - 18.50	
	18.50 - 19.90	
C	19.10 - 19.30	
C	19.90 - 20.10	
	19.90 - 21.40	

TCR%	SCR%	RQD%	Fl
97	60	9	NA
			9
			NI
			6
100	100	78	4
			2
			10
			NI

(Casing) Groundwater: 11; 12; 13 (12.90) Dry; 01/08/2017 0800 (12.90) Dry; 31/07/2017 1700 (12.90) Dry; 14; 15 (13.50) Dry; 16; 17 (13.50) Dry; 17.00 - 22.90 95 % Water (13.50) Dry; 01/08/2017 1700 (13.50) Dry; 18; 19; 20

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Firm thinly laminated slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone and limestone.	11.00	25.57
Firm dark brown slightly sandy silty CLAY. Sand is fine to coarse.	(0.80)	
Firm, thinly laminated, dark brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to rounded, fine to coarse of sandstone and mudstone.	11.80	24.77
Stiff, dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.30) 12.10	24.47
14.00m: Clay of low plasticity.	(4.10)	
Very stiff grey gravelly CLAY of intermediate plasticity. Gravel is angular to subangular, fine to coarse of mudstone. (Possible rockhead).	16.20	20.37
	(0.90)	
Firm grey slightly sandy gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	17.10	19.47
Very weak to weak, partially weathered, grey MUDSTONE. Fractures are very closely to closely spaced, subhorizontal, stepped, smooth and clean.	(0.23) 17.33	19.24
18.06 - 18.11m: Fractures are subhorizontal, planar, smooth with light grey siltstone gravel infill.	(0.86)	
Very weak, partially weathered, dark grey black MUDSTONE. Frequent randomly orientated interlocking fractures.	18.20	18.37
18.20 - 18.33m: Thin laminae (less than 5mm thick) of coal noted.	(0.13) 18.33	18.24
Very weak to weak, partially weathered, grey MUDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth and clean.	(0.17) 18.50	18.07
Very weak, partially weathered thinly laminated dark grey MUDSTONE. Fractures are closely spaced subhorizontal, smooth, undulose and clean.	(0.36) 18.86	17.71
Very weak to weak, partially weathered, light grey MUDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean.	(0.65) 19.51	17.06
	(0.39) 19.90	16.67

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
16.80	17.10	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	10.90
150	12.90
140	17.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.90
150	17.10
116	22.90

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH25

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.57 | Scale 1:50

Easting: 433589.11 | Northing: 559280.69

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 31/07/2017 - 15/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
			100	96	96	1, 2
C	21.40 - 21.55 21.40 - 22.90					4
C	21.90 - 22.00		100	100	91	3

(Casing) Groundwater

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Very weak, partially weathered, thinly laminated dark grey black MUDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth and clean. *19.57 - 19.62m: 10 degree fracture, planar, smooth, undulose and clean.* *19.63 - 19.82m: Thin laminae (less than 5mm thick) of coal noted.*	(0.75)	
Very weak to weak, partially weathered, light grey MUDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean. *19.98 - 20.04m: 30 degree fracture, planar, smooth, undulose.* *20.43 - 20.47m: 8 degree fracture, planar, smooth, undulose with light grey siltstone grained infill.*	20.65	15.92
Weak to medium strong, partially weathered, thinly laminated light grey SILTSTONE. *20.71 - 20.76m: 18 degree fracture, stepped, smooth and clean.*	(0.62)	
Weak to medium strong, partially weathered, grey fine to coarse grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth, undulose with light brown sand infill. *21.41 - 21.54m: Fracture is subvertical, planar, smooth with light brown sand infill.*	21.27	15.30
Very weak to weak, partially weathered, light grey SILTSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean. *22.74 - 22.79m: 12 degree fracture, planar, smooth with grey clay infill.*	(0.35)	
End of Borehole at 22.90 m	21.62	14.95
	(1.28)	
	22.90	13.67

Legend | Well/ Backfill

21 22 23 24 25 26 27 28 29 30

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
16.80	17.10	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	10.90
150	12.90
140	17.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.90
150	17.10
116	22.90

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH28

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.75 — Scale 1:50

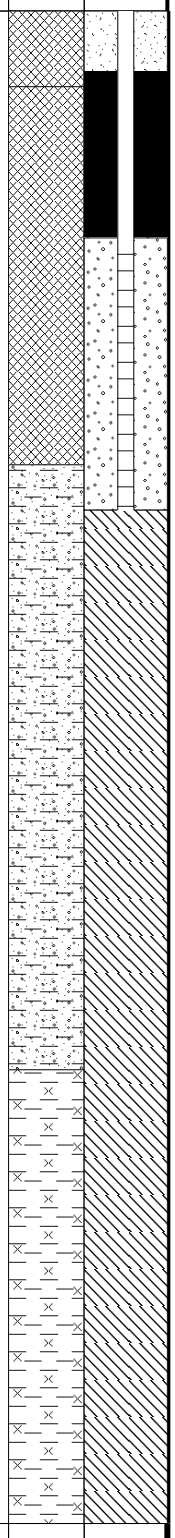
Easting: 433800.39 — Northing: 559240.50

Client: Sunderland City Council — Driller: SK/DC — Logged By: ST — Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 27/07/2017 - 08/08/2017

SAMPLE DETAILS			(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
Type	Depth From-To (m)	Insitu Testing				
D ES	0.10 0.10			MADE GROUND: Brown slightly sandy slightly gravelly clayey topsoil with some rootlets present. Gravel is angular to subrounded, fine to coarse of coal and sandstone.	(0.50)	
B D ES	0.50 - 1.00 0.50 0.50			MADE GROUND: Orangish brown slightly sandy gravelly clay of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of coal, sandstone and brick.	0.50	35.25
			1			
UT	1.20 - 1.65	60 blows				
D	1.70				(2.50)	
B D SPT (S)	2.00 - 2.50 2.00 2.00 - 2.45	N=16 (3,3/3,4,4,5)	2 (1.50) Dry			
D UT	3.00 3.00 - 3.45	70 blows	3	Firm brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded, fine to medium of coal and sandstone.	3.00	32.75
B D SPT (S)	4.00 - 4.50 4.00 4.00 - 4.45	N=11 (2,3/3,2,3,3)	4 (3.00) Dry			
D UT	5.00 5.00 - 5.45	75 blows	5	*5.00m: Clay of intermediate plasticity.*	(4.00)	
D	5.50					
B D SPT (S)	6.00 - 6.50 6.00 6.00 - 6.45	N=14 (3,3/3,3,4,4)	6 (3.00) Dry			
D UT	7.00 7.00 - 7.45	80 blows	7	Firm thinly laminated brown silty CLAY of low plasticity, with silt partings. Light brown silt dusting on laminae surfaces.	7.00	28.75
D	7.50					
B D SPT (S)	8.00 - 8.50 8.00 8.00 - 8.45	N=18 (3,4/4,5,4,5)	8 (3.00) Dry			
D UT	9.00 9.00 - 9.45	75 blows	9			
D	9.50					
B	10.00 - 10.50		10 (3.00) Dry		(6.00)	

Continued on next sheet



Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.50	14.80	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	12.00
150	14.00
140	14.70

Hole Diameter

Diameter (mm)	Depth (m)
150	14.70
200	14.80
116	28.85

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH28

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.75 — Scale 1:50

Easting: 433800.39 — Northing: 559240.50

Client: Sunderland City Council — Driller: SK/DC — Logged By: ST — Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 27/07/2017 - 08/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	TCR%	SCR%	RQD%	FI
D SPT (S)	10.00 10.00 - 10.45	N=19 (3,4/5,4,5,5)				
D UT	11.00 11.00 - 11.45	80 blows				
D	11.50					
B D SPT (S)	12.00 - 12.50 12.00 12.00 - 12.45	N=25 (4,4/5,6,6,8)				
D UT	13.00 13.00 - 13.45	90 blows				
D	13.50					
B D SPT (S)	14.00 - 14.50 14.00 14.00 - 14.39	N=50+ (10,11/13,15,16,6 for 15mm)				
D SPT (S)	14.70 - 15.30 14.80 14.80 - 15.02	N=50+ (21,4 for 10mm/29 ,21 for 57mm)	100	0	0	NA
						NI
C	15.20 - 15.30		100	92	92	1
	15.30 - 16.45					
C	15.50 - 15.75					
C	16.00 - 16.10					
	16.45 - 17.10					
C	16.70 - 16.80		89	0	0	NA
	17.10 - 18.60		100	26	19	NI
						8
						NI
	18.60 - 19.35		100	40	29	NA
C	19.00 - 19.13					NI
C	19.22 - 19.30					3
	19.35 - 20.85					NI
C	19.65 - 19.80					

(Casing) Groundwater

11
12 (12.00) Dry
13
14 (12.00) Dry
28/07/2017 1700 (12.00) Dry
15 14.70 - 15.30 100 % Water (12.00) Dry
15.30 - 17.10 95 % Water
16
17
17.10 - 20.85 90 % Water
18
19
20

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Firm thinly laminated brown silty CLAY of low plasticity, with silt partings. Light brown silt dusting on laminae surfaces.		
5.00m: Clay of intermediate plasticity.		
Very stiff reddish brown gravelly CLAY of high plasticity. Gravel is angular to subangular, fine to coarse of siltstone.	13.00	22.75
	(1.00)	
Very stiff grey gravelly clay. Gravel is angular to subangular, fine to medium of siltstone. (Weathered SILTSTONE).	14.00	21.75
	(0.70)	
Firm grey, locally mottled brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse of mudstone lithorelics. Rare angular gravel size fragments of coal.	14.70	21.05
	(0.54)	
Very weak, partially weathered, grey SILTSTONE.	15.24	20.51
	(1.21)	
15.88 - 15.97m: 40 degree, planar, smooth, undulose fracture.		
Firm grey, locally mottled brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone lithorelics.	16.45	19.30
	(0.75)	
Very weak to weak, partially weathered, grey SILTSTONE. Fractures are very closely to closely spaced, subhorizontal, planar and smooth.	17.20	18.55
	(0.58)	
Very weak, partially weathered, grey MUDSTONE. Frequent randomly orientated interlocking fractures.	17.78	17.97
	(0.82)	
Firm grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone lithorelics.	18.60	17.15
	(0.38)	
Very weak black COAL. Frequent randomly orientated interlocking fractures.	18.98	16.77
	(0.07)	16.70
Medium strong, partially weathered, grey fine grained SANDSTONE. Fractures are closely spaced, subhorizontal, planar and smooth.	19.05	
	(0.30)	16.40
Very weak black COAL. Frequently randomly orientated interlocking fractures.	19.35	16.30
	(0.10)	
	19.45	

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.50	14.80	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	12.00
150	14.00
140	14.70

Hole Diameter

Diameter (mm)	Depth (m)
150	14.70
200	14.80
116	28.85

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH28

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.75 | Scale 1:50
Easting: 433800.39 | Northing: 559240.50

Client: Sunderland City Council | Driller: SK/DC | Logged By: ST | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 27/07/2017 - 08/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
			100	93	71	
	20.85 - 21.85					7
C	21.20 - 21.31		100	97	69	
C	21.50 - 21.58					
	21.85 - 23.00					
			100	64	54	NI
						1
	23.00 - 24.50					
						NI
			100	92	92	
C	23.77 - 23.90					0
	24.50 - 25.85					NA
						NI
			100	50	50	
						2
C	25.69 - 25.85					
	25.85 - 27.35					
			100	100	94	
						3
	27.35 - 28.85					
			100	100	56	

(Casing) Groundwater

20.85 - 21.85
95 % Water

21.85 - 30.00
90 % Water

23 07/08/2017 1745
(14.70) 0
08/08/2017 0800
(14.70) 1.30

08/08/2017 1745
(14.70)

STRATA RECORD Description

Medium strong, partially weathered, grey SILTSTONE. Fractures are closely spaced, subhorizontal, planar and smooth.

19.95 - 19.98m: Fractures are subhorizontal, planar, smooth with clay infill.
20.08 - 20.10m: Fractures are subhorizontal, planar, smooth with clay infill.
20.24 - 20.38m: Thinly laminated grey fine grained sandstone.

21.10 - 21.14m: Fractures are subhorizontal, planar, smooth with mudstone gravel infill.

21.70 - 21.79m: Fractures are subhorizontal, planar, smooth with clay infill.

Very weak, partially weathered, thinly laminated grey MUDSTONE. Frequent randomly orientated interlocking fracture.

Weak, partially weathered, grey MUDSTONE.

22.80 - 22.85m: 30 degree fracture, planar, smooth, undulating with mudstone gravel infill.

23.30 - 23.42m: Very weak mudstone with frequent randomly orientated interlocking fractures.

Soft to firm grey slightly gravelly sandy CLAY. Gravel is angular to subangular, fine to coarse of mudstone.

Very weak, partially weathered, dark grey MUDSTONE. Frequent randomly orientated interlocking fractures.

Very weak black COAL. Frequent randomly orientated interlocking fractures.

Weak, partially weathered, grey SILTSTONE.

25.56 - 25.60m: 20 degree planar fracture, rough, undulating with clay infill.

Medium strong to strong, partially weathered, grey SILSTONE. Fractures are closely to medium spaced, subhorizontal, planar and smooth.

26.48 - 26.54m: 15 degree fracture, planar, smooth, undulating.

27.15 - 27.60m: Fracture is subvertical, planar, stepped.
27.20 - 27.27m: Fracture is subhorizontal, planar, smooth with clay infill.

End of Borehole at 28.85 m

Depth (m)	Level (m AOD)
(2.88)	
22.33	13.42
(0.40)	
22.70	13.05
(1.80)	
24.50	11.25
(0.35)	
24.85	10.90
(0.22)	
25.07	10.68
(0.13)	10.55
25.20	
(0.65)	
25.85	9.90
(3.00)	
28.85	6.90

Legend | Well/ Backfill

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.50	14.80	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	12.00
150	14.00
140	14.70

Hole Diameter

Diameter (mm)	Depth (m)
150	14.70
200	14.80
116	28.85

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH31

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.18 — Scale 1:50

Easting: 433642.91 — Northing: 559031.39

Client: Sunderland City Council — Driller: PK/DC — Logged By: ST/BC — Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 26/07/2017 - 11/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.10			MADE GROUND: Brown slightly sandy slightly gravelly clayey topsoil with some rootlets present. Gravel is angular to subrounded, fine to coarse of coal and sandstone.	(0.50)	
ES	0.10					
BRE	0.20					
D	0.20					
ES	0.20				0.50	34.68
B	0.40 - 0.90			MADE GROUND: Orangish brown slightly sandy gravelly clay of high plasticity. Gravel is subangular to subrounded, fine to coarse of coal, sandstone and brick.		
D	0.40					
ES	0.40					
D	0.70					
ES	0.70		1			
B	0.80 - 1.20				(1.20)	
BRE	0.80					
D	0.80					
B	1.00 - 1.50					
UT	1.20 - 1.65	6 blows				
BRE	1.50				1.70	33.48
D	1.50			Firm reddish brown slightly sandy gravelly CLAY. Gravel is angular to subrounded, fine to medium of coal and sandstone.	(0.30)	
D	1.65					
B	2.00 - 2.45		2 (1.80) Dry	Firm brown slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is angular to subrounded, fine to medium of coal and sandstone.	2.00	33.18
BRE	2.00					
D	2.00					
ES	2.00					
SPT (S)	2.00 - 2.45	N=9 (2,2/2,2,2,3)	26/07/2017 1700 (1.80) Dry			
BRE	2.50					
D	2.50		27/07/2017 0800 (1.80) Dry			
B	3.00 - 3.50		3	*3.00m: Stiff*	(2.00)	
UT	3.00 - 3.45	9 blows				
D	3.45					
BRE	3.50					
D	3.50					
BRE	3.70					
B	4.00 - 4.45		4 (3.10) Dry	Soft, thinly laminated brown silty CLAY. Light brown and grey silt dustings/partings on laminae surfaces.	4.00	31.18
D	4.00					
SPT (S)	4.00 - 4.45	N=5 (1,1/1,2,1,1)				
B	4.40 - 4.90					
BRE	4.50					
BRE	5.00		5	*5.00m: Clay of intermediate plasticity.*		
D	5.00					
UT	5.00 - 5.45	15 blows				
D	5.45					
	5.45	HVP=65 kPa				
BRE	5.70					
B	6.00 - 6.45		6 (3.10) Dry			
D	6.00					
SPT (S)	6.00 - 6.45	N=8 (1,2/1,2,2,3)				
BRE	6.50					
UT	7.00 - 7.45	15 blows	7			
D	7.45					
BRE	7.70					
B	8.00 - 8.45		8 (3.10) Dry			
D	8.00					
SPT (S)	8.00 - 8.45	N=7 (1,1/2,1,2,2)			(8.60)	
BRE	8.50					
D	8.70					
UT	9.00 - 9.45	10 blows	9	*9.00m: Clay of high plasticity.*		
D	9.45					
BRE	9.70					
B	10.00 - 10.45		10 (9.90) Dry			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.00	00:30
18.50	18.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	15.00
150	18.10
140	18.70

Hole Diameter

Diameter (mm)	Depth (m)
200	15.00
150	19.00
116	24.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH31

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.18 | Scale 1:50
Easting: 433642.91 | Northing: 559031.39

Client: Sunderland City Council | Driller: PK/DC | Logged By: ST/BC | Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 26/07/2017 - 11/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	10.00			Soft, thinly laminated brown silty CLAY. Light brown and grey silt dustings/partings on laminae surfaces.		
SPT (S)	10.00 - 10.45	N=6 (1,1/1,1,2,2)				
BRE	10.50					
UT	11.00 - 11.45	8 blows	11	*11.00m: Clay of high plasticity.*		
D	11.45					
BRE	11.70					
B	12.00 - 12.45		12 (10.90) Dry			
D	12.00					
SPT (S)	12.00 - 12.45	N=7 (1,1/2,1,2,2)				
BRE	12.50					
D	12.70			Firm thinly laminated reddish brown silty CLAY. Light grey silty dustings/partings on laminae surfaces.	12.60	22.58
UT	13.00 - 13.45	40 blows	13			
D	13.45					
BRE	13.70					
B	14.00 - 14.45		14 (10.90) Dry	*14.00m: Stiff.*		
D	14.00					
SPT (S)	14.00 - 14.45	N=32 (9,7/7,8,8,9)				
BRE	14.50					
UT	15.00 - 15.45	70 blows	15	*15.00m: Clay of low plasticity.*	(5.20)	
D	15.45					
BRE	15.70					
			16			
B	16.30 - 16.75		(16.10) Dry			
D	16.30					
SPT (S)	16.30 - 16.75	N=41 (5,7/8,11,11,11)				
BRE	16.80					
UT	17.00 - 17.45	80 blows	17			
D	17.45					
BRE	17.70				17.80	17.38
D	17.90			Very stiff, grey, slightly sandy, slightly gravelly, CLAY. Gravel is angular to subangular, fine to medium of mudstone and siltstone.		
B	18.00 - 18.45		18 (17.90) Dry			
D	18.00					
SPT (S)	18.00 - 18.40	N=50+ (7,9/11,15,15,9 for 30mm)			(1.20)	
BRE	18.50					
D	18.70		(18.10) Dry			
SPT (S)	18.70 - 18.88	N=50+ (25 for 70mm/30,20 for 35mm)	27/07/2017 1700			
	19.00 - 20.30		19 (18.10) Dry		19.00	
	19.00 - 20.30		18.70 - 20.30 95 % Water 27/07/2017 1700 (18.10) Dry	Firm to stiff reddish grey slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone, lithorelics.	19.00 (0.50)	16.18
C	19.50 - 19.75		TCR% 100, SCR% 62, RQD% 55, FI NA	Strong, partially weathered, reddish grey fine to medium grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar and smooth with light brown silt	19.50	15.68
			20			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.00	00:30
18.50	18.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	15.00
150	18.10
140	18.70

Hole Diameter

Diameter (mm)	Depth (m)
200	15.00
150	19.00
116	24.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH31

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.18 | Scale 1:50
Easting: 433642.91 | Northing: 559031.39

Client: Sunderland City Council | Driller: PK/DC | Logged By: ST/BC | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: BL | Dates: 26/07/2017 - 11/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
	20.30 - 21.80					
C	20.80 - 21.00		100	100	93	2
C	21.75 - 21.85 21.80 - 23.20		100	100	100	
C	23.20 - 24.70 23.30 - 23.45		100	100	100	2 6 2
C	24.40 - 24.55					

STRATA RECORD

(Casing) Groundwater	Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
20.30 - 21.70 95 % Water	infill.	(3.57)			
21.70 - 23.20 95 % Water	*21.59 - 21.63m: Subvertical fracture, planar, smooth, undulose with soft grey infill.*				
23.20 - 24.70 95 % Water	Medium strong to strong, partially weathered, light grey fine to coarse grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth, undulose and clean.	23.07 (0.81)	12.11		
	23.72 - 23.87m: Greenish grey surface staining.				
	Very weak to weak, partially weathered, dark grey MUDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth and clean.	23.88 (0.29) 24.17 (0.53)	11.30 11.01		
	24.00 - 24.06m: 30 degree, planar, smooth, undulose. *24.14 - 24.17m: Subhorizontal, planar, smooth with light grey clay infill.*				
11/08/2017 1700 (18.70) 2.60	Medium strong to strong, partially weathered, light grey fine to coarse grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth, undulose and clean.	24.70	10.48		

End of Borehole at 24.70 m

21 22 23 24 25 26 27 28 29 30

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.80	14.00	00:30
18.50	18.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	15.00
150	18.10
140	18.70

Hole Diameter

Diameter (mm)	Depth (m)
200	15.00
150	19.00
116	24.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH38

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.74 | Scale 1:50
Easting: 433694.57 | Northing: 558749.55

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017 - 11/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
D	0.10			MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, brick and coal.	(0.30)			
ES	0.10				0.30	35.44		
D	0.30			Stiff, brown mottled light grey, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.				
ES	0.40							
	0.40	HVP=70 kPa						
B	0.50 - 1.00							
BRE	0.50							
			1					
U	1.20 - 1.65	22 blows						
					(2.50)			
D	1.65							
BRE	1.90							
B	2.00 - 2.45		2 (1.60) Dry	*2.00m: Firm*				
D	2.00							
SPT (S)	2.00 - 2.45	N=13 (2,3/3,3,3,4)						
BRE	2.50							
					2.80	32.94		
D	2.90			Soft, thinly laminated, greyish brown, silty, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.				
UT	3.00 - 3.45	29 blows	3					
					(0.80)			
D	3.45							
					3.60	32.14		
BRE	3.70			Soft greyish brown slightly sandy slightly clayey SILT.				
					(0.30)			
D	3.90				3.90	31.84		
B	4.00 - 4.45		4 (1.60) Dry	Stiff thinly laminated greyish brown sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.				
D	4.00							
SPT (S)	4.00 - 4.45	N=7 (1,1/2,2,1,2)						
BRE	4.50							
UT	5.00 - 5.45	12 blows	5	*5.00m: Firm*				
D	5.45							
BRE	5.70							
B	6.00 - 6.45		6 (1.60) Dry					
D	6.00							
SPT (S)	6.00 - 6.45	N=10 (1,2/2,2,3,3)						
					(4.80)			
BRE	6.50							
UT	7.00 - 7.45	12 blows	7					
D	7.45							
BRE	7.70							
			8					
B	8.20 - 8.65		(1.60) Dry					
D	8.20							
SPT (S)	8.20 - 8.65	N=16 (2,2/3,3,4,6)						
BRE	8.70				8.70	27.04		
U	9.00 - 9.45	42 blows	9	Stiff, brownish grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, limestone, siltstone and coal. *9.00m: Clay of low plasticity.*				
D	9.45							
BRE	9.70							
B	10.00 - 10.45		10 (9.10) Dry					

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
11.90	12.10	00:30
14.20	14.40	00:30
15.50	15.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	12.10
140	16.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.90
116	21.60

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH38

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.74 | Scale 1:50
Easting: 433694.57 | Northing: 558749.55

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017 - 11/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.45	N=34 (4,5/6,8,9,11)
BRE	10.50	
U	11.00 - 11.45	59 blows
D	11.45	
BRE	11.70	
B	12.00 - 12.45	
D	12.00	
SPT (S)	12.00 - 12.41	N=49 (19,6 for 35mm/9,10,15,15)
BRE	12.50	
U	13.00 - 13.45	52 blows
D	13.45	
BRE	13.70	
B	14.00 - 14.45	
D	14.00	
SPT (S)	14.00 - 14.30	N=50+ (5,7/10,40 for 70mm)
BRE	14.50	
	14.65 - 16.15	
D	14.80	
B	15.00 - 15.50	
D	15.00	
SPT (S)	15.00 - 15.32	N=50+ (8,11/14,26,10 for 25mm)
D	15.70	
SPT (S)	15.70 - 15.90	N=50+ (9,16 for 35mm/42,8 for 15mm)
	14.65 - 16.15	
D	14.80	
B	15.00 - 15.50	
D	15.00	
SPT (S)	15.00 - 15.32	N=50+ (8,11/14, 26,10 for 25mm)
D	15.70	
SPT (S)	15.70 - 15.90	N=50+ (9,16 for 35mm/42 ,8 for 15mm)
	16.15 - 17.45	
	17.45 - 18.95	
C	18.35 - 18.55	
C	18.65 - 18.95	
	18.95 - 20.35	

TCR%	SCR%	RQD%	FI
100		0	20
100	70	0	A… 40
100	100	0	40
86	43	13	A… NI

(Casing) Groundwater: 11; 12; 13; 14 (12.10) Dry; 15 (12.10) Dry; 16 (12.10) Dry; 17; 18; 19; 20

10/08/2017 1700 (9.10) Dry
11/08/2017 0800 (9.10) Dry (11.90) Dry
(12.10) Dry
11/08/2017 1700 (12.10) Dry
15.10 - 18.95 90 % Water
11/08/2017 1700 (12.10) Dry
18.95 - 21.60 100 % Water

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Stiff, brownish grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, limestone, siltstone and coal.	(6.00)	
Very dense light grey, slightly clayey, slightly sandy, GRAVEL. Gravel is angular to subangular, fine to coarse of mudstone (Weathered MUDSTONE).	14.70 (1.15)	21.04
Extremely weak, partially weathered, dark red brown MUDSTONE. Fractures are very closely spaced subhorizontal, planar, smooth, clean.	15.85 (0.30)	19.89
15.90 - 16.15m: Subvertical planar, smooth, clean fracture	16.15 (0.30)	19.59
Stiff dark reddish brown gravelly CLAY. Gravel is is angular to subangular, fine to coarse of sandstone.	16.45	19.29
Extremely weak, partially weathered, dark red brown MUDSTONE. Fractures are extremely closely to very closely spaced subhorizontal, planar, smooth, clean.	(2.50)	
17.30 - 17.45m: Subvertical planar, smooth, clean fracture.		
18.74 - 18.77m: Dark grey sandstone.		
Stiff red brown slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	18.95 (0.35)	16.79
Stiff black slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	19.30 (0.30)	16.44
Very weak, partially weathered, reddish brown MUDSTONE. Fractures are extremely closely to very closely spaced	19.60	16.14

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
11.90	12.10	00:30
14.20	14.40	00:30
15.50	15.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	12.10
140	16.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.90
116	21.60

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH38

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.74 | Scale 1:50

Easting: 433694.57 | Northing: 558749.55

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017 - 11/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
						20		subhorizontal, planar, smooth. *19.95 - 20.05m: Subvertical planar, smooth, clean fracture.*				
	20.35 - 21.60							*20.45 - 20.50m: Subvertical planar, smooth fracture.*	(2.00)			
C	20.75 - 21.05		100	100	82	6	21					
C	21.45 - 21.60							*21.35 - 21.55m: Subvertical undulating, smooth, clean fractures.*				
								End of Borehole at 21.60 m	21.60	14.14		
							22					
							23					
							24					
							25					
							26					
							27					
							28					
							29					
							30					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
11.90	12.10	00:30
14.20	14.40	00:30
15.50	15.70	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	12.10
140	16.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.90
116	21.60

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH39

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.84 — Scale 1:50

Easting: 433520.01 — Northing: 558654.45

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 1 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.20			Dark brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	(0.30)	
ES	0.20				0.30	37.54
	0.20	HVP=24 kPa				
B	0.50 - 1.20			Firm light brown slightly sandy slightly gravelly CLAY of very high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.		
D	0.50					
ES	0.50				(0.90)	
	0.70	HVP=67 kPa				
BRE	1.00		1			
D	1.00					
D	1.20				1.20	36.64
UT	1.20 - 1.65	22 blows		Firm brown mottled dark grey, slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.		
D	1.65					
BRE	1.90					
B	2.00 - 2.45		2			
D	2.00				(1.80)	
SPT (S)	2.00 - 2.45	N=10 (1,2/2,2,3,3)				
BRE	2.50					
			11/08/2017 1700 (1.60) Dry			
			23/08/2017 0800			
UT	3.00 - 3.30	23 blows	3 (1.60) Dry	Firm greyish brown silty, slightly sandy CLAY of intermediate plasticity.	3.00	34.84
D	3.35					
B	3.40 - 3.90				(0.90)	
BRE	3.50					
D	3.90				3.90	33.94
B	4.00 - 4.50		4 (3.90) Dry	Stiff, greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone, siltstone and coal.		
D	4.00					
SPT (S)	4.00 - 4.45	N=16 (3,3/4,4,3,5)				
BRE	4.50					
UT	5.00 - 5.45	87 blows	5	*5.00m: Clay of low plasticity.*		
D	5.50					
BRE	5.70					
B	6.00 - 6.50		6 (5.90) Dry			
D	6.00					
SPT (S)	6.00 - 6.45	N=19 (4,3/4,4,5,6)				
BRE	6.70					
UT	7.00 - 7.45	80 blows	7			
					(7.00)	
D	7.50					
BRE	7.70					
B	8.00 - 8.50		8 (7.90) Dry			
D	8.00					
SPT (S)	8.00 - 8.45	N=23 (3,4/4,5,7,7)				
BRE	8.70					
UT	9.00 - 9.30	100 blows	9	*9.00m: Clay of intermediate plasticity.*		
D	9.35					
BRE	9.70					
B	10.00 - 10.50		10 (9.90) Dry			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.90	10.10	00:30
11.00	11.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	10.50
140	13.00

Hole Diameter

Diameter (mm)	Depth (m)
200	11.35
140	13.00
116	16.75

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH39

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.84 | Scale 1:50
Easting: 433520.01 | Northing: 558654.45

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 2 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	TCR%	SCR%	RQD%	FI
D	10.00					
SPT (S)	10.00 - 10.45	N=26 (10,12/5,6,6,9)				
BRE	10.70					
D	10.90					
B	11.00 - 11.30					
D	11.00					
SPT (S)	11.00 - 11.32	N=50+ (4,10/15,24,11 for 20mm)				
BRE	11.25					
D	11.30					
SPT (S)	11.30 - 11.44	N=50+ (25 for 70mm/50 for 70mm)				NI
C	11.70 - 11.85					
C	12.60 - 12.75		100	93	0	15
	13.00 - 13.70		100	36	26	20
C	13.60 - 13.75					40
	13.70 - 15.25					8
C	13.95 - 14.25					20
C	14.60 - 14.75		100	73	86	
	15.25 - 16.75					4
C	15.40 - 15.60		100	73	63	
						40

(Casing) Groundwater: 11 (10.50) Dry; (10.50) Dry; 22/08/2017 11.00; (10.50) Dry; 11.50 - 16.75 100 % Water

STRATA RECORD Description

Depth (m)	Level (m AOD)
10.90	26.94
(0.45)	
11.35	26.49
(0.15)	26.34
11.50	
(2.45)	
14.00	23.84
(2.15)	
16.15	21.69
(0.60)	
16.75	21.09

Stiff, greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone, siltstone and coal.

10.70m: Firm.

Very dense reddish brown sandy GRAVEL. Gravel is angular to subangular, fine to coarse of mudstone. (Weathered MUDSTONE).

Brown gravelly sandy CLAY. (Weathered mudstone).

Very weak to weak, partially weathered, reddish brown sandy MUDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth, clean.

11.68 - 11.75m: Subvertical planar, smooth, clean fracture.

12.05 - 12.40m: Subvertical undulating, rough, clean fracture

13.28 - 13.36m: Firm red brown sandy gravel.

13.50 - 13.56m: Extremely closely spaced subhorizontal planar, smooth, clean fracture.

13.75 - 13.85m: Subvertical undulating, smooth, clean fracture.

Very weak to weak, partially weathered, dark reddish brown MUDSTONE. Fractures are subhorizontal, closely spaced, planar, smooth, clean.

Extremely weak to very weak, partially weathered, dark grey MUDSTONE. Fractures are extremely closely to very closely spaced subhorizontal, planar, smooth, clean.

End of Borehole at 16.75 m

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.90	10.10	00:30
11.00	11.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	10.50
140	13.00

Hole Diameter

Diameter (mm)	Depth (m)
200	11.35
140	13.00
116	16.75

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH40

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.97 | Scale 1:50
Easting: 433340.02 | Northing: 558582.52

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 1 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 25/08/2017 - 04/09/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	0.20	
ES	0.20	
	0.20	HVP=25 kPa
B	0.50 - 1.20	
D	0.50	
ES	0.50	
	0.70	HVP=67 kPa
BRE	1.00	
D	1.00	
B	1.20 - 1.70	
D	1.20	
SPT (S)	1.20 - 1.65	N=16 (1,3/4,4,4,4)
BRE	1.90	
U	2.20 - 2.65	57 blows
B	2.50 - 3.00	
D	2.70	
BRE	2.90	
B	3.20 - 3.70	
D	3.20	
SPT (S)	3.20 - 3.65	N=17 (2,2/3,4,5,5)
BRE	3.90	
UF	4.20 - 4.70	54 blows
B	4.70 - 5.20	
D	4.70	
SPT (S)	4.70 - 5.15	N=12 (2,3/3,3,3,3)
BRE	4.90	
BRE	5.40	
U	5.70 - 5.90	100 blows
D	5.95	
D	6.20	
SPT (S)	6.20 - 6.30	N=50+ (25 for 50mm/50 for 50mm)
	6.30 - 7.35	
C	6.40 - 6.50	
	7.35 - 8.85	
	8.85 - 10.35	

TCR%	SCR%	RQD%	FI
95	76	28	AZCL 20
			30
			A…
			30
90	73	16	
			12
100	100	26	

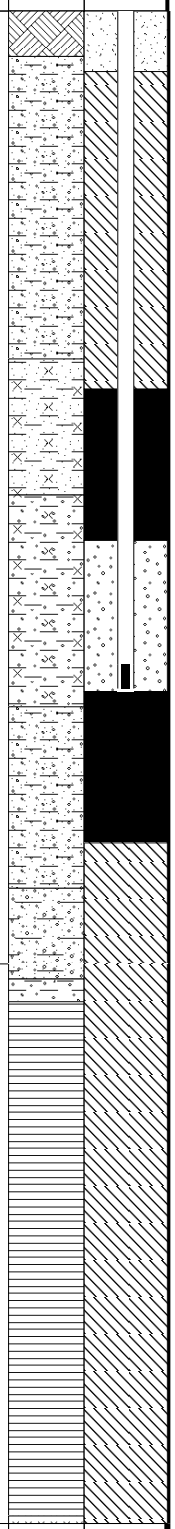
(Casing) Groundwater: Dry; (3.00) Dry; (3.00) Dry; 6.30 - 11.85 95 % Water

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Dark brown slightly sandy, slightly gravelly, clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, siltstone and coal.	(0.30) 0.30	38.67
Firm dark brown mottled light grey slightly sandy, slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and siltstone. *1.20m: Stiff*	(2.00) 2.30	36.67
Very soft greyish brown silty sandy CLAY. Sand is fine to coarse.	(0.90) 3.20	35.77
Stiff brown slightly gravelly silty CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and siltstone.	(1.40) 4.60	34.37
Firm greyish dark brown slightly sandy slightly gravelly CLAY of low plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone, siltstone and coal.	(1.20) 5.80	33.17
Very dense brownish grey slightly clayey sandy GRAVEL. Gravel is angular to subangular, fine to coarse of siltstone. (Weathered SILTSTONE).	(0.60) 6.40	32.57
Firm dark brown sandy gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	(0.15) 6.55	32.42
Very weak, partially weathered, dark reddish brown MUDSTONE. Fractures are closely to very closely spaced subhorizontal, planar, smooth, clean. *7.00m: Subvertical, stepped, smooth, clean fracture.* *7.80 - 7.86m: Subvertical undulating, smooth, clean fracture.* *8.35 - 8.42m: Subvertical planar, smooth, clean fracture.* *8.82m: Subvertical, planar, smooth, clean fractures.* *9.00- 9.85m: Subvertical undulating, smooth, clean fracture.*	(3.40) 9.95	29.02

Continued on next sheet

Legend | **Well/ Backfill**



Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
6.00	6.20	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	3.00
140	7.50

Hole Diameter

Diameter (mm)	Depth (m)
116	6.30
200	6.30
116	11.85

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH40

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.97 | Scale 1:50

Easting: 433340.02 | Northing: 558582.52

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 2 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 25/08/2017 - 04/09/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
	10.35 - 11.85		100	100	94	4	11	Weak, partially weathered, dark grey SILTSTONE. Fractures are very closely to closely spaced subhorizontal, planar, smooth, clean. *10.95 - 11.00m: Subvertical undulating, smooth fracture.* *11.50 - 11.65m: At 50-90 degree, undulating, rough fractures,*	(1.90)			
							12	End of Borehole at 11.85 m	11.85	27.12		
							13					
							14					
							15					
							16					
							17					
							18					
							19					
							20					

Ground Water (m)				
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Log last updated 08/02/2018

Chiselling / Hard Strata		
From (m)	To (m)	Time (hr)
6.00	6.20	01:00

Casing Depths	
Diameter (mm)	Depth (m)
200	3.00
140	7.50

Hole Diameter	
Diameter (mm)	Depth (m)
116	6.30
200	6.30
116	11.85

General Remarks

1. Hand dug inspection pit to 1.20m.

BOREHOLE RECORD

Borehole BH45

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.63 — Scale 1:50

Easting: 433350.81 — Northing: 559060.39

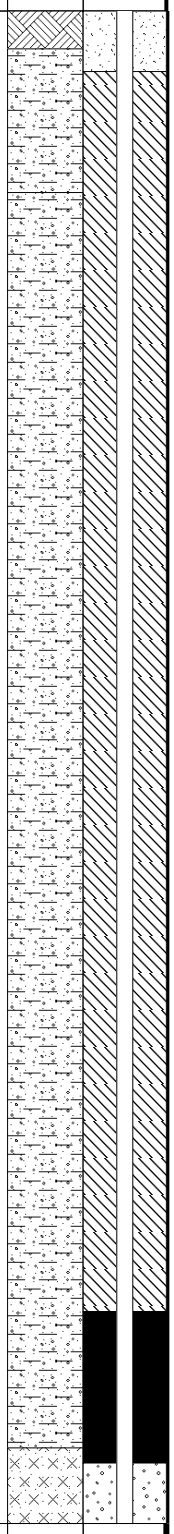
Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 1 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 02/08/2017 - 17/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.10			Dark brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, limestone, mudstone and coal.	(0.25)	
ES	0.10				0.25	35.38
D	0.30					
B	0.50 - 1.00			Firm brown slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.95)	
			1			
B	1.20 - 1.65			Firm greyish brown slightly sandy slightly gravelly silty CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, limestone and mudstone.	1.20	34.43
UF	1.20 - 1.65	49 blows				
BRE	1.70					
B	2.00 - 2.45		2 (1.60) Dry			
D	2.00					
SPT (S)	2.00 - 2.45	N=15 (3,5/4,4,3,4)				
BRE	2.50					
U	3.00 - 3.45	22 blows	3			
D	3.45					
BRE	3.70					
B	4.00 - 4.45		4 (1.60) Dry			
D	4.00					
SPT (S)	4.00 - 4.45	N=7 (1,2/2,2,1,2)				
BRE	4.50					
U	5.00 - 5.45	16 blows	5			
D	5.45				(8.30)	
BRE	5.70					
B	6.00 - 6.45		6 (1.60) Dry			
D	6.00					
SPT (S)	6.00 - 6.45	N=9 (3,2/3,2,2,2)				
BRE	6.50					
U	7.00 - 7.45	12 blows	7	*7.00m: Clay of high plasticity.*		
D	7.45					
BRE	7.70					
B	8.00 - 8.45		8 (1.60) Dry			
D	8.00					
SPT (S)	8.00 - 8.45	N=7 (3,2/2,1,2,2)				
BRE	8.50					
B	9.00 - 9.45		9 (1.60) Dry			
D	9.00					
SPT (S)	9.00 - 9.45	N=9 (2,3/2,2,3,2)				
BRE	9.50			Firm, greyish brown slightly sandy clayey SILT. Sand is fine to coarse.	9.50	26.13
D	9.50					
B	10.00 - 10.65		10			

Continued on next sheet

Legend / **Well/ Backfill**



Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
13.20	12.00	3.4	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.60	13.80	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	13.80
140	13.80

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	13.60
121	19.10

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH45

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.63 — Scale 1:50

Easting: 433350.81 — Northing: 559060.39

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 2 of 2

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: BL — Dates: 02/08/2017 - 17/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
UF	10.00 - 10.64	4 blows
BRE	10.70	
D	10.70	
U	11.00 - 11.45	7 blows
D	11.45	
BRE	11.70	
D	11.90	
B	12.00 - 12.45	
D	12.00	
SPT (S)	12.00 - 12.45	N=30 (4,5/6,7,8,9)
BRE	12.50	
D	12.80	
B	13.20 - 13.65	
D	13.20	
SPT (S)	13.20 - 13.65	N=39 (4,4/6,8,10,15)
BRE	13.60	
D	13.70	
D	13.80	
SPT (S)	13.90 - 14.90	N=50+ (8,17/40,10 for 10mm)
C	13.90 - 14.90	
C	14.70 - 14.90	
	14.90 - 15.90	
C	15.80 - 15.90	
	15.90 - 16.30	
	16.30 - 17.70	
C	16.90 - 17.20	
	17.70 - 19.10	
C	18.00	
C	18.20 - 18.40	

TCR%	SCR%	RQD%	FI
			NI
100	80	80	1
			NI
			0
			A...
91	91	49	3
			A...
90	90	90	
100	100	91	1
100	80	62	NA
			6
			4
			5

(Casing) Groundwater: 11, 12 (11.90) Dry, 13 (12.10) Dry, 03/08/2017 1700 (13.80) 3.10, 14 (13.80) 3.10, 0 % Water, 17.70 - 19.10 75 % Water

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Firm, greyish brown slightly sandy clayey SILT. Sand is fine to coarse.	(1.20)	
Firm slightly sandy slightly gravelly silty CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	10.70	24.93
12.00m: Stiff.	(2.00)	
Stiff reddish brown slightly sandy slightly gravelly CLAY of low plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	12.70	22.93
Very dense light brown sandy GRAVEL. Gravel is angular to subangular, fine to coarse of sandstone. (Weathered rockhead).	(0.90)	
Medium strong, partially weathered, light brown fine to medium grained SANDSTONE. Fractures are closely spaced, subhorizontal, planar, smooth, undulose with light brown clay infill.	13.60	22.03
14.62 - 14.72m: Fracture is subhorizontal, planar, rough, undulating with reddish brown sandstone gravel infill.	(0.45)	
14.90 - 14.99m: AZCL.	14.05	21.58
15.66 - 15.77m: Fracture is 30 degrees, planar and smooth.	(3.80)	
15.90 - 15.94m: AZCL.		
16.46m: Fracture is 10 degrees, planar, smooth with grey clay infill.		
16.46 - 16.56m: Fractures are 30 degrees, planar, rough with grey clay infill.		
Firm to stiff light brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of sandstone.	17.70	17.93
Medium strong to strong, partially weathered light brown fine to medium grained SANDSTONE. Fractures are closely spaced, subhorizontal, planar, smooth and clean.	(0.23) 17.93	17.70
Medium strong, partially weathered, light grey fine grained SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean.	(0.27) 18.20	17.43
Medium strong to strong, partially weathered, light brown fine to coarse grained SANDSTONE. Fractures are closely spaced, subhorizontal, planar, smooth and clean.	(0.50) 18.70	16.93
18.82m: Fractures are 20 degree, planar, smooth with black clay infill.	(0.40) 19.10	16.53
18.92 - 18.99m: Fractures are subhorizontal, planar, smooth with reddish brown slightly gravelly clay infill. Gravel is angular to subangular, fine to medium of sandstone.		
End of Borehole at 19.10 m		

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
13.20	12.00	3.4	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
13.60	13.80	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	13.80
140	13.80

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	13.60
121	19.10

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH46

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.56 | Scale 1:50
Easting: 433172.22 | Northing: 558831.72

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 1 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
ES	0.20	
	0.40	HVP=57 kPa
ES	0.50	
B	0.60 - 1.20	
D	0.60	
BRE	1.00	
D	1.00	
UT	1.20 - 1.65	54 blows
D	1.65	
BRE	2.00	
D	2.00	
B	2.20 - 2.70	
D	2.20	
SPT (S)	2.20 - 2.29	N=50+ (25 for 40mm/50 for 50mm)
B	3.00	
BRE	3.00	
D	3.00	
B	3.20 - 3.70	
UT	3.20 - 3.65	94 blows
U	3.80 - 4.25	150 blows
D	4.25	
BRE	4.80	
D	4.80	
B	5.00 - 5.50	
D	5.00	
SPT (S)	5.00 - 5.45	N=31 (5,7/7,7,8,9)
BRE	5.80	
D	5.80	
U	6.00 - 6.45	135 blows
D	6.45	
BRE	6.80	
D	6.80	
B	7.00 - 7.50	
D	7.00	
SPT (S)	7.00 - 7.44	N=50+ (7,9/9,12,15,14 for 60mm)
BRE	7.80	
D	7.80	
D	7.90	
D	8.00	
SPT (S)	8.20 - 8.40	N=50+ (12,13 for 10mm/50 for 20mm)
SPT (C)	8.20 - 9.60	N=0 (25 for 40mm,0 for 30mm/)
C	9.50 - 9.60	
	9.60 - 11.10	

TCR%	SCR%	RQD%	FI
100	92	61	4

(Casing) Groundwater: 1; 2; (2.00) Dry; 3; 4; 5 (4.50) Dry; 6; 7 (6.00) Dry; 8 (7.50) Dry; (6.60) 2.00; 8.20 - 11.10 75 % Water; 9; 10

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Dark brown slightly sandy slightly gravelly slightly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, siltstone and coal.	(0.10) 0.10 (0.40)	38.46
Firm brownish grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone, siltstone and coal. Occasional rootlets noted.	0.50	38.06
Stiff orangish brown, mottled grey, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(1.70)	
Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, siltstone and coal. Cobbles are of sandstone.	2.20	36.36
3.20m: Clay of low plasticity.		
6.00m: Clay of intermediate plasticity.	(5.70)	
6.45 - 6.80m: Firm.		
Very dense reddish brown sandy GRAVEL. Gravel is angular to subangular, fine to coarse of siltstone. (Weathered SILTSTONE).	7.90 (0.30) 8.20	30.66
Very weak to weak, partially weathered, brownish grey SILTSTONE. Fractures are closely spaced subhorizontal planar, smooth, clean.	8.20	30.36
8.22 - 8.53m: Subvertical, stepped, smooth, clean with light brown discolouration on fracture surface.		
8.91 - 8.95m: 10 degree, planar, smooth with light grey siltstone gravel.	(1.87)	

Legend | Well/ Backfill

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
2.20	2.60	00:45
8.00	8.20	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	7.50
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
200	8.20
116	30.60

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH46

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.56 | Scale 1:50
Easting: 433172.22 | Northing: 558831.72

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 2 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
C	10.10 - 10.22		100	100	97	3
	11.10 - 12.60		100	95	84	4
C	12.20 - 12.35					NI
	12.60 - 14.10		100	100	97	3
C	13.30 - 13.40					
	14.10 - 15.60		100	100	100	
C	14.20 - 14.30					
	15.60 - 17.10		100	100	87	
C	15.70 - 16.05					
	17.10 - 18.60		100	100	61	2
	18.60 - 20.10		100	100	93	
	20.10 - 21.60					

(Casing) Groundwater: 11.10 - 30.60, 95 % Water

STRATA RECORD Description

Depth (m)	Level (m AOD)
10.07	28.49
(1.84)	
11.91	26.65
(2.95)	
14.86	23.70
(5.48)	

Very weak to weak, partially weathered, thinly laminated, brownish dark grey MUDSTONE. Fractures are closely to medium spaced subhorizontal, planar, smooth, undulose, clean.

11.32 - 11.34m: Subhorizontal, planar, smooth with light grey clay infill.

11.88 - 11.91m: Subhorizontal, planar, smooth with light grey clay infill.

Very weak to weak, partially weathered, thinly laminated grey MUDSTONE. Fractures are closely spaced subhorizontal, planar, smooth, clean. (Drillers description).

12.53 - 12.60m: Fractures are frequent, interlock and orientated.

12.93 - 12.95m: 15 degree, planar, smooth with light grey clay infill.

13.96 - 13.98m: 15 degree, planar, smooth with light grey clay infill.

14.37m: Subhorizontal, stepped, smooth, clean fractures.

14.70 - 14.71m: 20 degree planar, smooth with light grey sandstone gravel infill.

Medium strong to strong, unweathered, grey fine grained SANDSTONE. Fractures are closely to medium spaced between 20-30 degrees, planar, smooth, clean.

15.28 - 15.33m: Very weak to weak blue, grey mudstone band.

16.05 - 16.08m: Subhorizontal planar, smooth with light grey clay infill.

16.58 - 16.62m: Weak blue, grey mudstone band.

17.10 - 17.27m: Subvertical, planar, smooth, undulose, clean fracture

19.70 - 19.74m: Weak thinly laminated blue, grey mudstone band.

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
2.20	2.60	00:45
8.00	8.20	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	7.50
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
200	8.20
116	30.60

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH46

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.56 | Scale 1:50
Easting: 433172.22 | Northing: 558831.72

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 3 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
						4		Very weak, partially weathered, grey MUDSTONE. Fractures are closely spaced between 5 - 20 degree, planar, smooth, clean.	20.34	18.22		
			100	100	90				(0.51)			
								Medium strong to strong, partially weathered, grey fine to medium grained SANDSTONE. Fractures are subhorizontal, planar, smooth, clean.	20.85	17.71		
							21					
	21.60 - 23.10											
			100	100	67		22					
								22.38m: Fractures are subhorizontal, planar, smooth, undulose with grey clay infill.				
								22.59 - 22.88m: Subvertical planar, smooth, undulose, clean fractures.				
	23.10 - 24.60						23					
			100	100	100							
							24					
	24.60 - 26.10											
			100	100	0		25					
						2						
								25.60m: Fractures are subhorizontal, planar, smooth, undulose with light grey clay infill.	(9.75)			
	26.10 - 27.60						26					
			100	100	0							
							27	*26.89m: Fractures are subhorizontal, planar, smooth with light grey clay infill.*				
								26.96m: Fractures are subhorizontal, planar, rough with grey clay infill.				
								27.20m: Fractures are subhorizontal, planar, smooth with light grey sandstone gravel infill.				
	27.60 - 29.10											
			100	100	100		28					
							29					
	29.10 - 30.60											
			100	100	100							
							30					

Continued on next sheet

Ground Water (m)				
Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata		
From (m)	To (m)	Time (hr)
2.20	2.60	00:45
8.00	8.20	01:00

Casing Depths		Hole Diameter	
Diameter (mm)	Depth (m)	Diameter (mm)	Depth (m)
200	7.50	200	8.20
140	11.00	116	30.60

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH46

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.56 | Scale 1:50
Easting: 433172.22 | Northing: 558831.72

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 4 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 10/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
								End of Borehole at 30.60 m	30.60	7.96		
							31					
							32					
							33					
							34					
							35					
							36					
							37					
							38					
							39					
							40					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
2.20	2.60	00:45
8.00	8.20	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	7.50
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
200	8.20
116	30.60

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH47

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.54 | Scale 1:50
Easting: 433430.80 | Northing: 558934.44

Client: Sunderland City Council | Driller: PK/DC | Logged By: AH | Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 07/08/2017 - 18/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater
D	0.10		
ES	0.10		
	0.30	HVP=25 kPa	
D	0.70		
ES	0.70		
	0.70	HVP=66 kPa	
B	0.80 - 1.20		1
BRE	0.80		
U	1.20 - 1.65	29 blows	
D	1.65		
BRE	1.90		
D	2.00		2 (1.60) Dry
SPT (S)	2.00 - 2.45	N=14 (2,2/3,3,4,4)	
BRE	2.50		
U	3.00 - 3.45	22 blows	3
D	3.45		
BRE	3.70		
B	4.00 - 4.45		4 (1.60) Dry
D	4.00		
SPT (S)	4.00 - 4.45	N=12 (1,2/2,3,4,3)	
D	4.30		
BRE	4.50		
UT	5.00 - 5.45	12 blows	5
D	5.45		
BRE	5.70		
B	6.00 - 6.45		6 (1.20) Dry
D	6.00		
SPT (S)	6.00 - 6.45	N=13 (2,3/3,3,3,4)	
BRE	6.50		
UT	7.00 - 7.45	22 blows	7
D	7.45		
BRE	7.70		
B	8.00 - 8.45		8 (1.60) Dry
D	8.00		
SPT (S)	8.00 - 8.45	N=20 (5,5/6,5,5,4)	
BRE	8.50		
UT	9.00 - 9.45	18 blows	9
D	9.45		
BRE	9.70		
B	10.00 - 10.45		10 (9.90) Dry

STRATA RECORD

Description	Depth (m)	Level (m AOD)
MADE GROUND: Brown slightly sandy slightly gravelly clayey topsoil. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, coal and brick.	(0.60)	
	0.60	35.94
Firm, dark brown mottled grey, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone, siltstone and coal. *1.20m: Stiff*	(2.50)	
	3.10	33.44
Firm, dark brown mottled grey, silty slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and siltstone.	(1.20)	
	4.30	32.24
Firm thinly laminated greyish brown silty slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and siltstone. *5.00m: Clay of low plasticity.*	(3.70)	
	8.00	28.54
Stiff greyish brown silty slightly sandy CLAY of low plasticity.	(1.50)	
	9.50	27.04
Firm, slightly sandy slightly gravelly CLAY with frequent cobbles. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone, limestone and coal. Cobbles are of		

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
15.30	14.90	11.8	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
10.30	10.50	00:30
12.80	13.10	01:00
13.90	14.20	00:45
14.40	14.50	00:20
14.90	15.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	15.00
140	18.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.30
121	20.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH47

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.54 — Scale 1:50

Easting: 433430.80 — Northing: 558934.44

Client: Sunderland City Council — Driller: PK/DC — Logged By: AH — Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 07/08/2017 - 18/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.37	N=50+ (5,9/12,11,27 for 70mm)
BRE	10.50	
U	11.00 - 11.45	56 blows
D	11.45	
BRE	11.70	
B	12.00 - 12.45	
D	12.00	
SPT (S)	12.00 - 12.44	N=50+ (7,10/12,14,14,10 for 70mm)
BRE	12.50	
D	12.70	
B	13.00 - 13.45	
D	13.00	
SPT (S)	13.00 - 13.38	N=49 (25/12,11,11,15)
BRE	13.50	
D	13.80	
B	14.00 - 14.40	
D	14.00	
SPT (S)	14.00 - 14.22	N=50+ (21,4 for 10mm/21,29 for 60mm)
D	14.80	
	15.20 - 16.70	
D	15.30	
D	15.20 - 16.70	
SPT (S)	15.30 - 15.39	N=50+ (25 for 45mm/50 for 45mm)
SPT (S)	15.30 - 15.39	N=50+ (25 for 45mm/50 for 45mm)
C	15.47 - 15.89	
C	16.10 - 16.29	
C	16.70 - 16.83	
	16.70 - 18.20	
C	17.70 - 17.84	
	18.20 - 19.70	
	19.70 - 20.70	

TCR%	SCR%	RQD%	FI
			NI
100	72	53	3
			40
100	100	100	3
100	80	20	12
			30
			10

(Casing) Groundwater

11
07/08/2017 (10.90) Dry
08/08/2017 0800
12 (10.90) Dry
(11.90) Dry
13 (12.90) Dry
14 (13.90) Dry
15
08/08/2017 1700 (15.00) Dry
(15.00) 53 % Water
08/08/2017 1700 (15.00) Dry
(15.00) Dry
16
16.70 - 18.20 60 % Water
17
18.20 - 19.70 45 % Water
18
19.70 - 20.70 90 % Water
19
20

STRATA RECORD Description

Firm, slightly sandy slightly gravelly CLAY with frequent cobbles. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone, limestone and coal. Cobbles are of sandstone.

10.00m: Very stiff.

11.00m: Clay of low plasticity.

(5.30)

Very dense yellowish brown sandy GRAVEL. Gravel is subangular to angular, fine to coarse of sandstone. (Weathered sandstone, rockhead).

14.80 — 21.74

(0.50)

15.30 — 21.24

Weak, partially weathered, light brown fine to medium SANDSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean. Below 16.62m fractures are medium to widely spaced.

16.25 - 16.70m: Subvertical, planar, smooth, clean fracture.

16.40 - 16.62m: Frequent subvertical fractures with brown clay infill.

(2.75)

17.50 - 18.00m: Dark red staining.

18.05 — 18.49

Weak, partially weathered, orange brown fine, predominantly medium to coarse, micaceous SANDSTONE. Fractures are subhorizontal, planar, smooth with dark red staining.

18.05 - 19.05m: Subvertical, undulose fracture with orange staining.

(1.00)

19.05 — 17.49

19.04 - 19.06m: Dark red brown clay.

Extremely weak, partially weathered, thinly to thickly bedded red brown MUDSTONE with occasional thin laminae of siltstone. Fractures are very closely spaced, subhorizontal, planar, smooth and clean.

19.38m: Subvertical, planar, smooth, clean fracture.

(0.95)

20.00 — 16.54

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
15.30	14.90	11.8	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
10.30	10.50	00:30
12.80	13.10	01:00
13.90	14.20	00:45
14.40	14.50	00:20
14.90	15.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	15.00
140	18.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.30
121	20.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH47

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 36.54 | Scale 1:50

Easting: 433430.80 | Northing: 558934.44

Client: Sunderland City Council | Driller: PK/DC | Logged By: AH | Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 07/08/2017 - 18/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
			100	40	10	28		*19.90 - 20.08m: 40 - 60 degree planar, smooth, clean fracture.* Extremely weak to weak, partially weathered, dark grey red brown MUDSTONE. Fractures are subhorizontal, planar, smooth with occasional clay infill.	(0.40) 20.40	16.14		
						NI		Red brown gravelly CLAY. Gravel is angular, fine to coarse of mudstone. (Weathered MUDSTONE). Occasional very thin beds of mudstone.	(0.30) 20.70	15.84		
							21	End of Borehole at 20.70 m				
							22					
							23					
							24					
							25					
							26					
							27					
							28					
							29					
							30					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
15.30	14.90			

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
10.30	10.50	00:30
12.80	13.10	01:00
13.90	14.20	00:45
14.40	14.50	00:20
14.90	15.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	15.00
140	18.00

Hole Diameter

Diameter (mm)	Depth (m)
200	1.60
150	15.30
121	20.70

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH48

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.44 — Scale 1:50

Easting: 433655.60 — Northing: 558895.29

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 1 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 08/08/2017 - 18/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
D	0.10			Dark brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, limestone, mudstone, siltstone and coal.	(0.50)	
ES	0.10					
	0.40	HVP=26 kPa				
D	0.50			Firm, brown mottled light brown, slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.50	34.94
ES	0.50					
B	0.60 - 1.20					
BRE	0.60					
	0.70	HVP=68 kPa	1		(0.80)	
U	1.20 - 1.65	29 blows				
				Firm brown, mottled light grey, slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	1.30	34.14
D	1.65					
BRE	1.90					
B	2.00 - 2.45		2 (1.60) Dry	*2.00m: Stiff*		
D	2.00					
SPT (S)	2.00 - 2.45	N=17 (2,3/3,4,5,5)				
					(2.15)	
BRE	2.50					
U	3.00 - 3.45	15 blows	3			
D	3.45			Firm, thinly laminated, greyish brown, slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded, fine to coarse of sandstone, mudstone and coal.	3.45	31.99
BRE	3.70					
B	4.00 - 4.45		4 (1.60) Dry			
D	4.00					
SPT (S)	4.00 - 4.45	N=9 (1,2/2,2,2,3)				
BRE	4.50					
UT	5.00 - 5.45	9 blows	5	*5.00m: Clay of intermediate plasticity.*		
D	5.45					
BRE	5.70					
B	6.00 - 6.45		6 (1.60) Dry			
D	6.00					
SPT (S)	6.00 - 6.45	N=10 (2,2/2,2,3,3)				
BRE	6.50		08/08/2017 1700 (1.60) Dry 09/08/2017 0800 (1.60) 2.10			
UT	7.00 - 7.45	12 blows	7		(7.35)	
D	7.45					
BRE	7.70					
B	8.00 - 8.45		8 (1.60) Dry	*8.00m: Clay of high plasticity.*		
D	8.00					
SPT (S)	8.00 - 8.45	N=9 (2,2/2,2,2,3)				
BRE	8.50					
UT	9.00 - 9.45	10 blows	9			
D	9.45					
BRE	9.70					
B	10.00 - 10.45		10 (9.90) Dry			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
18.00	12.40	5.3	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.90	15.10	00:20
17.10	17.20	00:20
18.00	18.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	11.50
140	22.50

Hole Diameter

Diameter (mm)	Depth (m)
200	10.00
150	18.50
121	23.50

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH48

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.44 | Scale 1:50
Easting: 433655.60 | Northing: 558895.29

Client: Sunderland City Council | Driller: PK/DC | Logged By: BC | Sheet 2 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 08/08/2017 - 18/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	10.00	
SPT (S)	10.00 - 10.45	N=10 (1,2/2,2,3,3)
BRE	10.50	
D	10.90	
B	11.00 - 11.65	
UF	11.00 - 11.65	4 blows
BRE	11.70	
D	11.80	
B	12.00 - 12.45	
D	12.00	
SPT (S)	12.00 - 12.45	N=22 (3,4/4,5,6,7)
BRE	12.50	
U	13.00 - 13.45	60 blows
D	13.45	
BRE	13.70	
B	14.00 - 14.45	
D	14.00	
SPT (S)	14.00 - 14.45	N=29 (4,5/7,8,8,6)
BRE	14.50	
B	15.20 - 15.65	
D	15.20	
SPT (S)	15.20 - 15.64	N=50+ (6,8/13,14,11,12 for 70mm)
BRE	15.70	
U	16.00 - 16.45	72 blows
D	16.45	
BRE	16.70	
B	17.00 - 17.45	
D	17.00	
SPT (S)	17.00 - 17.20	N=50+ (9,16 for 55mm/50)
BRE	17.50	
B	18.00 - 18.30	
D	18.00	
SPT (S)	18.00 - 18.14	N=50+ (15,10 for 15mm/50 for 55mm)
D	18.30	
SPT (S)	18.30 - 18.50	
	18.50 - 20.00	
C	19.40 - 19.60	
	20.00 - 21.30	

TCR%	SCR%	RQD%	FI
100	81	29	NI
			10
			NI
			0
			12

STRATA RECORD

(Casing)	Groundwater	Description	Depth (m)	Level (m AOD)
		Firm, thinly laminated, greyish brown, slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded, fine to coarse of sandstone, mudstone and coal.	10.80	24.64
11		Firm thinly laminated slightly sandy silty CLAY of intermediate plasticity.	(1.00)	
12 (11.90)	Dry	Stiff, brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	11.80	23.64
13		*13.00m: Clay of low plasticity.*		
14 (12.40)	Dry			
15			(6.20)	
(12.40)	Dry			
16				
17 (12.40)	Dry			
18 (12.40)	Dry		18.00	17.44
(12.40) 4.70		Very dense reddish brown sandy GRAVEL. Gravel is subangular to angular, fine to coarse of sandstone. (Weathered SANDSTONE).	(0.50)	
09/08/2017 1700 (12.40) 4.70		Weak to medium strong, partially weathered, brown fine to coarse grained SANDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth with localised clay infill.	18.50	16.94
18.50 - 20.00 80 % Water		*18.83 - 18.85m: Fractures are subhorizontal, planar, smooth, undulose with light brown clay infill.*	(0.79)	
19		*18.90 - 19.01m: Fractures are 60 degrees, steeped, smooth and clean.*	19.29	16.15
		Very weak to weak, partially weathered, brown fine to coarse grained SANDSTONE. Frequent randomly orientated interlocking fractures.	(0.15) 19.44 (0.33) 19.77	16.00 15.67
20		Medium strong to strong, partially weathered, light brown fine	(0.16) 19.93	15.51

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
18.00	12.40	5.3	20	

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.90	15.10	00:20
17.10	17.20	00:20
18.00	18.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	11.50
140	22.50

Hole Diameter

Diameter (mm)	Depth (m)
200	10.00
150	18.50
121	23.50

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH48

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.44 — Scale 1:50

Easting: 433655.60 — Northing: 558895.29

Client: Sunderland City Council — Driller: PK/DC — Logged By: BC — Sheet 3 of 3

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 08/08/2017 - 18/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
						2
						NI
			100	85	44	5
C	20.95 - 21.10					NA
	21.30 - 22.50					
C	21.50 - 21.60		100	83	56	4
	22.50 - 23.50					A...
			90	90	62	4

(Casing) Groundwater: 20.00 - 21.30 50 % Water; 21.30 - 22.50 60 % Water; 22.50 - 23.50 90 % Water

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
to medium grained SANDSTONE.	(0.49)	
Weak to medium strong, partially weathered, brown fine to coarse grained SANDSTONE. Fractures are very closely to closely spaced, subhorizontal, planar, smooth with localised clay infill. *19.82 - 19.93m: Fractures are subvertical, planar, smooth, undulose and clean.*	20.42 (0.10) 20.52	15.02 14.92
Medium strong to strong, partially weathered, reddish brown fine to medium grained SANDSTONE. Fractures are medium spaced, subhorizontal, planar, smooth and clean.	(0.61) 21.13	14.31
Weak to medium strong, partially weathered, reddish brown fine to medium grained SANDSTONE. Frequent randomly orientated interlocking fractures.	(0.10) 21.23	14.21
Medium strong to strong, partially weathered, brown fine to coarse grained SANDSTONE. *20.76 - 20.88m: Fracture is 35 degrees, planar, smooth and clean.* *21.01m: Fracture is subhorizontal, planar, smooth with light grey clay infill.* *21.06 - 21.11m: Fracture is 25 degrees, planar, smooth and clean with light grey discolouration on surface of fracture.*	(2.27)	
Firm brown slightly sandy CLAY.		
Weak to medium strong, partially weathered, greyish brown SILTSTONE. Fractures are closely to medium spaced, subhorizontal, planar, smooth and clean. *21.76 -21.79m: Fracture is subhorizontal, planar, smooth with reddish brown clay infill.* *22.50 - 22.60m: AZCL.* *23.16 - 23.17m: Fracture is subhorizontal, planar, smooth with brown clay infill.*		
End of Borehole at 23.50 m	23.50	11.94

Legend / Well/ Backfill

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)
18.00	12.40			

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
14.90	15.10	00:20
17.10	17.20	00:20
18.00	18.30	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	1.60
150	11.50
140	22.50

Hole Diameter

Diameter (mm)	Depth (m)
200	10.00
150	18.50
121	23.50

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH49

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 39.21 — Scale 1:50

Easting: 433226.03 — Northing: 558647.01

Client: Sunderland City Council — Driller: RH/DC — Logged By: BC — Sheet 1 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	Insitu Testing
D	0.20	
ES	0.20	
	0.20	HVP=24 kPa
B	0.50 - 1.20	
D	0.50	
ES	0.50	
	0.70	HVP=65 kPa
BRE	1.00	
D	1.00	
B	1.20 - 1.60	
D	1.20	
SPT (S)	1.20 - 1.65	N=10 (2,2/2,2,3,3)
BRE	1.75	
U	2.20 - 2.45	100 blows
D	2.50	
BRE	2.70	
D	2.90	
B	3.00 - 3.50	
D	3.00	
SPT (S)	3.00 - 3.45	N=12 (2,2/3,3,3,3)
BRE	3.75	
UF	4.20 - 4.70	100 blows
B	4.70 - 5.20	
SPT (S)	4.70 - 4.91	N=50+ (3,3/50 for 60mm)
BRE	4.75	
BRE	5.20	
B	5.75 - 6.25	
D	5.75	
SPT (S)	5.75 - 6.20	N=42 (5,5/8,10,10,14)
BRE	6.20	
D	6.75	
SPT (S)	6.75 - 7.14	N=50+ (10,13/16,21,13,8)
SPT (S)	6.75 - 7.14	N=50+ (10,13/16,21,13,8)
	6.75 - 8.00	
	8.00 - 9.50	
C	9.00 - 9.12	
	9.50 - 11.00	

TCR%	SCR%	RQD%	FI
			NI
100	100	66	40
			12
			A
96	84	0	15
			NI

(Casing) Groundwater: Dry; (2.90) Dry; (4.60) Dry; (5.70) Dry; (6.70) Dry

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
Dark brown slightly sandy, slightly gravelly clayey TOPSOIL. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.30) 0.30	38.91
Firm brown mottled light grey slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of mudstone, siltstone and coal.	(1.45) 1.75	37.46
Firm brown slightly sandy slightly gravelly CLAY of high plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.	(1.55) 3.30	35.91
Stiff dark brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(2.70) 6.00	33.21
5.75m: Clay of low plasticity.		
Very dense grey slightly clayey sandy GRAVEL. Gravel is angular to subangular, fine to coarse of mudstone. (Lightly weathered mudstone, possible rockhead).	(0.50) 6.50	32.71
Stiff red brown slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone and coal.	(0.20) 6.70	32.51
Stiff dark grey slightly sandy gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone and sandstone.	(0.18) 6.88	32.33
Black COAL.		
Extremely weak very thinly laminated dark grey MUDSTONE. Fractures are extremely closely spaced, subhorizontal, planar, smooth, clean.	(0.82) 7.70	31.51
Very weak dark grey fine SANDSTONE. Fractures are closely spaced, subhorizontal planar, smooth, clean.	(0.90) 8.60	30.61
8.05 - 8.30m: Subvertical undulating, smooth fracture.		
8.55 - 8.65m: 40-60 degree, stepped, smooth, clean fracture.		
Extremely weak dark grey MUDSTONE with bands. Fractures are very closely spaced, subhorizontal planar, smooth, clean.	(0.70) 9.30	29.91
Weak dark grey SILTSTONE with bands of mudstone. Fractures are very closely to closely spaced, subhorizontal planar, smooth, clean.		

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
4.90	5.10	00:30
6.70	7.00	01:00

Casing Depths

Diameter (mm)	Depth (m)
150	6.70
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
150	6.85
121	30.30

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH49

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 39.21 — Scale 1:50

Easting: 433226.03 — Northing: 558647.01

Client: Sunderland City Council — Driller: RH/DC — Logged By: BC — Sheet 2 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI
C	10.30 - 10.45		100	100	53	
	11.00 - 11.30		100	83	83	
	11.30 - 12.80					11
C	11.83 - 11.93		100	100	80	
C	12.50 - 12.90					
C	12.55 - 12.80					
	12.80 - 14.30					40
			100	96	80	
C	13.90					
	14.30 - 15.80					20
C	14.80 - 15.00		100	96	93	
	15.80 - 17.00					
C	15.90 - 16.00					
			100	83	28	20
						NI
						A...
	17.00 - 17.80		87	66	22	12
	17.80 - 19.00		100	86	13	20
	19.00 - 20.80		100	93	90	

(Casing) Groundwater: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

STRATA RECORD Description

Description	Depth (m)	Level (m AOD)
9.95 - 10.10m: Subvertical planar, smooth, clean fracture. *10.05 - 10.30m: Weak grey mudstone.* *10.70 - 10.80m: Subvertical planar, smooth, clean fracture.* *11.12 - 11.15m: Subvertical planar, smooth, clean fracture* *11.24 - 11.27m: Subvertical undulating, smooth, clean fracture.* *11.40 - 11.45m: Subhorizontal planar, smooth fracture.* *11.40 - 11.50m: Subvertical undulating, smooth, clean fracture.* *12.55m: Medium strong.*	(3.30)	
Weak, partially weathered, orange brown medium grained SANDSTONE. Fractures are closely spaced, subhorizontal planar, smooth. *12.94 - 13.00m: Subvertical planar, smooth, clean fracture.* *15.55 - 15.60m: Subrounded to rounded, medium to coarse of grout.*	12.60	26.61
Very weak, partially weathered, thinly bedded, dark grey MUDSTONE. Fractures are extremely closely to very closely spaced, planar with clay infill. *16.00 - 16.10m: Subvertical planar, smooth, clean fracture.* *17.45 - 17.55m: Subvertical planar, smooth, clean, fracture.*	(3.40)	
Very weak, partially weathered black carbonated MUDSTONE. Fractures are very closely spaced, subhorizontal planar, smooth, clean. *18.20 - 18.35m: Subvertical undulating, smooth, fracture.* *18.75 - 18.95m: Subvertical, stepped, smooth, clean, fracture.* *19.15 - 19.30m: Subvertical planar, smooth, clean fracture.*	16.00	23.21
Weak, partially weathered dark grey SILTSTONE with bands of fine to medium sandstone. Fractures are closely to medium spaced, subhorizontal planar, smooth, clean.	(1.50)	
	17.50	21.71
	(1.90)	
	19.40	19.81

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
4.90	5.10	00:30
6.70	7.00	01:00

Casing Depths

Diameter (mm)	Depth (m)
150	6.70
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
150	6.85
121	30.30

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH49

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 39.21 — Scale 1:50

Easting: 433226.03 — Northing: 558647.01

Client: Sunderland City Council — Driller: RH/DC — Logged By: BC — Sheet 3 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling — Checked By: JH — Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
								20.30 - 20.45: Dark grey fine to medium sandstone.	(2.05)			
	20.80 - 22.30		100	100	83	6	21	*20.70 - 20.80m: Dark grey fine to medium sandstone.* *21.22 - 21.36m: Subvertical undulating, smooth, clean fracture.*	21.45	17.76		
							22	Weak, partially weathered dark grey fine to medium SANDSTONE. Fractures are closely to medium spaced, subhorizontal planar, smooth, clean.	(1.15)			
	22.30 - 23.80		100	93	73		23	Weak, partially weathered thinly bedded dark grey SILSTONE. Fractures are closely to medium spaced, subhorizontal planar, smooth, clean. *22.90 - 23.00m: Subvertical stepped, smooth, clean fracture.* *23.20 - 23.50m: Subvertical undulating, smooth, clean fracture.*	22.60	16.61		
	23.80 - 24.80		95	75	70	15	24	Weak, partially weathered dark grey SILSTONE. Fractures are very closely to closely spaced, planar, smooth.	(1.35)			
	24.80 - 26.30		96	96	86	A…	25	*24.55m: Subvertical planar, smooth, clean fracture.*	23.95	15.26		
	26.30 - 27.80		100	100	73	12	26	*25.80 - 26.00m: Subvertical planar, smooth, clean fracture.* *26.30 - 26.45m: Subvertical planar, smooth, clean fracture.* *26.58 - 26.62m: Subvertical planar, smooth, clean fracture.*	(4.30)			
	27.80 - 29.30		100	100	53	4	27 28	Very weak, partially weathered dark grey MUDSTONE. Fractures are very closely to closely spaced	28.25	10.96		
	29.30 - 30.30		100	85	30	15	29 30	*28.90 - 29.50m: Subvertical planar, smooth, clean fracture.*	(2.05)			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
4.90	5.10	00:30
6.70	7.00	01:00

Casing Depths

Diameter (mm)	Depth (m)
150	6.70
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
150	6.85
121	30.30

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH49

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 39.21 | Scale 1:50
Easting: 433226.03 | Northing: 558647.01

Client: Sunderland City Council | Driller: RH/DC | Logged By: BC | Sheet 4 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 11/08/2017 - 24/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI A…						
								30.18 - 30.24m: Subvertical planar, smooth, clean fracture.	30.30	8.91		
								End of Borehole at 30.30 m				
							31					
							32					
							33					
							34					
							35					
							36					
							37					
							38					
							39					
							40					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Log last updated 08/02/2018

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
4.90	5.10	00:30
6.70	7.00	01:00

Casing Depths

Diameter (mm)	Depth (m)
150	6.70
140	11.00

Hole Diameter

Diameter (mm)	Depth (m)
150	6.85
121	30.30

General Remarks

1. Hand dug inspection pit to 1.20m.
2. No groundwater encountered.

BOREHOLE RECORD

Borehole BH50

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.09 | Scale 1:50
Easting: 433419.38 | Northing: 558721.55

Client: Sunderland City Council | Driller: CT/DC | Logged By: BC | Sheet 1 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 24/08/2017 - 25/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)
B	0.00 - 0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone, siltstone and coal.	(0.35)	
D	0.10				0.35	37.74
ES	0.20					
D	0.35					
B	0.40 - 0.90			Firm brown mottled light grey slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.		
ES	0.50					
BRE	0.75				(0.75)	
ES	1.00		1			
B	1.20 - 1.70		Dry	Firm dark brown mottled dark grey slightly sandy, slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, siltstone, mudstone and coal.	1.10	36.99
D	1.20					
SPT (S)	1.20 - 1.65	N=11 (2,2/2,3,3,3)				
BRE	1.75					
			2		(2.00)	
U	2.20 - 2.65	76 blows		*2.20m: Stiff.*		
D	2.70					
BRE	2.75					
			3		3.10	34.99
B	3.20		(3.10) Dry	Stiff greyish brown silty slightly sandy CLAY of low plasticity. Sand is fine to medium.		
D	3.20			*3.20-4.70m: Silt bands noted.*		
SPT (S)	3.20 - 3.65	N=17 (4,4/4,4,4,5)				
BRE	3.75					
			4			
U	4.20 - 4.65	57 blows		*4.20m: Firm silt of low plasticity.*		
D	4.70				(3.30)	
BRE	4.90					
			5			
B	5.20 - 5.70		(4.50) Dry			
D	5.20					
SPT (S)	5.20 - 5.65	N=11 (1,3/3,2,2,4)				
BRE	5.90					
			6			
U	6.20 - 6.50	100 blows				
				Stiff brownish grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	6.40	31.69
D	6.60					
BRE	6.90					
			7			
B	7.20 - 7.70		(4.50) Dry			
D	7.20					
SPT (S)	7.20 - 7.46	N=50+ (5,7/26,24 for 40mm)				
BRE	7.90					
			8	*7.90m: Very soft band noted.*		
U	8.20 - 8.70	100 blows				
					(4.20)	
B	8.70 - 9.20		(4.50) Dry			
D	8.70					
SPT (S)	8.70 - 9.14	N=50+ (6,7/8,11,16,15 for 70mm)				
BRE	8.90		9			
B	9.70 - 10.20		(4.50) Dry			
D	9.70					
SPT (S)	9.70 - 10.15	N=42 (6,9/9,10,10,13)				
BRE	9.90		10			

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.00	9.10	00:20
10.70	10.85	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
140	15.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.60
116	31.20

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH50

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.09 | Scale 1:50
Easting: 433419.38 | Northing: 558721.55

Client: Sunderland City Council | Driller: CT/DC | Logged By: BC | Sheet 2 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 24/08/2017 - 25/08/2017

Type	Depth From-To (m)	Insitu Testing	TCR%	SCR%	RQD%	FI	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
								Stiff brownish grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.				
	10.60 - 14.40								10.60			
D	10.70					NI	10.60 - 15.40 80 % Water (4.50) Dry	Very dense reddish grey sandy GRAVEL. Gravel is angular to subangular, fine to coarse of sandstone. (Weathered SANDSTONE).	10.60 (0.35)	27.49		
SPT (S)	10.70 - 10.91	N=50+ (7,11/9,23,18 for 20mm)				18	11		10.95	27.14		
						6		Weak, partially weathered, reddish brown SANDSTONE.	(0.06)	27.08		
								Weak, partially weathered, reddish brown fine to medium grained SANDSTONE. Fractures are very closely to closely spaced, subhorizontal planar, smooth, clean.	11.01 (0.39)			
	11.40 - 12.40					28			11.40	26.69		
			100	40	0		12	Very weak, partially weathered, reddish brown thinly interbedded MUDSTONE and SILTSTONE. Fractures are subangular, closely to very closely spaced, subhorizontal planar, smooth, clean.				
C	12.20 - 12.40											
	12.40 - 13.90		100	9	0							
						7						
							13					
C	13.20 - 13.40		100	100	95							
	13.90 - 15.40											
C	14.00 - 14.15					20	14					
									(6.00)			
			100	93	86							
C	14.85 - 15.15											
						4	15					
C	15.20 - 15.40											
	15.40 - 16.35						15.40 - 19.35 100 % Water					
			46	43	43							
C	16.00 - 16.10						16					
						AZCL						
	16.35 - 17.85											
						6						
			100	100	70		17					
						20		Extremely weak, partially weathered, dark grey MUDSTONE. Fractures are extremely closely spaced, planar, smooth.	17.40	20.69		
	17.85 - 19.35											
						12	18					
						NI		*18.05m: Subvertical, planar, clean fracture.*				
						20						
						NI						
						6						
			96	70	6	NI			(2.35)			
						40	19					
	19.35 - 20.85						19.35 - 22.35 95 % Water					
						A... 40						
						NI						
								Very weak, partially weathered, dark grey MUDSTONE.	19.75	18.34		
							20					

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.00	9.10	00:20
10.70	10.85	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
140	15.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.60
116	31.20

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH50

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.09 | Scale 1:50
Easting: 433419.38 | Northing: 558721.55

Client: Sunderland City Council | Driller: CT/DC | Logged By: BC | Sheet 3 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 24/08/2017 - 25/08/2017

Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI	(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
			90	46	0			Fractures are very closely to subhorizontal, planar, smooth, clean. (drillers description). *20.30 - 20.35m: Medium strong dark grey fine to medium sandstone.*				
	20.85 - 22.35		100	100	33	40	21	*20.66 - 20.76m: Weak dark grey siltstone.* *21.00 - 21.15m: Subvertical planar, smooth fracture.* *21.50 - 21.70m: Subvertical undulating, smooth, rough, clean fracture.*	(1.95)			
								Weak, partially weathered, dark grey MUDSTONE. Fractures are subhorizontal planar, smooth, clean. *21.75 - 21.90m: Subvertical undulating, smooth, clean fracture.*	21.70 (0.30)	16.39		
	22.35 - 23.85		100	73	73	12	22	Weak to medium strong, partially weathered, dark grey SILTSTONE with bands of sandstone. Fractures are very closely to closely subhorizontal planar, clean. *22.95 - 23.10m: Subvertical planar, smooth, clean fracture.*	22.00	16.09		
	23.85 - 25.35		100	95	53	1	22.35 - 23.85 100 % Water; 23		(3.15)			
							23.85 - 25.35 95 % Water; 24					
	25.35 - 26.85		100	73	66	12	25	Extremely weak, partially weathered, dark grey MUDSTONE. Fractures are very closely subhorizontal, planar, smooth, clean.	25.15 (0.65)	12.94		
							25.35 - 26.85 100 % Water; 26	Very weak, partially weathered, dark grey SILTSTONE. Fractures are closely subhorizontal, planar, smooth, clean. *25.85 - 26.00m: Subvertical planar, smooth, clean fracture* *26.60 - 26.75m: Subvertical planar, smooth, clean fracture.*	25.80 (0.90)	12.29		
	26.85 - 28.20		88	88	26	30	27	Extremely weak, partially weathered, dark grey MUDSTONE. Fractures are very closely subhorizontal, planar, smooth, clean.	26.70	11.39		
							26.85 - 31.20 100 % Water; 28					
	28.20 - 29.70		100	46	10	NI 15 40 15	29	*28.20 - 28.70m: Subvertical planar, smooth, tight, clean fracture.* *29.00 - 29.25m: Subvertical undulating, smooth, clean fracture* *29.32 - 29.42m: Medium strong dark grey sandstone.*	(2.90)			
	29.70 - 31.20						30	Weak dark grey SILTSTONE with occasional thin beds of mudstone. Fractures are closely subhorizontal planar, smooth, clean.	29.60	8.49		

Continued on next sheet

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.00	9.10	00:20
10.70	10.85	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
140	15.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.60
116	31.20

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

BOREHOLE RECORD

Borehole BH50

Contract No: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.09 | Scale 1:50

Easting: 433419.38 | Northing: 558721.55

Client: Sunderland City Council | Driller: CT/DC | Logged By: BC | Sheet 4 of 4

Method: Cable Percussive Drilling with Rotary Core Drilling | Checked By: JH | Dates: 24/08/2017 - 25/08/2017

SAMPLE DETAILS							(Casing) Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD)	Legend	Well/ Backfill
Type	Depth From-To (m)	N (cu)	TCR %	SCR %	RQD %	FI						
			100	50	50			*29.70 - 29.85m: Subvertical undulating, smooth, clean fracture.*	(1.60)			
							31	End of Borehole at 31.20 m	31.20	6.89		
							32					
							33					
							34					
							35					
							36					
							37					
							38					
							39					
							40					

Ground Water (m)

Depth Struck (m)	Casing Depth (m)	Water Level	Minutes	Water sealed (m)

Chiselling / Hard Strata

From (m)	To (m)	Time (hr)
9.00	9.10	00:20
10.70	10.85	01:00

Casing Depths

Diameter (mm)	Depth (m)
200	4.50
140	15.00

Hole Diameter

Diameter (mm)	Depth (m)
200	10.60
116	31.20

General Remarks

1. Hand dug inspection pit to 1.20m.

Log last updated 08/02/2018

DUNELM GEOTECHNICAL & ENVIRONMENTAL	TRIAL PIT RECORD	TP No. CPTM4
Contract No.: D8044	**Site:** IAMP - Preliminary Ground Investigation	GL (m AOD) 37.92 Scale 1:25 Easting: 433520.57 Northing: 558656.92
Client: Sunderland City Council	**Logged By:** BC	Sheet 1 of 1
Method: Hand Excavated Inspection Pit	**Checked By:** BL	Dates: 27/07/2017

SAMPLE DETAILS			Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
Type	Depth From-To (m)	Insitu Testing						
				MADE GROUND: Dark brown slightly sandy, slightly gravelly clayey topsoil. Gravel is subangular to subrounded, fine to coarse of sandstone, brick, limestone and coal.	(0.30)			
				Firm light grey mottled light brown, silty, slightly sandy CLAY.	0.30	37.62		
					(0.60)			
				Firm reddish brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.90	37.02		
			1		(0.30)			
				End of Trial Pit at 1.20 m	1.20	36.72		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Rain	
			Remarks: Hand Excavated Inspection Pit	

TRIAL PIT RECORD

TP No. CPTM5

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 39.05 | Scale 1:25

Easting: 433430.12 | Northing: 558585.31

Client: Sunderland City Council | **Logged By:** BC | Sheet 1 of 1

Method: Hand Excavated Inspection Pit | **Checked By:** BL | Dates: 27/07/2017

SAMPLE DETAILS			Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
Type	Depth From-To (m)	Insitu Testing						
				Dark brown slightly sandy, slightly gravelly clayey TOPSOIL. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.30)			
				Firm to stiff dark brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, limestone, mudstone and coal.	0.30	38.75		
			1		(0.90)			
				End of Trial Pit at 1.20 m	1.20	37.85		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Drizzle	
			Remarks: Hand Excavated Inspection Pit	

DUNELM GEOTECHNICAL & ENVIRONMENTAL	TRIAL PIT RECORD	TP No. CPTM6
Contract No.: D8044	**Site:** IAMP - Preliminary Ground Investigation	GL (m AOD) 38.50 Scale 1:25 Easting: 433426.36 Northing: 558606.45
Client: Sunderland City Council	**Logged By:** BC	Sheet 1 of 1
Method: Hand Excavated Inspection Pit	**Checked By:** BL	Dates: 27/07/2017

SAMPLE DETAILS			Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
Type	Depth From-To (m)	Insitu Testing						
				MADE GROUND: Dark brown slightly sandy, slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of brick, sandstone, mudstone and coal.	(0.30)			
				Firm to stiff brown mottled light grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.30	38.20		
			1		(0.90)			
				End of Trial Pit at 1.20 m	1.20	37.30		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Overcast	
			Remarks: Hand Excavated Inspection Pit	

DUNELM GEOTECHNICAL & ENVIRONMENTAL	TRIAL PIT RECORD	TP No. CPTM7
Contract No.: D8044	**Site:** IAMP - Preliminary Ground Investigation	GL (m AOD) 39.42 Scale 1:25 Easting: 433288.31 Northing: 558537.15
Client: Sunderland City Council	**Logged By:** BC	Sheet 1 of 1
Method: Hand Excavated Inspection Pit	**Checked By:** BL	Dates: 27/07/2017

SAMPLE DETAILS			Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
Type	Depth From-To (m)	Insitu Testing						
				Dark brown slightly sandy, slightly gravelly clayey topsoil. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.30)			
				Firm brown mottled light grey slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, limestone, mudstone and coal.	0.30	39.12		
			1		(0.90)			
				End of Trial Pit at 1.20 m	1.20	38.22		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Drizzle	
			Remarks: Hand Excavated Inspection Pit	

TRIAL PIT RECORD

TP No. CPTM8

Contract No.: D8044	**Site:** IAMP - Preliminary Ground Investigation	GL (m AOD) 39.30 Scale 1:25 Easting: 433226.55 Northing: 558648.45
Client: Sunderland City Council	**Logged By:** BC	Sheet 1 of 1
Method: Hand Excavated Inspection Pit	**Checked By:** BL	Dates: 28/07/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				Dark brown slightly sandy, slightly gravelly, clayey TOPSOIL. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	(0.25)			
				Firm brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, limestone and coal.	0.25 (0.55)	39.05		
			1	Firm to stiff dark brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.80 (0.40)	38.50		
				End of Trial Pit at 1.20 m	1.20	38.10		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Fine	
			Remarks: Hand Excavated Inspection Pit	

TRIAL PIT RECORD

TP No. CPTM9

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.19 | Scale 1:25

Easting: 433419.97 | Northing: 558722.50

Client: Sunderland City Council | **Logged By:** BC | Sheet 1 of 1

Method: Hand Excavated Inspection Pit | **Checked By:** BL | Dates: 28/07/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				Dark brown slightly sandy, slightly gravelly clayey TOPSOIL. Gravel is subrounded to subangular, fine to coarse of sandstone, limestone, mudstone and coal.	(0.25)			
				Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of sandstone, mudstone and coal.	0.25	37.94		
			1		(0.95)			
				End of Trial Pit at 1.20 m	1.20	36.99		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.30m x 0.30m	A B C D °
			Stability: Stable	
			Weather: Fine	
			Remarks: Hand Excavated Inspection Pit	

TRIAL PIT RECORD

TP No. TP10

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.01 — Scale 1:25

Easting: 433662.00 — Northing: 559544.50

Client: Sunderland City Council — **Logged By:** AB — Sheet 1 of 1

Method: Machine Excavated Trial Pit — **Checked By:** JH — Dates: 22/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone and brick.	(0.25)			
D ES	0.20 0.20			Firm light grey and brown mottled slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone, coal and limestone.	0.25	36.76		
D ES HVP B	0.40 0.40 0.40 0.50 - 0.70	HVP: 53kPa			(0.85)			
BRE D	1.00 1.00		1		1.10	35.91		
				Stiff thinly laminated dark grey slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.				
B	1.50							
			2					
BRE D	2.10 2.10				(2.40)			
B HVP	2.50 2.50	HVP: 120kPa						
BRE D HVP	3.00 3.00 3.00	HVP: 55kPa	3	*Below 3.00m Rare cobbles noted. Cobbles are subangular to subrounded of mudstone.*				
B	3.50			Firm brown slightly clayey slightly sandy slightly gravelly SILT. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.	3.50	33.51		
BRE D	4.00 4.00		4	*3.90m: 1 No. Subrounded boulder of sandstone.*	(1.00)			
B HVP	4.50 4.50	HVP: 31kPa		End of Trial Pit at 4.50 m	4.50	32.51		
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.60m x 3.90m	A B C D — 83°
			Stability: Good	
			Weather: Overcast	
			Remarks: Machine Excavated Trial Pit	

TRIAL PIT RECORD

TP No. TP13

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.47 — Scale 1:25

Easting: 433861.00 — Northing: 559478.70

Client: Sunderland City Council — **Logged By:** AB — Sheet 1 of 1

Method: Machine Excavated Trial Pit — **Checked By:** JH — Dates: 23/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clay. Gravel is angular to subrounded, fine to coarse of sandstone and occasional mudstone.	(0.30)			
D ES	0.20 0.20				0.30	35.16		
BRE D ES HVP B	0.40 0.40 0.40 0.40 0.50 - 0.70	HVP: 90kPa		Stiff grey mottled brown slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal. *0.50m: Becoming dark greyish brown.*				
BRE D	1.00 1.00		1	*1.00m: Clay of low plasticity.*				
B	1.50			*1.50m: Occasional subrounded cobbles of sandstone.*	(2.30)			
BRE D	2.00 2.00		2					
HVP	2.20	HVP: 108kPa						
B	2.50							
				Firm locally soft, dark grey silty slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone. Rare sandstone cobbles noted.	2.60	32.86		
BRE D	3.00 3.00		3	*3.00m: Becoming firm.*				
HVP	3.30	HVP: 41kPa						
B	3.50				(2.10)			
			4					
BRE D HVP	4.20 4.20 4.30	HVP: 31kPa						
B	4.60							
				End of Trial Pit at 4.70 m	4.70	30.76		
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered.	Depth Strike	Remarks	Dimensions: 0.60m x 3.80m	A B C D — 136°
			Stability: Good	
			Weather: Overcast	
			Remarks: Machine Excavated Trial Pit	

TRIAL PIT RECORD

TP No. TP16

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.98 | Scale 1:25

Easting: 433688.72 | Northing: 559238.29

Client: Sunderland City Council | **Logged By:** AH | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 08/09/2017

SAMPLE DETAILS			Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
Type	Depth From-To (m)	Insitu Testing						
				MADE GROUND: Brown, slightly sandy, slightly gravelly, clayey topsoil. Gravel is angular to subangular, fine to coarse of mudstone and coal.	(0.30)			
				Firm orangeish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone sandstone and limestone.	0.30	35.68		
					(0.70)			
			1	End of Trial Pit at 1.00 m	1.00	34.98		
			2					
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered. 2. Trial Pit terminated at 1.00m due to land drain being encountered.	Depth Strike	Remarks	Dimensions: 0.60m x 3.00m Stability: Stable Weather: Dry Remarks: Machine Excavated Trial Pit	A B C D 360°

TRIAL PIT RECORD

TP No. TP16A

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.87 | Scale 1:25

Easting: 433684.22 | Northing: 559233.12

Client: Sunderland City Council | **Logged By:** AH | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 08/09/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
D ES	0.10 0.10			MADE GROUND: Dark brown, slightly sandy, slightly gravelly clayey topsoil. Gravel is angular to subangular, fine to coarse of mudstone, brick and coal.	(0.30)			
				Firm, dark brown, sandy CLAY. Sand is fine to coarse.	0.30 (0.10)	35.57		
				Stiff, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone and sandstone.	0.40	35.47		
B BRE D ES HVP	0.50 0.50 0.50 0.50 0.50	HVP: 93kPa						
B BRE D ES HVP	1.00 1.00 1.00 1.00 1.00	HVP: 90kPa	1		(1.70)			
B BRE D	2.00 2.00 2.00		2					
				Very stiff, brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, sandstone and coal.	2.10	33.77		
B BRE D	3.00 3.00 3.00		3		(1.80)			
				Very stiff, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone and coal.	3.90	31.97		
B BRE D	4.00 4.00 4.00		4		(0.70)			
				End of Trial Pit at 4.60 m	4.60	31.27		
			5					

Remarks

1. No groundwater encountered.

Ground Water (m)	
Depth Strike	Remarks

Excavation Details

Dimensions: 0.60m x 4.00m

Stability: Stable

Weather: Dry

Remarks: Machine Excavated Trial Pit

Orientation

A B C D

360°

TRIAL PIT RECORD

TP No. TP19

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.65 — Scale 1:25

Easting: 433558.57 — Northing: 559178.56

Client: Sunderland City Council — **Logged By:** AB — Sheet 1 of 1

Method: Machine Excavated Trial Pit — **Checked By:** JH — Dates: 23/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone and mudstone.	(0.30)			
D	0.20							
ES	0.20				0.30	35.35		
				Firm light orangish brown mottled light grey, slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, occasional mudstone and coal.				
BRE	0.40							
D	0.40							
ES	0.40							
HVP	0.40	HVP: 56kPa		*0.40m: Clay of very high plasticity.*				
B	0.50 - 0.70							
HVP	0.80	HVP: 68kPa						
BRE	1.00		1					
D	1.00							
B	1.50				(2.60)			
BRE	2.00		2					
D	2.00			*2.00m: Clay of intermediate plasticity.*				
				2.30m: Occasional sandstone and rare mudstone subrounded cobbles.				
B	2.50							
				Firm dark grey silty slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, occasional mudstone and coal.	2.90	32.75		
BRE	3.00		3					
D	3.00				(0.30)			
HVP	3.00	HVP: 69kPa						
				Dark grey slightly clayey fine to medium silty SAND.	3.20	32.45		
					(0.30)			
B	3.50			Firm grey slightly sandy SILT. Sand is fine to coarse.	3.50	32.15		
				3.50m: Firm grey slightly sandy SILT. Sand is fine to corse.				
				3.80m: Becoming sandy.	(0.80)			
BRE	4.00		4					
D	4.00							
B	4.20							
				End of Trial Pit at 4.30 m	4.30	31.35		
			5					

Remarks

1. Seepage at 3.80m.

Ground Water (m)

Depth Strike	Remarks
3.80	

Excavation Details

Dimensions: 0.60m x 4.00m

Stability: Poor from 3.20m.

Weather: Overcast

Remarks: Machine Excavated Trial Pit

Orientation

A B C D — 73°

TRIAL PIT RECORD

TP No. TP25

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 37.51 — Scale 1:25

Easting: 433503.76 — Northing: 558776.40

Client: Sunderland City Council — **Logged By:** AB — Sheet 1 of 1

Method: Machine Excavated Trial Pit — **Checked By:** JH — Dates: 23/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
D	0.20			MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone. Rare clay tiles fragments noted.	(0.30)			
ES	0.20				0.30	37.21		
BRE	0.40			Firm light orange and greyish brown slightly sandy slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, occasional coal and mudstone.				
D	0.40							
ES	0.40							
HVP	0.40	HVP: 62kPa						
B	0.60			*0.60m: Becoming dark grey and brown mottled.*				
				0.80m: Becoming stiff with occasional subangular to subrounded cobbles and boulders of sandstone.				
			1					
BRE	1.10							
D	1.10							
B	1.50				(2.60)			
BRE	2.00		2					
D	2.00							
B	2.50							
HVP	2.50	HVP: 83kPa						
				Stiff dark grey silty slightly gravelly CLAY of intermediate plasticity. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	2.90	34.61		
D	3.00		3					
B	3.50			*3.50m: Becoming firm.*				
HVP	3.60	HVP: 53kPa			(1.70)			
			4					
BRE	4.10							
D	4.10							
B	4.50							
HVP	4.60	HVP: 34kPa		End of Trial Pit at 4.60 m	4.60	32.91		
			5					

Remarks

1. No groundwater encountered.

Ground Water (m)	
Depth Strike	Remarks

Excavation Details

Dimensions: 0.60m x 3.80m

Stability: Good

Weather: Rain

Remarks: Machine Excavated Trial Pit

Orientation

A B C D

65°

TRIAL PIT RECORD

TP No. TPS-01

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 38.57 | Scale 1:25

Easting: 433408.79 | Northing: 558610.29

Client: Sunderland City Council | **Logged By:** AB | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 25/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone and coal. Rare clay tile fragments noted.	(0.30)			
				Firm dark orangey and greyish brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.30	38.27		
HVP	0.50	HVP: 58kPa						
			1					
HVP	1.20	HVP: 84kPa		*1.10m: Becoming stiff dark greyish brown.*	(1.70)			
			2	End of Trial Pit at 2.00 m	2.00	36.57		
			3					
			4					
			5					

Remarks

1. No groundwater encountered.
2. Soakaway test carried out at 2.00m.

Ground Water (m)	
Depth Strike	Remarks

Excavation Details

Dimensions: 0.65m x 2.00m

Stability: Good

Weather: Sunny

Remarks: Machine Excavated Trial Pit

Orientation

A B C D

59°

TRIAL PIT RECORD

TP No. TPS-02

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.68 | Scale 1:25

Easting: 433549.01 | Northing: 558961.59

Client: Sunderland City Council | **Logged By:** AB | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 25/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly gravelly sandy clayey topsoil. Gravel is angular to subrounded, fine to coarse of mudstone and coal.	(0.30)			
				Firm dark orangey, greyish brown slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.30	35.38		
HVP	0.50	HVP: 57kPa						
HVP	1.00	HVP: 80kPa	1	*0.70m: Becoming stiff dark greyish brown.*	(1.80)			
			2					
				End of Trial Pit at 2.10 m	2.10	33.58		
			3					
			4					
			5					

Remarks

1. No groundwater encountered.
2. Soakaway test carried out at 2.10m.

Ground Water (m)

Depth Strike	Remarks

Excavation Details

Dimensions: 0.65m x 2.00m

Stability: Stable

Weather: Overcast

Remarks: Machine Excavated Trial Pit

Orientation

A B C D

158°

TRIAL PIT RECORD

TP No. TPS-03

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.58 | Scale 1:25

Easting: 433468.90 | Northing: 559142.80

Client: Sunderland City Council | **Logged By:** AB | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 25/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone, occasional mudstone, rare coal, glass, clay tile and pot.	(0.30)			
				Firm orangish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, occasional mudstone and coal.	0.30	35.28		
HVP	0.50	HVP: 46kPa		*0.60m: Becoming slightly sandy gravelly clay.*				
				0.70m: Becoming dark grey.				
HVP	1.00	HVP: 63kPa	1		(1.70)			
HVP	1.50	HVP: 88kPa		*Below 1.50m: Stiff.*				
			2	End of Trial Pit at 2.00 m	2.00	33.58		
			3					
			4					
			5					

Remarks

1. No groundwater encountered.
2. Soakaway test carried out at 2.00m.

Ground Water (m)	
Depth Strike	Remarks

Excavation Details

Dimensions: 0.65m x 2.10m

Stability: Stable

Weather: Sunny

Remarks: Machine Excavated Trial Pit

Orientation

A B C D

81°

TRIAL PIT RECORD

TP No. TPS-04

Contract No.: D8044

Site: IAMP - Preliminary Ground Investigation

GL (m AOD) 35.73 | Scale 1:25

Easting: 433794.09 | Northing: 559250.90

Client: Sunderland City Council | **Logged By:** AB | Sheet 1 of 1

Method: Machine Excavated Trial Pit | **Checked By:** JH | Dates: 25/08/2017

SAMPLE DETAILS Type	Depth From-To (m)	Insitu Testing	Groundwater	STRATA RECORD Description	Depth (m)	Level (m AOD) PID (ppm)	Legend	Backfill
				MADE GROUND: Dark brown slightly sandy slightly gravelly clayey topsoil. Gravel is angular to subrounded, fine to coarse of sandstone, occasional mudstone, rare coal and brick fragments.	(0.25)			
HVP	0.40	HVP: 51kPa		Firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of sandstone, mudstone and coal.	0.25	35.48		
				0.70m: Becoming dark greyish brown.				
			1	*0.90m: Occasional subangular to subrounded sandstone cobbles.*	(1.75)			
				1.40m: Stiff.				
			2	End of Trial Pit at 2.00 m	2.00	33.73		
			3					
			4					
			5					

Remarks	Ground Water (m)		Excavation Details	Orientation
1. No groundwater encountered. 2. Soakaway test carried out at 2.00m.	Depth Strike	Remarks	Dimensions: 0.65m x 2.00m Stability: Stable Weather: Overcast Remarks: Machine Excavated Trial Pit	A B C D 126°

IN SITU SITE INVESTIGATION

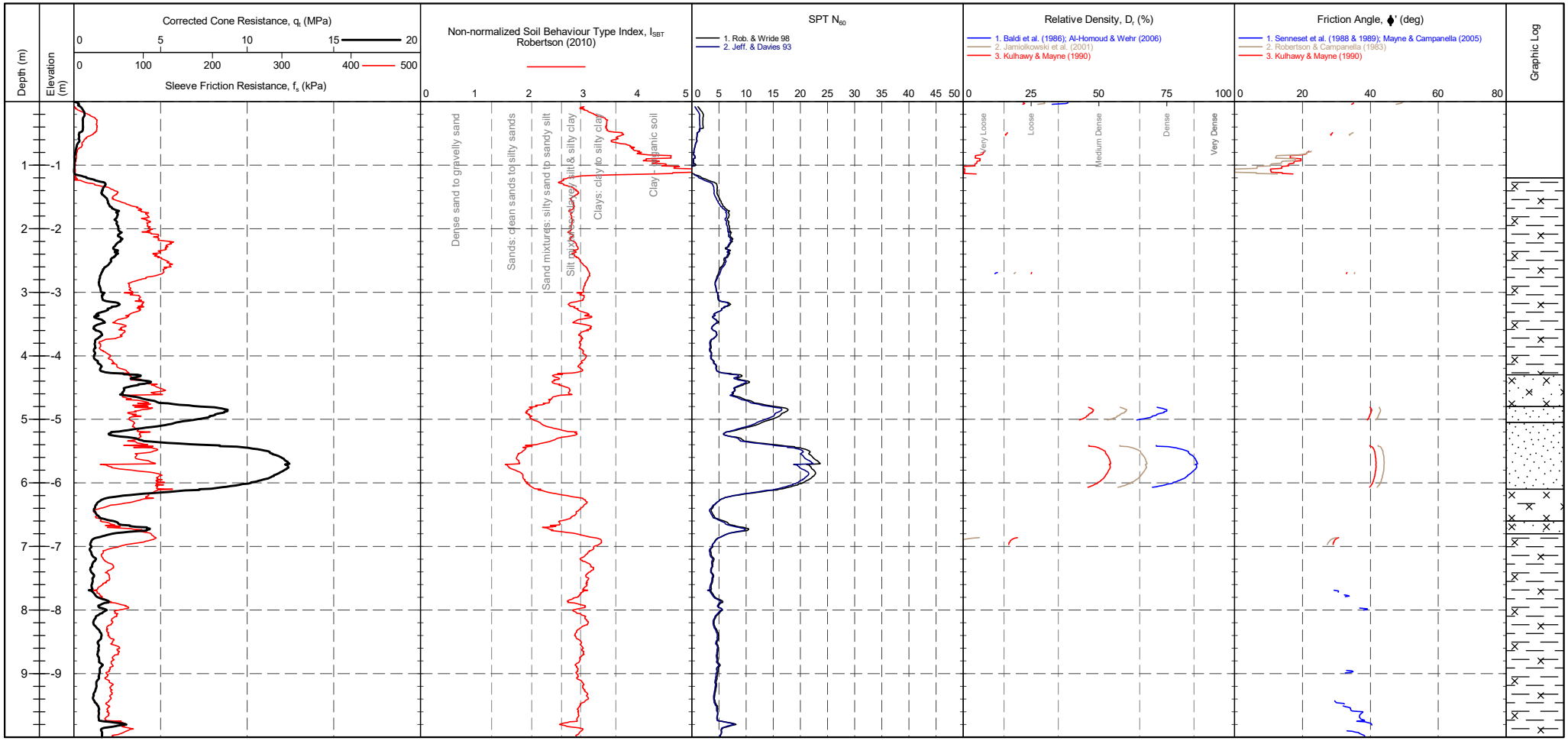
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 309 mV / 308 mV / -0.011 MPa Sleeve / 277 mV / 271 mV / -0.004 kPa Pore Pressure 2 / 242 mV / 271 mV / 0.008 kPa X-Y Inclinometer / 2403 mV / 2427 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

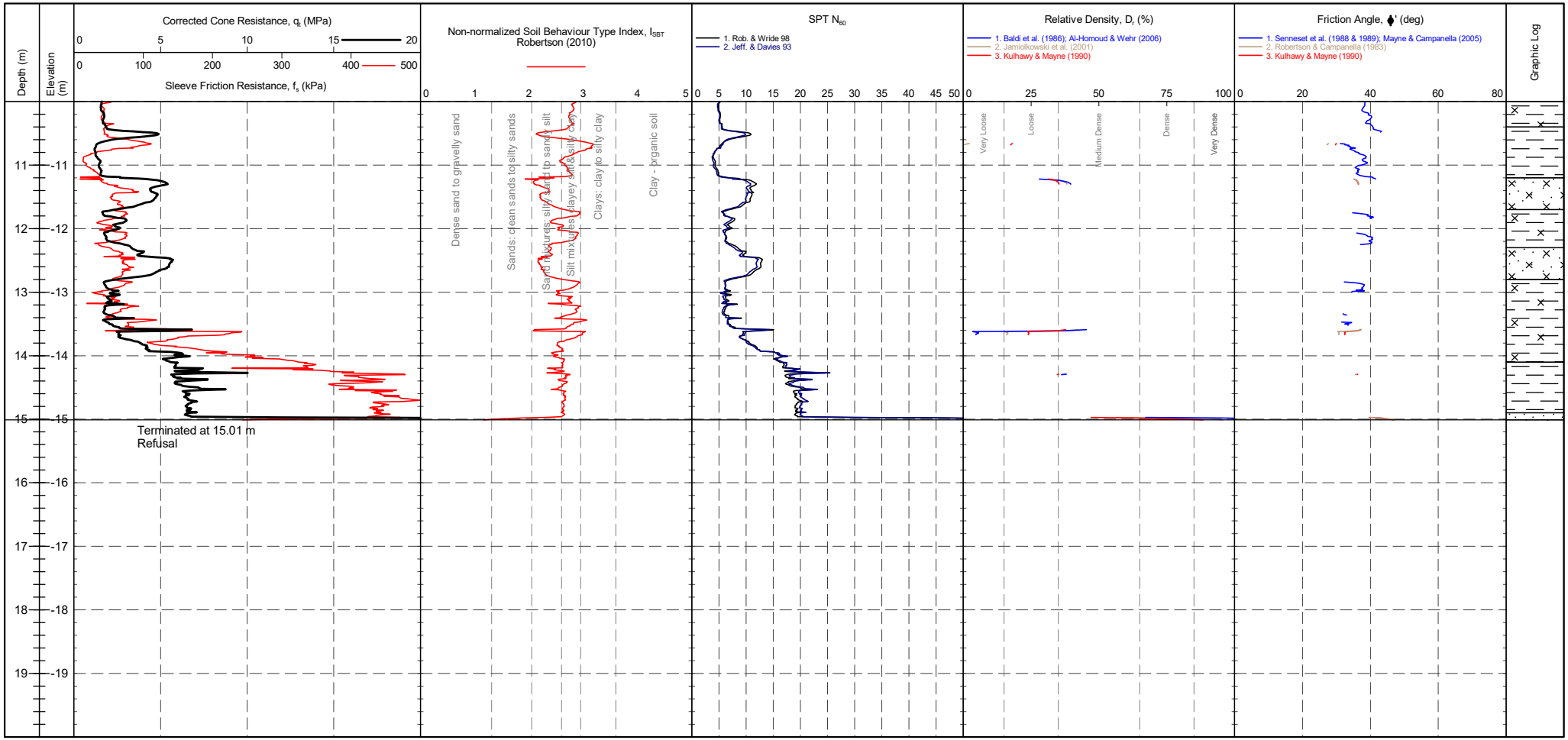
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 309 mV / 308 mV / -0.011 MPa Sleeve / 277 mV / 271 mV / -0.004 kPa Pore Pressure 2 / 242 mV / 271 mV / 0.008 kPa X-Y Inclinometer / 2403 mV / 2427 mV	Groundwater Level Dissipation Test

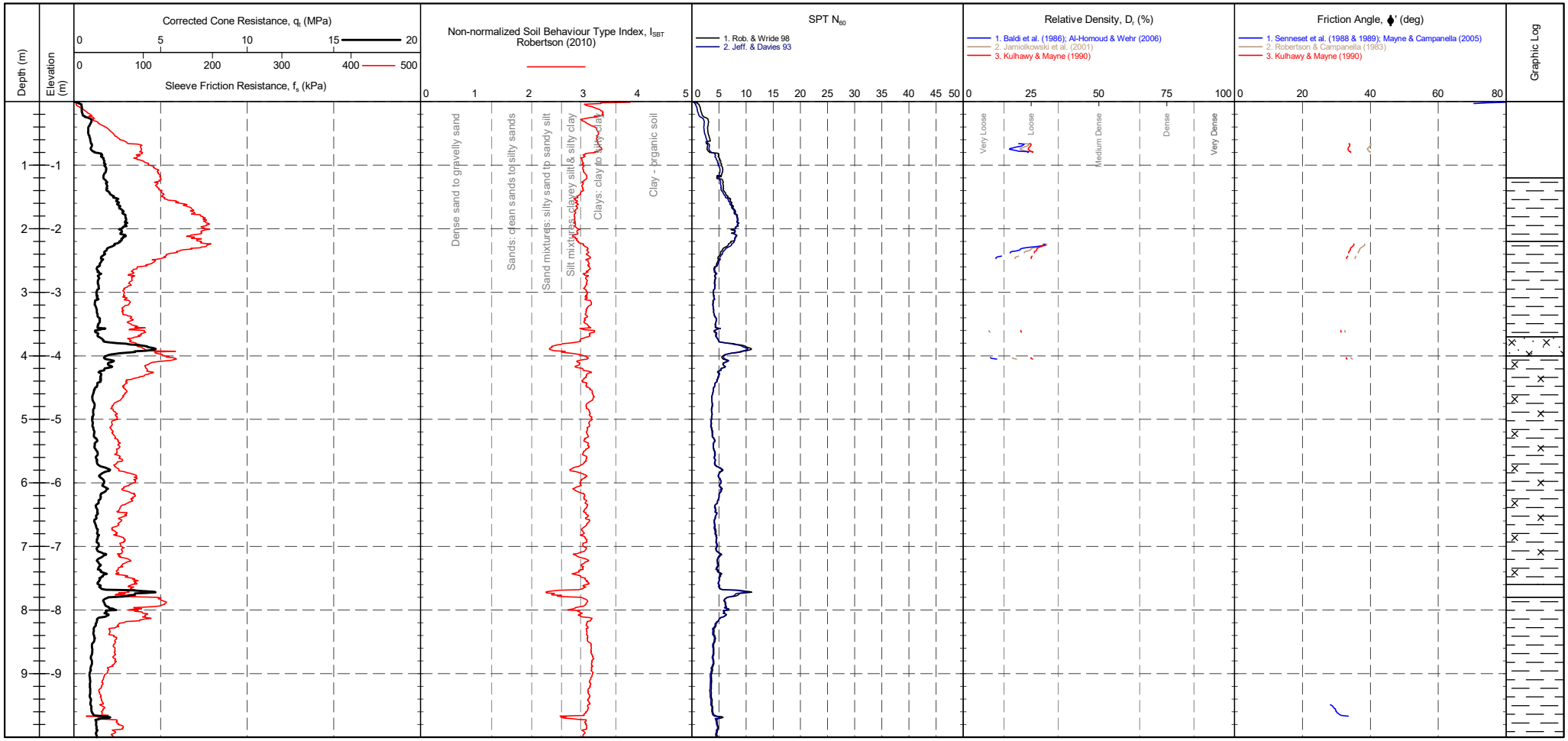
CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 306 mV / 0.011 MPa Sleeve / 263 mV / 266 mV / 0.002 kPa Pore Pressure 2 / 260 mV / 235 mV / -0.007 kPa X-Y Inclinometer / 2427 mV / 2439 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

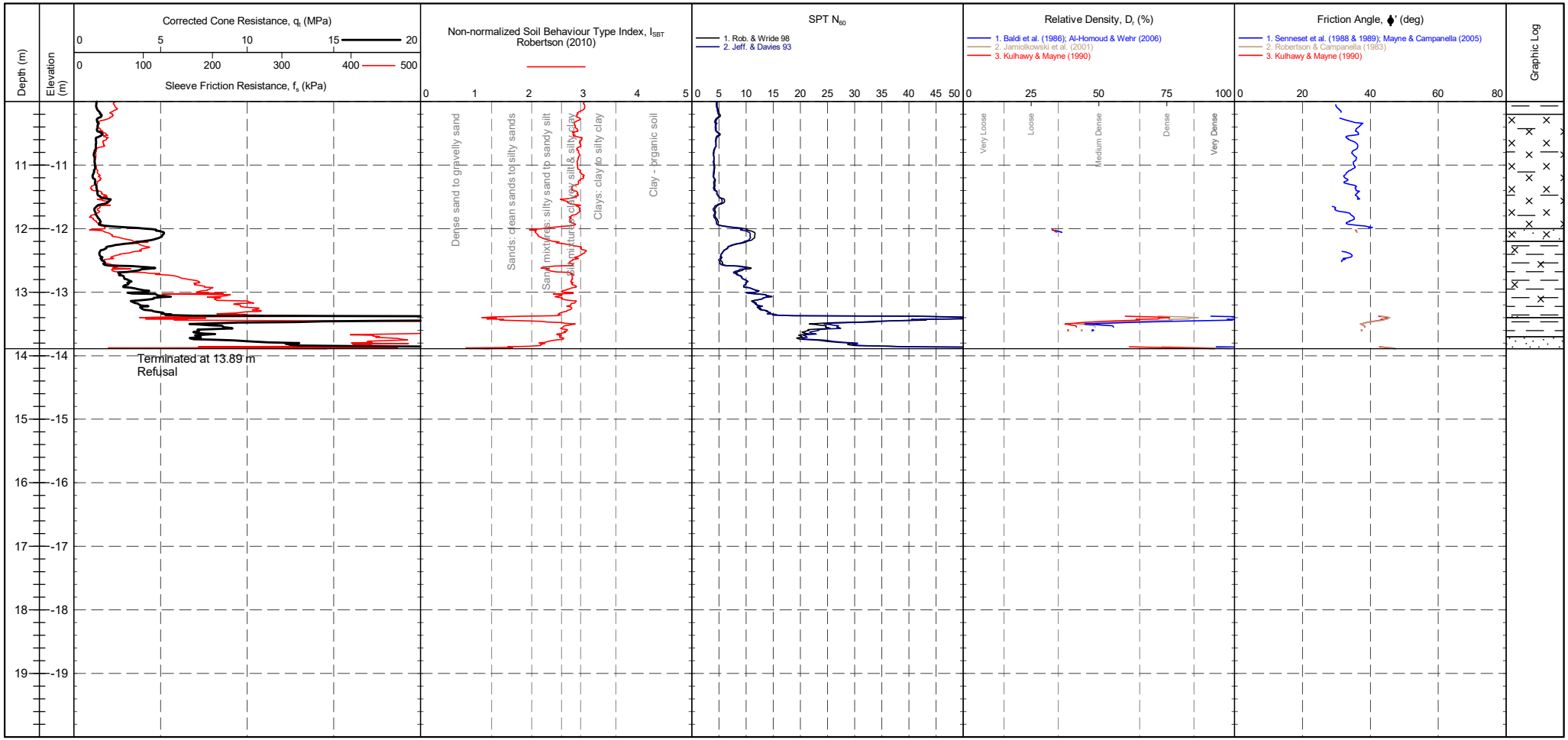
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 306 mV / 0.011 MPa Sleeve / 263 mV / 266 mV / 0.002 kPa Pore Pressure 2 / 260 mV / 235 mV / -0.007 kPa X-Y Inclinometer / 2427 mV / 2439 mV		Groundwater Level Dissipation Test

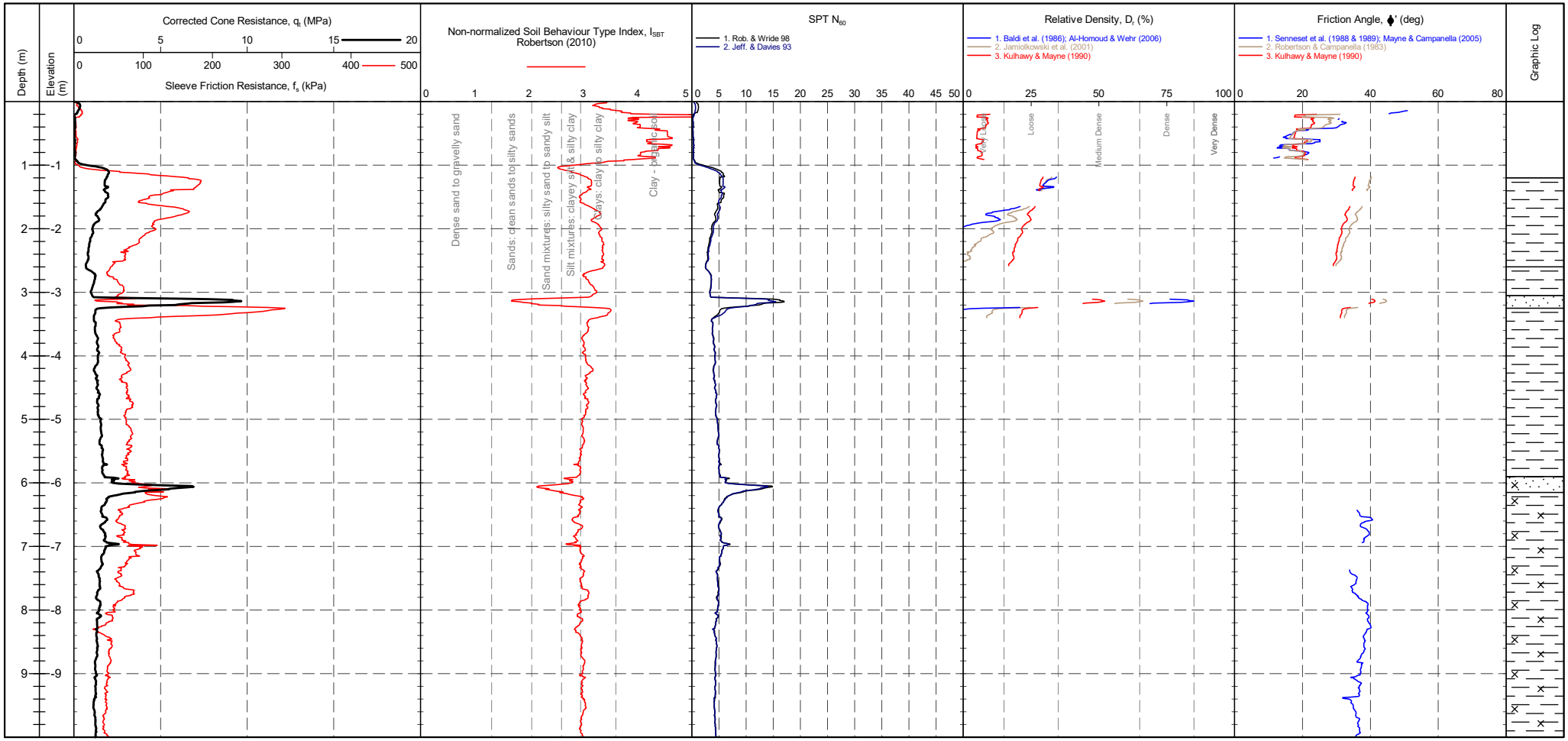
CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 266 mV / 265 mV / -0.001 kPa Pore Pressure 2 / 227 mV / 262 mV / 0.01 kPa X-Y Inclinometer / 2411 mV / 2426 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

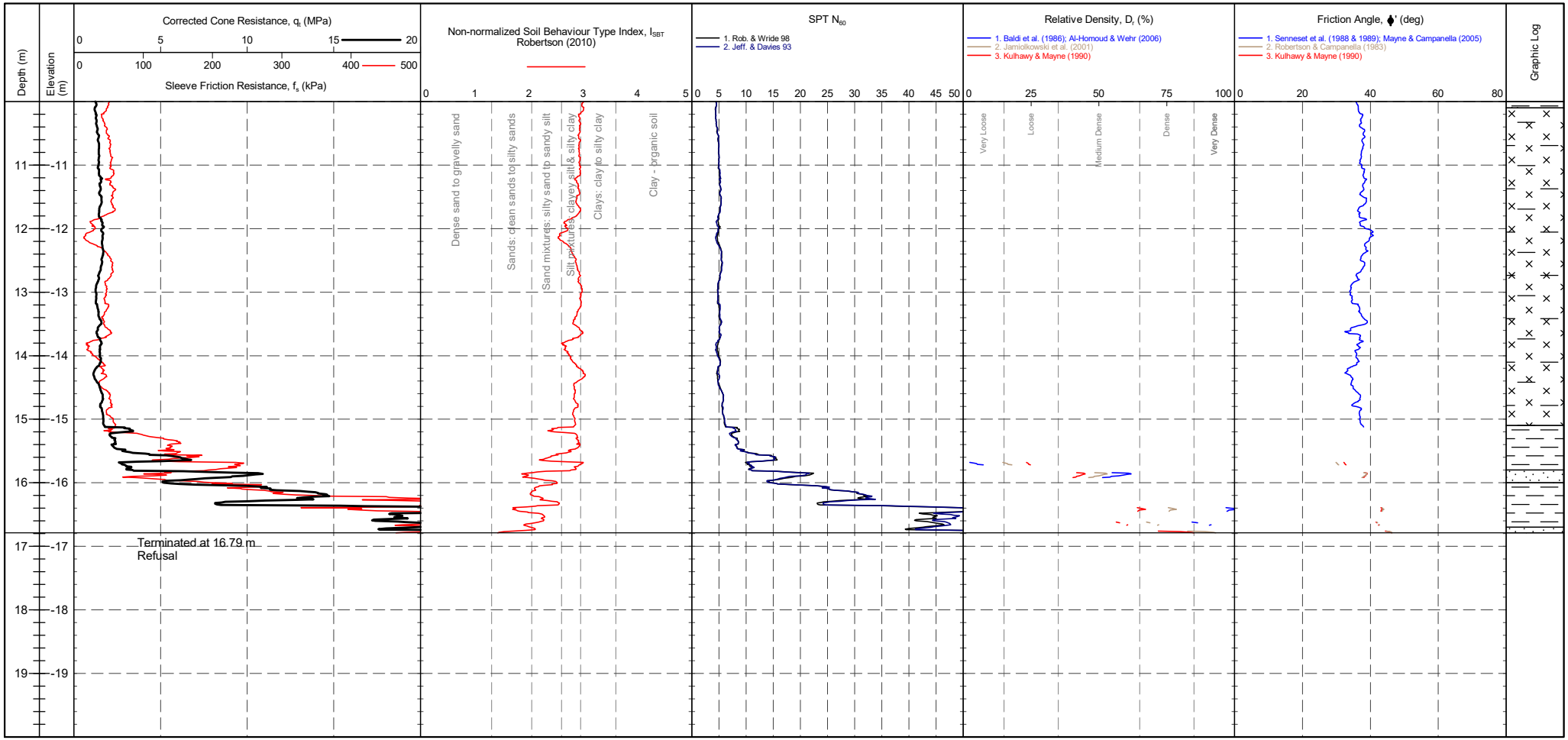
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	305 mV	304 mV	-0.011 MPa
Sleeve	266 mV	265 mV	-0.001 kPa
Pore Pressure 2	227 mV	262 mV	0.01 kPa
X-Y Inclinometer	2411 mV	2426 mV	

IN SITU SITE INVESTIGATION

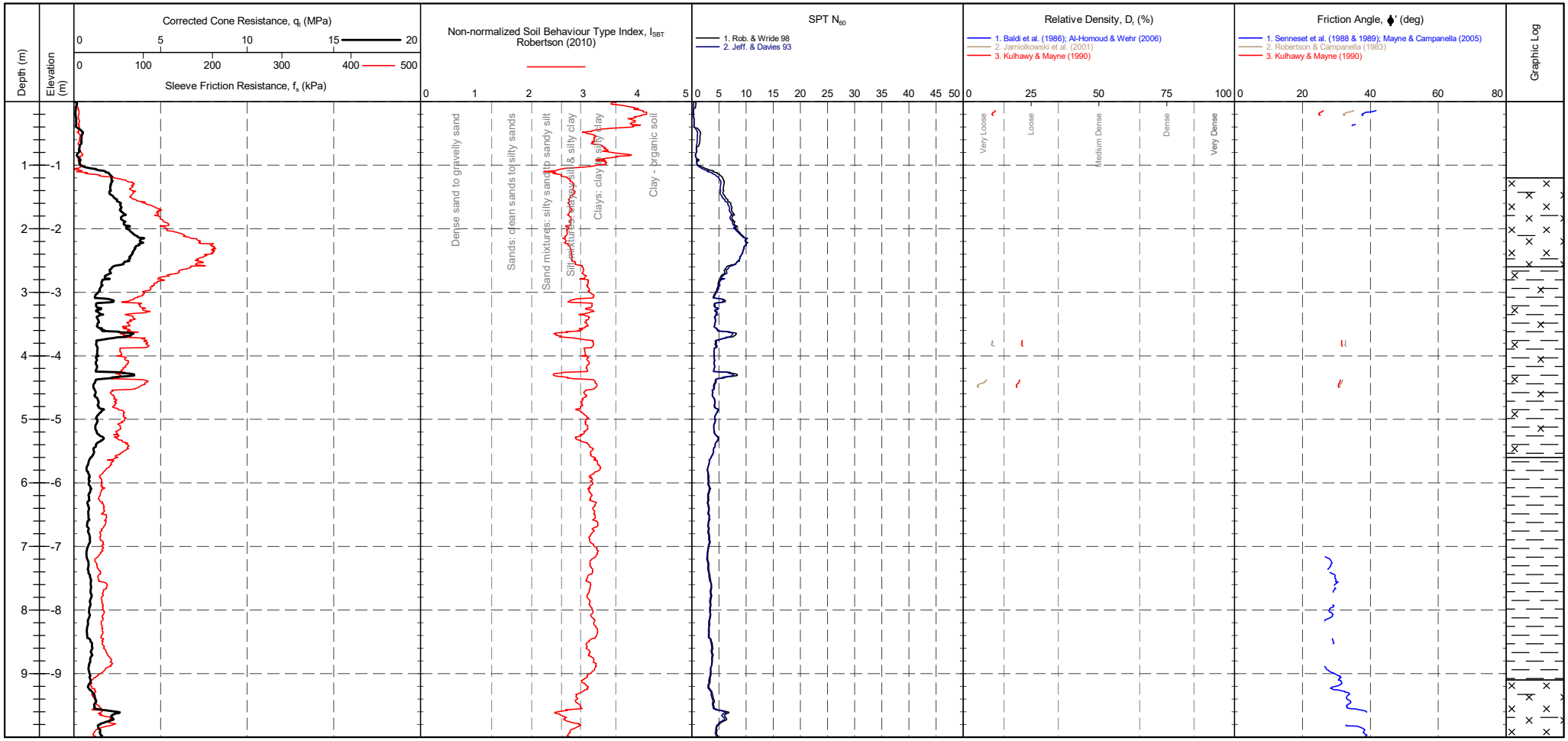
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 305 mV / 0 MPa Sleeve / 279 mV / 273 mV / -0.004 kPa Pore Pressure 2 / 238 mV / 276 mV / 0.011 kPa X-Y Inclinometer / 2446 mV / 2466 mV	Groundwater Level Dissipation Test

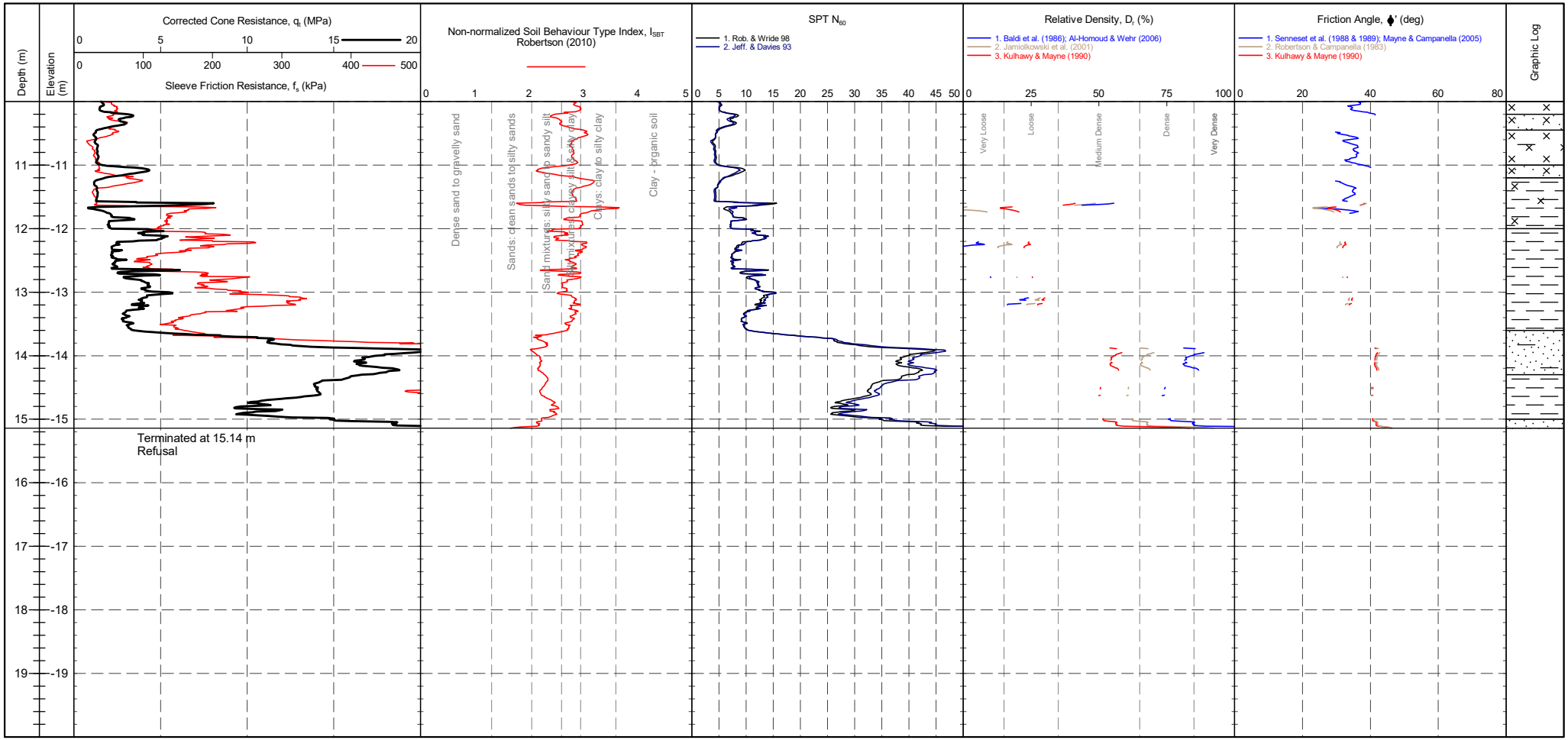
CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 305 mV / 0 MPa Sleeve / 279 mV / 273 mV / -0.004 kPa Pore Pressure 2 / 238 mV / 276 mV / 0.011 kPa X-Y Inclinometer / 2446 mV / 2466 mV	Groundwater Level Dissipation Test

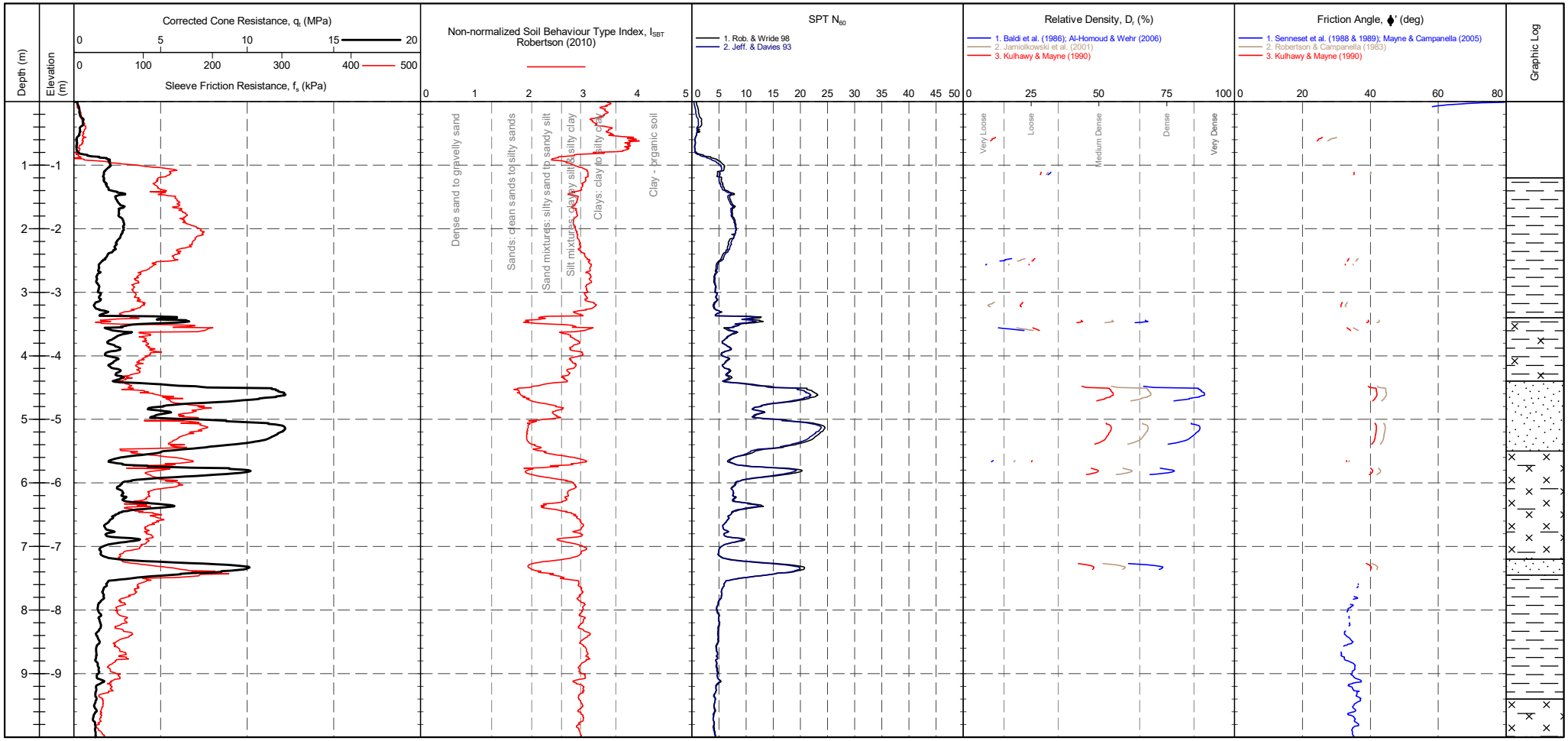
CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	306 mV	306 mV	0 MPa
Sleeve	275 mV	263 mV	-0.009 kPa
Pore Pressure 2	278 mV	269 mV	-0.003 kPa
X-Y Inclinometer	2428 mV	2402 mV	

IN SITU SITE INVESTIGATION

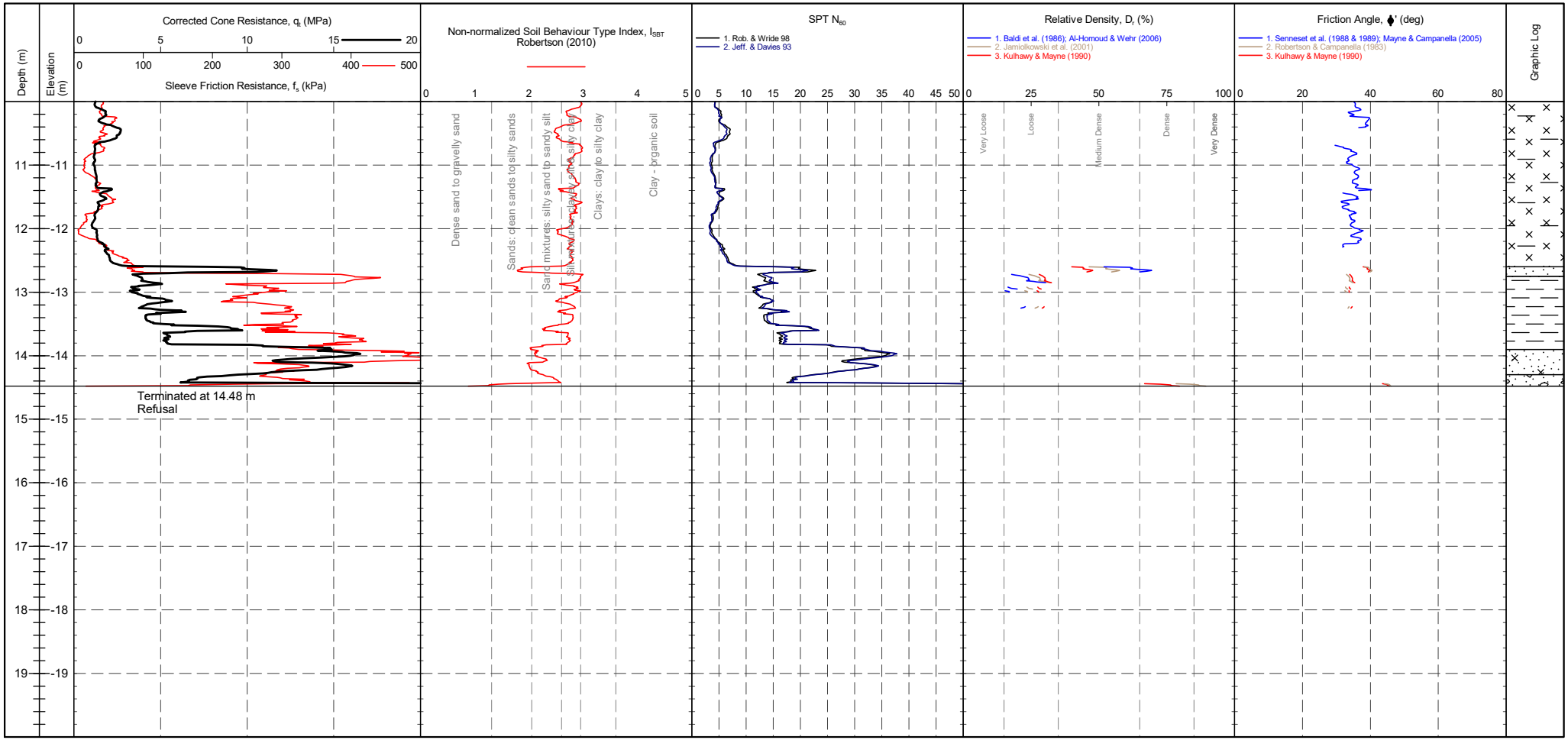
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 306 mV / 0 MPa Sleeve / 275 mV / 263 mV / -0.009 kPa Pore Pressure 2 / 278 mV / 269 mV / -0.003 kPa X-Y Inclinometer / 2428 mV / 2402 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

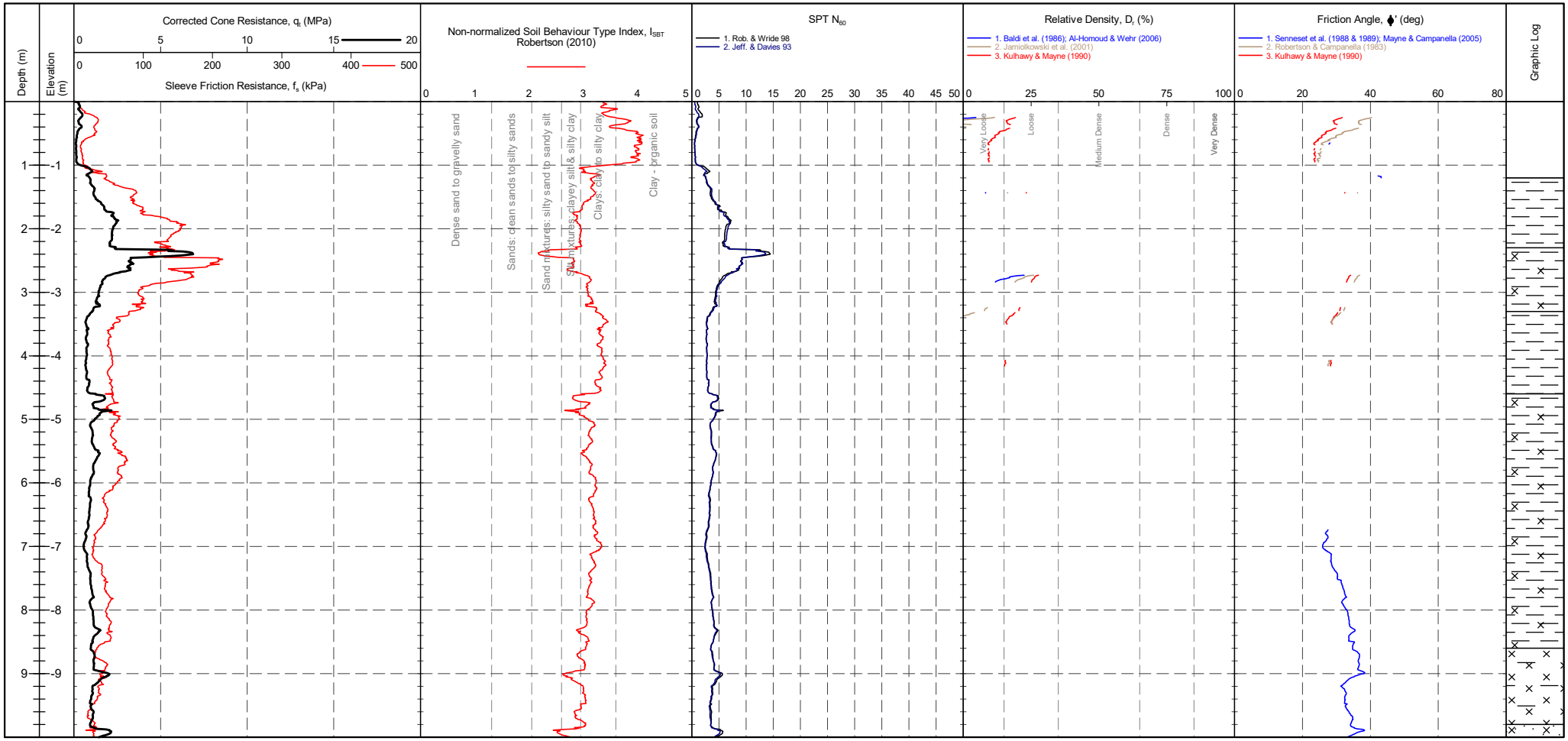
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 305 mV / 0 MPa Sleeve / 269 mV / 269 mV / 0 kPa Pore Pressure 2 / 263 mV / 361 mV / 0.028 kPa X-Y Inclinometer / 2456 mV / 2447 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

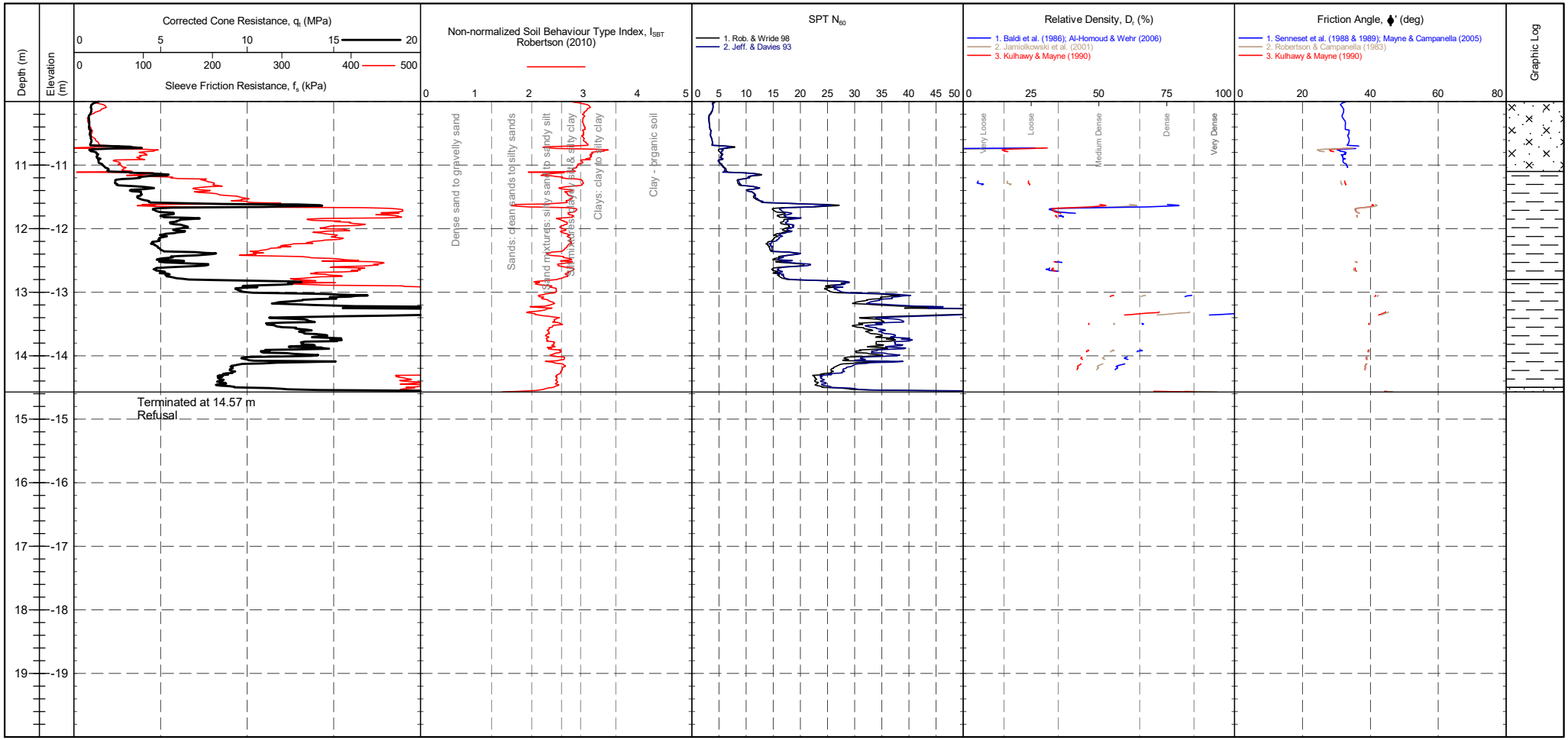
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	269 mV	269 mV	0 kPa
Pore Pressure 2	263 mV	361 mV	0.028 kPa
X-Y Inclinometer	2456 mV	2447 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

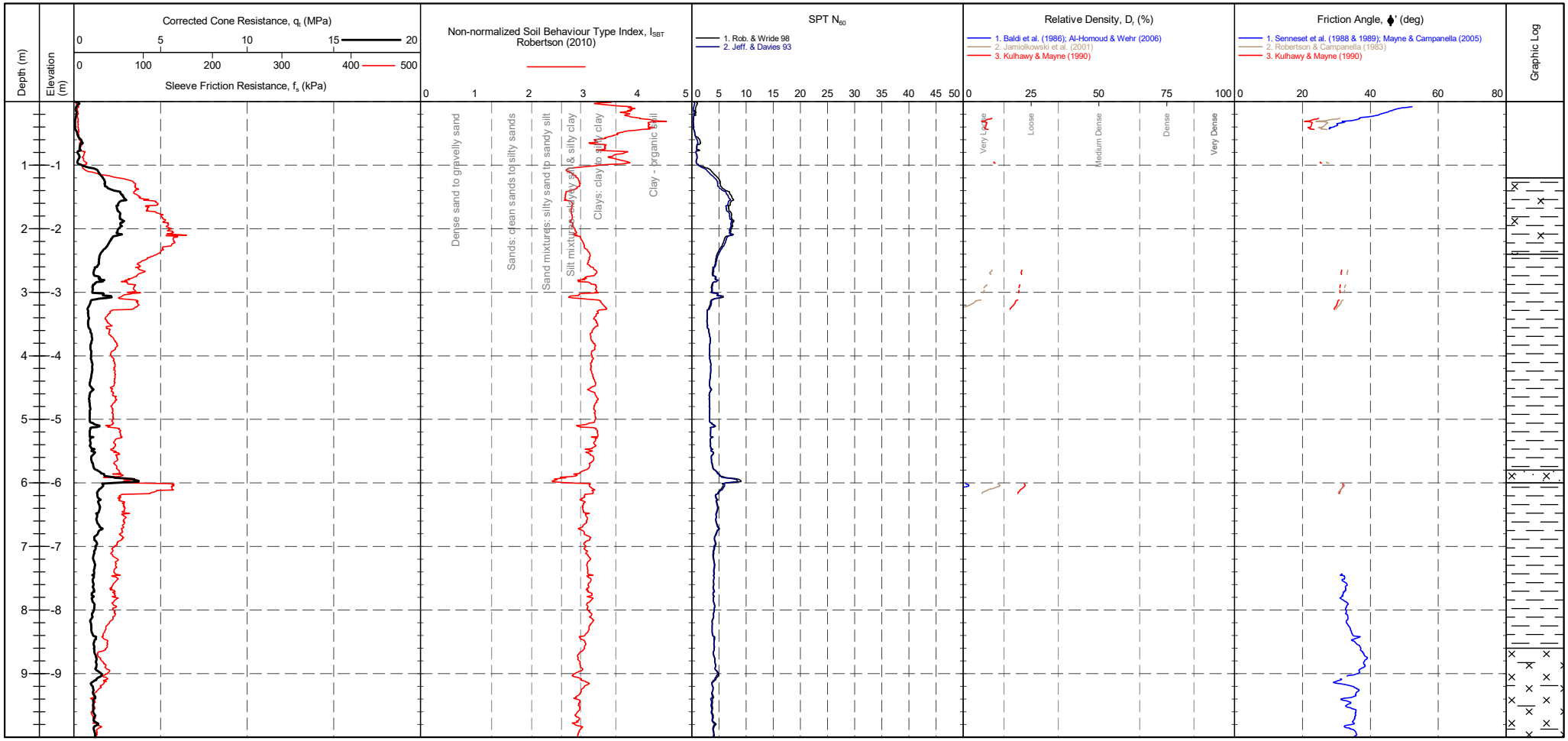
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 301 mV / -0.055 MPa Sleeve / 292 mV / 284 mV / -0.006 kPa Pore Pressure 2 / 229 mV / 273 mV / 0.012 kPa X-Y Inclinometer / 2468 mV / 2511 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

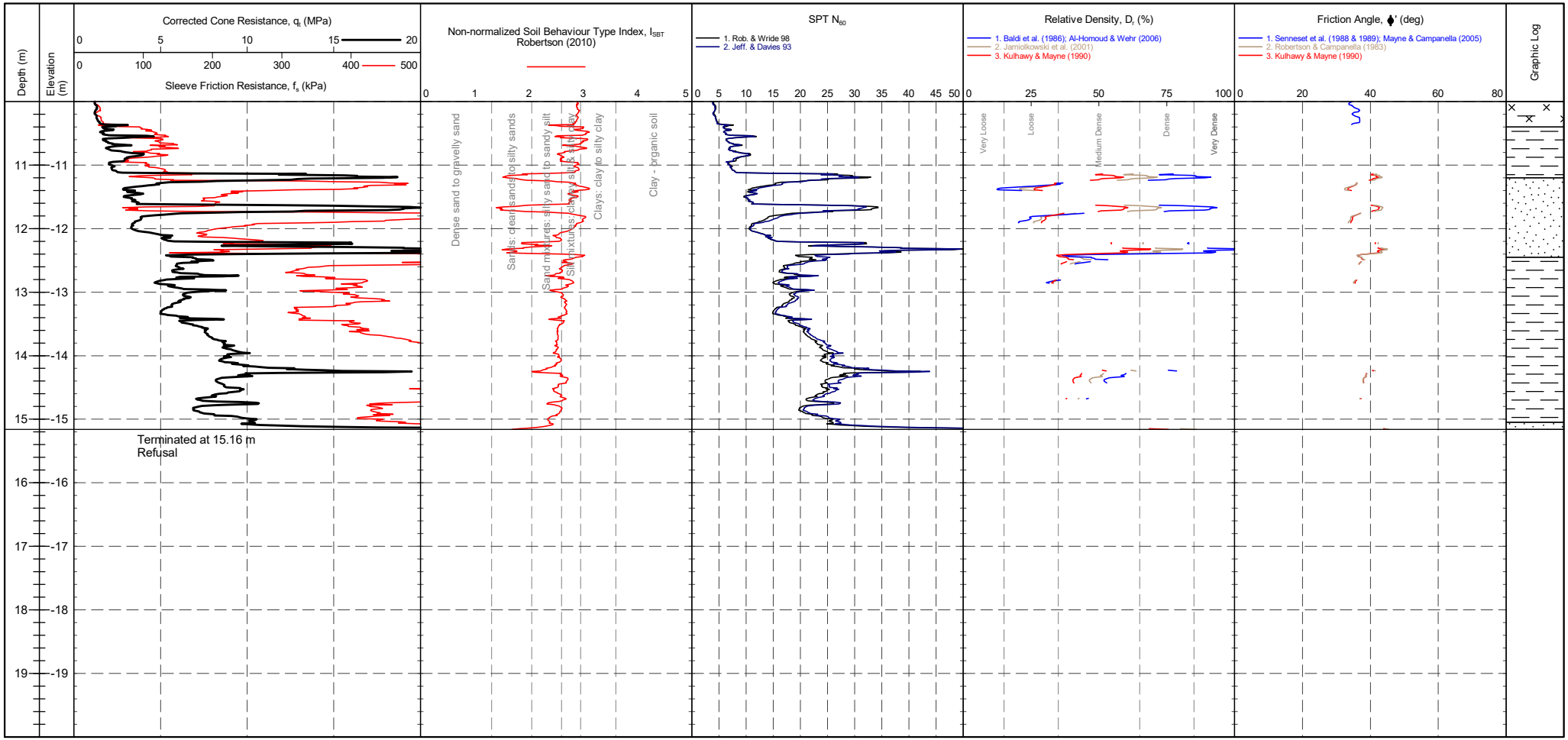
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	306 mV	301 mV	-0.055 MPa
Sleeve	292 mV	284 mV	-0.006 kPa
Pore Pressure 2	229 mV	273 mV	0.012 kPa
X-Y Inclinometer	2468 mV	2511 mV	

IN SITU SITE INVESTIGATION

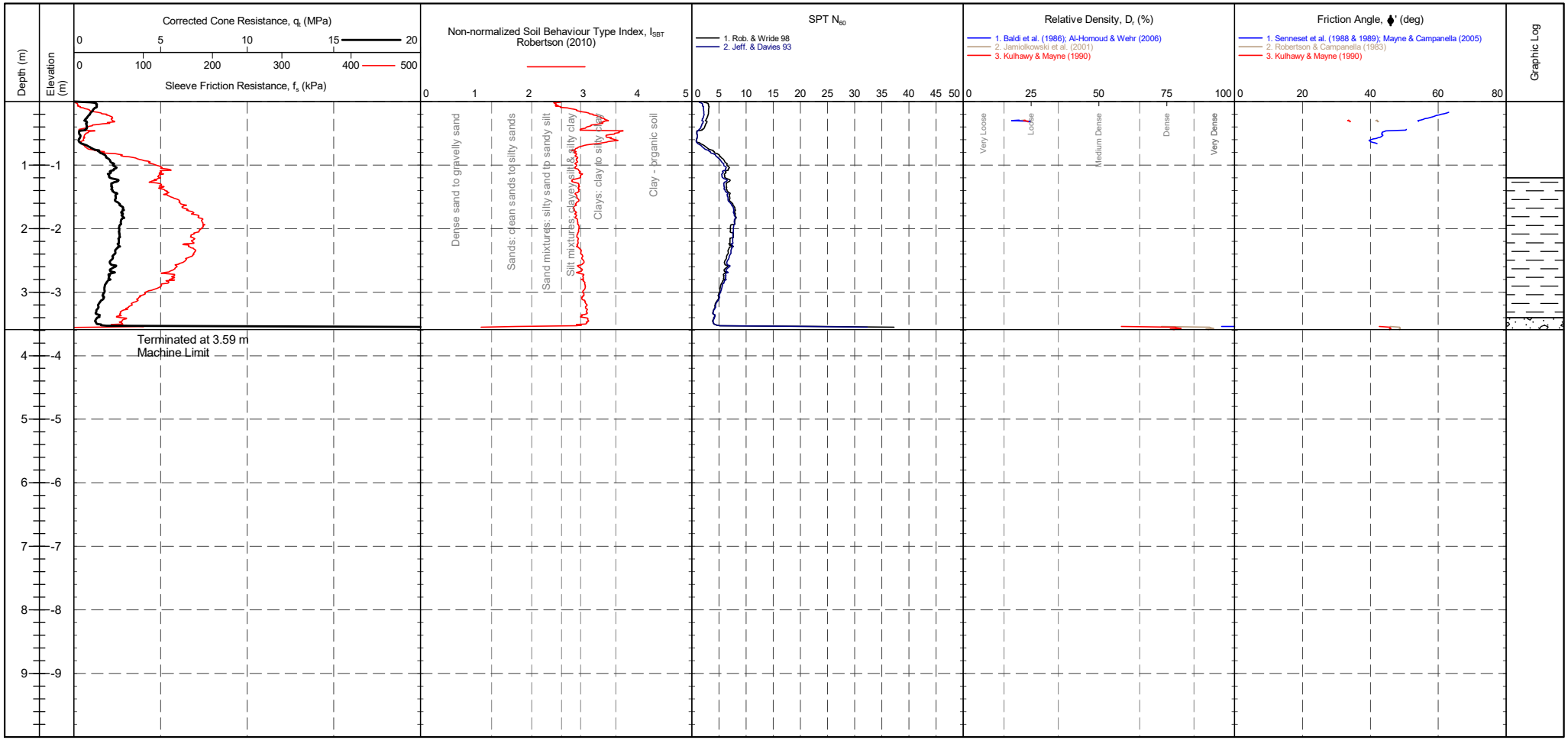
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 28

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 302 mV / 308 mV / 0.066 MPa Sleeve: 284 mV / 290 mV / 0.004 kPa Pore Pressure 2: 258 mV / 257 mV / 0 kPa X-Y Inclinometer: 2457 mV / 2455 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

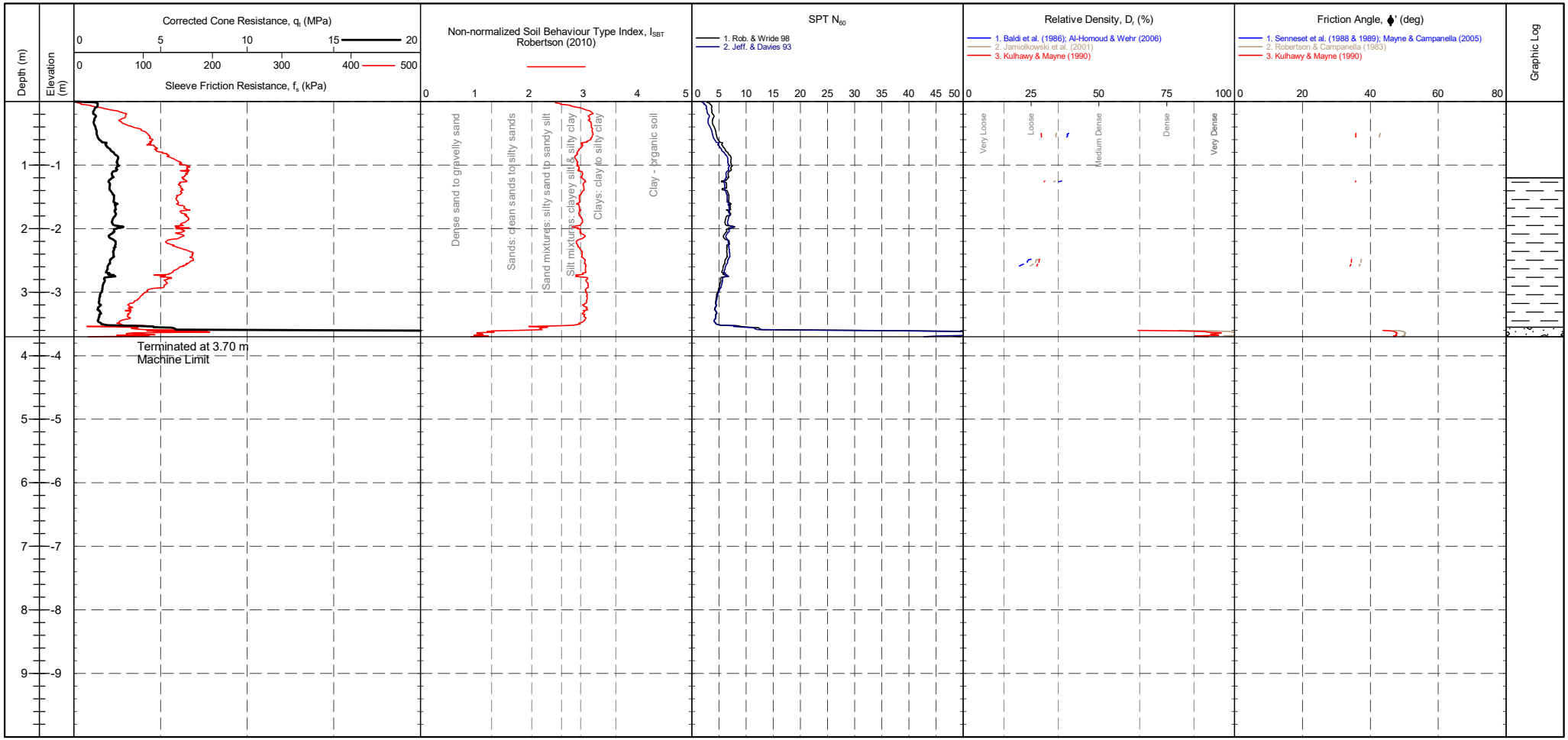
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 28A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488	TEST TYPE : TE2	CPTU ZERO VALUES	
CONE AREA : 15cm²	APPLICATION CLASS : 2	Transducer / Pre / Post / Difference	
CONE AREA RATIO : 0.79	RIG : CPT 007	Tip / 307 mV / 310 mV / 0.033 MPa	
FILTER POSITION : u2	OPERATOR : RS & PB	Sleeve / 289 mV / 287 mV / -0.001 kPa	
FILTER TYPE : HDPE	FILE NAME : 1170315-CPT 28A	Pore Pressure 2 / 256 mV / 232 mV / -0.007 kPa	
FRICTION REDUCER : None	WEATHER : Overcast & Mild	X-Y Inclinometer / 2457 mV / 2464 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

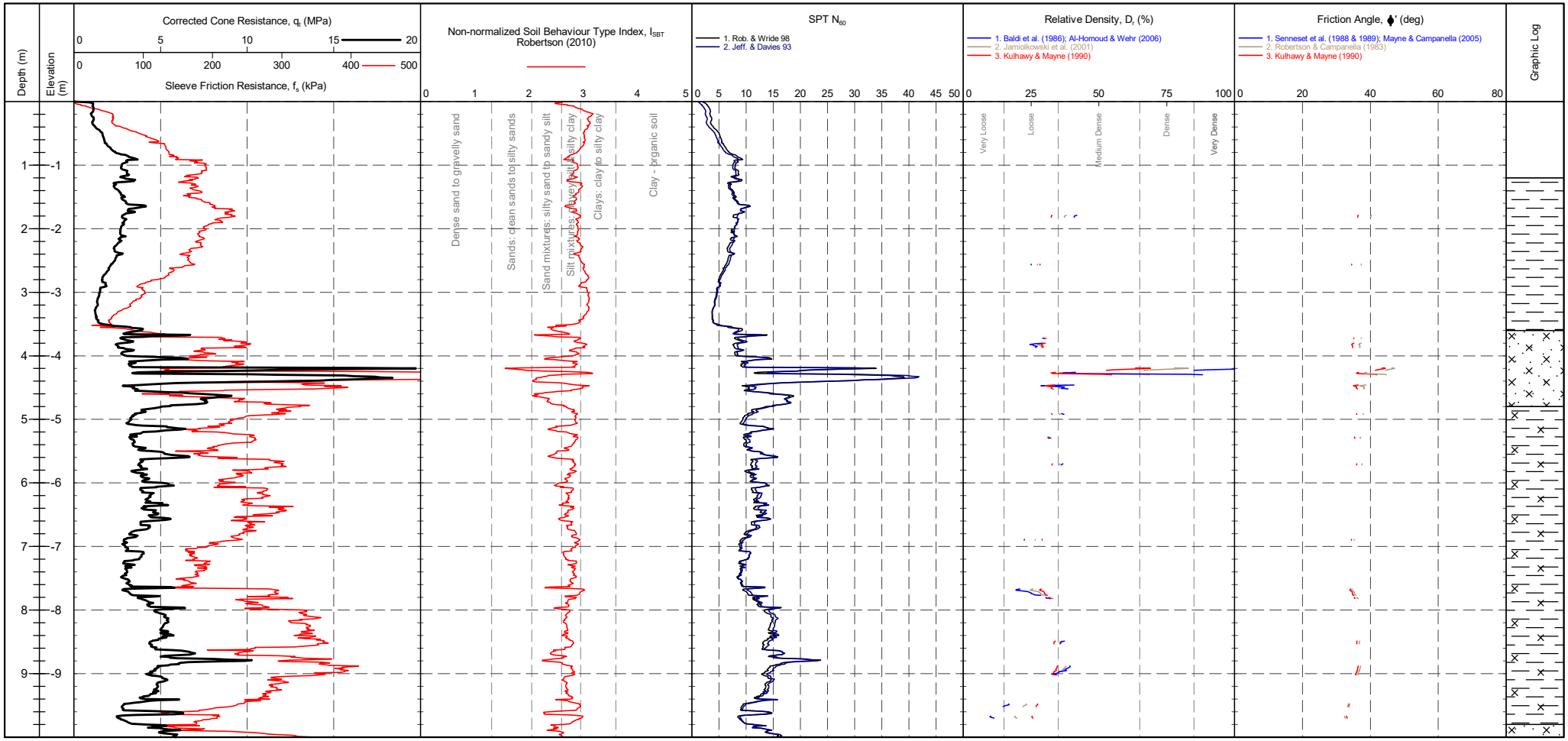
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488	TEST TYPE : TE2	CPTU ZERO VALUES	
CONE AREA : 15cm²	APPLICATION CLASS : 2	Transducer / Pre / Post / Difference	
CONE AREA RATIO : 0.79	RIG : CPT 007	Tip: 307 mV / 308 mV / 0.011 MPa	
FILTER POSITION : u2	OPERATOR : RS & PB	Sleeve: 270 mV / 267 mV / -0.002 kPa	
FILTER TYPE : HDPE	FILE NAME : 1170315-CPT 28B	Pore Pressure 2: 246 mV / 236 mV / -0.003 kPa	
FRICTION REDUCER : None	WEATHER : Sunny & Mild	X-Y Inclinometer: 2411 mV / 2420 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

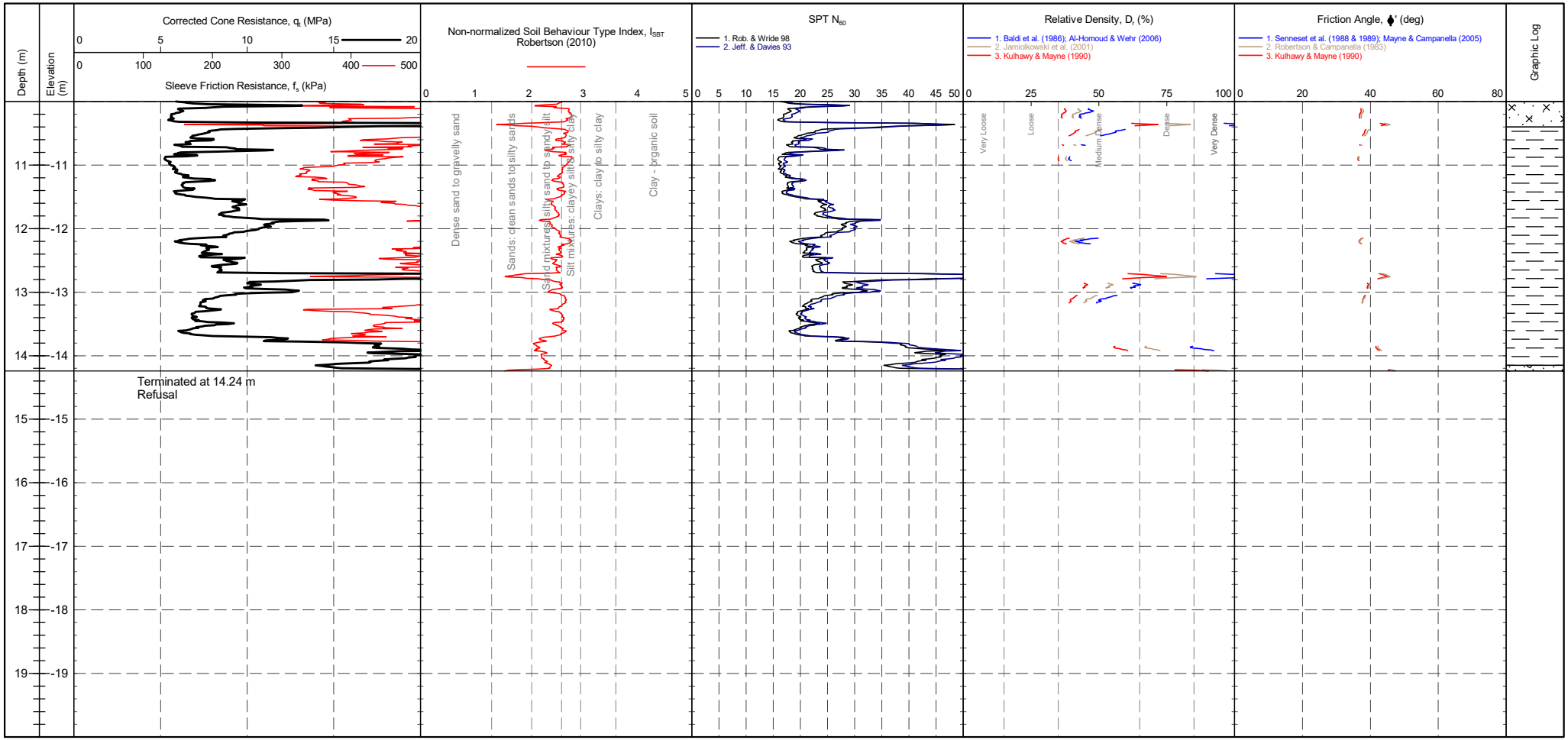
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	307 mV	308 mV	0.011 MPa
Sleeve	270 mV	267 mV	-0.002 kPa
Pore Pressure 2	246 mV	236 mV	-0.003 kPa
X-Y Inclinometer	2411 mV	2420 mV	

IN SITU SITE INVESTIGATION

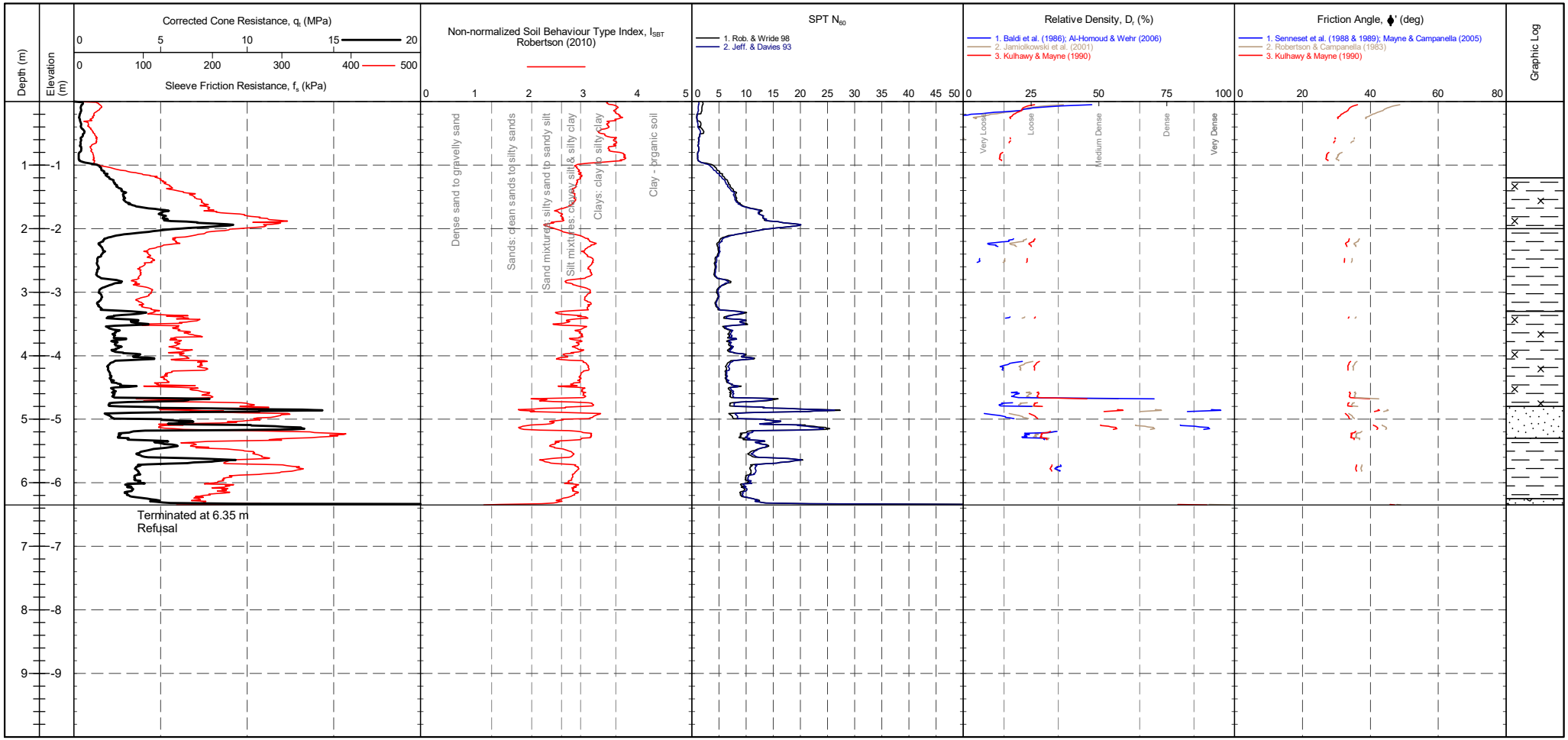
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 29

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES	
CONE AREA	: 15cm²	APPLICATION CLASS	: 2	Transducer / Pre / Post / Difference	
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip: 305 mV / 304 mV / -0.011 MPa	
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve: 281 mV / 280 mV / -0.001 kPa	
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 29	Pore Pressure 2: 223 mV / 240 mV / 0.005 kPa	
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer: 2466 mV / 2429 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

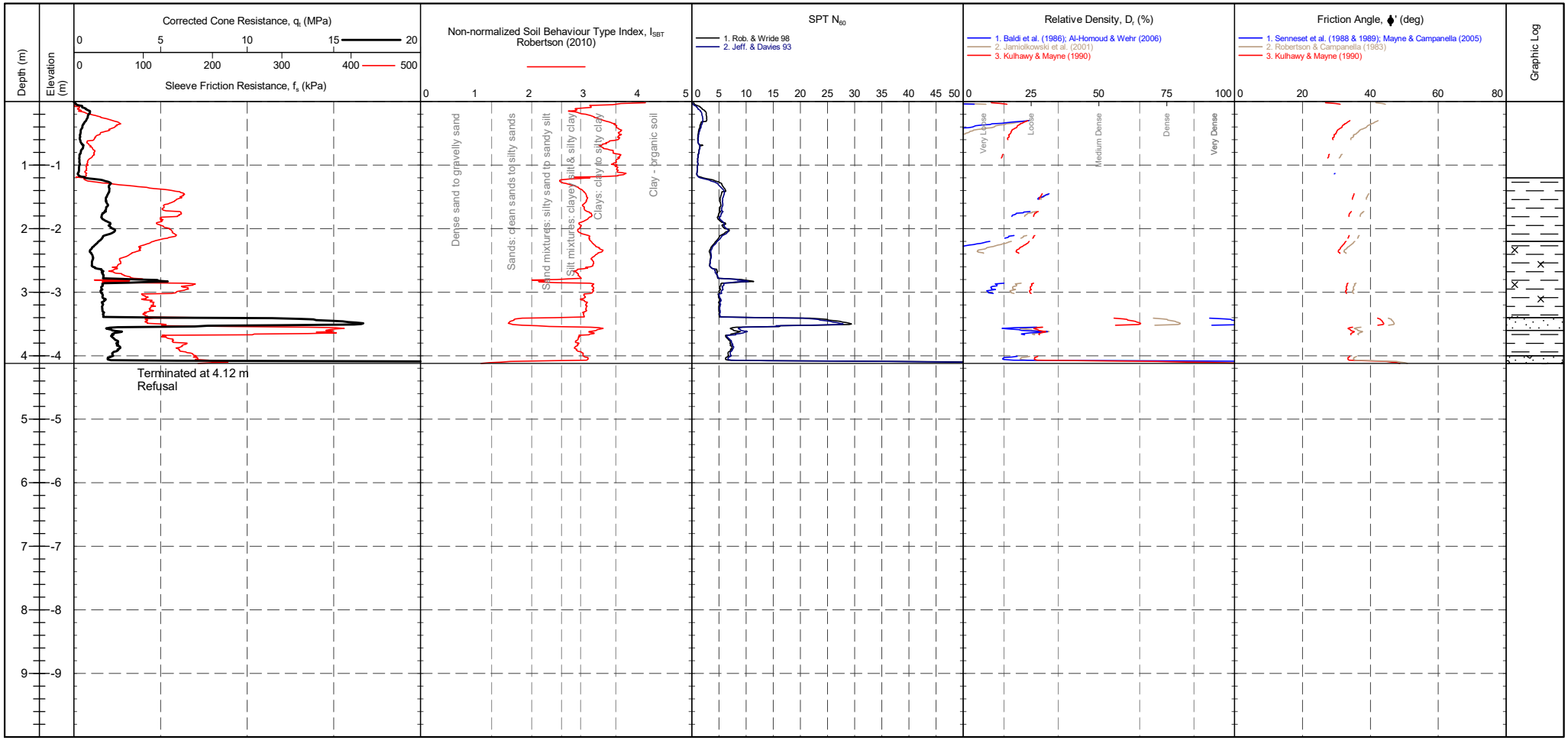
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 30

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES	
CONE AREA	: 15cm²	APPLICATION CLASS	: 2	Transducer	Pre / Post / Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	304 mV / 307 mV / 0.033 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	280 mV / 283 mV / 0.002 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 30	Pore Pressure 2	231 mV / 234 mV / 0.001 kPa
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer	2437 mV / 2466 mV

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

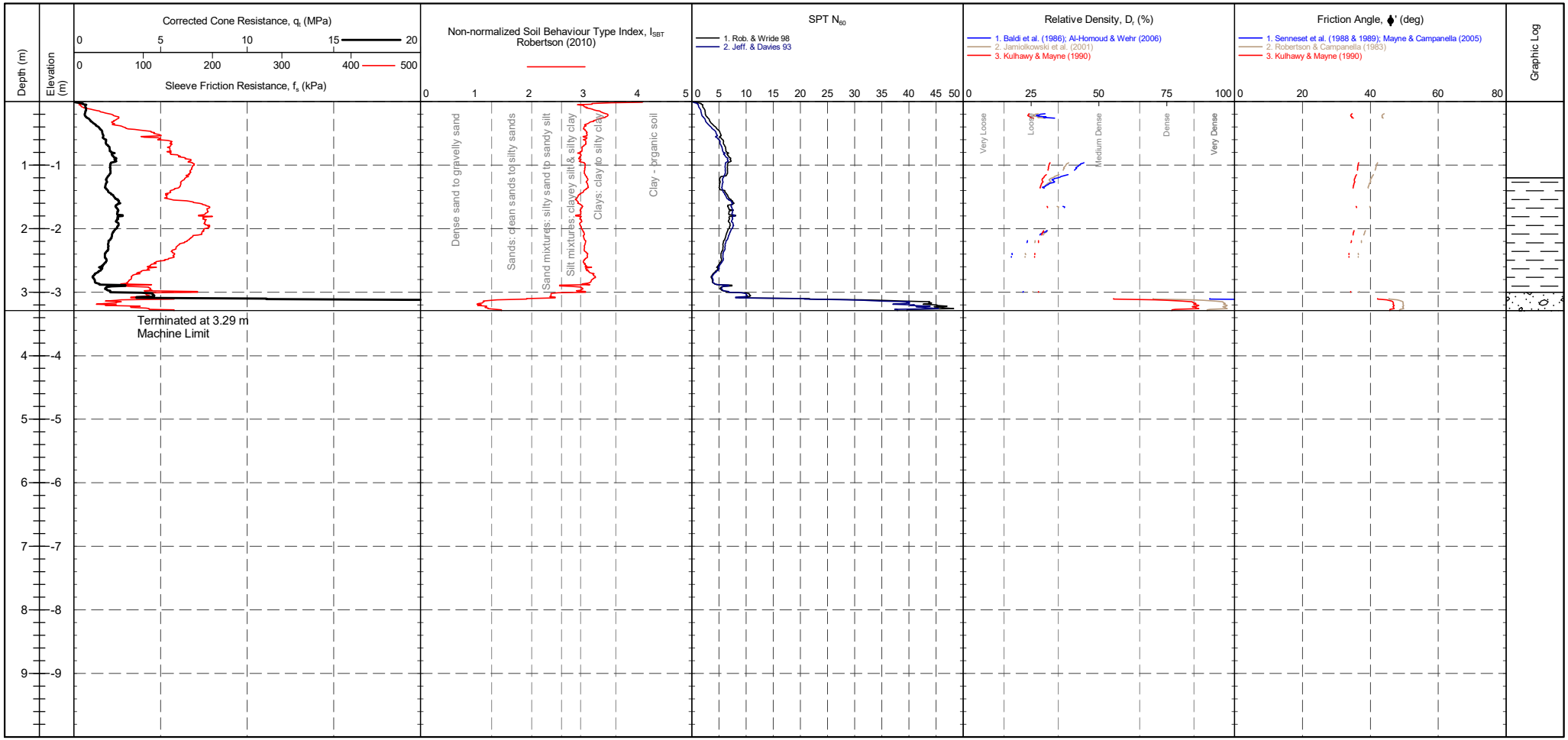
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 31

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 309 mV / 0.044 MPa Sleeve / 282 mV / 285 mV / 0.002 kPa Pore Pressure 2 / 228 mV / 230 mV / 0.001 kPa X-Y Inclinometer / 2432 mV / 2438 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

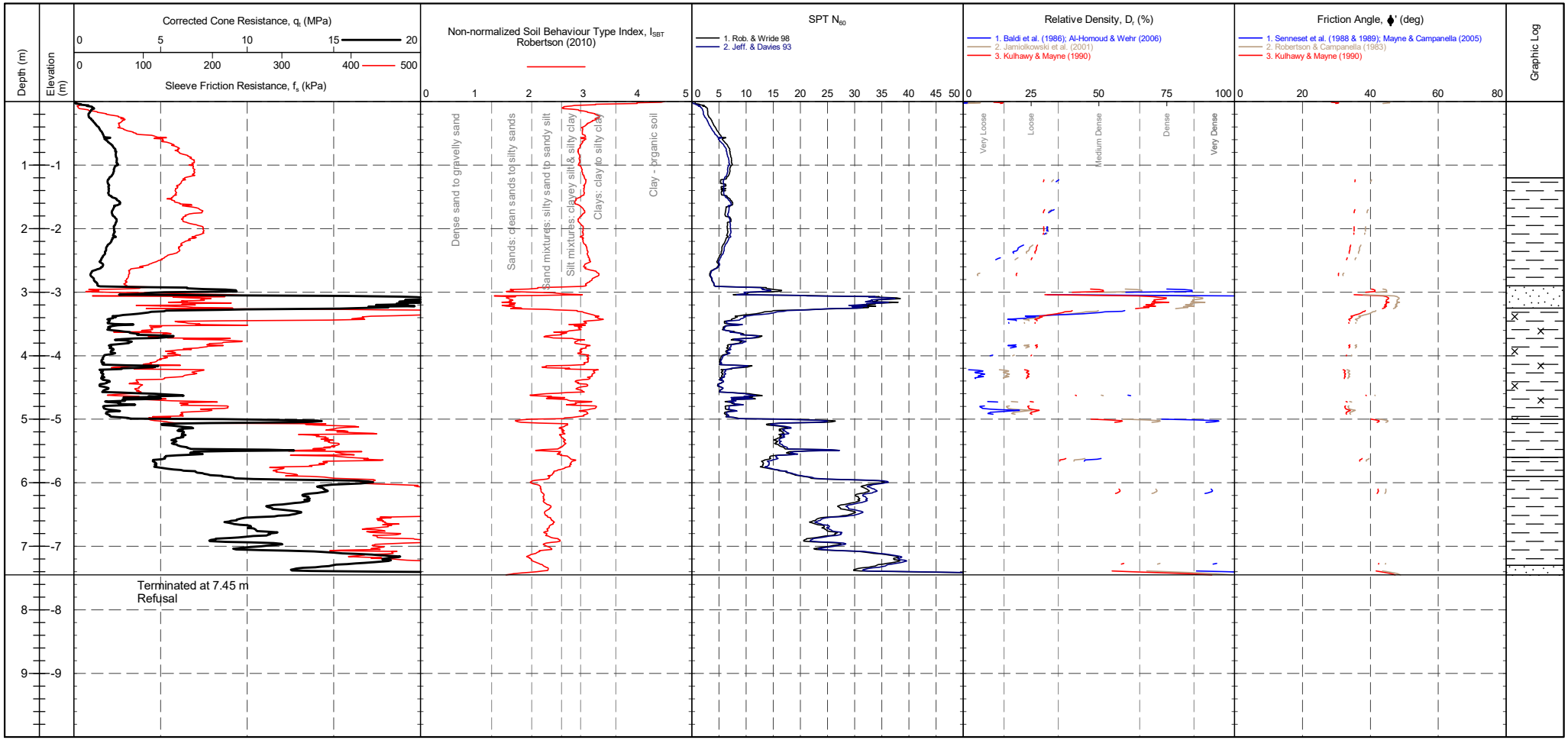
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 31A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES	
CONE AREA	: 15cm²	APPLICATION CLASS	: 2	Transducer	Pre / Post / Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	308 mV / 305 mV / -0.033 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	284 mV / 281 mV / -0.002 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 31A	Pore Pressure 2	229 mV / 211 mV / -0.005 kPa
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer	2439 mV / 2453 mV

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

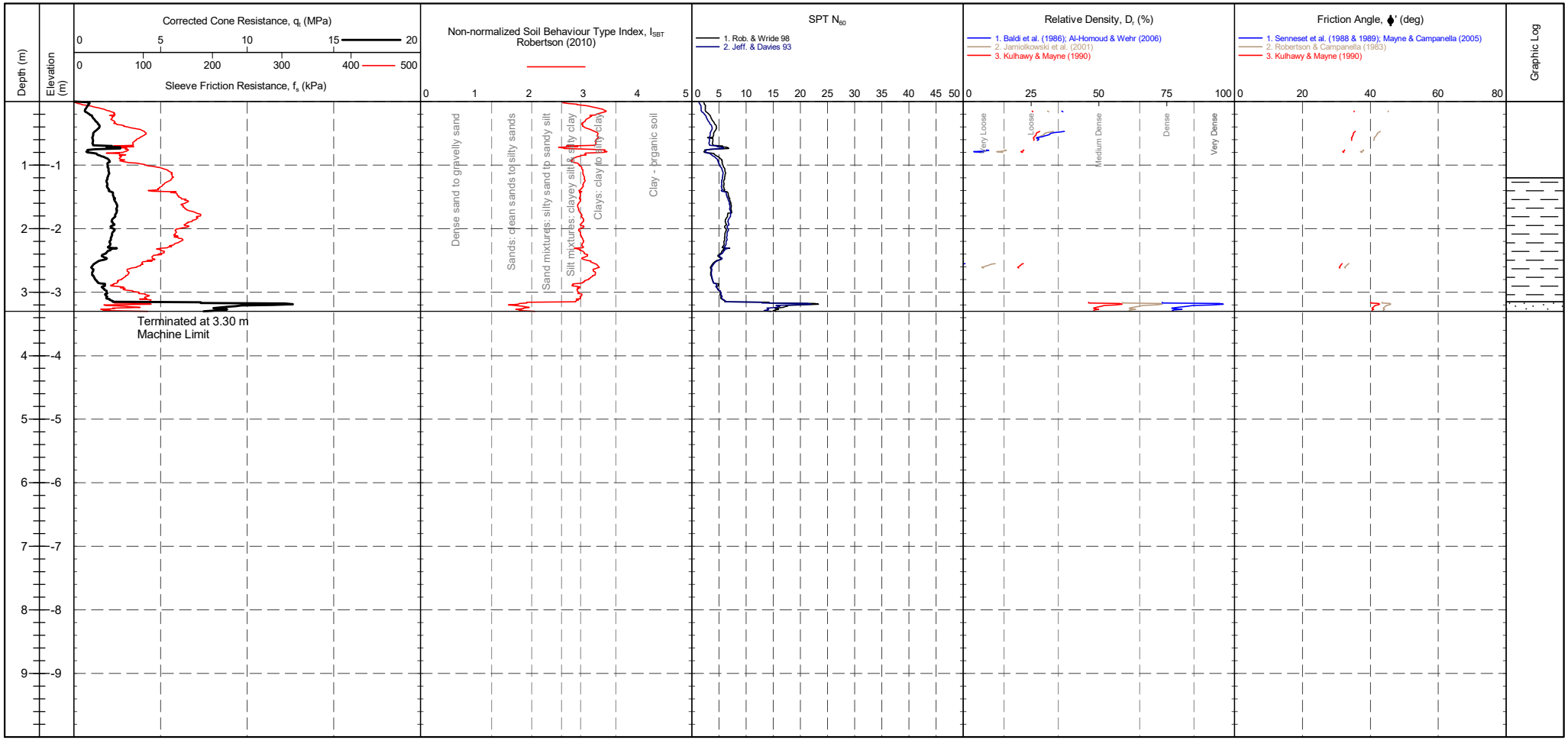
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 31B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31B WEATHER : Sunny & Mild	CPTU ZERO VALUES			Groundwater Level Dissipation Test
		Transducer	Pre	Post	Difference
		Tip	309 mV	312 mV	0.033 MPa
		Sleeve	270 mV	273 mV	0.002 kPa
		Pore Pressure 2	237 mV	282 mV	0.013 kPa
		X-Y Inclinometer	2466 mV	2413 mV	

IN SITU SITE INVESTIGATION

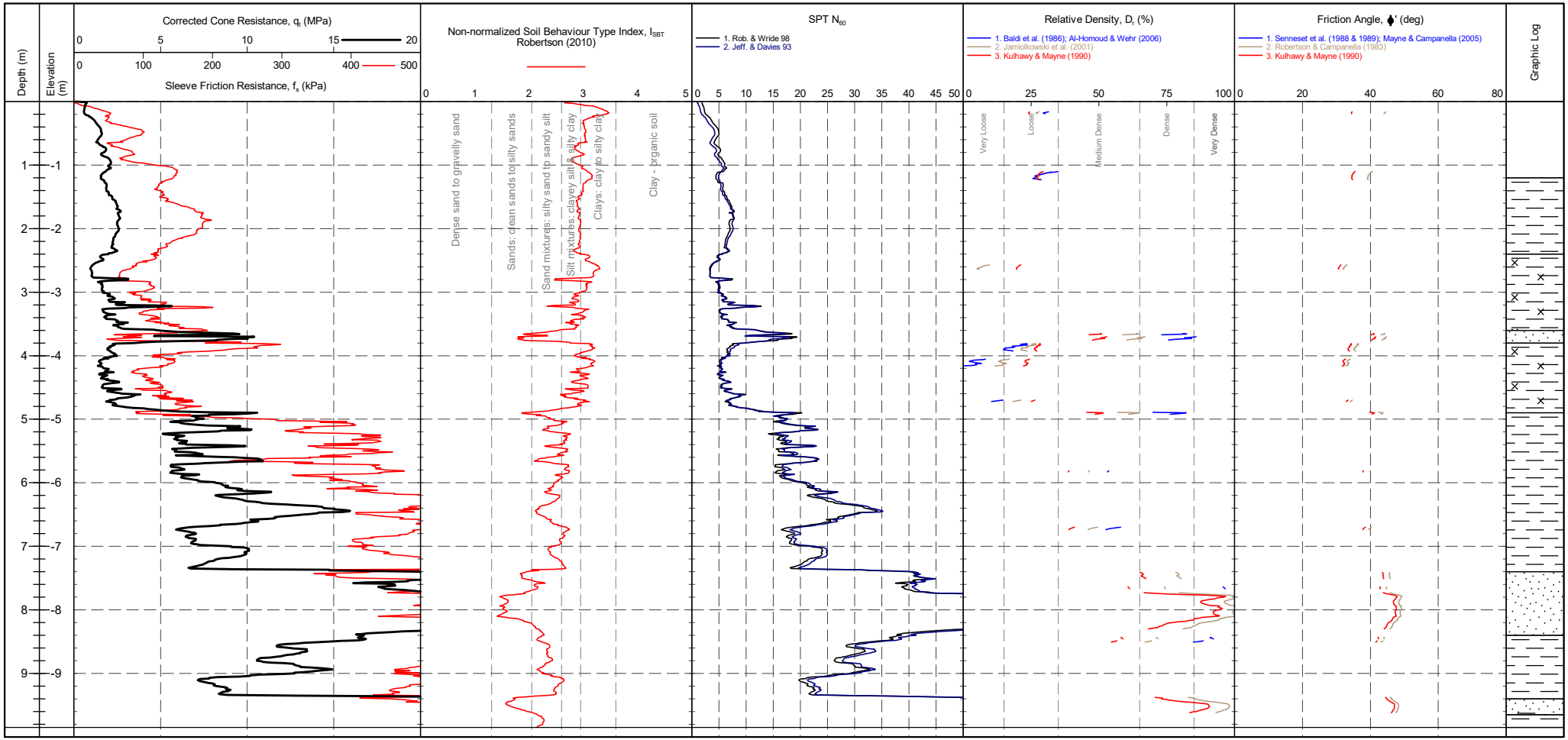
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



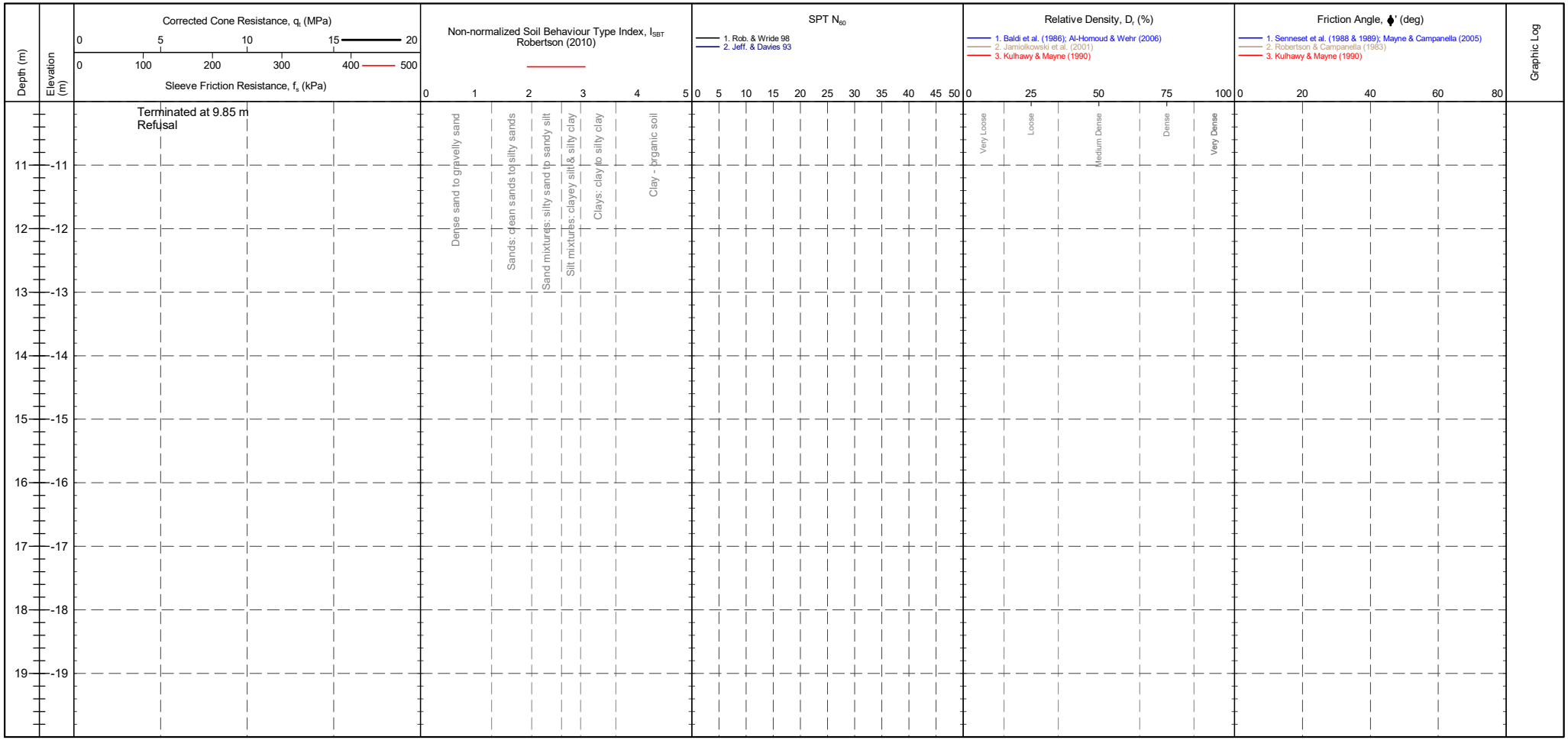
CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 311 mV / 308 mV / -0.033 MPa Sleeve: 273 mV / 264 mV / -0.006 kPa Pore Pressure 2: 266 mV / 99 mV / -0.047 kPa X-Y Inclinometer: 2405 mV / 2420 mV	Groundwater Level Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 311 mV / 308 mV / -0.033 MPa Sleeve: 273 mV / 264 mV / -0.006 kPa Pore Pressure 2: 266 mV / 99 mV / -0.047 kPa X-Y Inclinometer: 2405 mV / 2420 mV	Groundwater Level Dissipation Test

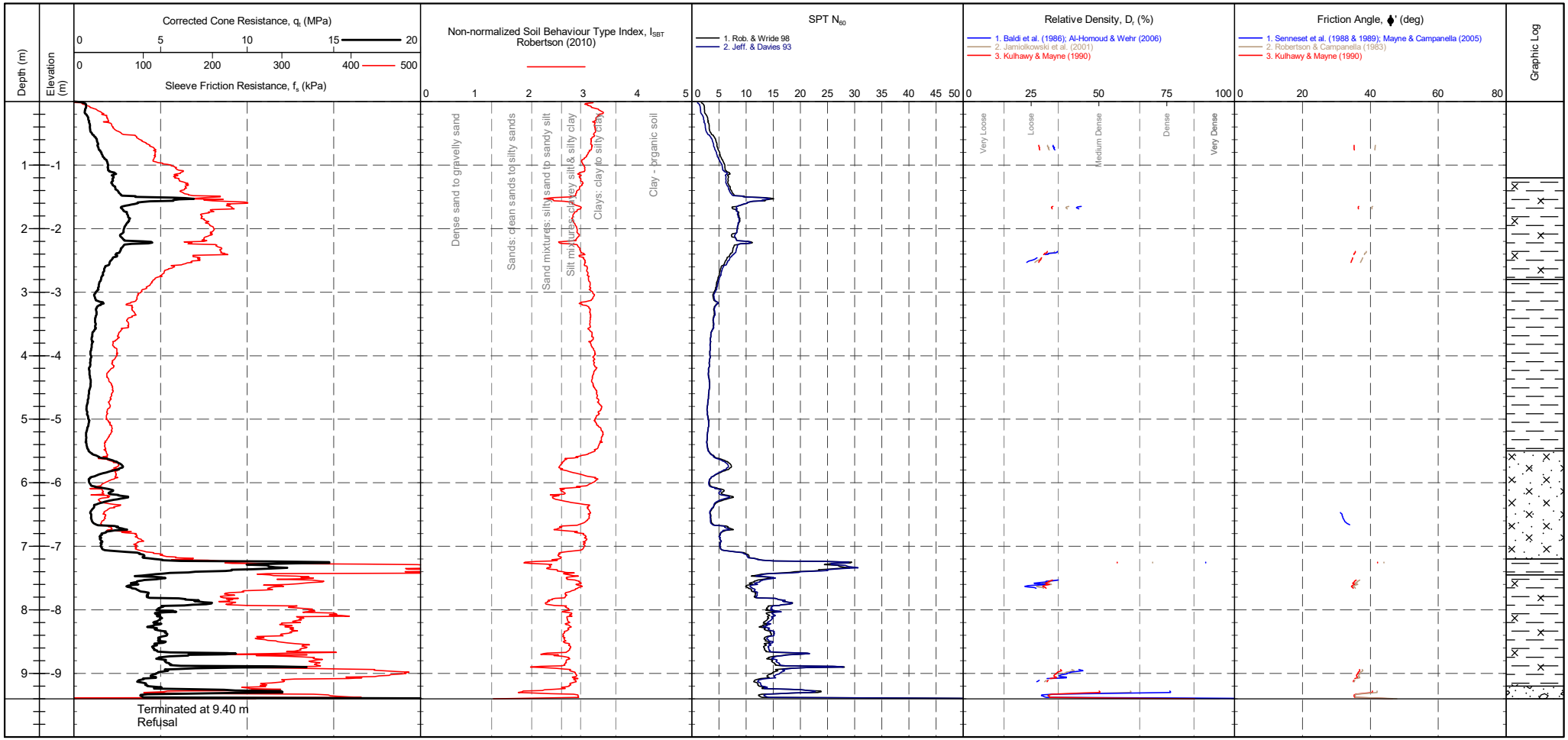
CPT LOG 02

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 32

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 304 mV / 310 mV / 0.066 MPa Sleeve / 267 mV / 275 mV / 0.006 kPa Pore Pressure 2 / 234 mV / 300 mV / 0.019 kPa X-Y Inclinometer / 2439 mV / 2437 mV		Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

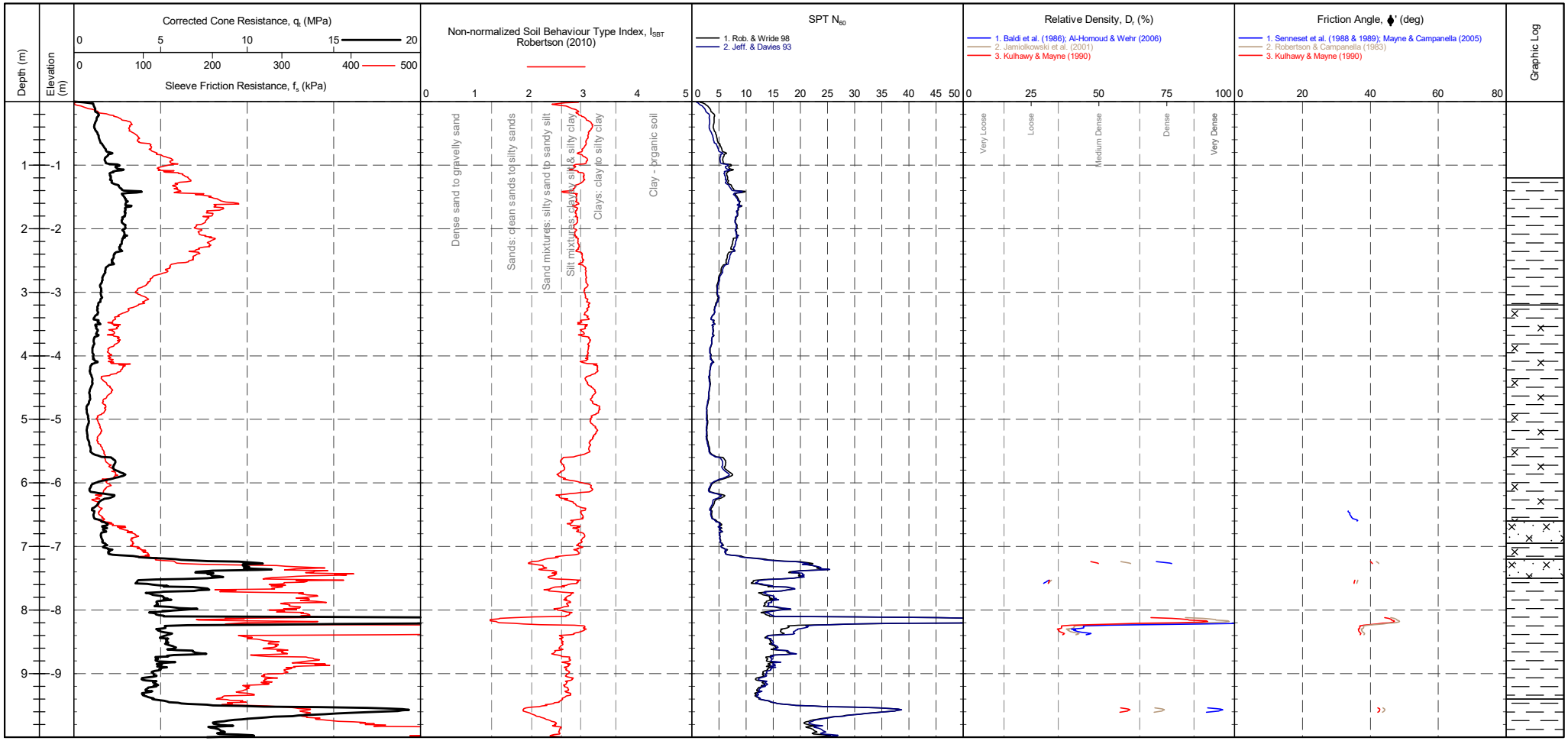
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 32B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild	CPTU ZERO VALUES	
		Transducer / Pre / Post / Difference	
		Tip / 309 mV / 307 mV / -0.022 MPa	
		Sleeve / 266 mV / 268 mV / 0.001 kPa	
		Pore Pressure 2 / 170 mV / 234 mV / 0.018 kPa	
		X-Y Inclinometer / 2408 mV / 2483 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

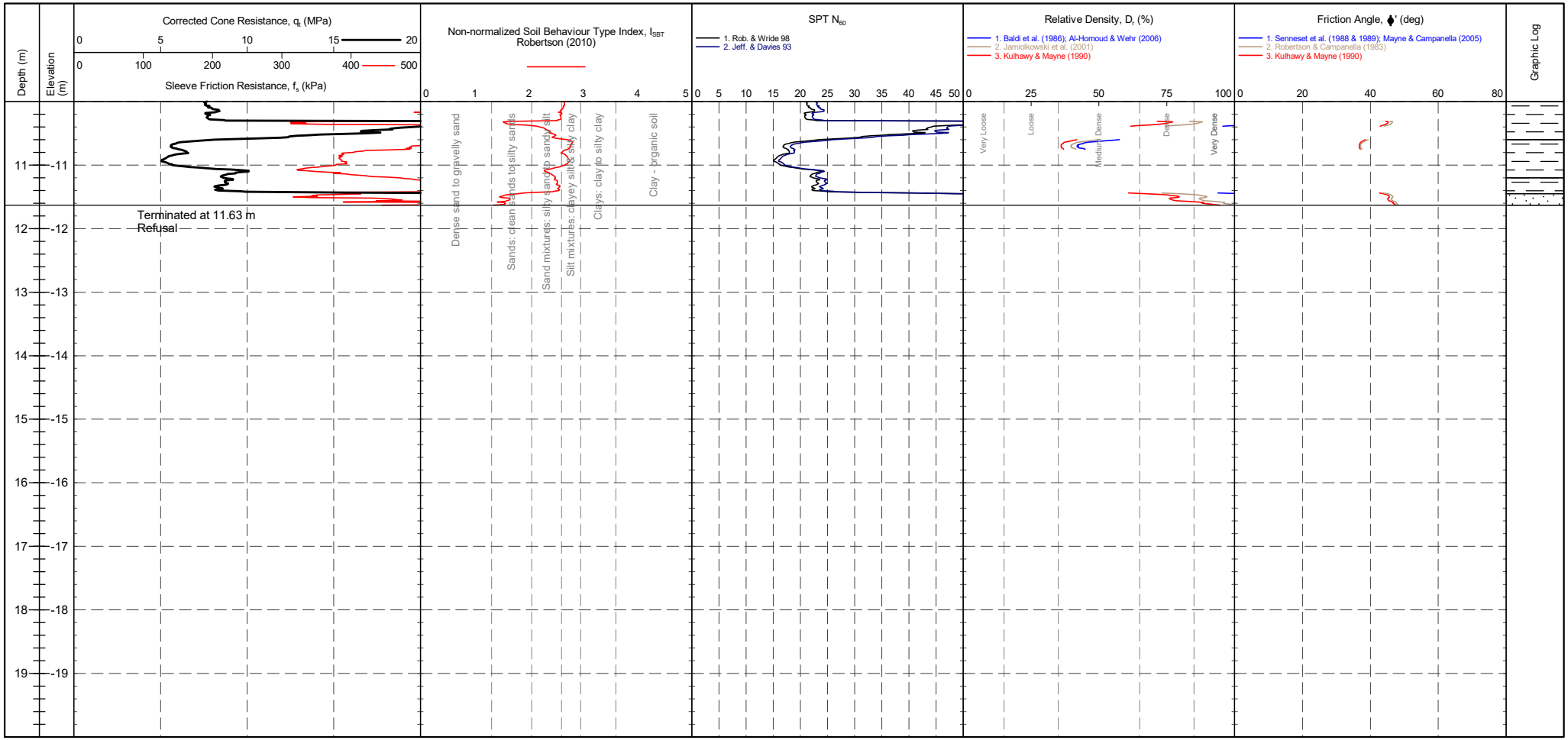
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 32B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 309 mV / 307 mV / -0.022 MPa Sleeve: 266 mV / 268 mV / 0.001 kPa Pore Pressure 2: 170 mV / 234 mV / 0.018 kPa X-Y Inclinometer: 2408 mV / 2483 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

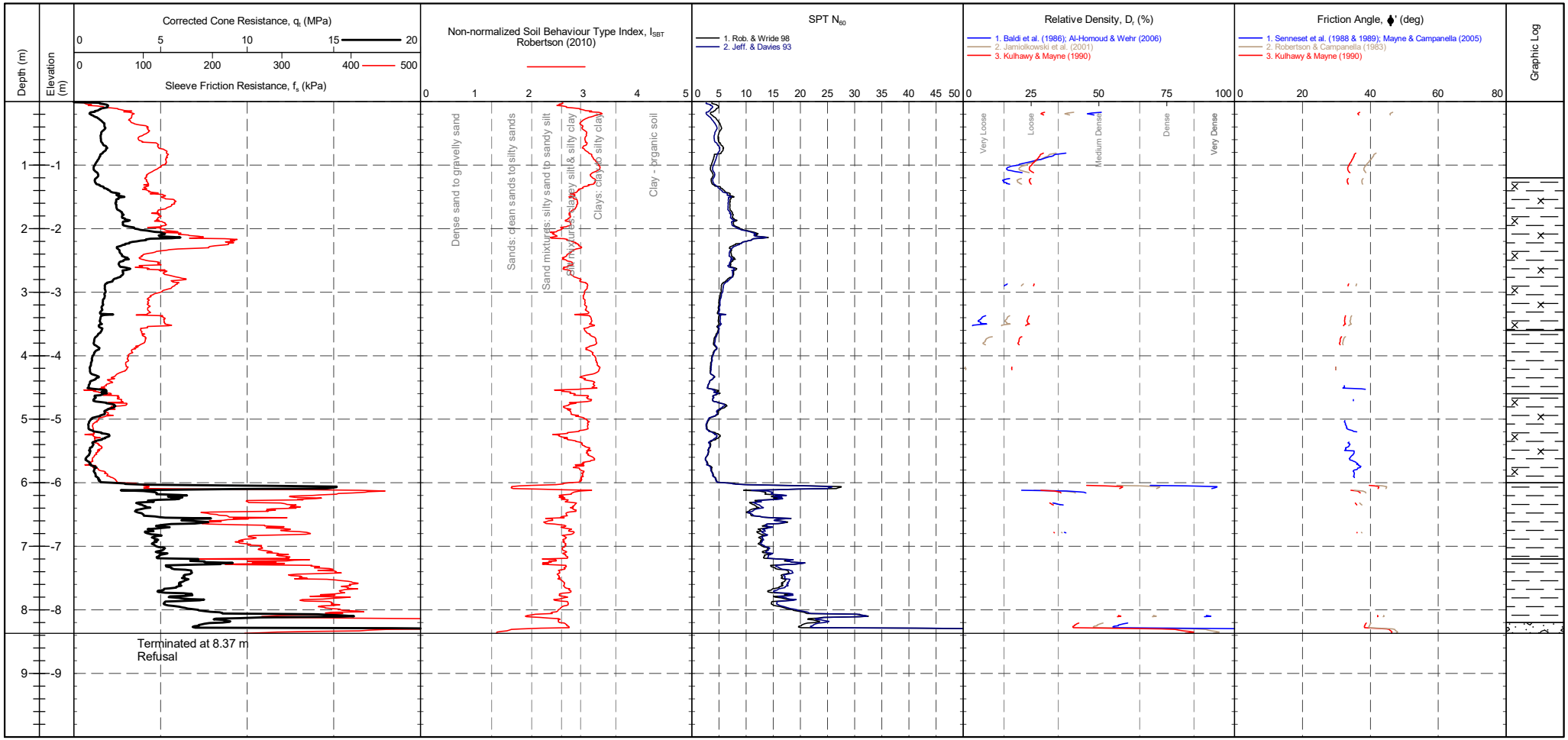
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 02

PointID

CPT 33

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 33 WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	282 mV	268 mV	-0.01 kPa
Pore Pressure 2	225 mV	259 mV	0.01 kPa
X-Y Inclinometer	2530 mV	2436 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

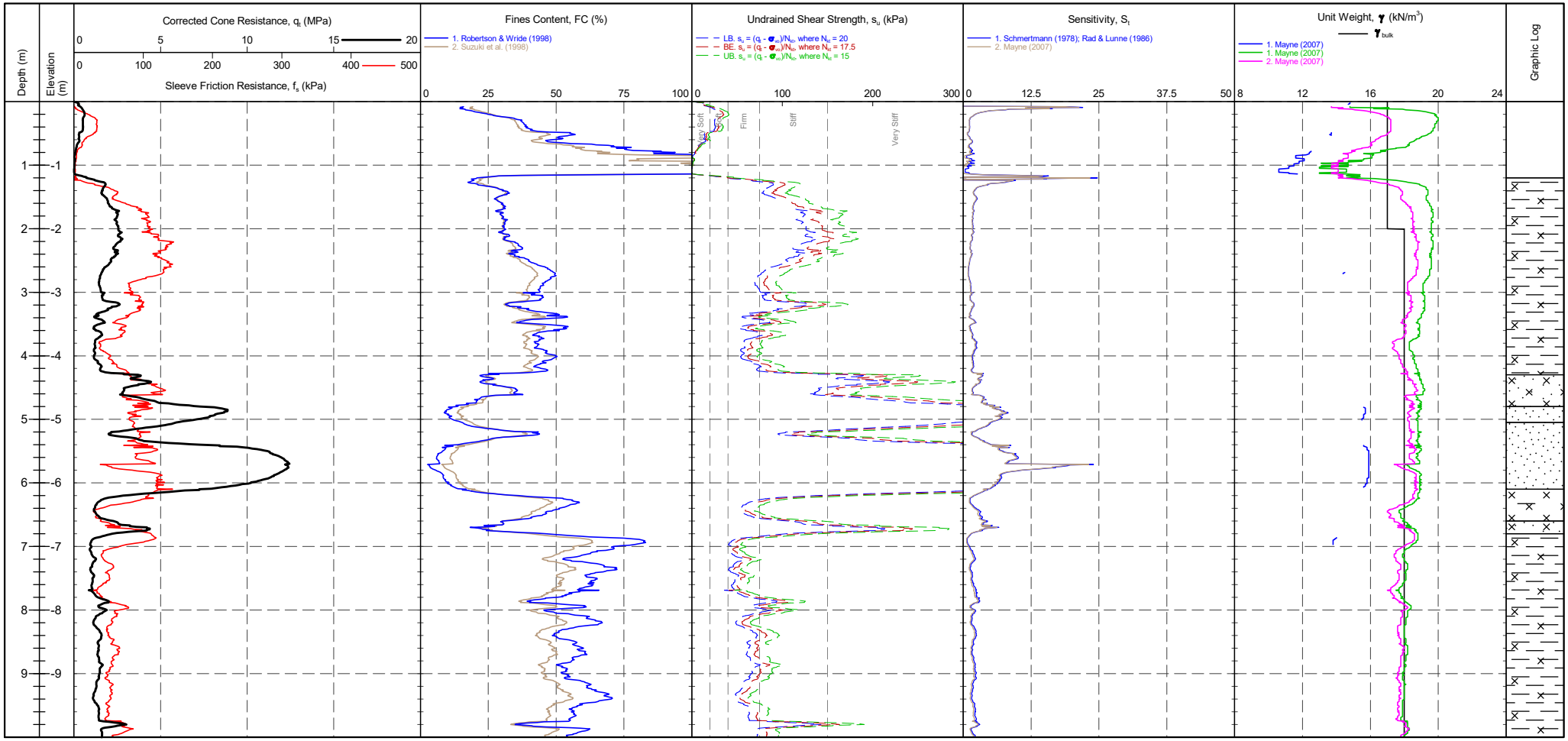
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild	CPTU ZERO VALUES			
		Transducer	Pre	Post	Difference
		Tip	309 mV	308 mV	-0.011 MPa
		Sleeve	277 mV	271 mV	-0.004 kPa
		Pore Pressure 2	242 mV	271 mV	0.008 kPa
		X-Y Inclinometer	2403 mV	2427 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

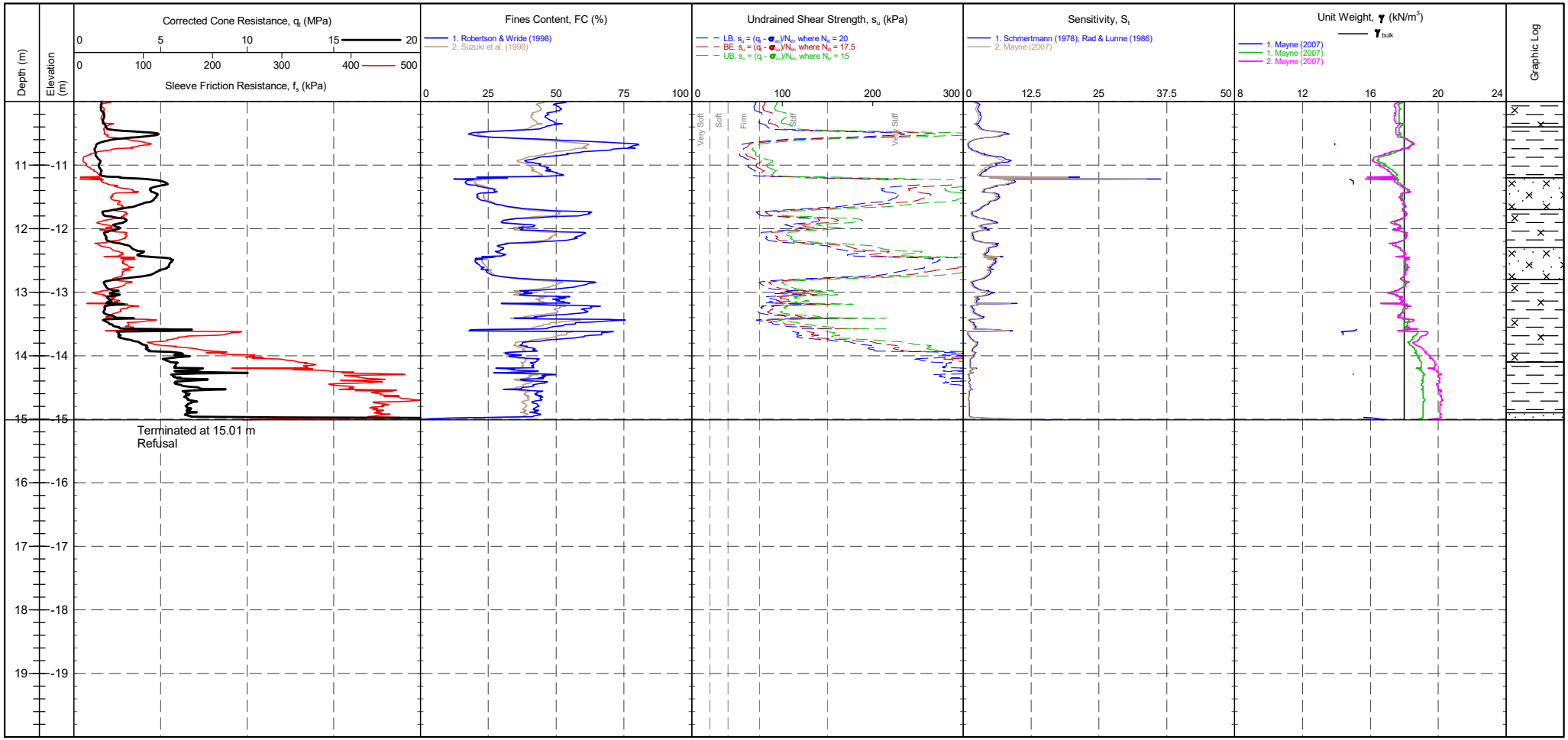
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE AREA	: 15cm^2	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	309 mV	308 mV	-0.011 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	277 mV	271 mV	-0.004 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 14	Pore Pressure 2	242 mV	271 mV	0.008 kPa
FRICTION REDUCER	: None	WEATHER	: Sunny & Mild	X-Y Inclinometer	2403 mV	2427 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

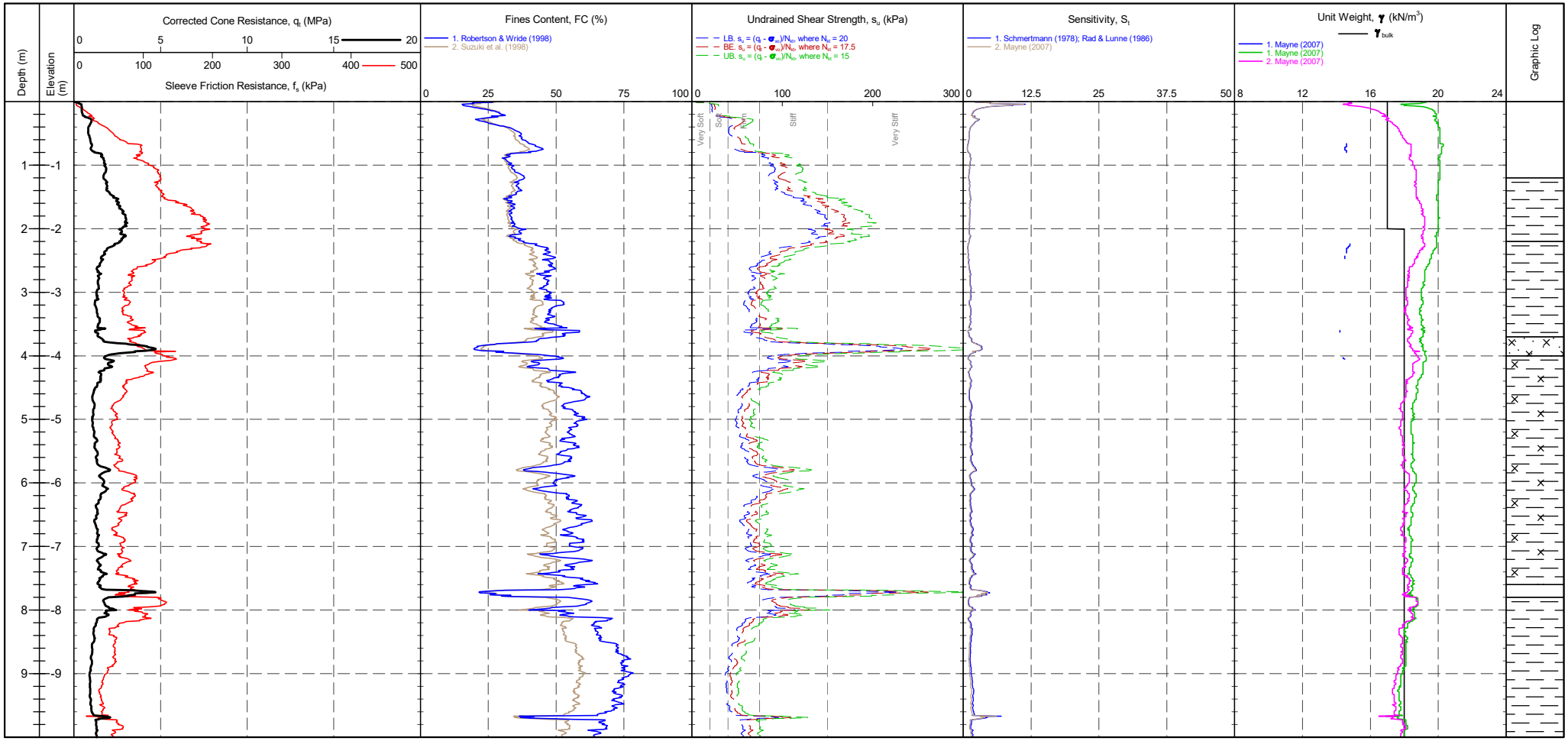
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES			
		Transducer	Pre	Post	Difference
		Tip	305 mV	306 mV	0.011 MPa
		Sleeve	263 mV	266 mV	0.002 kPa
		Pore Pressure 2	260 mV	235 mV	-0.007 kPa
		X-Y Inclinometer	2427 mV	2439 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

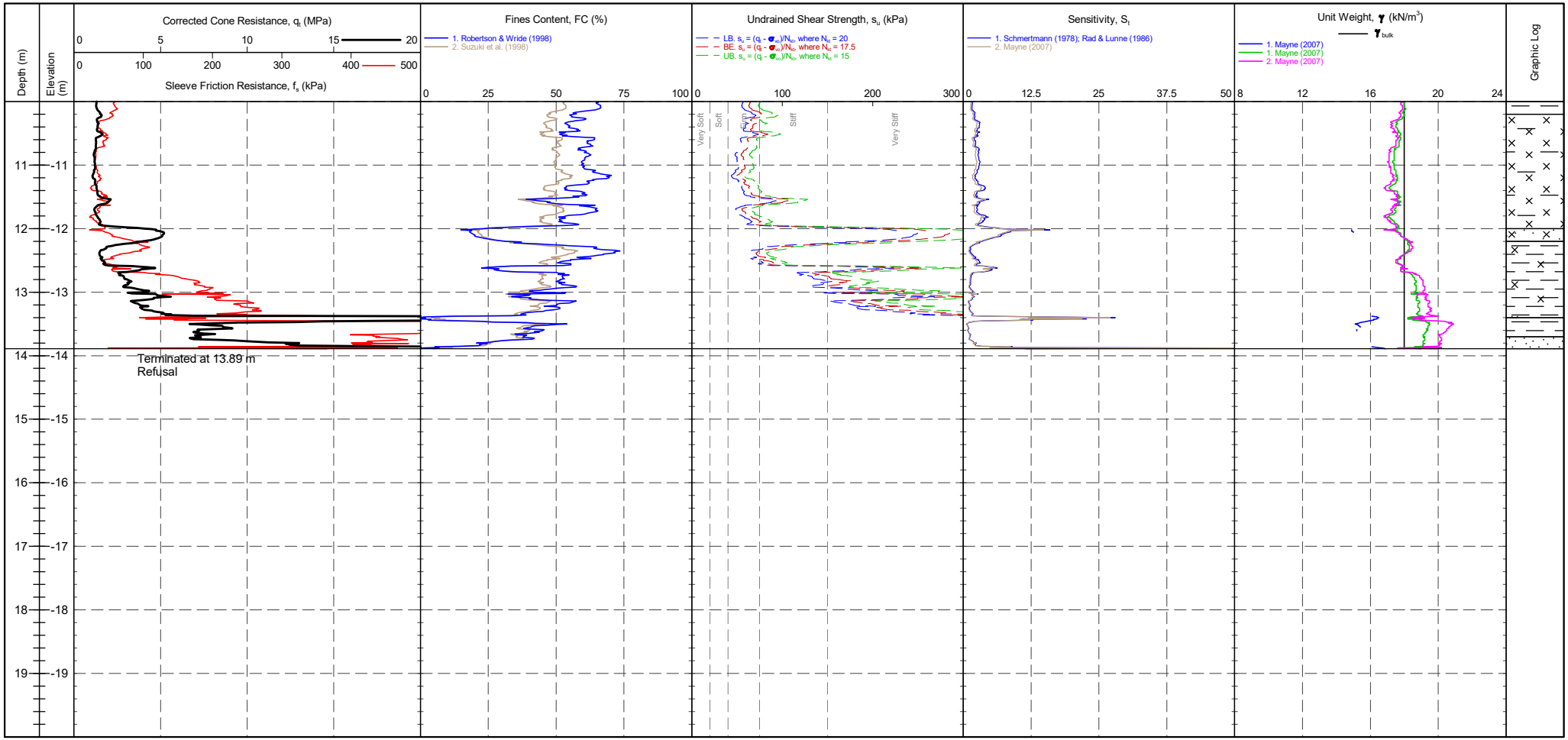
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	305 mV	306 mV	0.011 MPa
Sleeve	263 mV	266 mV	0.002 kPa
Pore Pressure 2	260 mV	235 mV	-0.007 kPa
X-Y Inclinometer	2427 mV	2439 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

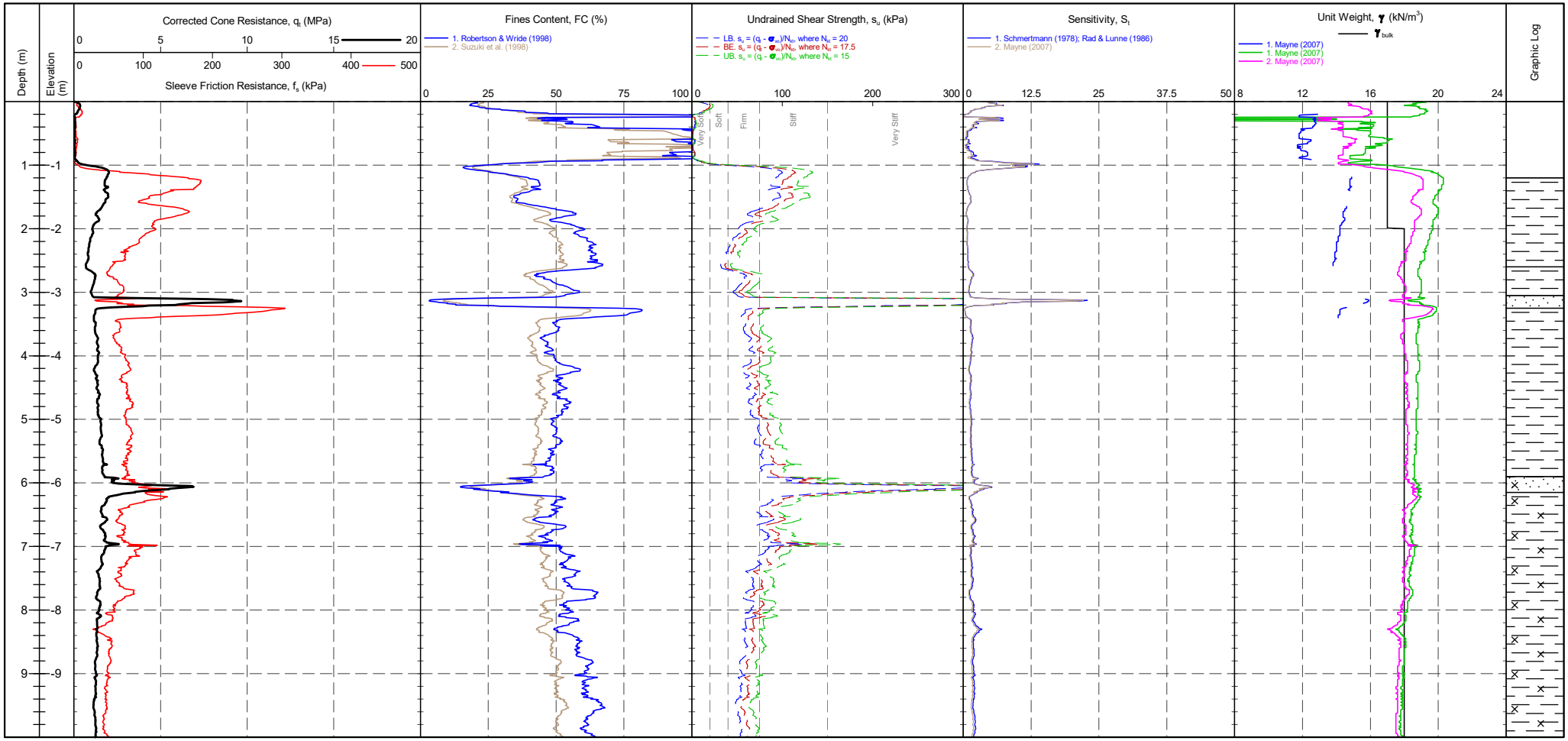
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES			
		Transducer	Pre	Post	Difference
		Tip	305 mV	304 mV	-0.011 MPa
		Sleeve	266 mV	265 mV	-0.001 kPa
		Pore Pressure 2	227 mV	262 mV	0.01 kPa
		X-Y Inclinometer	2411 mV	2426 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

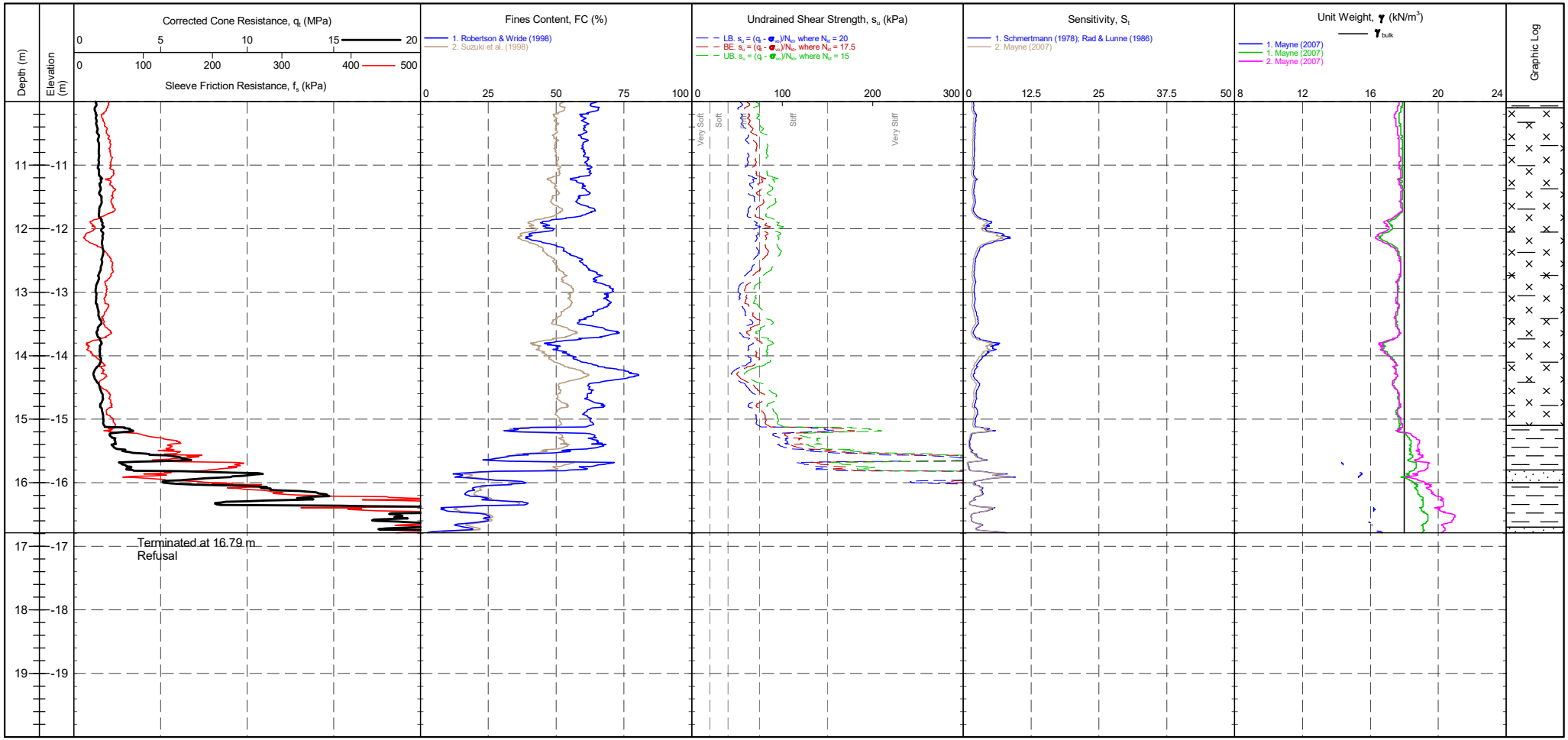
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE AREA	: 15cm^2	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	305 mV	304 mV	-0.011 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	266 mV	265 mV	-0.001 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 16	Pore Pressure 2	227 mV	262 mV	0.01 kPa
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer	2411 mV	2426 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

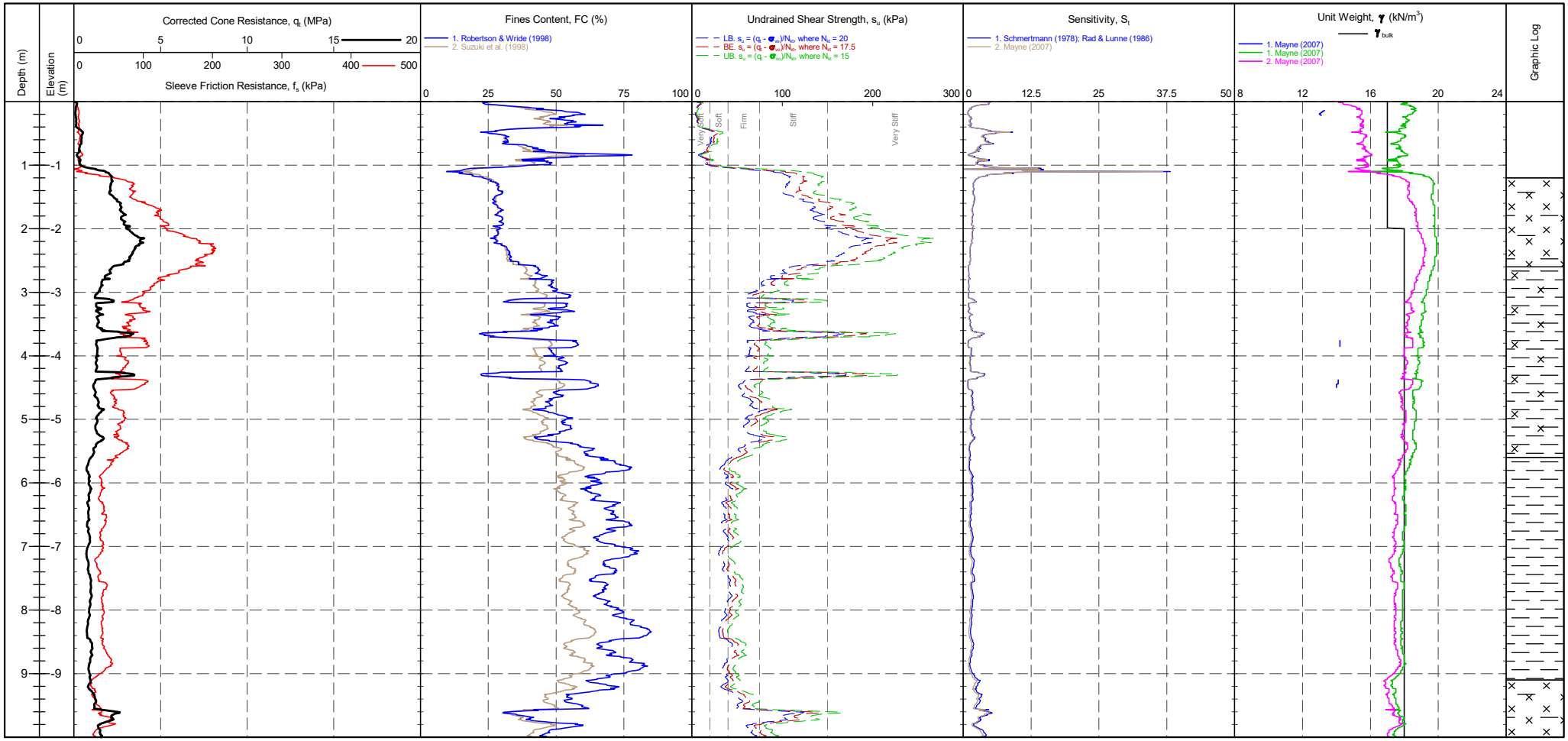
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 305 mV / 305 mV / 0 MPa Sleeve: 279 mV / 273 mV / -0.004 kPa Pore Pressure 2: 238 mV / 276 mV / 0.011 kPa X-Y Inclinometer: 2446 mV / 2466 mV		Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

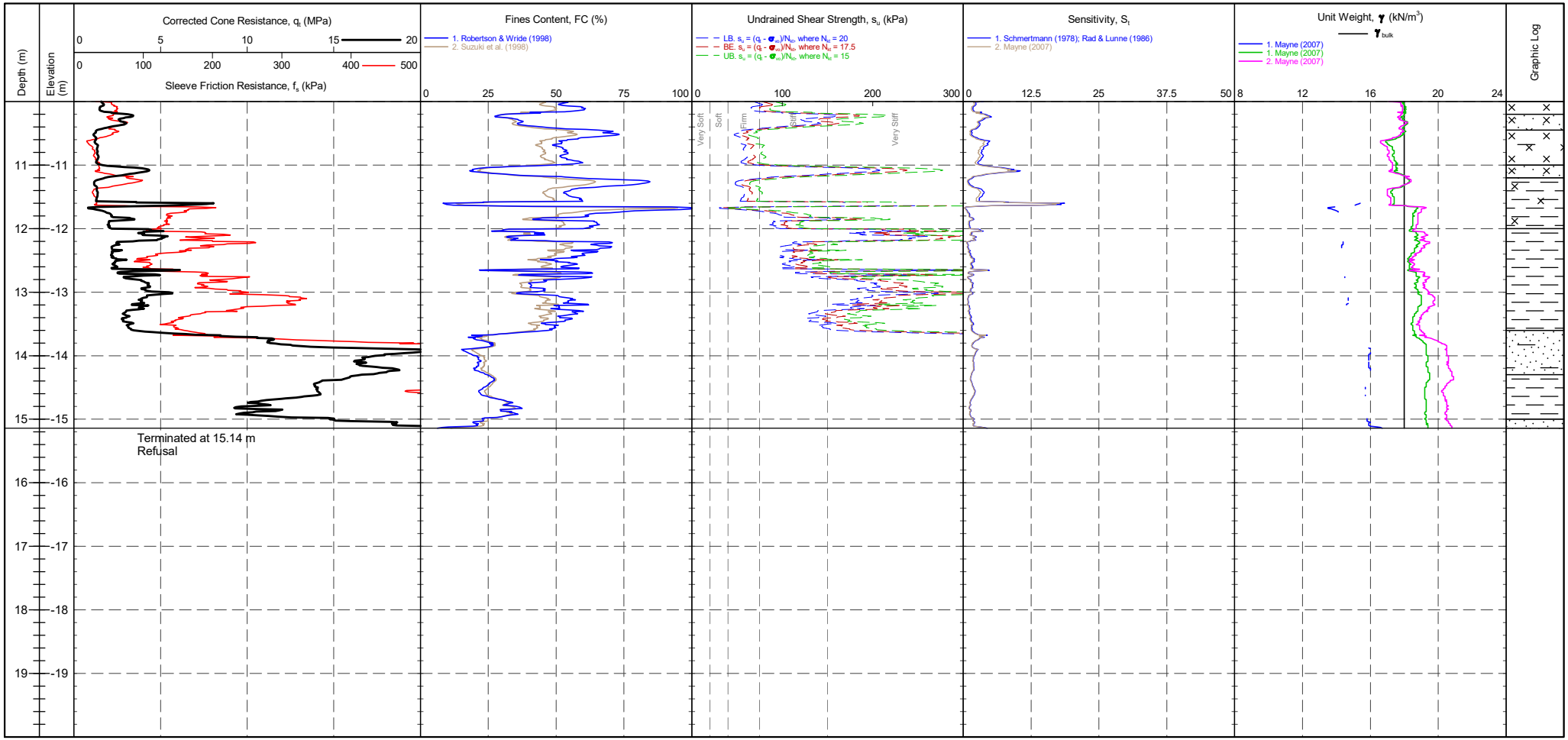
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	279 mV	273 mV	-0.004 kPa
Pore Pressure 2	238 mV	276 mV	0.011 kPa
X-Y Inclinometer	2446 mV	2466 mV	

IN SITU SITE INVESTIGATION

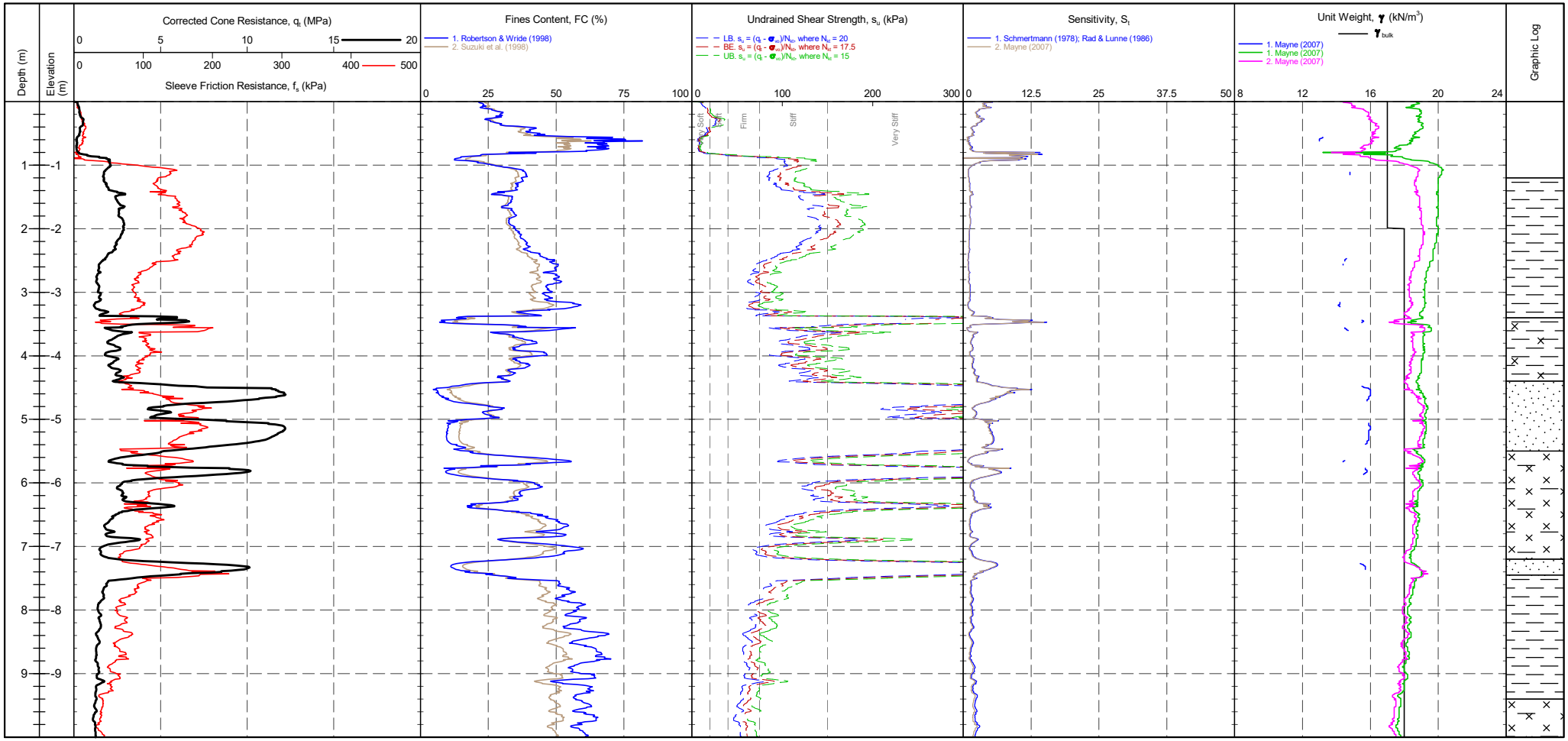
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES			Groundwater Level Dissipation Test
		Transducer	Pre	Post	Difference
		Tip	306 mV	306 mV	0 MPa
		Sleeve	275 mV	263 mV	-0.009 kPa
		Pore Pressure 2	278 mV	269 mV	-0.003 kPa
		X-Y Inclinometer	2428 mV	2402 mV	

IN SITU SITE INVESTIGATION

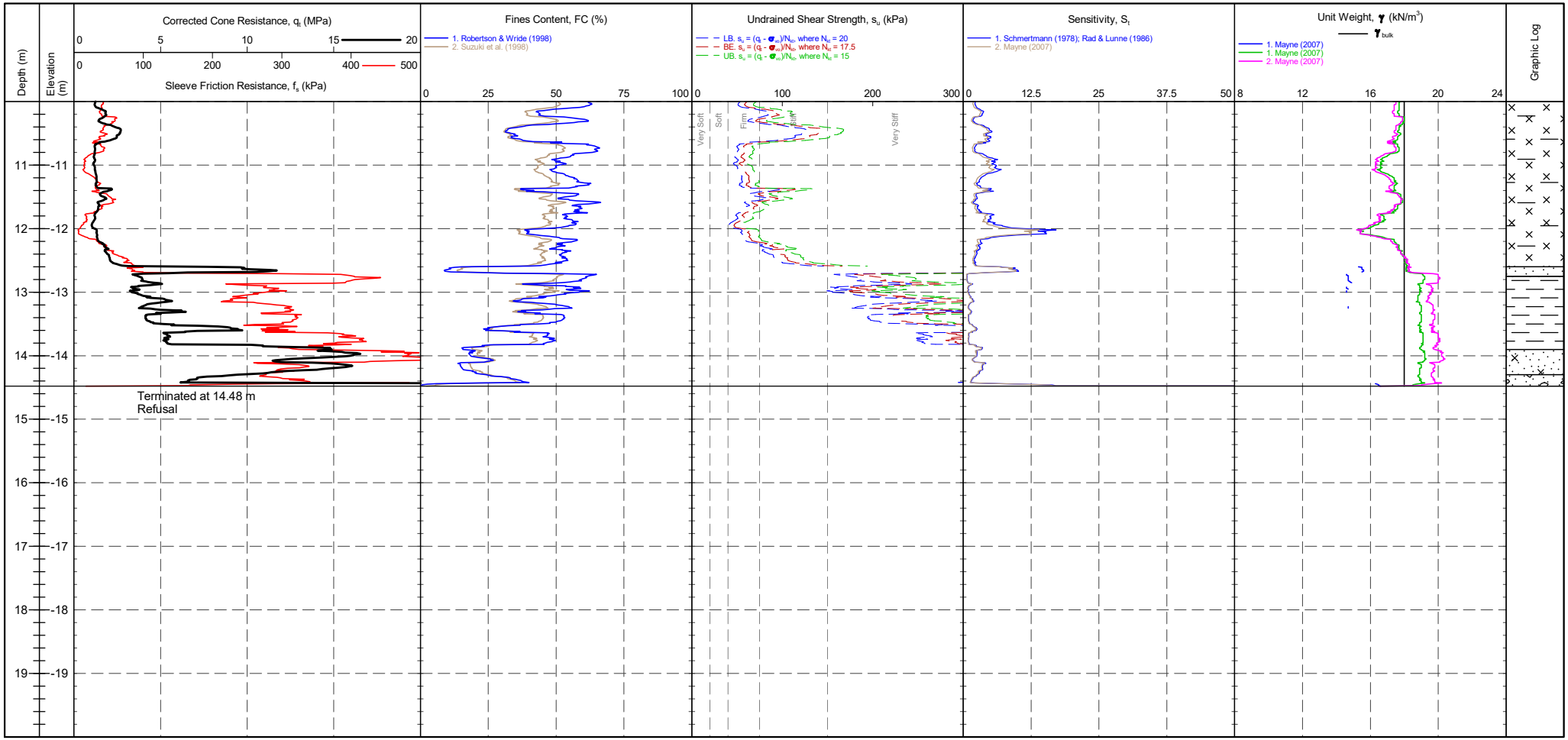
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	306 mV	306 mV	0 MPa
Sleeve	275 mV	263 mV	-0.009 kPa
Pore Pressure 2	278 mV	269 mV	-0.003 kPa
X-Y Inclinometer	2428 mV	2402 mV	

IN SITU SITE INVESTIGATION

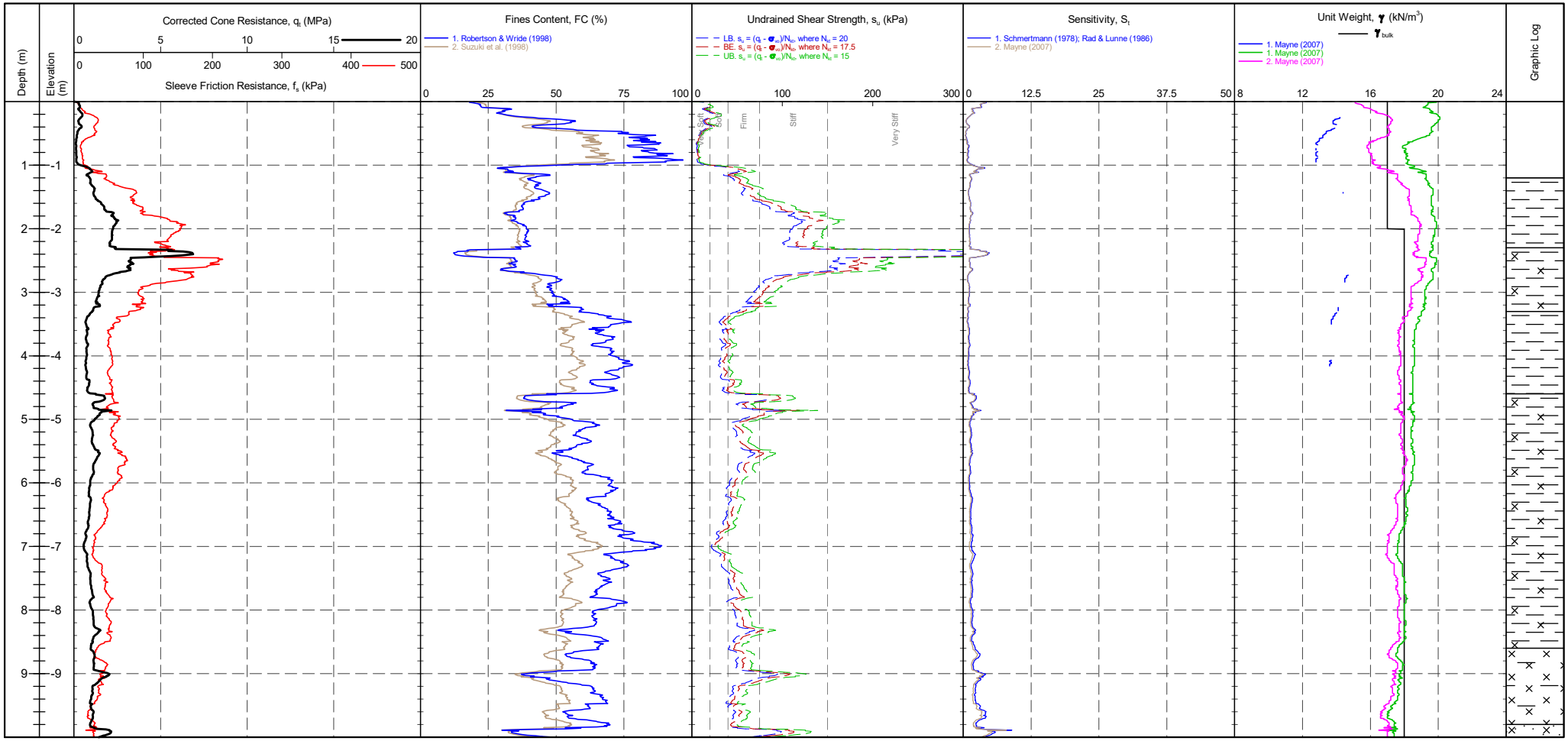
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE AREA	: 15cm^2	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	305 mV	305 mV	0 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	269 mV	269 mV	0 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 26	Pore Pressure 2	263 mV	361 mV	0.028 kPa
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer	2456 mV	2447 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

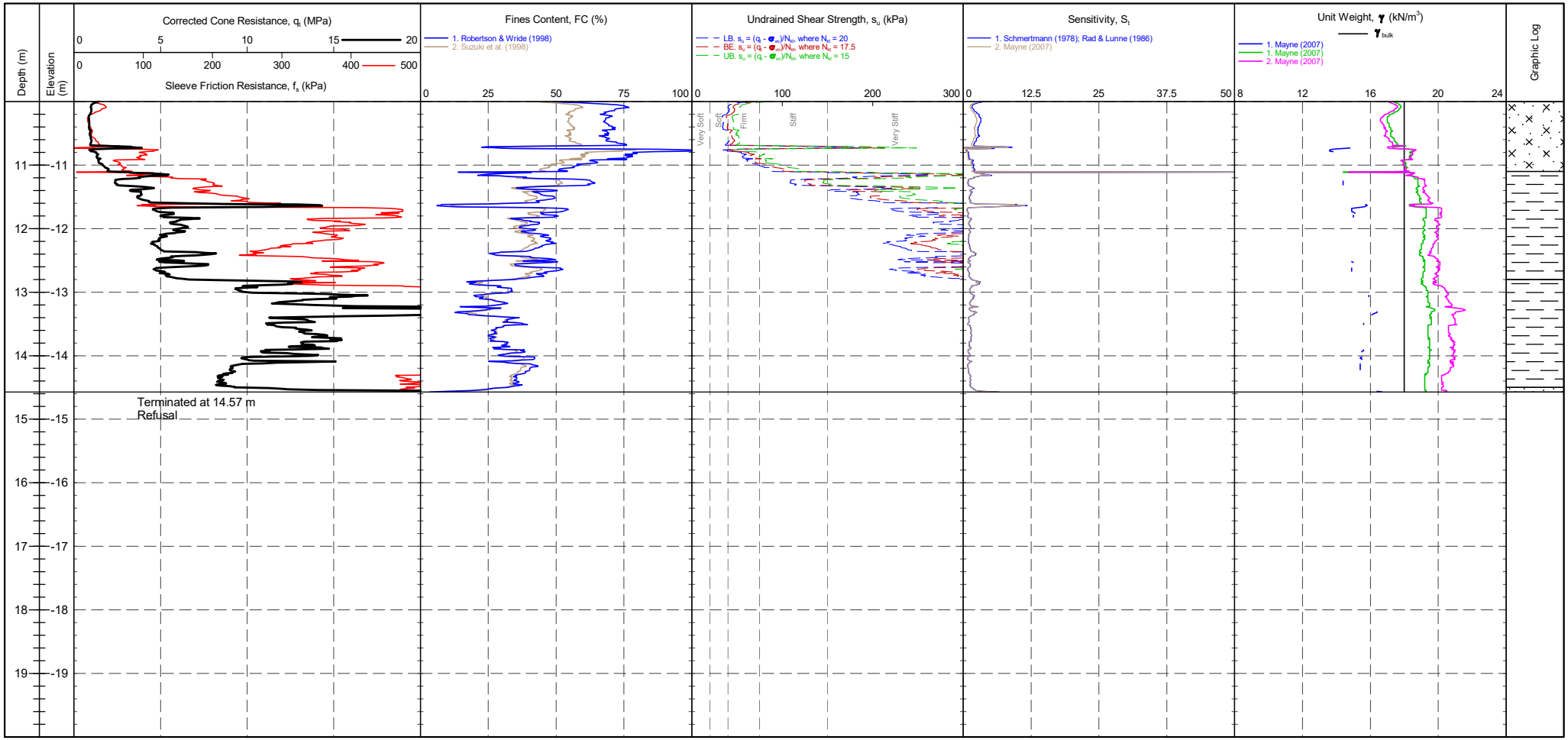
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	269 mV	269 mV	0 kPa
Pore Pressure 2	263 mV	361 mV	0.028 kPa
X-Y Inclinometer	2456 mV	2447 mV	

IN SITU SITE INVESTIGATION

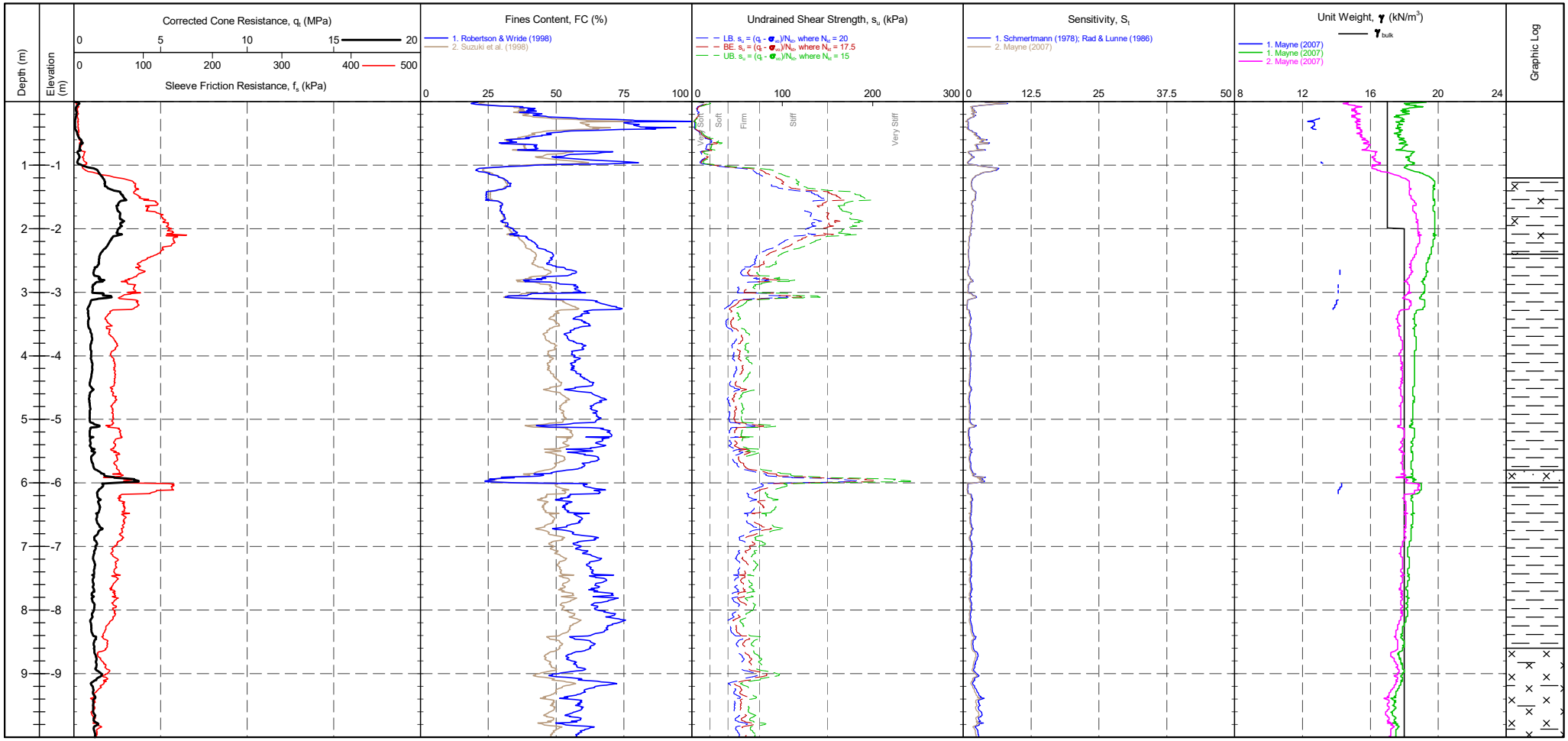
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES			Groundwater Level Dissipation Test
		Transducer	Pre	Post	Difference
		Tip	306 mV	301 mV	-0.055 MPa
		Sleeve	292 mV	284 mV	-0.006 kPa
		Pore Pressure 2	229 mV	273 mV	0.012 kPa
		X-Y Inclinometer	2468 mV	2511 mV	

IN SITU SITE INVESTIGATION

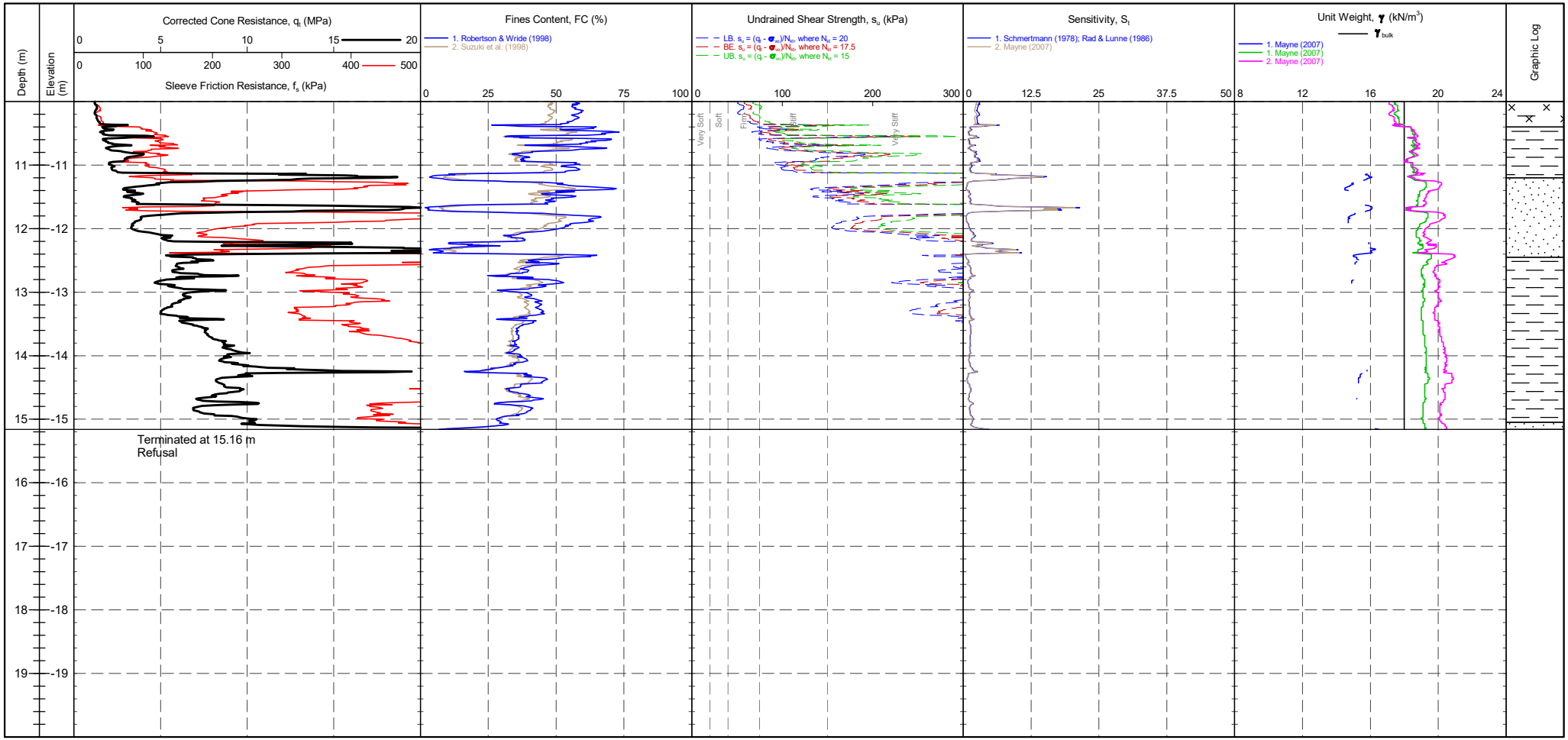
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1488	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE AREA	: 15cm^2	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA RATIO	: 0.79	RIG	: CPT 007	Tip	306 mV	301 mV	-0.055 MPa
FILTER POSITION	: u2	OPERATOR	: RS & PB	Sleeve	292 mV	284 mV	-0.006 kPa
FILTER TYPE	: HDPE	FILE NAME	: 1170315-CPT 27	Pore Pressure 2	229 mV	273 mV	0.012 kPa
FRICTION REDUCER	: None	WEATHER	: Overcast & Mild	X-Y Inclinometer	2468 mV	2511 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

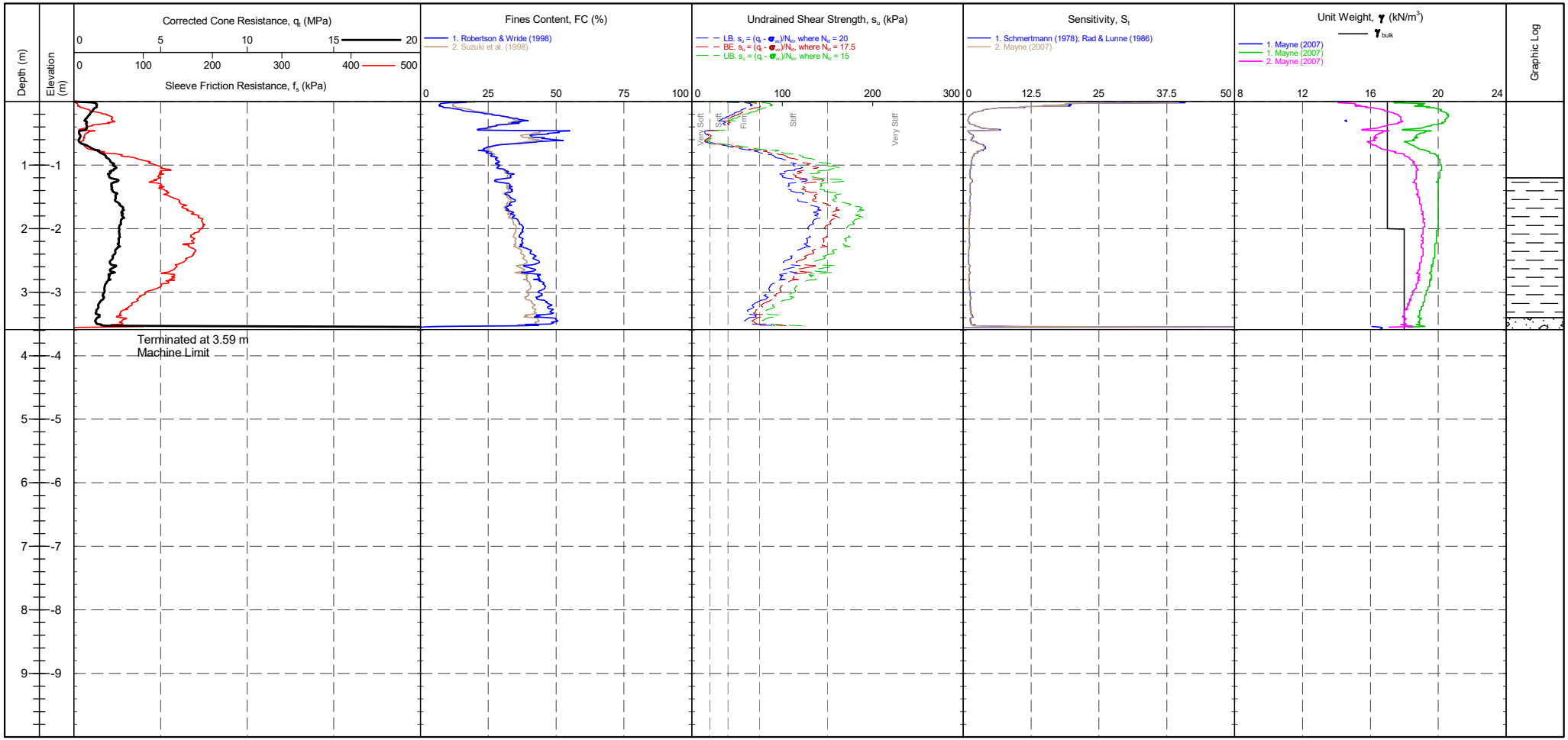
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 28

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	302 mV	308 mV	0.066 MPa
Sleeve	284 mV	290 mV	0.004 kPa
Pore Pressure 2	258 mV	257 mV	0 kPa
X-Y Inclinometer	2457 mV	2455 mV	

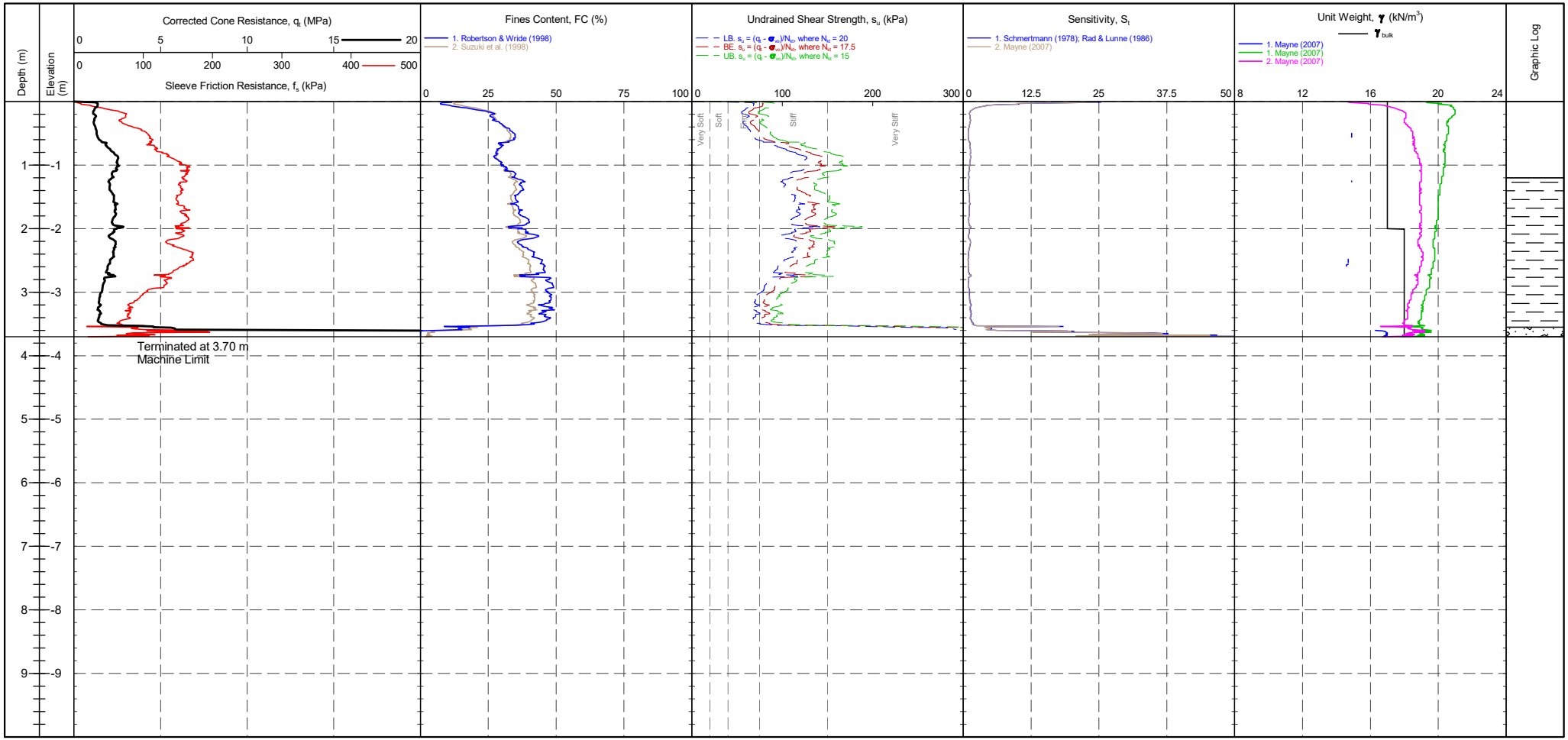
CPT LOG 03

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 28A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28A WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 307 mV / 310 mV / 0.033 MPa Sleeve / 289 mV / 287 mV / -0.001 kPa Pore Pressure 2 / 256 mV / 232 mV / -0.007 kPa X-Y Inclinometer / 2457 mV / 2464 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

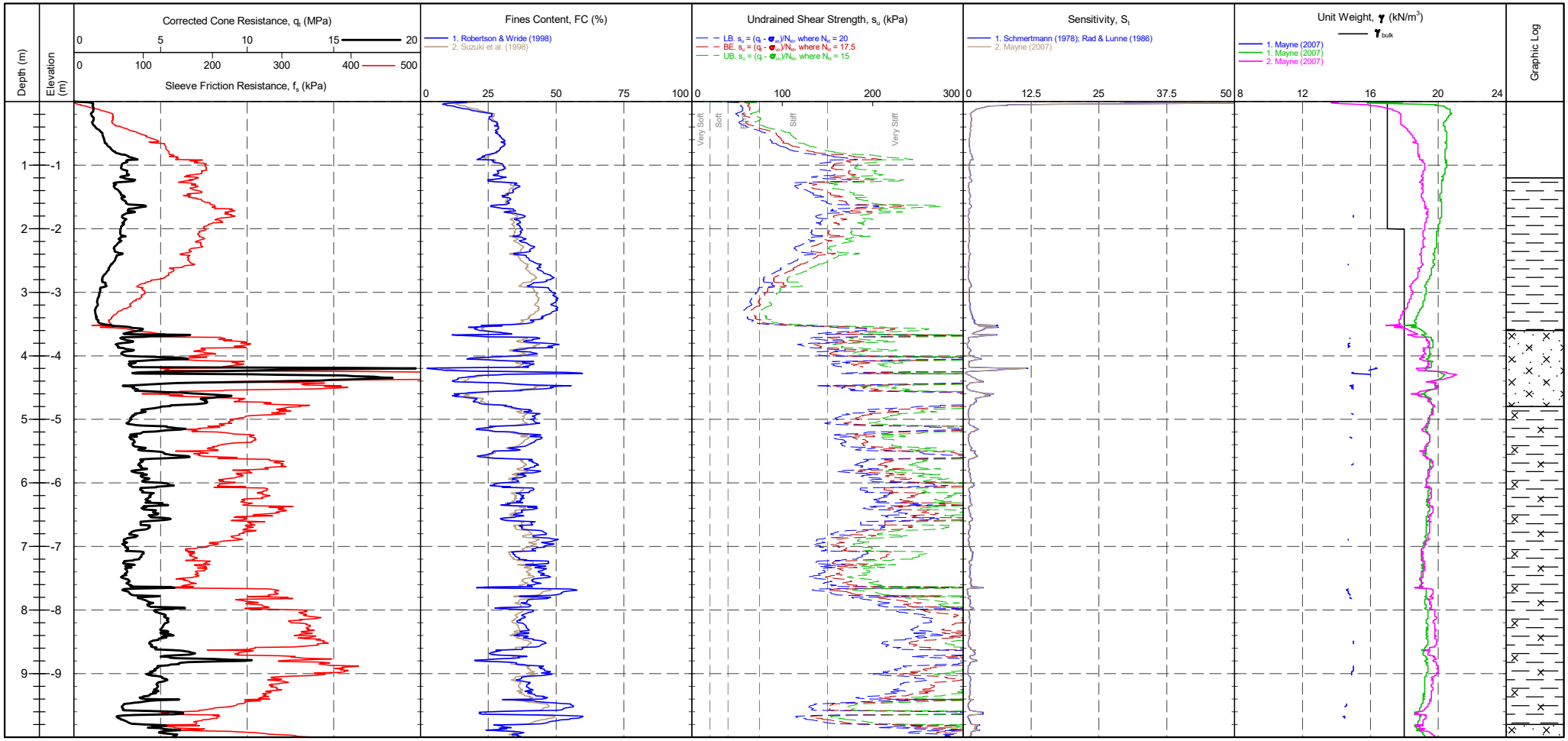
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	307 mV	308 mV	0.011 MPa
Sleeve	270 mV	267 mV	-0.002 kPa
Pore Pressure 2	246 mV	236 mV	-0.003 kPa
X-Y Inclinometer	2411 mV	2420 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

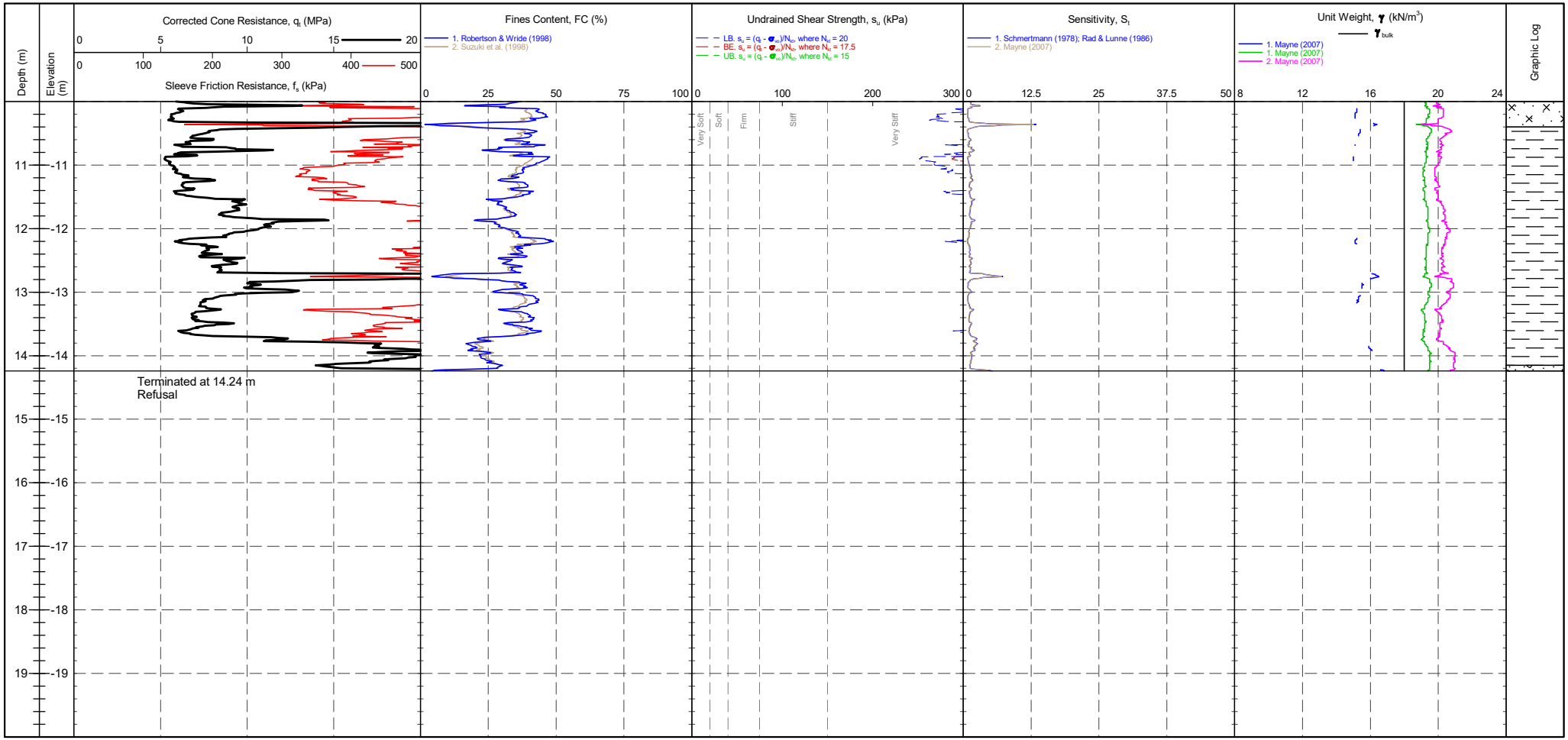
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	307 mV	308 mV	0.011 MPa
Sleeve	270 mV	267 mV	-0.002 kPa
Pore Pressure 2	246 mV	236 mV	-0.003 kPa
X-Y Inclinometer	2411 mV	2420 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

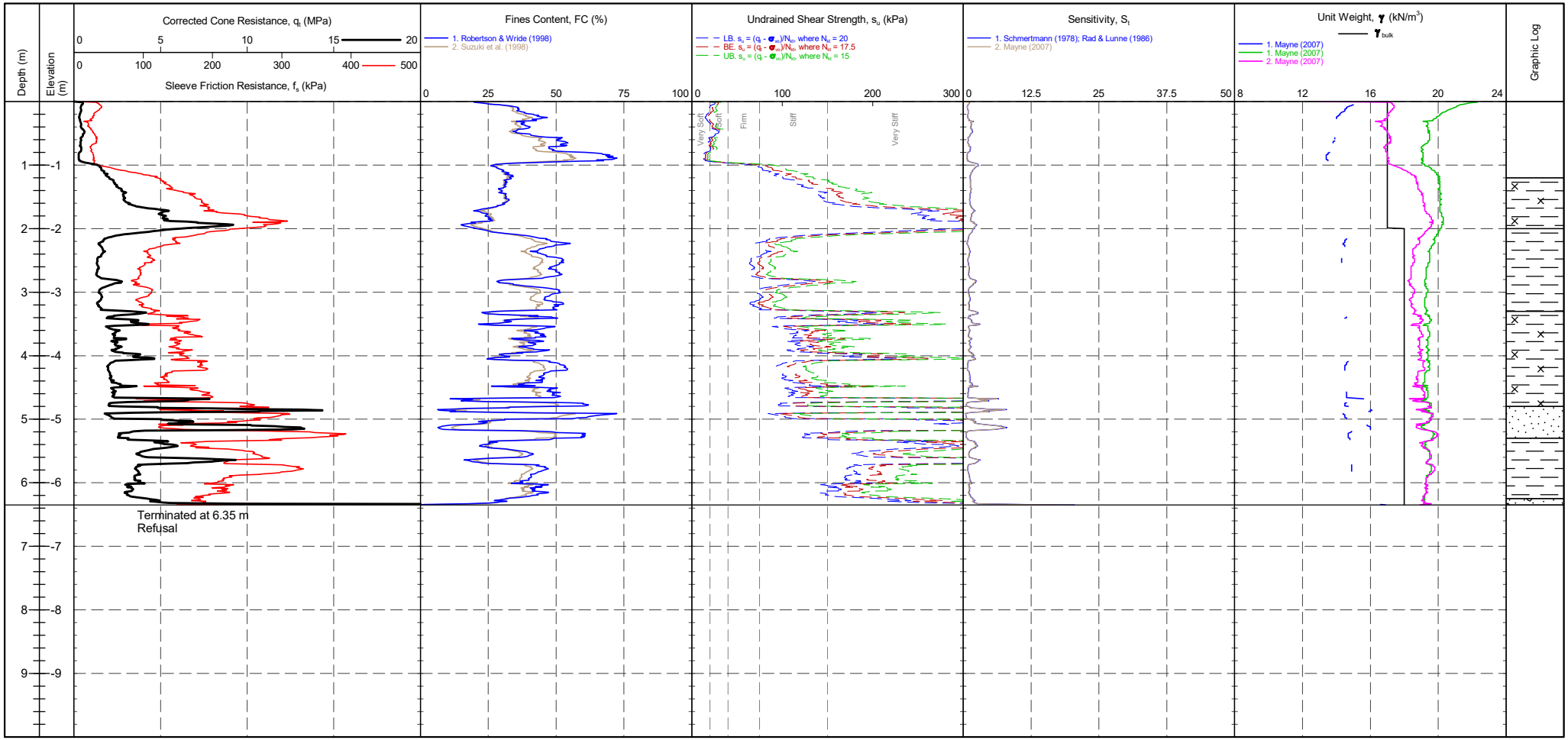
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 29

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 29 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 281 mV / 280 mV / -0.001 kPa Pore Pressure 2 / 223 mV / 240 mV / 0.005 kPa X-Y Inclinometer / 2466 mV / 2429 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

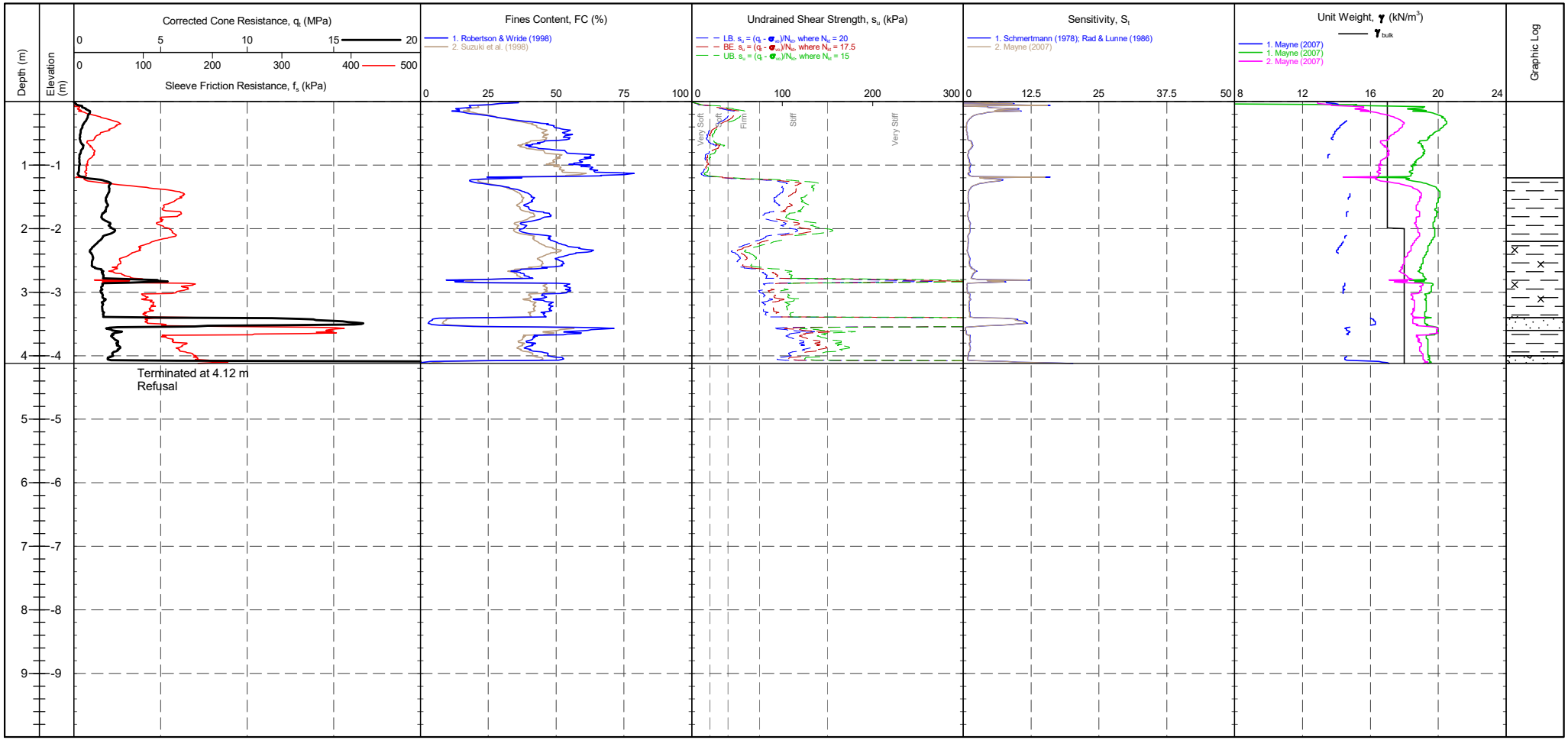
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 30

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 30 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	304 mV	307 mV	0.033 MPa
Sleeve	280 mV	283 mV	0.002 kPa
Pore Pressure 2	231 mV	234 mV	0.001 kPa
X-Y Inclinometer	2437 mV	2466 mV	

IN SITU SITE INVESTIGATION

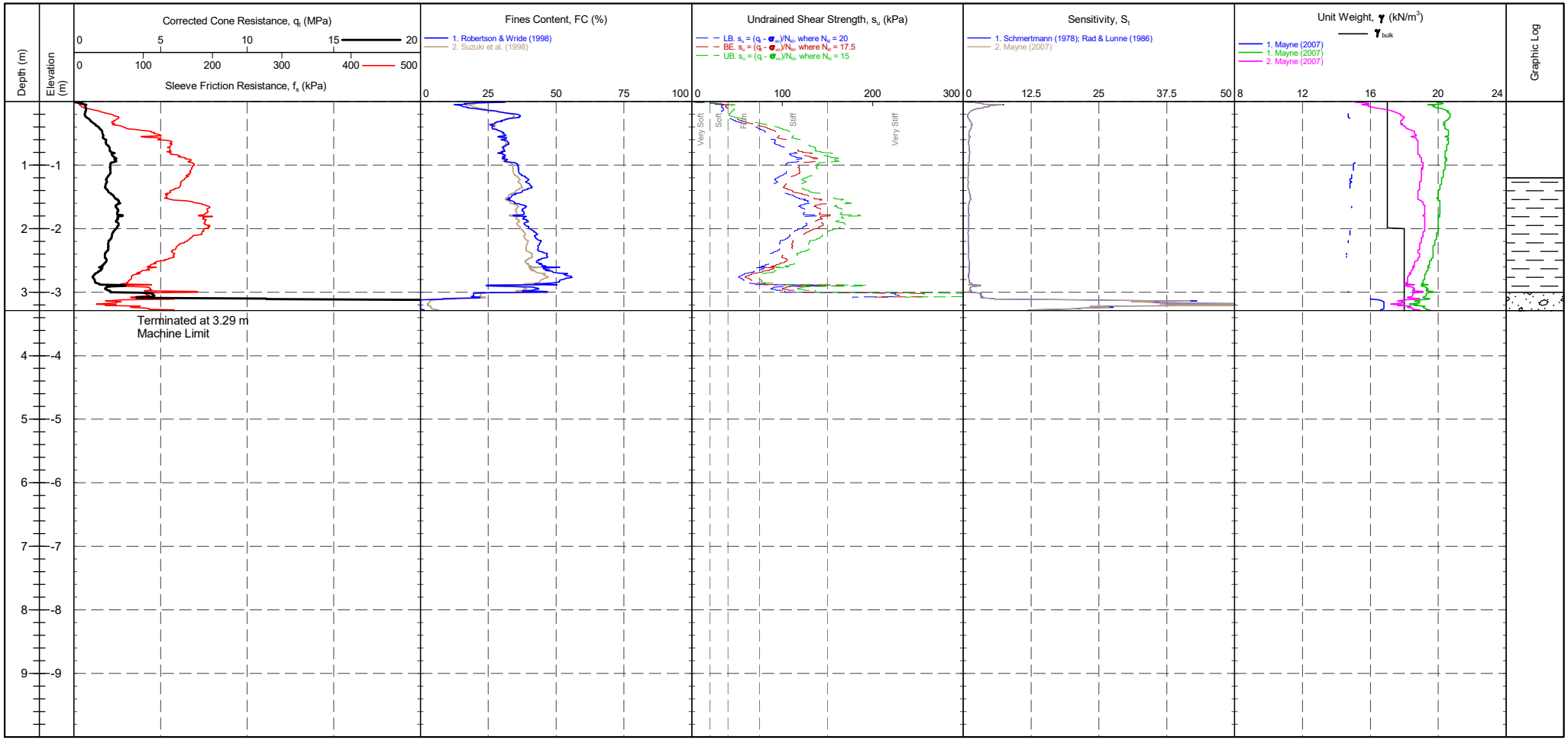
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 31

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31 WEATHER : Overcast & Mild	CPTU ZERO VALUES	Groundwater Level Dissipation Test

Transducer	Pre	Post	Difference
Tip	305 mV	309 mV	0.044 MPa
Sleeve	282 mV	285 mV	0.002 kPa
Pore Pressure 2	228 mV	230 mV	0.001 kPa
X-Y Inclinometer	2432 mV	2438 mV	

IN SITU SITE INVESTIGATION

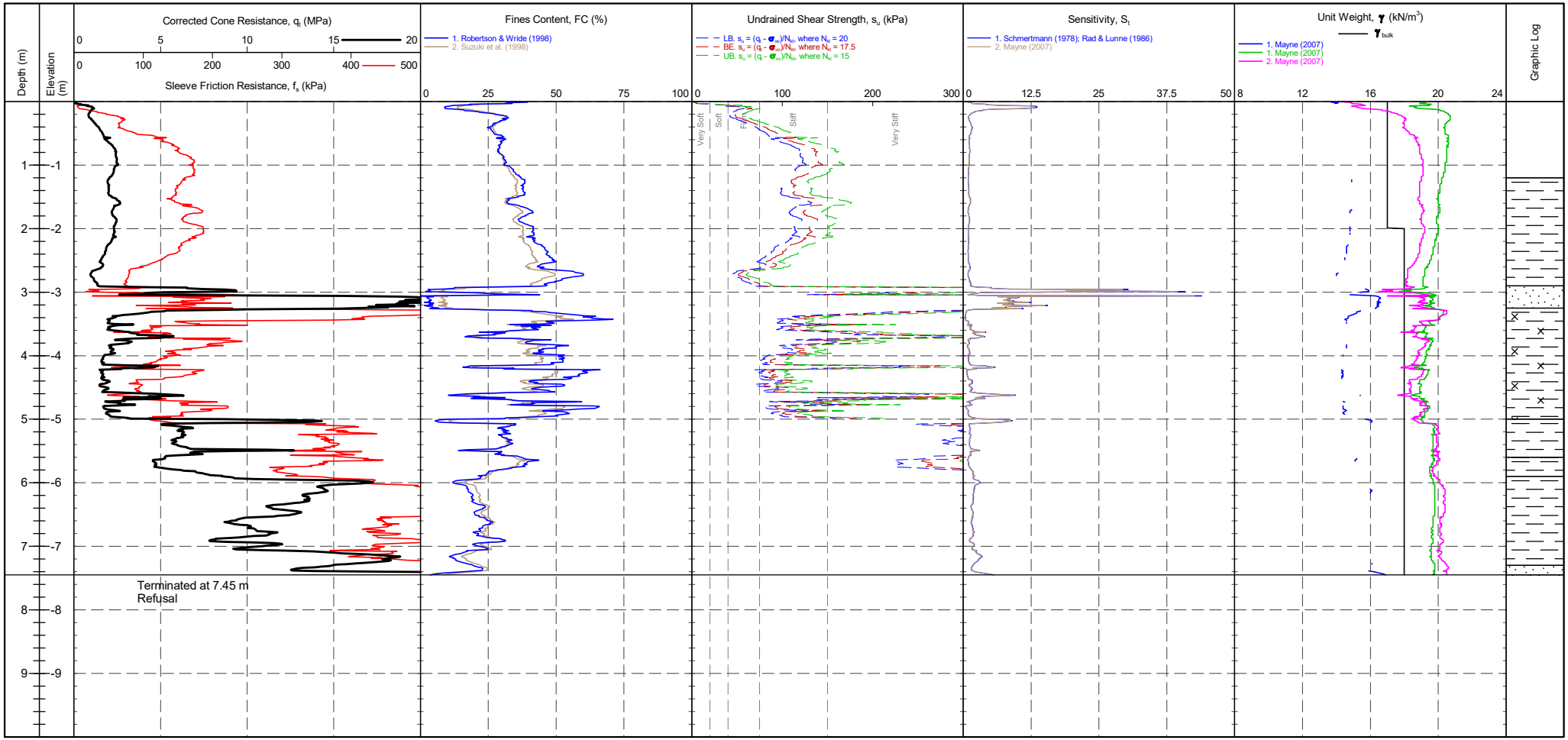
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 31A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31A WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	308 mV	305 mV	-0.033 MPa
Sleeve	284 mV	281 mV	-0.002 kPa
Pore Pressure 2	229 mV	211 mV	-0.005 kPa
X-Y Inclinometer	2439 mV	2453 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

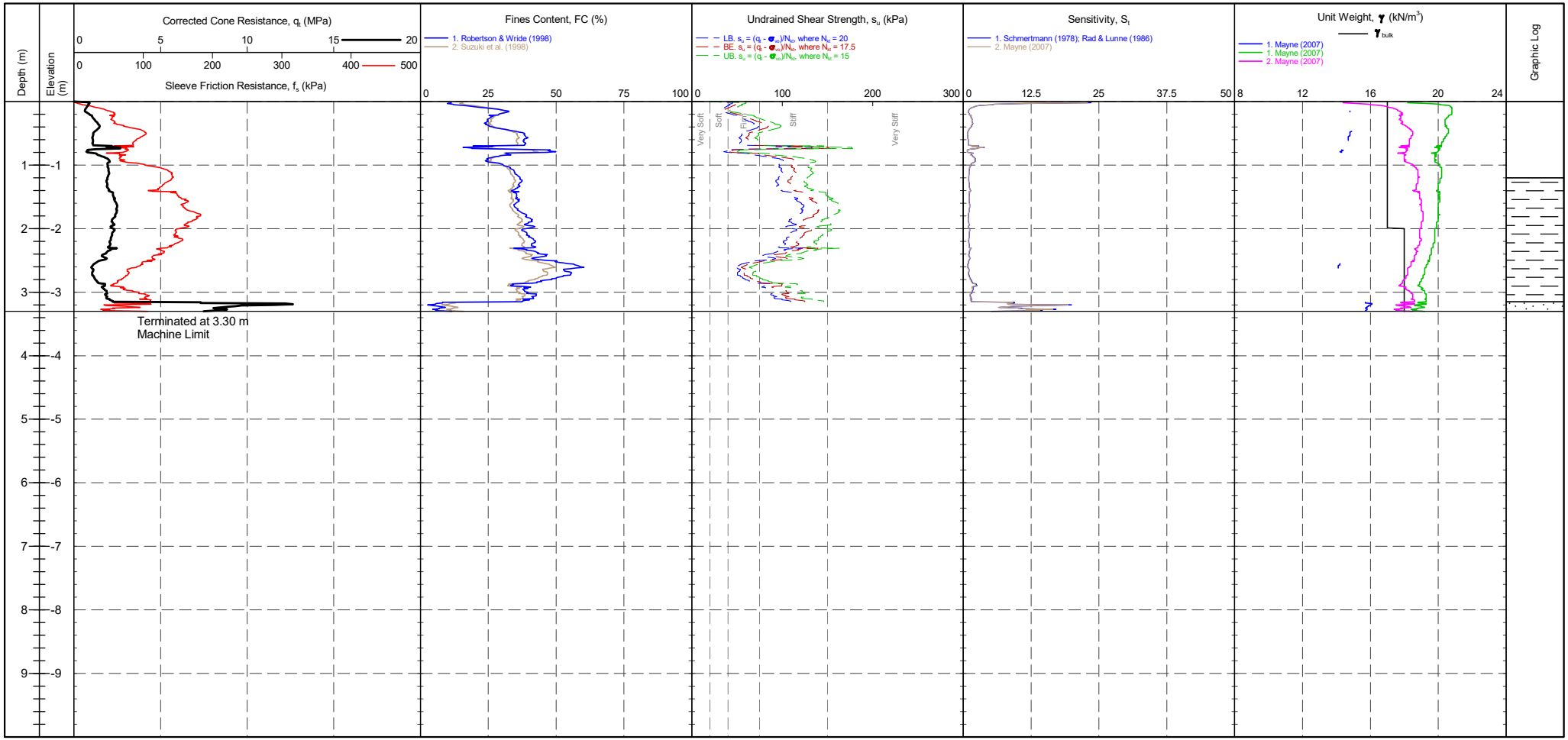
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 31B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31B WEATHER : Sunny & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	309 mV	312 mV	0.033 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	237 mV	282 mV	0.013 kPa
X-Y Inclinometer	2466 mV	2413 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

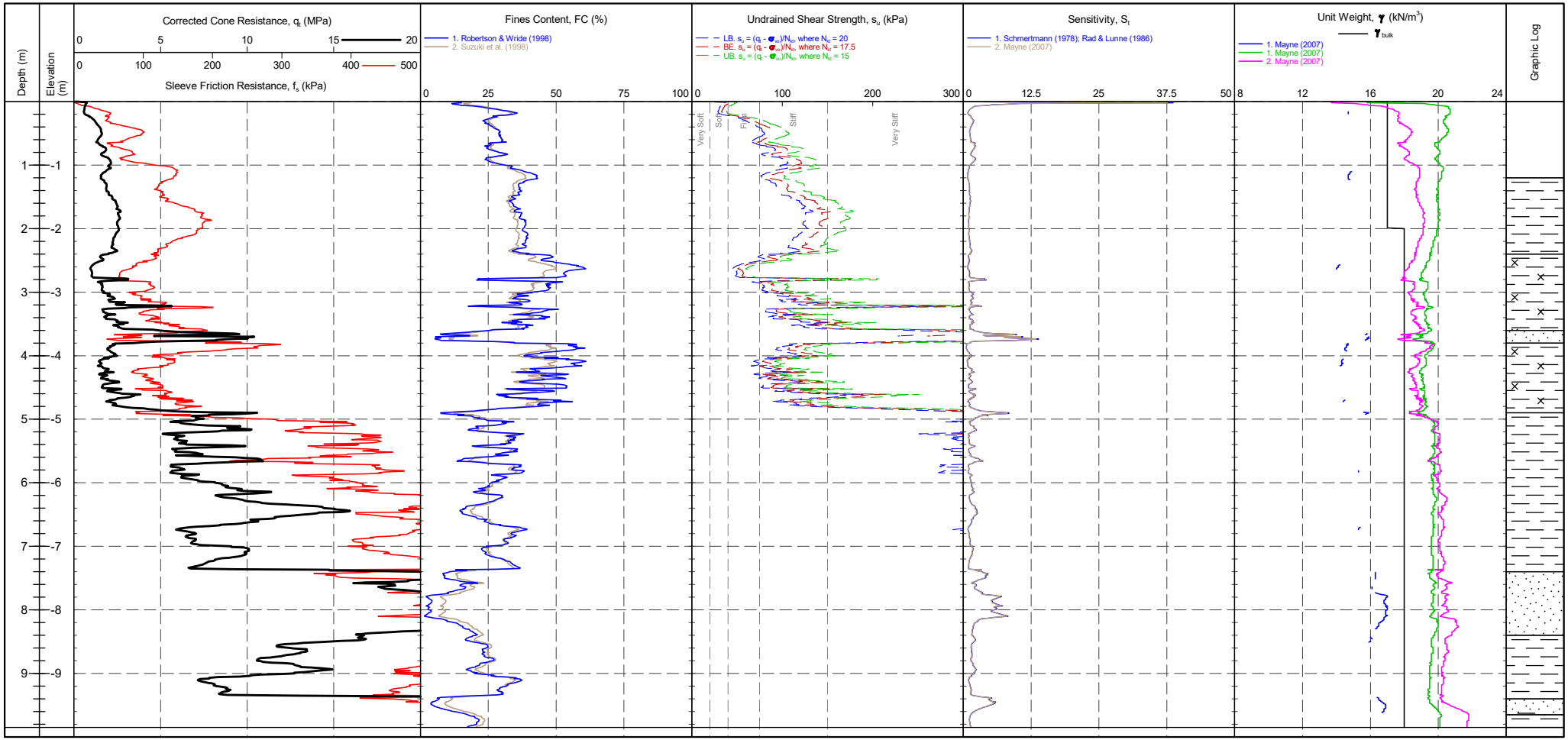
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	311 mV	308 mV	-0.033 MPa
Sleeve	273 mV	264 mV	-0.006 kPa
Pore Pressure 2	266 mV	99 mV	-0.047 kPa
X-Y Inclinometer	2405 mV	2420 mV	

Groundwater Level

Dissipation Test

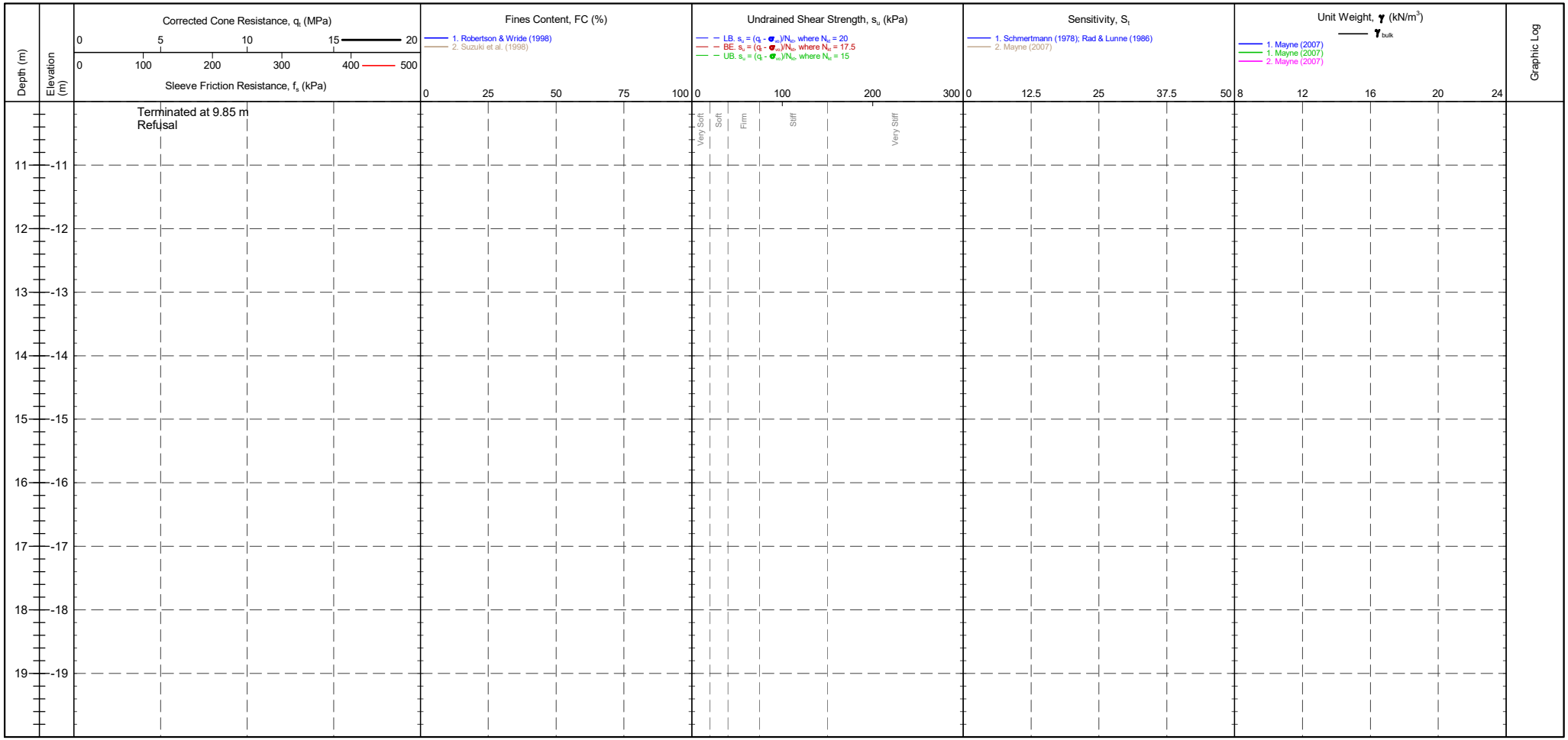
CPT LOG 03

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 311 mV / 308 mV / -0.033 MPa Sleeve / 273 mV / 264 mV / -0.006 kPa Pore Pressure 2 / 266 mV / 99 mV / -0.047 kPa X-Y Inclinometer / 2405 mV / 2420 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

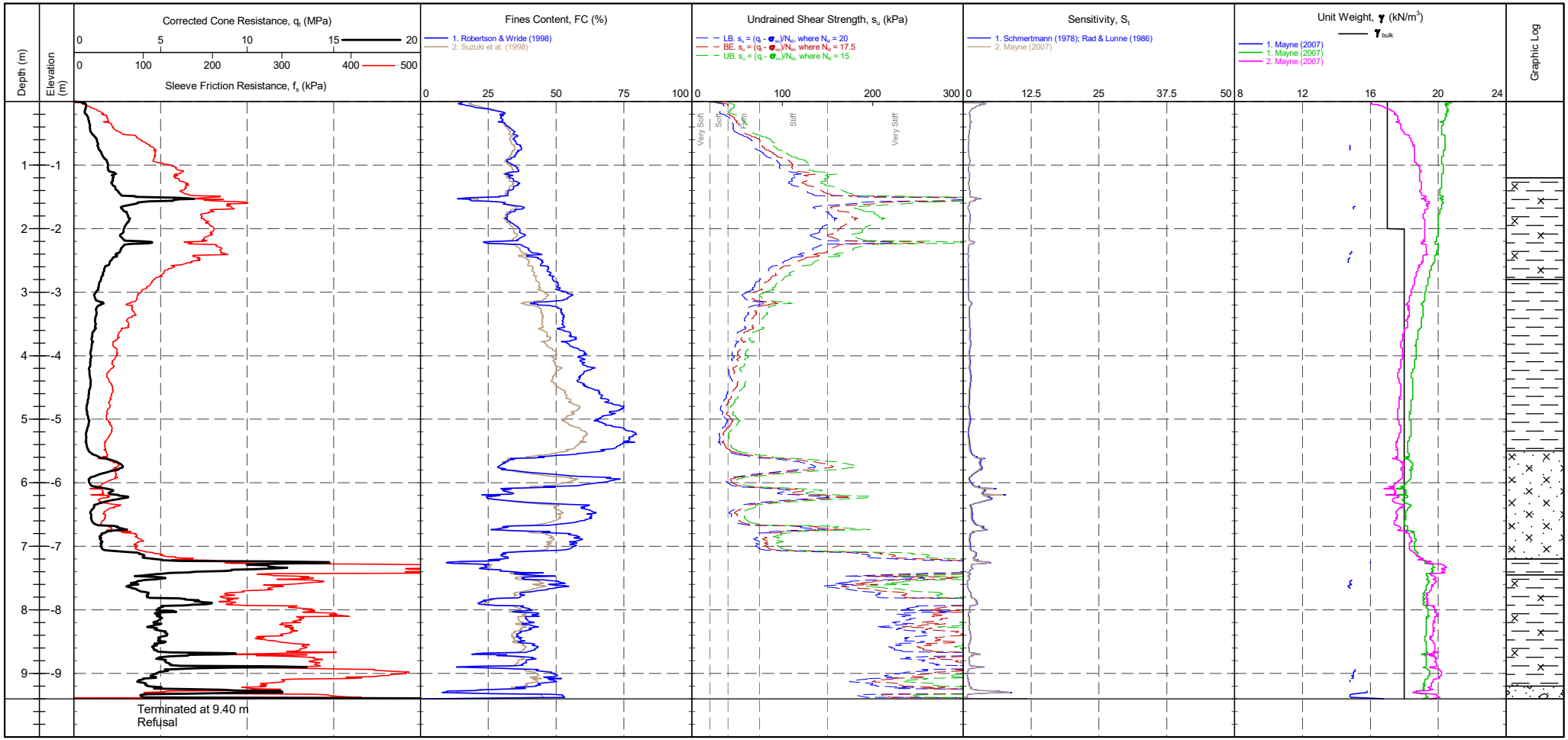
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 32

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32 WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	304 mV	310 mV	0.066 MPa
Sleeve	267 mV	275 mV	0.006 kPa
Pore Pressure 2	234 mV	300 mV	0.019 kPa
X-Y Inclinometer	2439 mV	2437 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

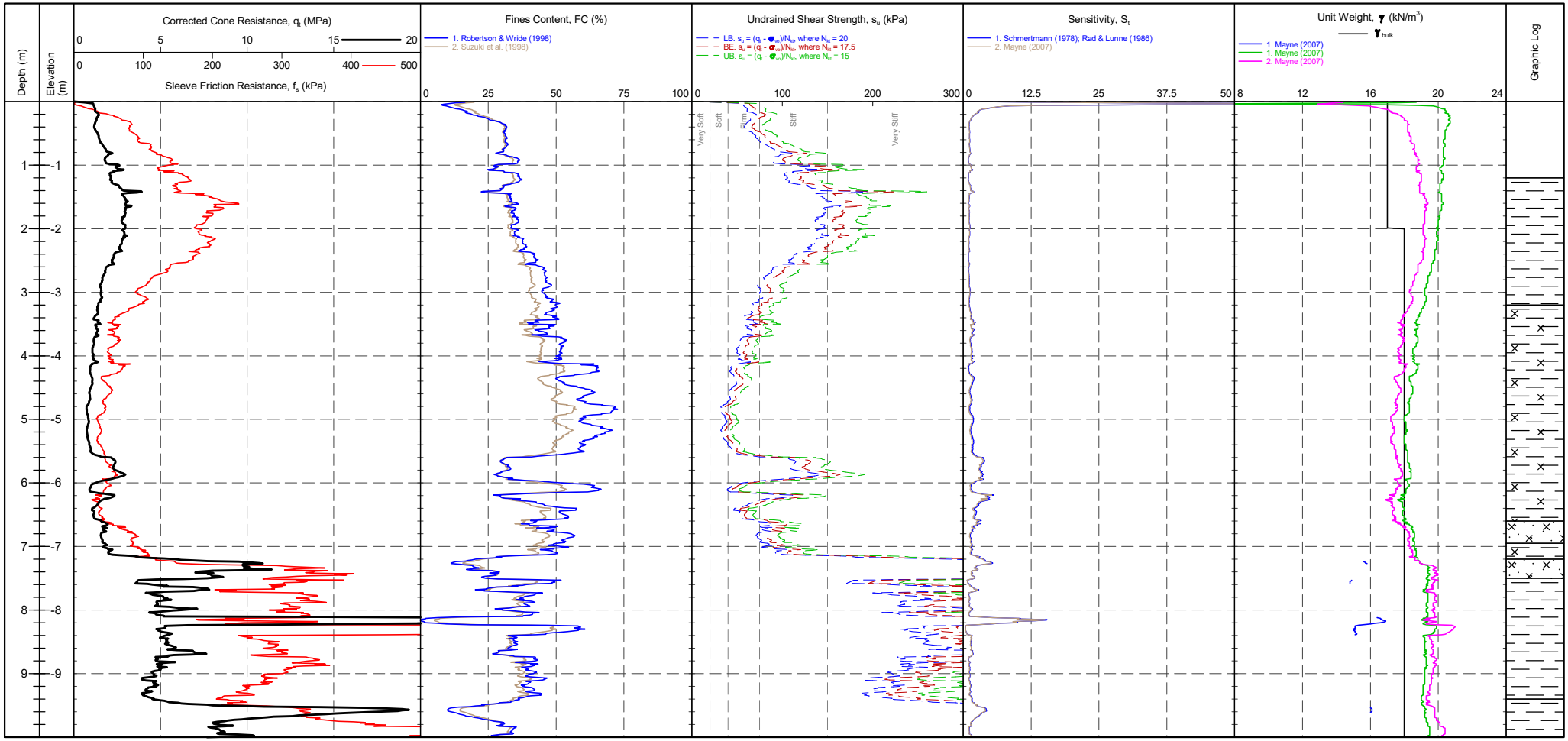
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 32B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	309 mV	307 mV	-0.022 MPa
Sleeve	266 mV	268 mV	0.001 kPa
Pore Pressure 2	170 mV	234 mV	0.018 kPa
X-Y Inclinometer	2408 mV	2483 mV	

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

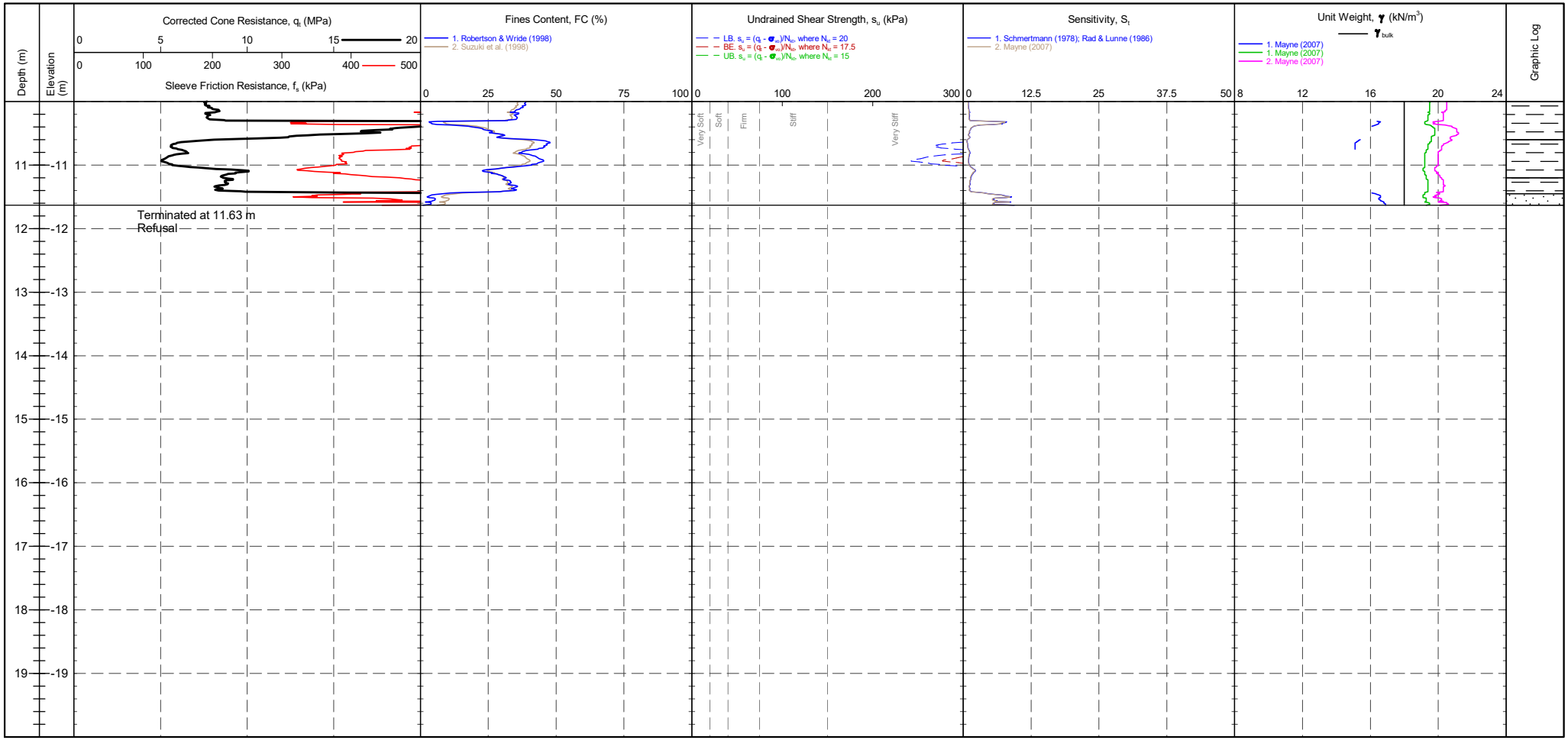
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 32B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 309 mV / 307 mV / -0.022 MPa Sleeve / 266 mV / 268 mV / 0.001 kPa Pore Pressure 2 / 170 mV / 234 mV / 0.018 kPa X-Y Inclinometer / 2408 mV / 2483 mV	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

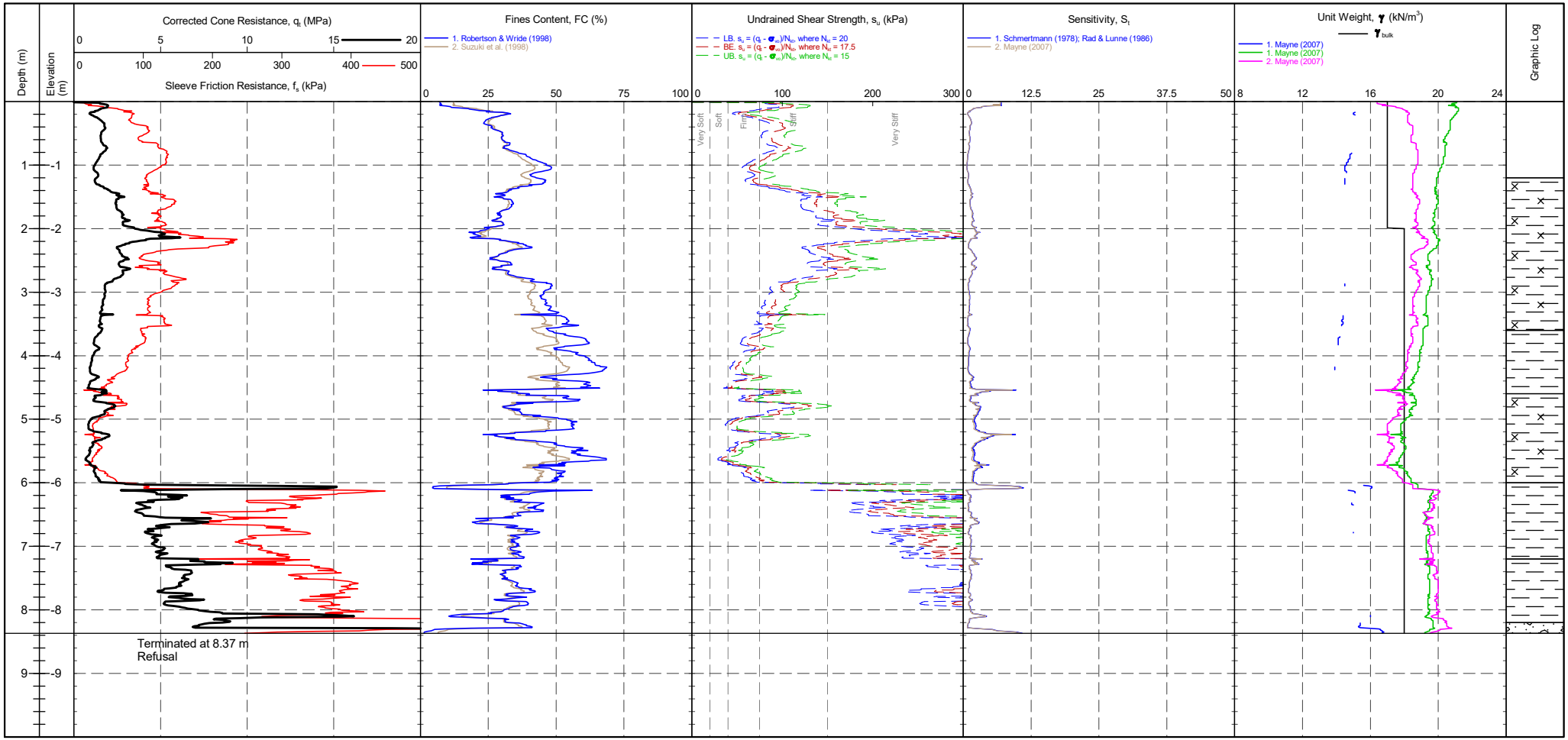
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 03

PointID

CPT 33

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 33 WEATHER : Overcast & Mild	CPTU ZERO VALUES	

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	282 mV	268 mV	-0.01 kPa
Pore Pressure 2	225 mV	259 mV	0.01 kPa
X-Y Inclinometer	2530 mV	2436 mV	

Groundwater Level

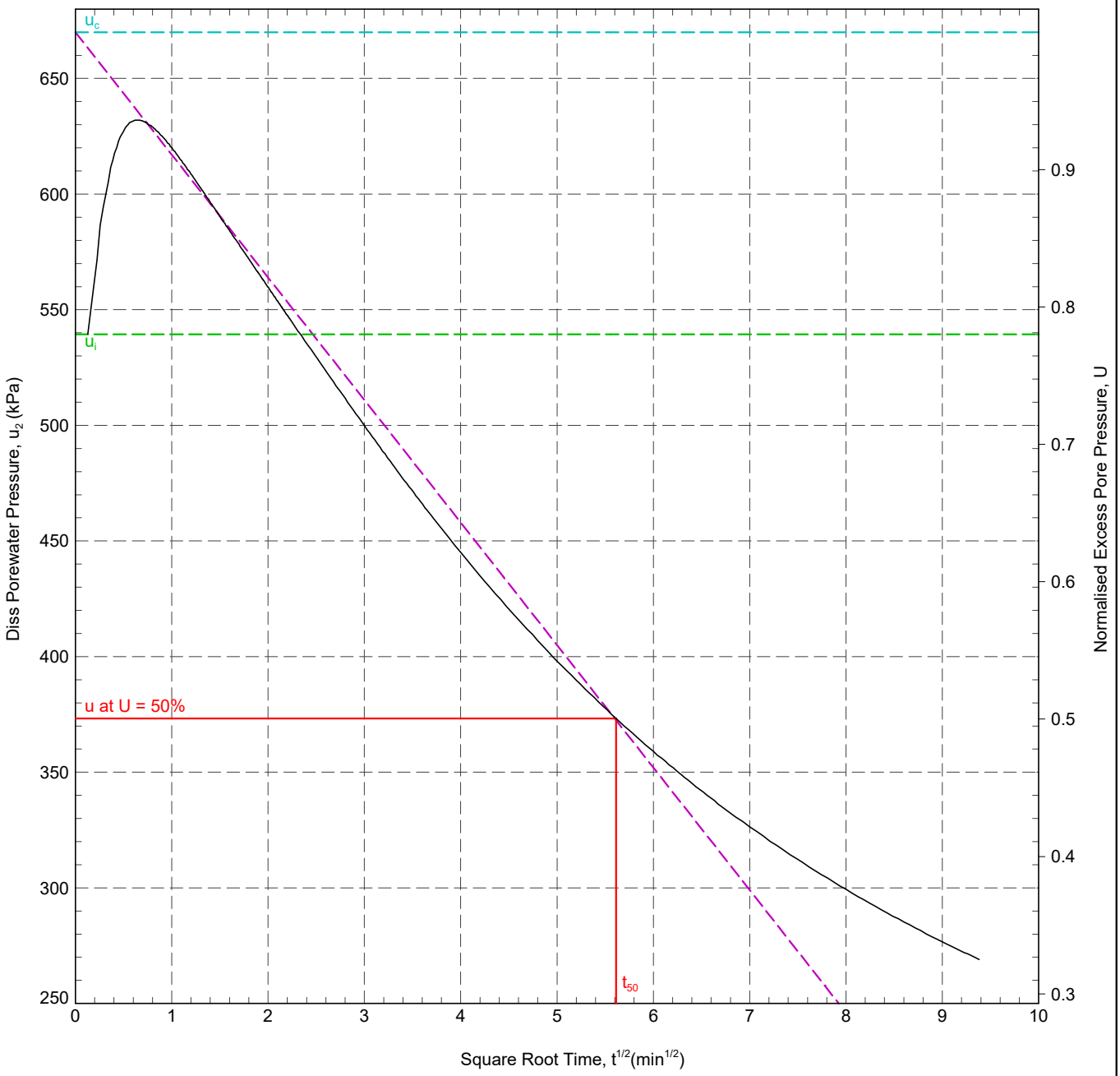
Dissipation Test

DISSIPATION TEST

IN SITU
SITE INVESTIGATION

Test ID
CPT 14 - 9.74 m

CLIENT : Dunelm Geotechnical	AREA : Sunderland	SHEET : 1 OF 1
ENGINEER : James Huntington	EASTING :	STATUS : Final
PROJECT : Sunderland	NORTHING :	DATE : 26/08/67
LOCATION : Sunderland	COORD. SYS.:	
PROJECT No. : 1170315	ELEVATION : 0.00 m	



In Situ Pore Pressure, u_0:	75.9 kPa	Rigidity Index, I_r:	9.9
Initial Pore Pressure, u_i:	539.4 kPa	Horizontal Coefficient of Consolidation, c_h:	4.17×10^0 m^2/yr
Final Pore Pressure:	269.0 kPa	Ratio c_h/c_v:	3
Back Extrapolated Pore Pressure, u_c:	670 kPa	Vertical Coefficient of Consolidation, c_v:	1.39×10^0 m^2/yr
Degree of Dissipation:	50%		
Dissipation Pressure:	373.2 kPa		
Time for 50% Dissipation, t_{50}:	31.50 min		

RIG : CPT 007	ANALYSED BY : LD	DATE: 09/08/2017	REMARK
CONE TYPE : S15-CFIP	CHECKED BY : LD	DATE: 09/08/2017	Test OK.
CONE ID : S15-CFIP.1488	APPROVED BY : DW	DATE: 09/08/2017	
OPERATOR : RS			

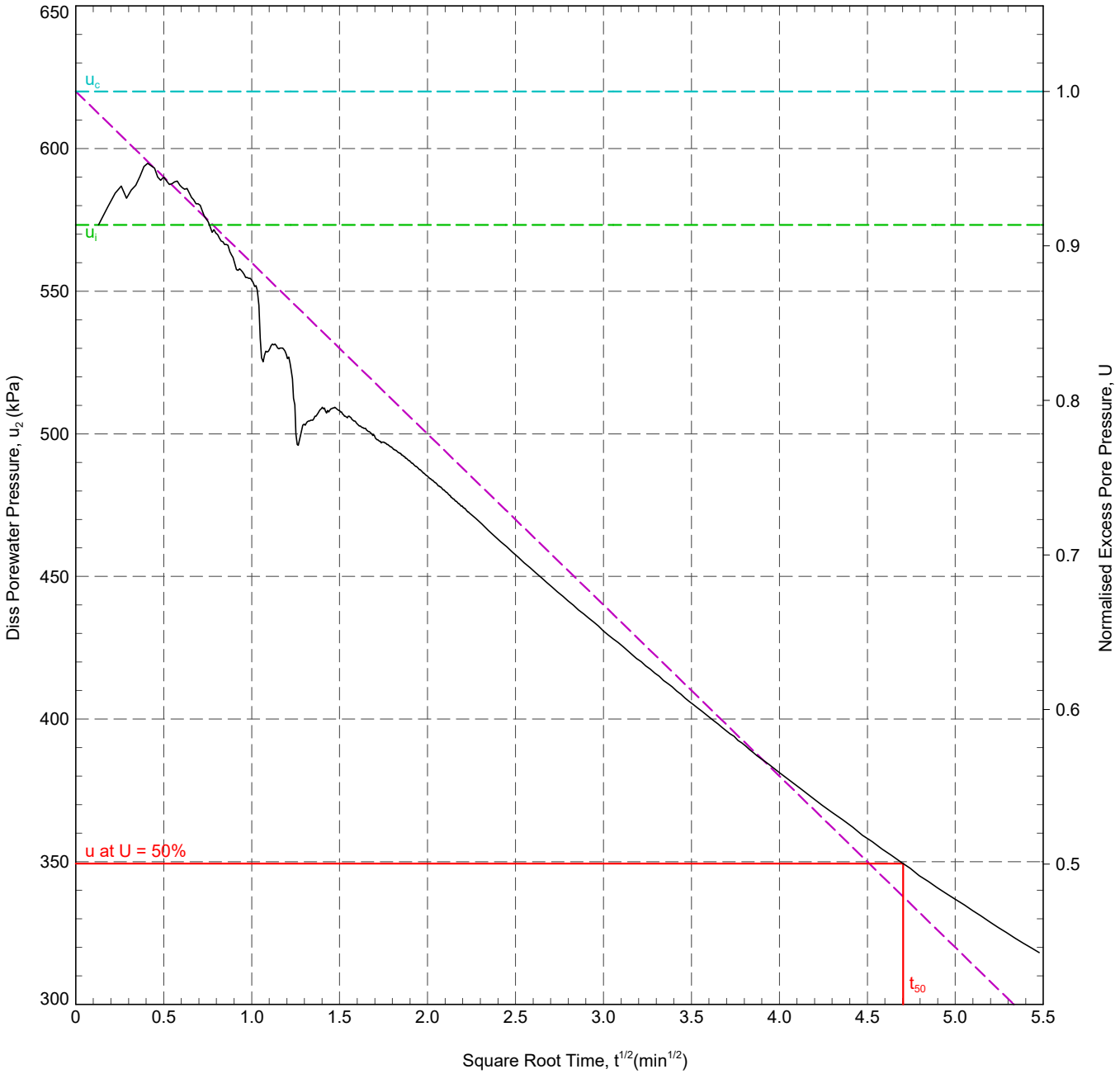
INSITUSI 1.01.0 LIB.GLB Graph CPT DISS. PORE PRESSURE VS. SQR T A4P 1170315-SUNDERLAND.GPJ <<DrawingFile>> 10/Aug/2017 11:11 10.0.000 Datgel CPT Tool gINT Add-In

DISSIPATION TEST

IN SITU
SITE INVESTIGATION

Test ID
CPT 19 - 10.00 m

CLIENT : Dunelm Geotechnical	AREA : Sunderland	SHEET : 1 OF 1
ENGINEER : James Huntington	EASTING :	STATUS : Final
PROJECT : Sunderland	NORTHING :	DATE : 04/08/17
LOCATION : Sunderland	COORD. SYS.:	
PROJECT No. : 1170315	ELEVATION : 0.00 m	



In Situ Pore Pressure, u_0:	78.5 kPa	Rigidity Index, I_r:	9.6
Initial Pore Pressure, u_i:	573.2 kPa	Horizontal Coefficient of Consolidation, c_h:	5.84×10^0 m^2/yr
Final Pore Pressure:	318.1 kPa	Ratio c_h/c_v:	3
Back Extrapolated Pore Pressure, u_c:	620 kPa	Vertical Coefficient of Consolidation, c_v:	1.95×10^0 m^2/yr
Degree of Dissipation:	50%		
Dissipation Pressure:	349.4 kPa		
Time for 50% Dissipation, t_{50}:	22.13 min		

RIG : CPT 007	ANALYSED BY : LD	DATE: 04/08/2017	REMARK
CONE TYPE : S15-CFIP	CHECKED BY : LD	DATE: 04/08/2017	Test OK.
CONE ID : S15-CFIP.1488	APPROVED BY : DW	DATE: 04/08/2017	
OPERATOR : RS			

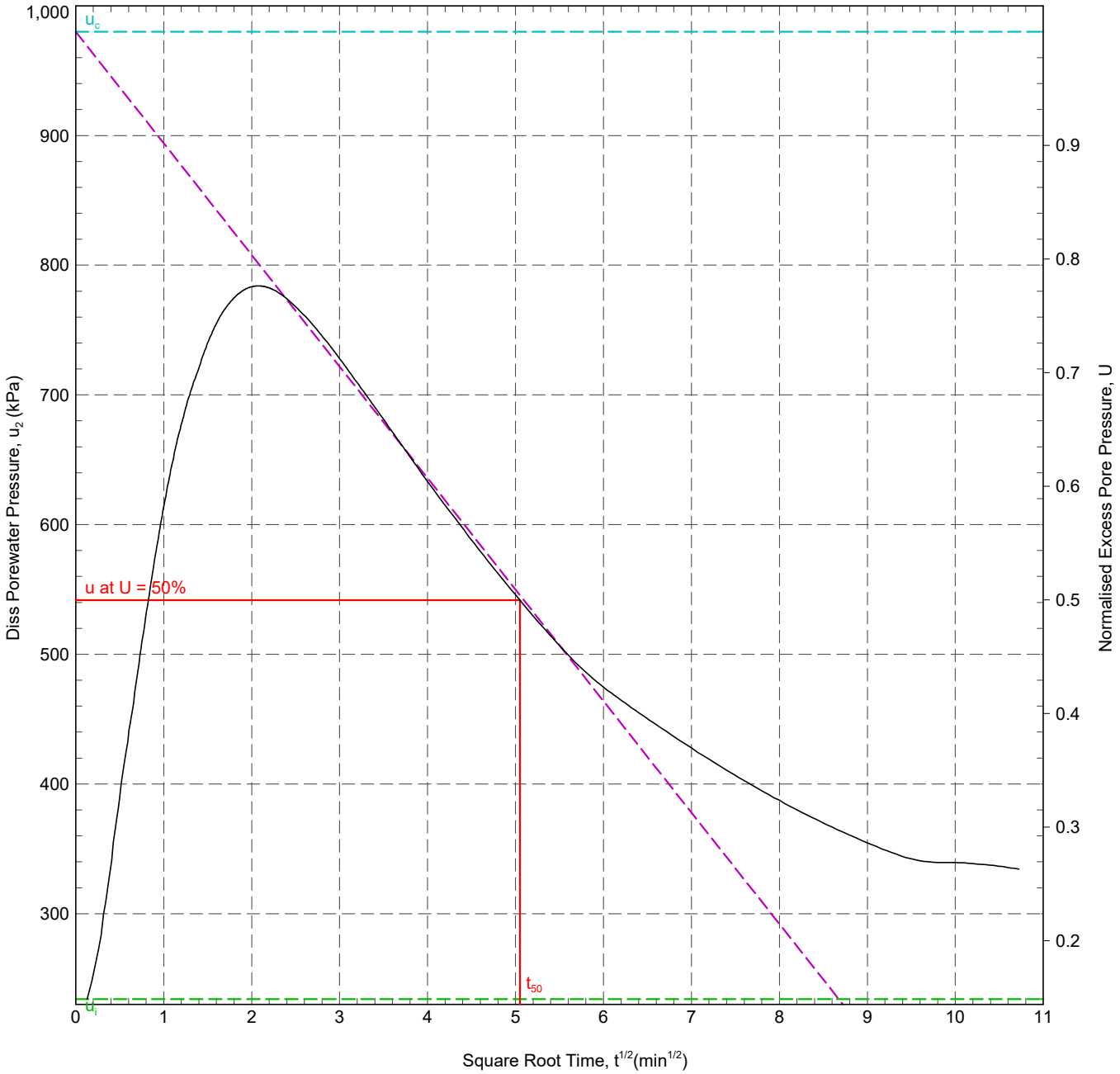
INSITUSI 1.01.0 LIB.GLB Graph CPT DISS. PORE PRESSURE VS. SQR T A4P 1170315-SUNDERLAND.GPJ <<DrawingFile>> 10/Aug/2017 11:11 10.0.000 Datgel CPT Tool gINT Add-In

DISSIPATION TEST

IN SITU
SITE INVESTIGATION

Test ID
CPT 28B - 12.60 m

CLIENT : Dunelm Geotechnical	AREA : Sunderland	SHEET : 1 OF 1
ENGINEER : James Huntington	EASTING :	STATUS : Final
PROJECT : Sunderland	NORTHING :	DATE : 07/08/17
LOCATION : Sunderland	COORD. SYS.:	
PROJECT No. : 1170315	ELEVATION : 0.00 m	



In Situ Pore Pressure, u_0:	104.0 kPa	Rigidity Index, I_r:	100
Initial Pore Pressure, u_i:	234.1 kPa	Ratio c_h/c_v:	3
Final Pore Pressure:	334.3 kPa		
Back Extrapolated Pore Pressure, u_c:	980 kPa		
Degree of Dissipation:	50%		
Dissipation Pressure:	541.7 kPa		
Time for 50% Dissipation, t_{50}:	25.50 min		

RIG : CPT 007	ANALYSED BY : LD	DATE: 09/08/2017	REMARK
CONE TYPE : S15-CFIP	CHECKED BY : LD	DATE: 09/08/2017	Test OK.
CONE ID : S15-CFIP.1488	APPROVED BY : DW	DATE: 09/08/2017	
OPERATOR : RS			

INSITUSI 1.01.0 LIB.GLB Graph CPT DISS. PORE PRESSURE VS. SQR T A4P 1170315-SUNDERLAND.GPJ <<DrawingFile>> 10/Aug/2017 11:11 10.0.000 Datgel CPT Tool gINT Add-In

IN SITU SITE INVESTIGATION

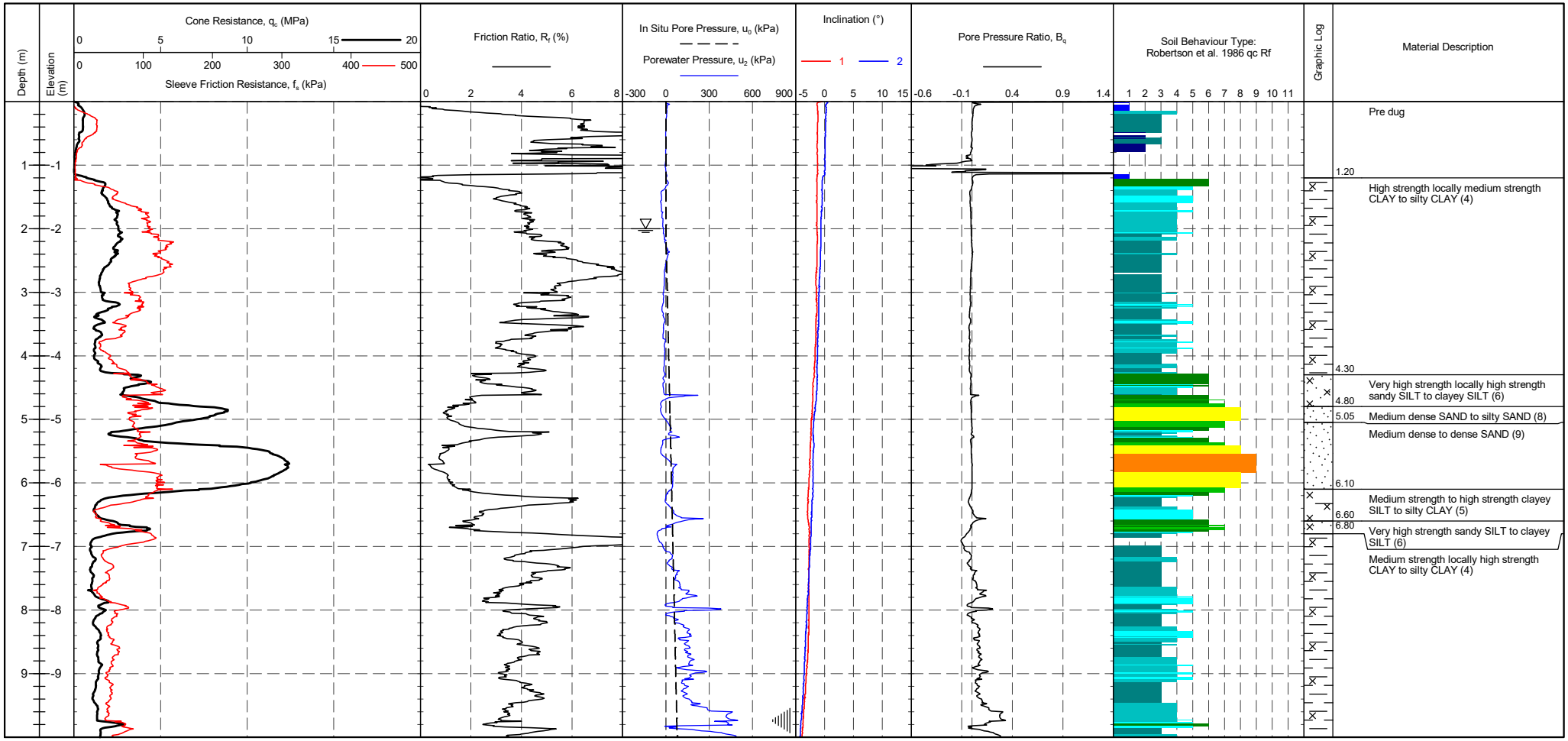
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	309 mV	308 mV	-0.011 MPa
Sleeve	277 mV	271 mV	-0.004 kPa
Pore Pressure 2	242 mV	271 mV	0.008 kPa
X-Y Inclinometer	2403 mV	2427 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - Clay
- 4 - Silty clay to clay
- 5 - Clayey silt to silty clay
- 6 - Sandy silt to clayey silt
- 7 - Silty sand to sandy silt
- 8 - Sand to silty sand
- 9 - Sand
- 10 - Gravelly sand to sand
- 11 - Very stiff fine grained
- 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

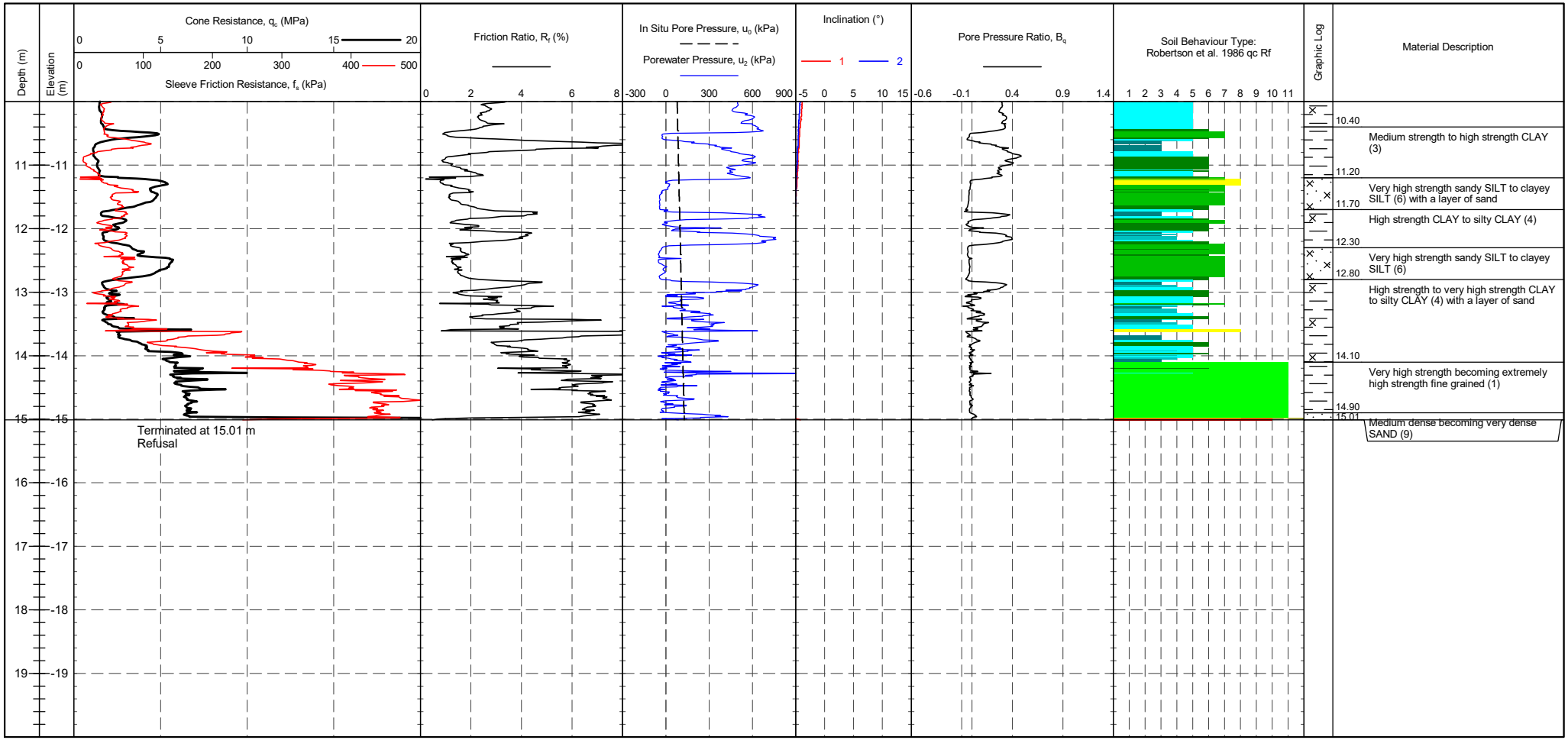
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	309 mV	308 mV	-0.011 MPa
Sleeve	277 mV	271 mV	-0.004 kPa
Pore Pressure 2	242 mV	271 mV	0.008 kPa
X-Y Inclinometer	2403 mV	2427 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

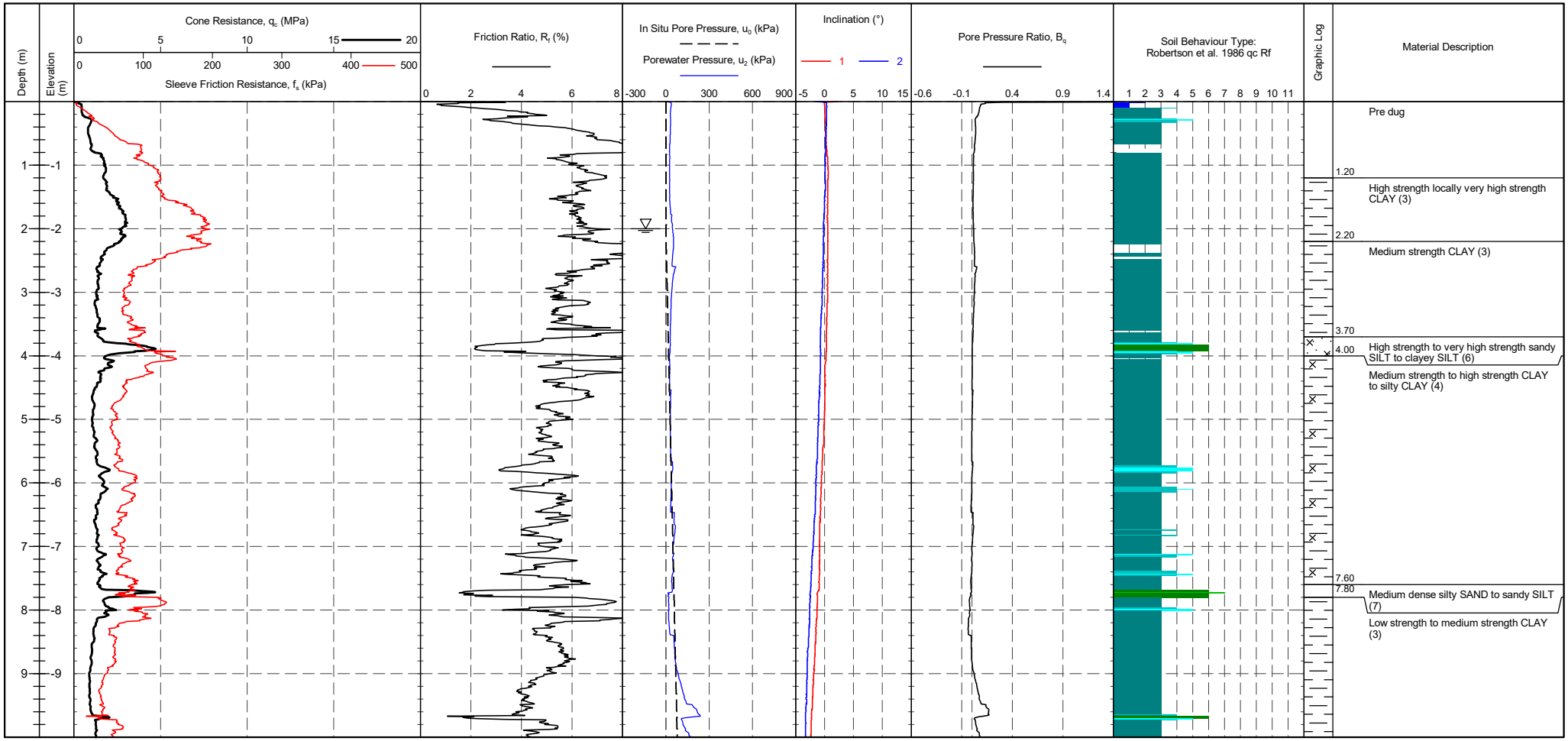
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 15**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	306 mV	0.011 MPa
Sleeve	263 mV	266 mV	0.002 kPa
Pore Pressure 2	260 mV	235 mV	-0.007 kPa
X-Y Inclinometer	2427 mV	2439 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

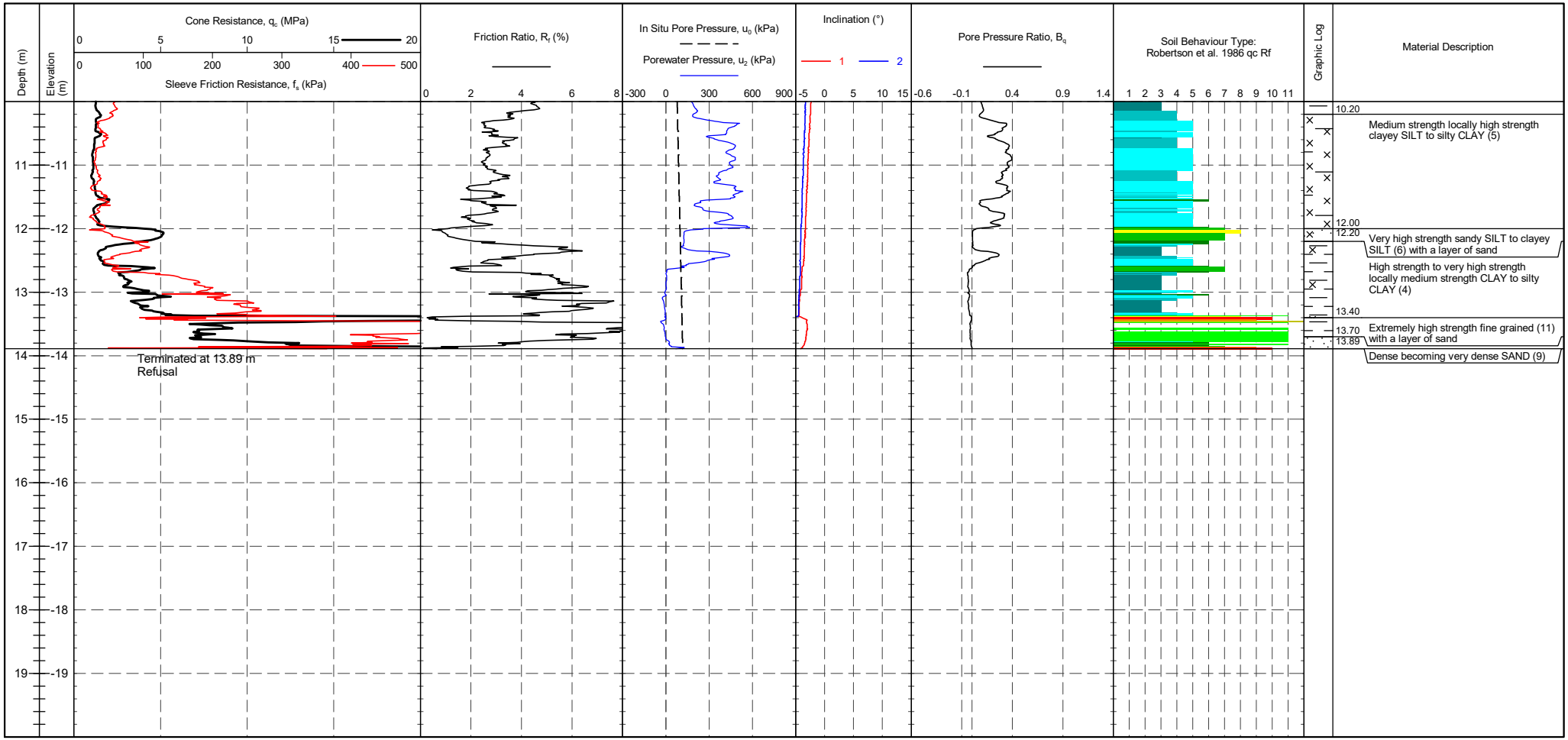
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	306 mV	0.011 MPa
Sleeve	263 mV	266 mV	0.002 kPa
Pore Pressure 2	260 mV	235 mV	-0.007 kPa
X-Y Inclinometer	2427 mV	2439 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

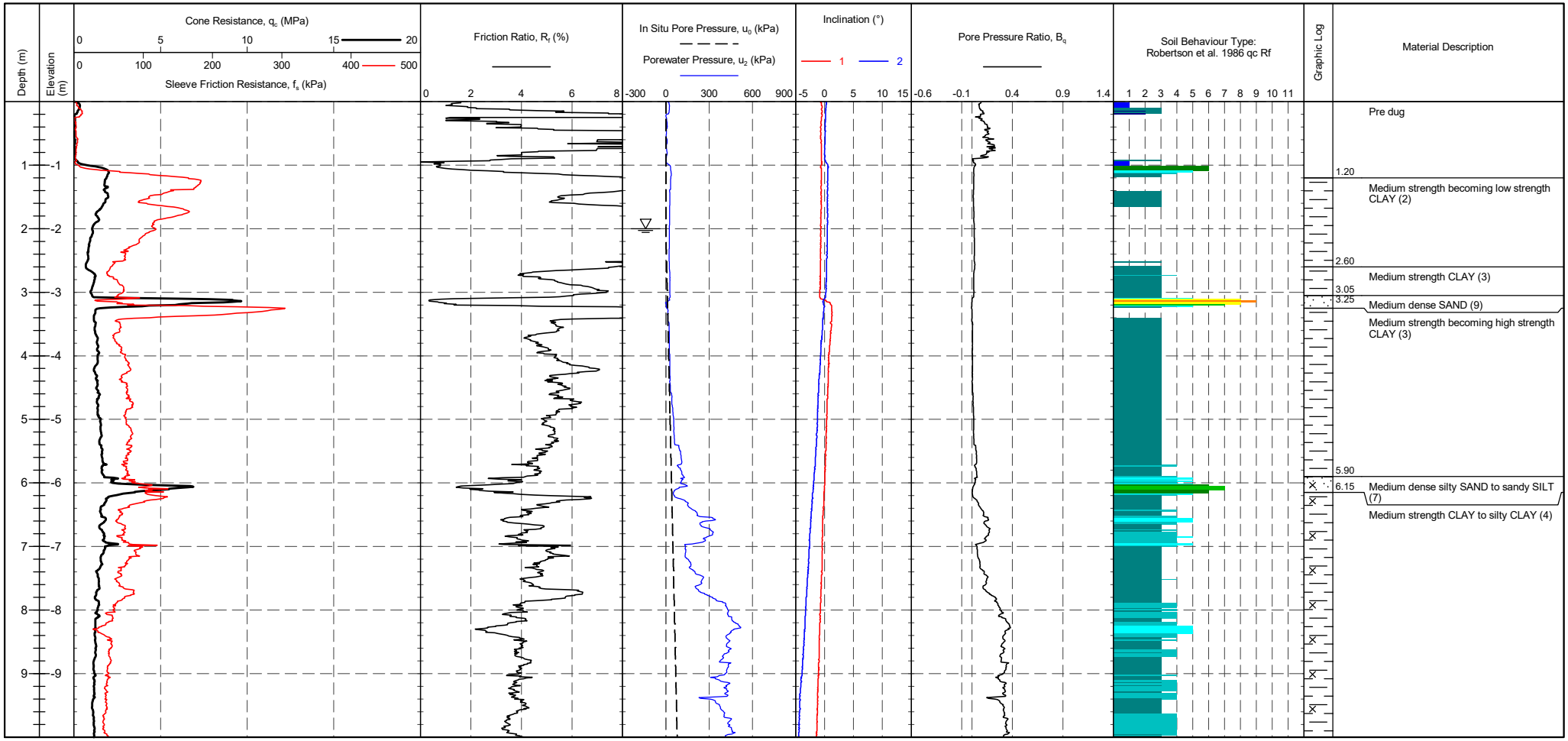
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 16**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	304 mV	-0.011 MPa
Sleeve	266 mV	265 mV	-0.001 kPa
Pore Pressure 2	227 mV	262 mV	0.01 kPa
X-Y Inclinometer	2411 mV	2426 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

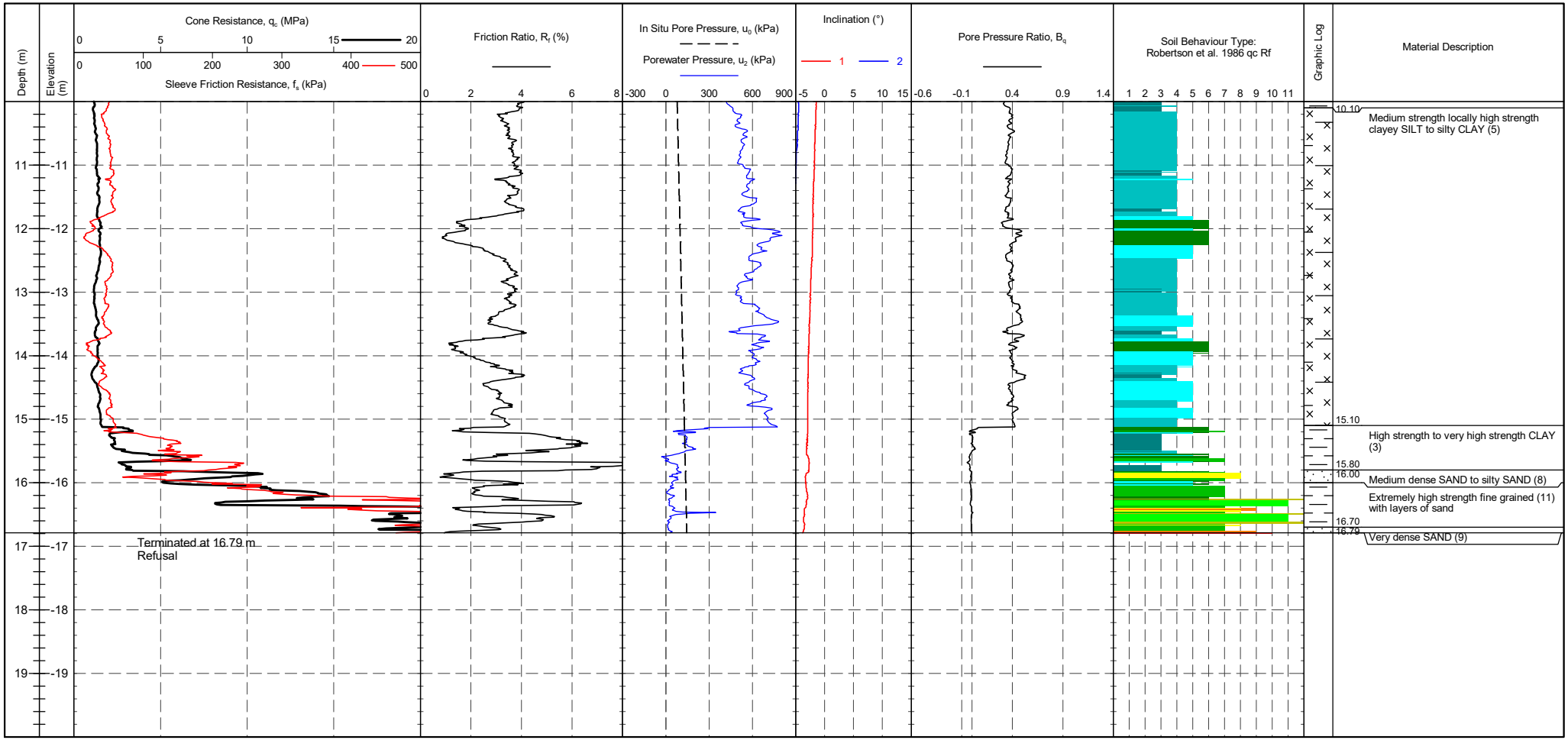
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 266 mV / 265 mV / -0.001 kPa Pore Pressure 2 / 227 mV / 262 mV / 0.01 kPa X-Y Inclinometer / 2411 mV / 2426 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

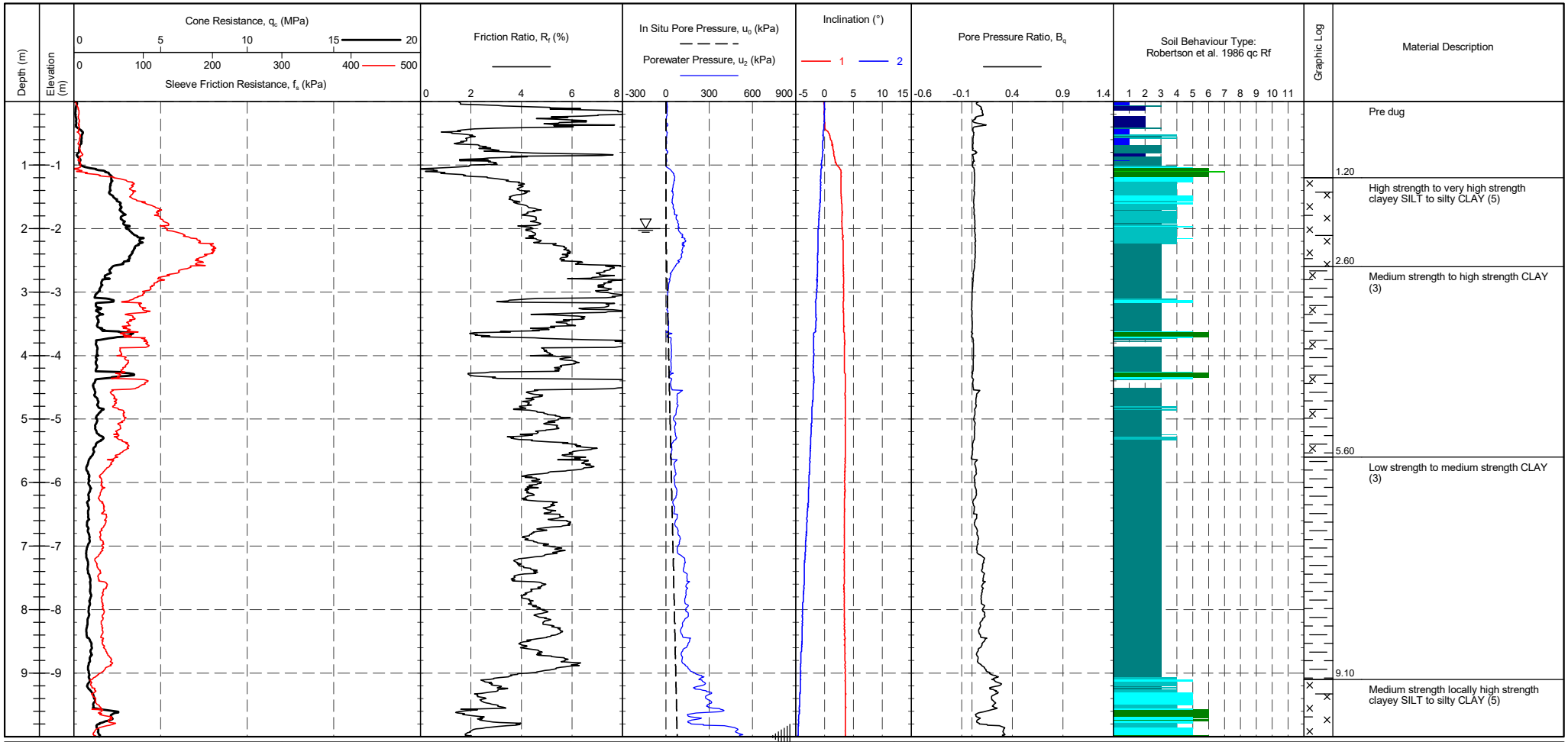
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	279 mV	273 mV	-0.004 kPa
Pore Pressure 2	238 mV	276 mV	0.011 kPa
X-Y Inclinometer	2446 mV	2466 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

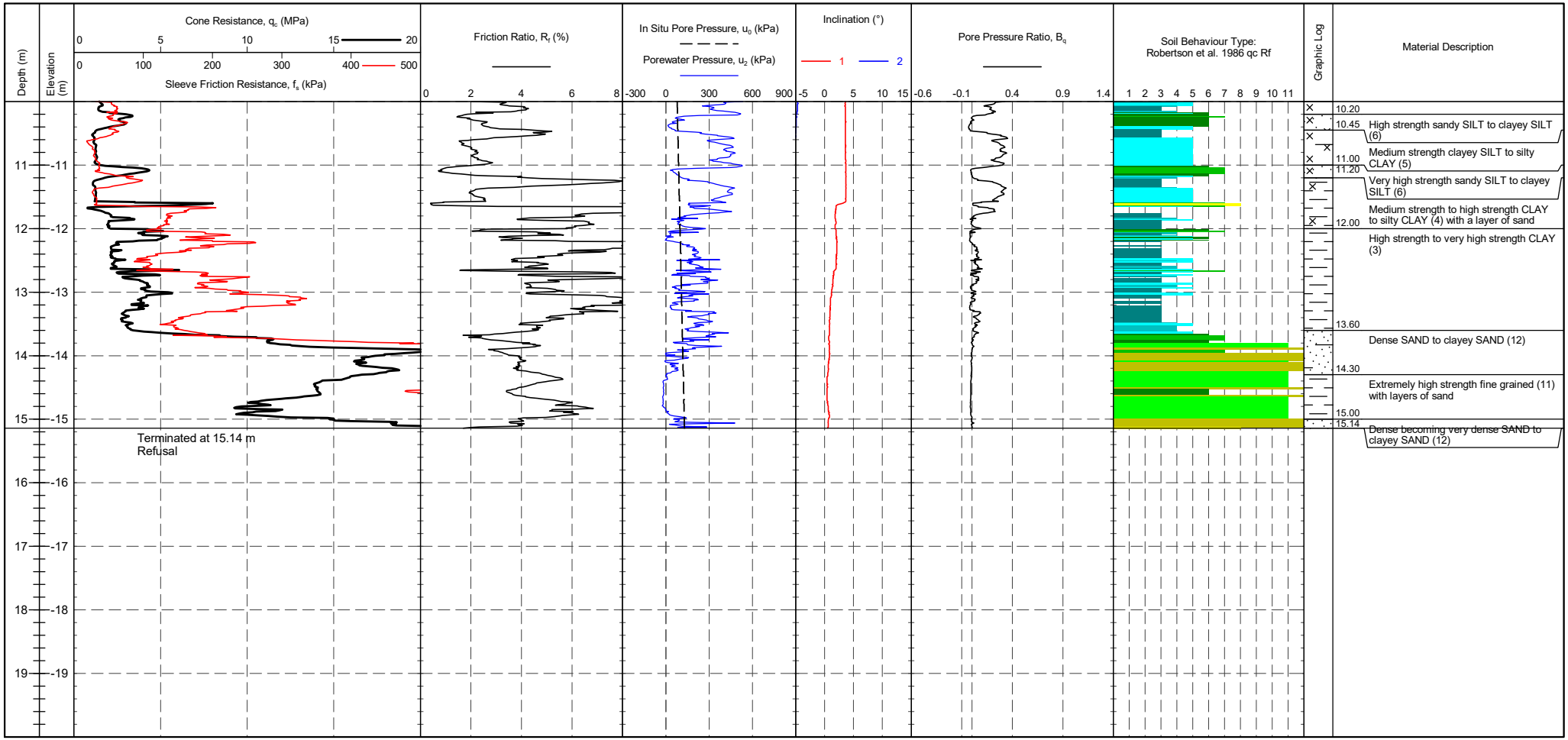
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 19**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 305 mV / 305 mV / 0 MPa Sleeve: 279 mV / 273 mV / -0.004 kPa Pore Pressure 2: 238 mV / 276 mV / 0.011 kPa X-Y Inclinometer: 2446 mV / 2466 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

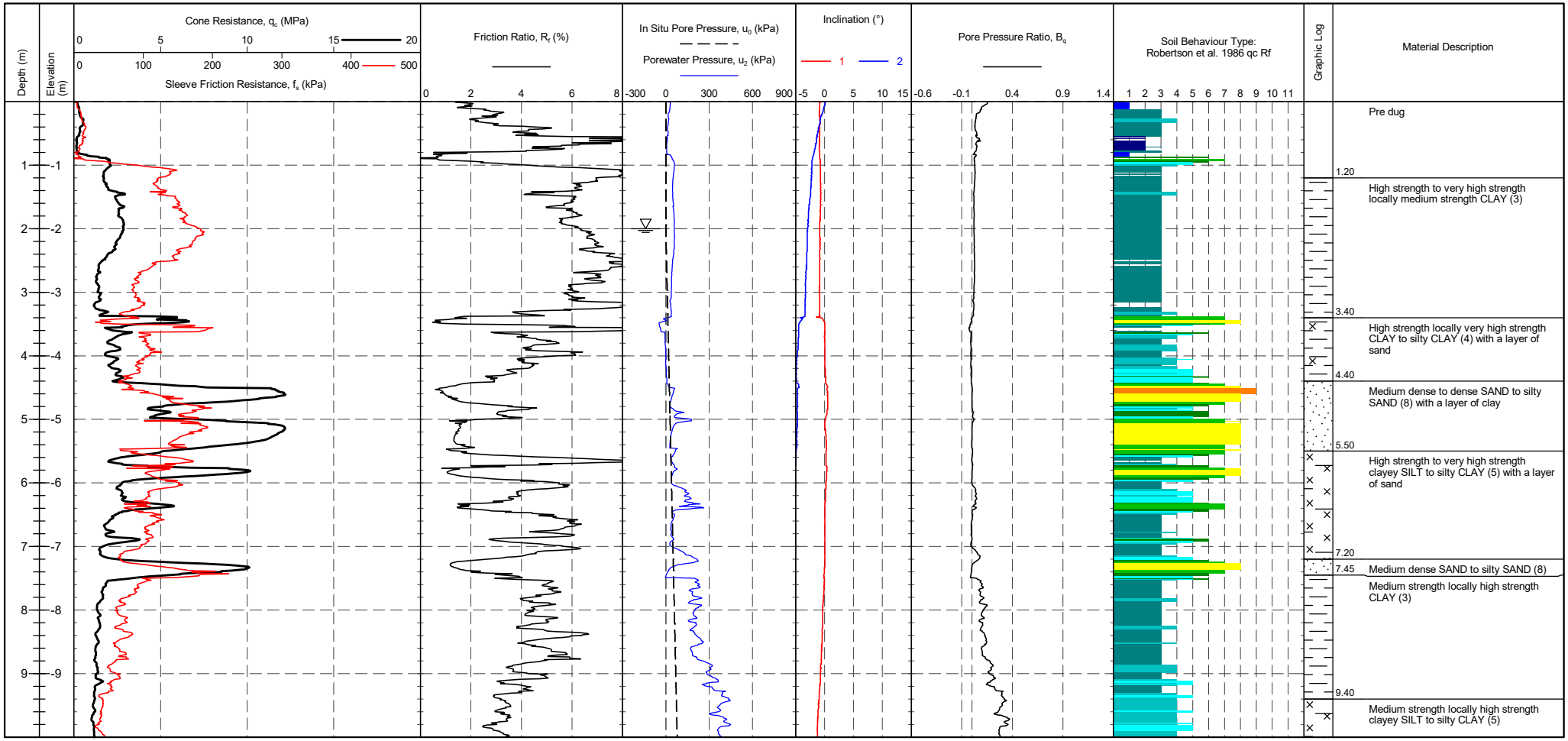
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	306 mV	306 mV	0 MPa
Sleeve	275 mV	263 mV	-0.009 kPa
Pore Pressure 2	278 mV	269 mV	-0.003 kPa
X-Y Inclinometer	2428 mV	2402 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - Clay
- 4 - Silty clay to clay
- 5 - Clayey silt to silty clay
- 6 - Sandy silt to clayey silt
- 7 - Silty sand to sandy silt
- 8 - Sand to silty sand
- 9 - Sand
- 10 - Gravelly sand to sand
- 11 - Very stiff fine grained
- 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

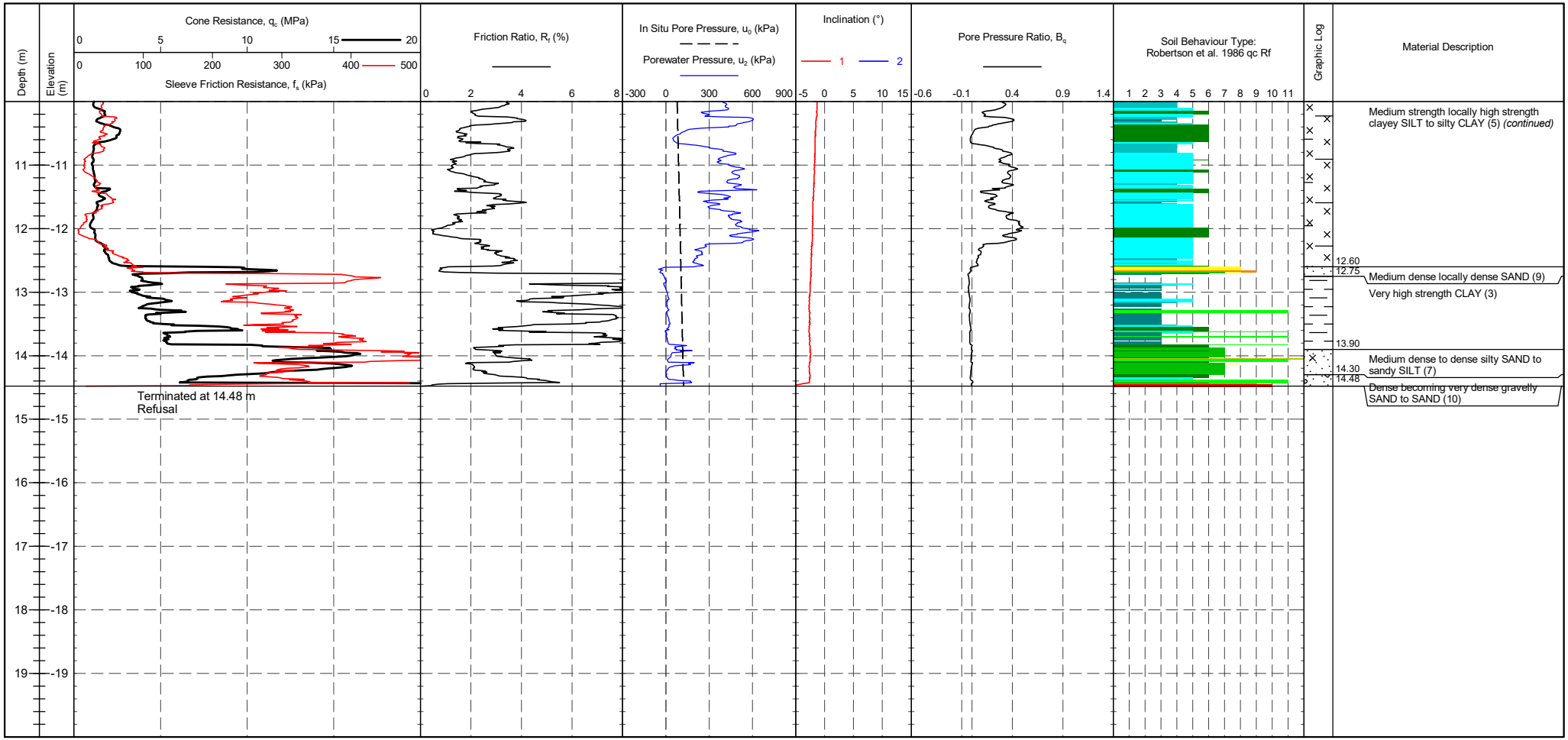
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 306 mV / 306 mV / 0 MPa Sleeve: 275 mV / 263 mV / -0.009 kPa Pore Pressure 2: 278 mV / 269 mV / -0.003 kPa X-Y Inclinometer: 2428 mV / 2402 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

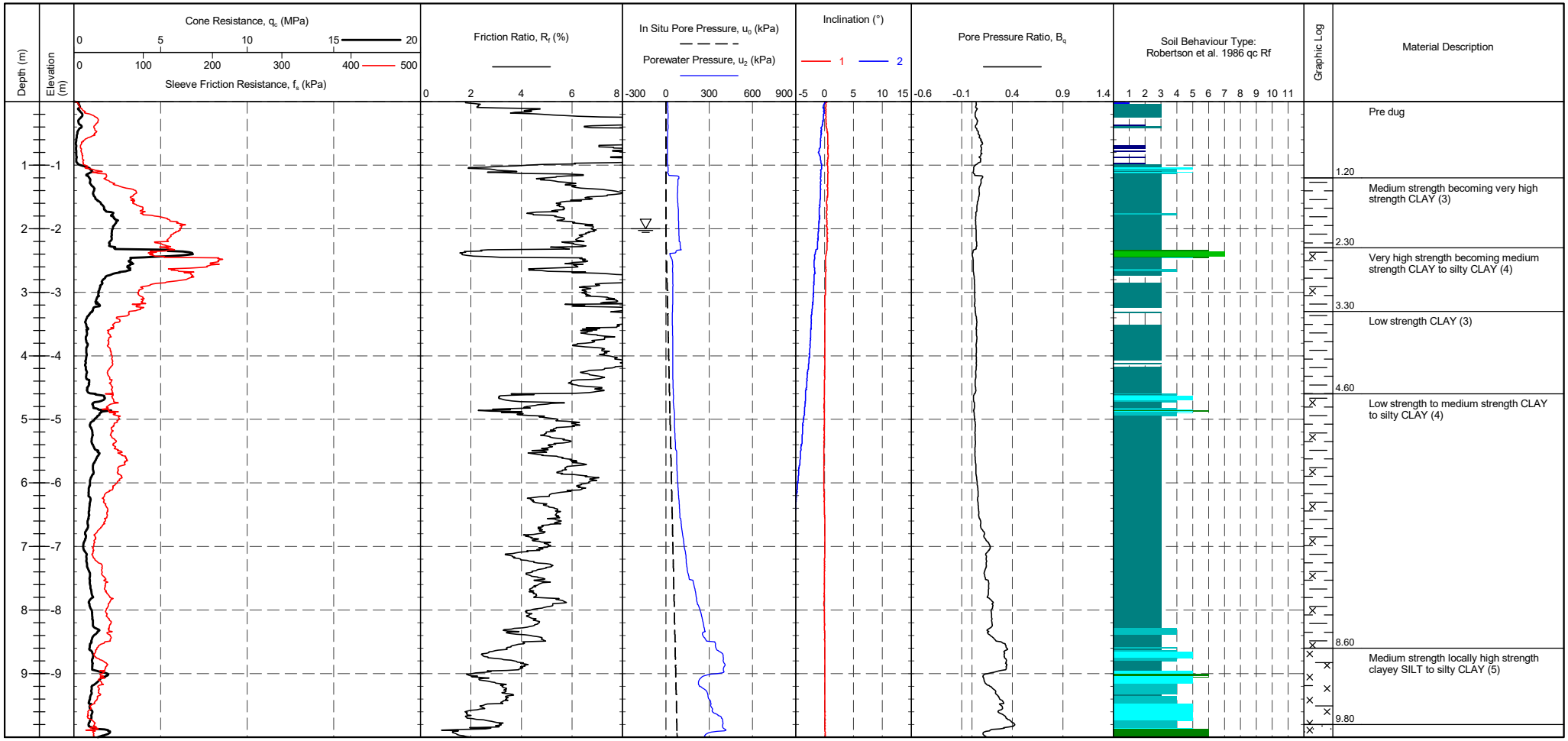
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	269 mV	269 mV	0 kPa
Pore Pressure 2	263 mV	361 mV	0.028 kPa
X-Y Inclinometer	2456 mV	2447 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

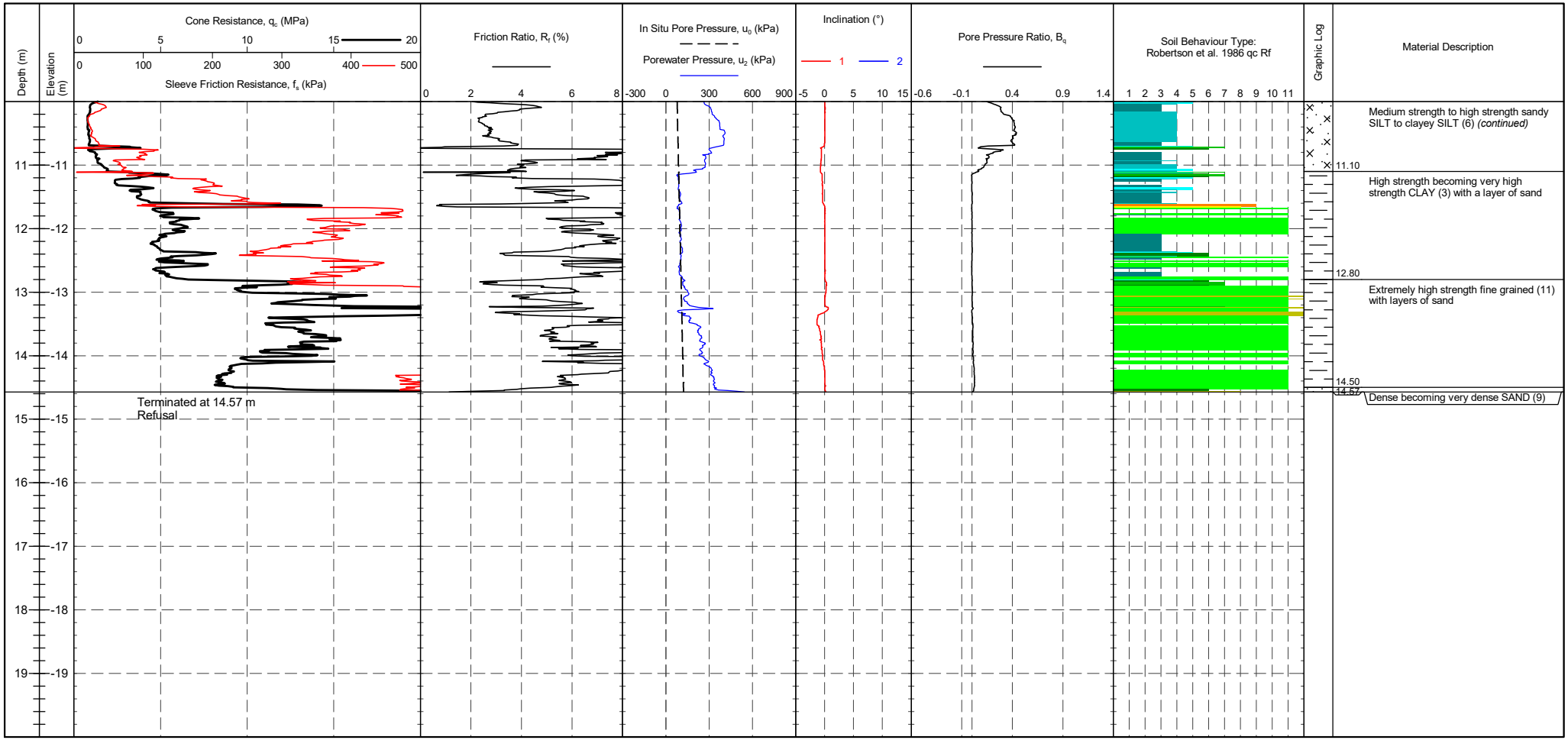
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	269 mV	269 mV	0 kPa
Pore Pressure 2	263 mV	361 mV	0.028 kPa
X-Y Inclinometer	2456 mV	2447 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

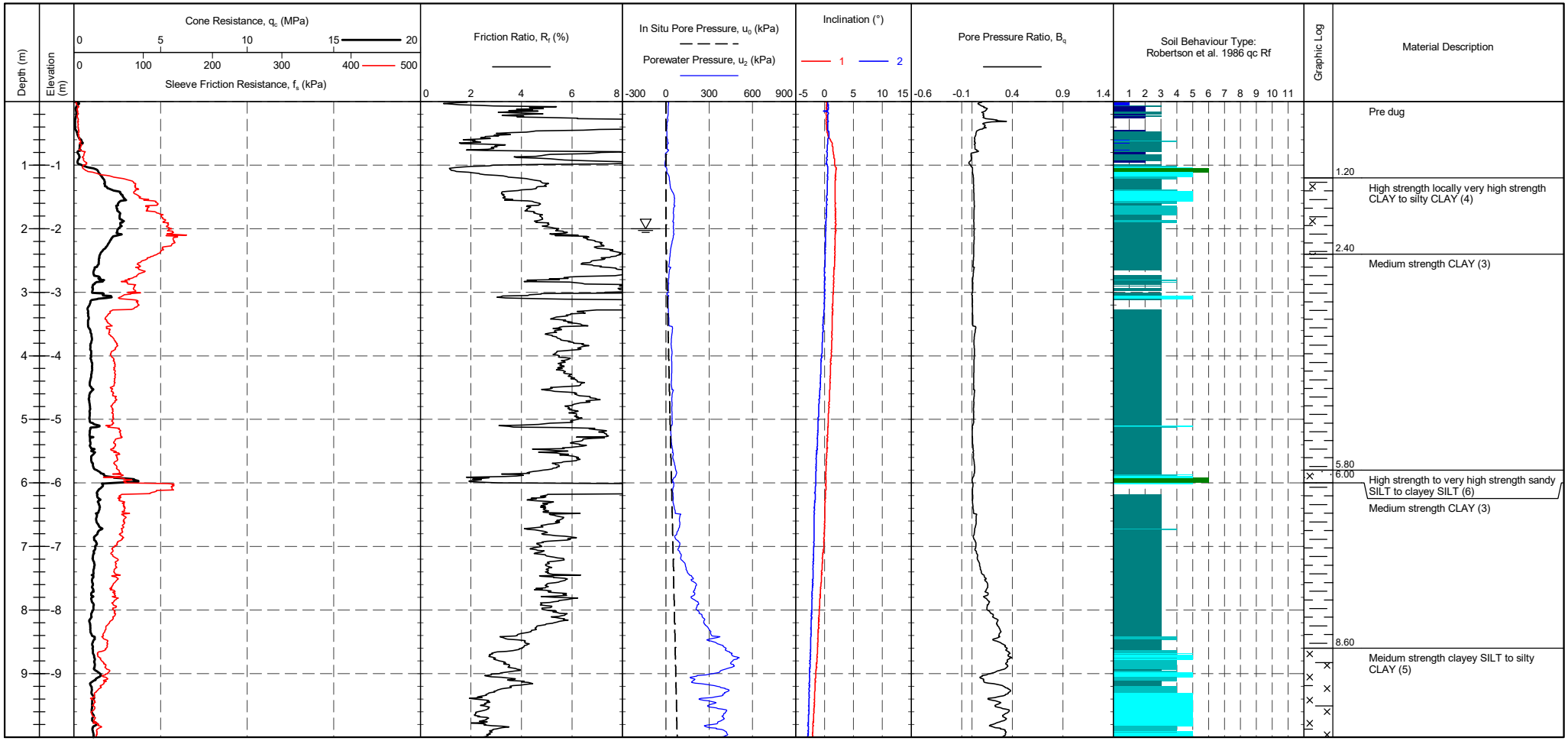
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 301 mV / -0.055 MPa Sleeve / 292 mV / 284 mV / -0.006 kPa Pore Pressure 2 / 229 mV / 273 mV / 0.012 kPa X-Y Inclinometer / 2468 mV / 2511 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

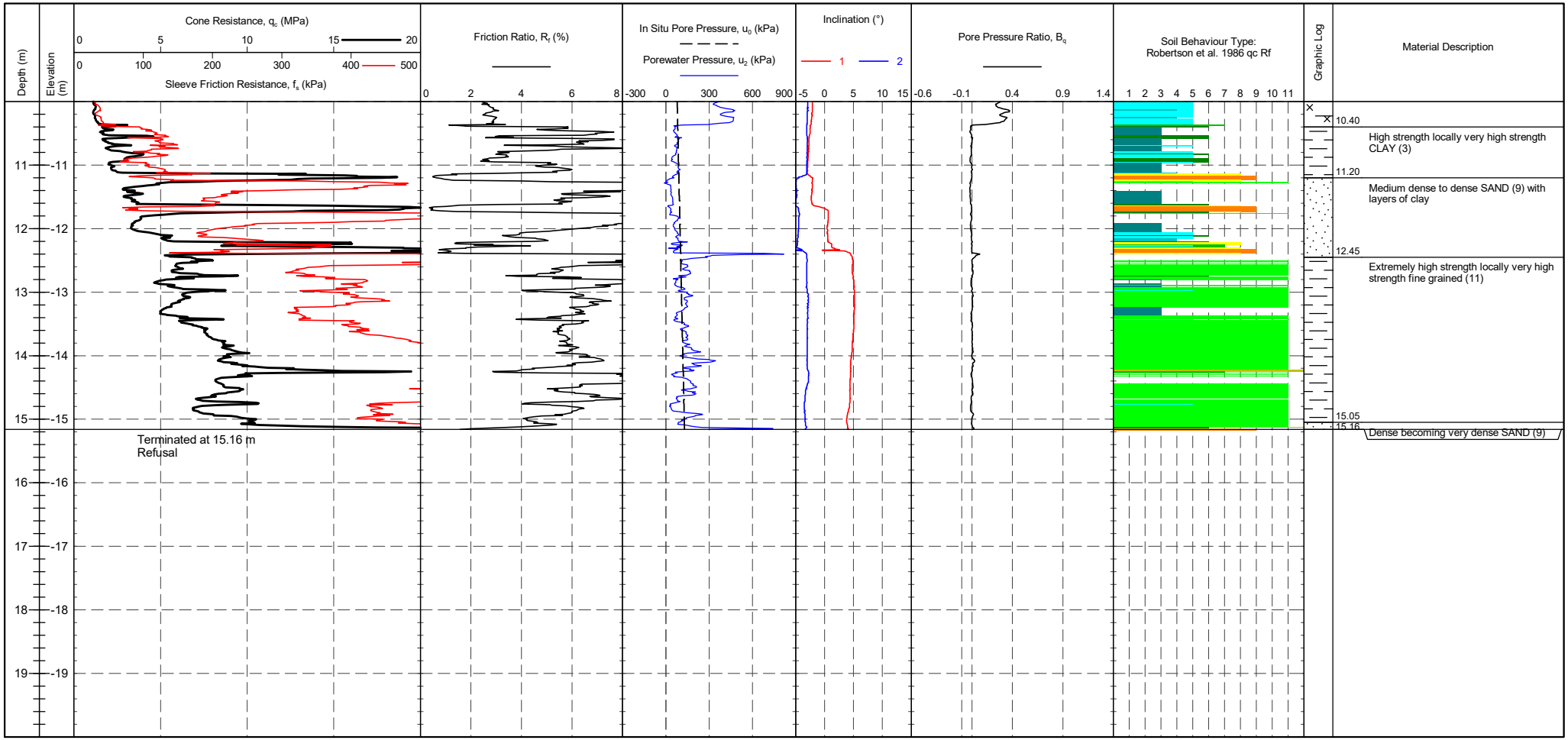
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 306 mV / 301 mV / -0.055 MPa Sleeve: 292 mV / 284 mV / -0.006 kPa Pore Pressure 2: 229 mV / 273 mV / 0.012 kPa X-Y Inclinometer: 2468 mV / 2511 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

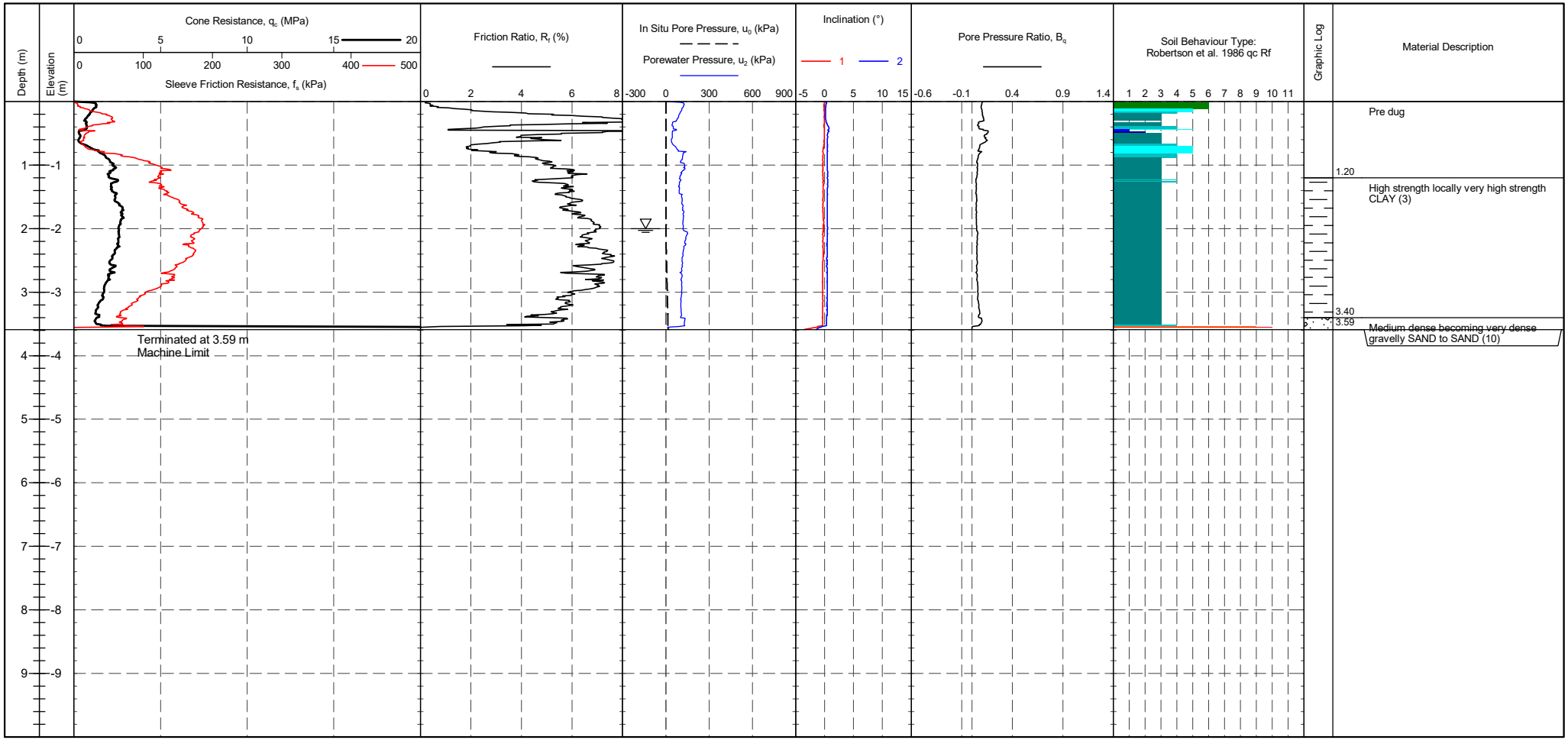
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 28**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	302 mV	308 mV	0.066 MPa
Sleeve	284 mV	290 mV	0.004 kPa
Pore Pressure 2	258 mV	257 mV	0 kPa
X-Y Inclinometer	2457 mV	2455 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

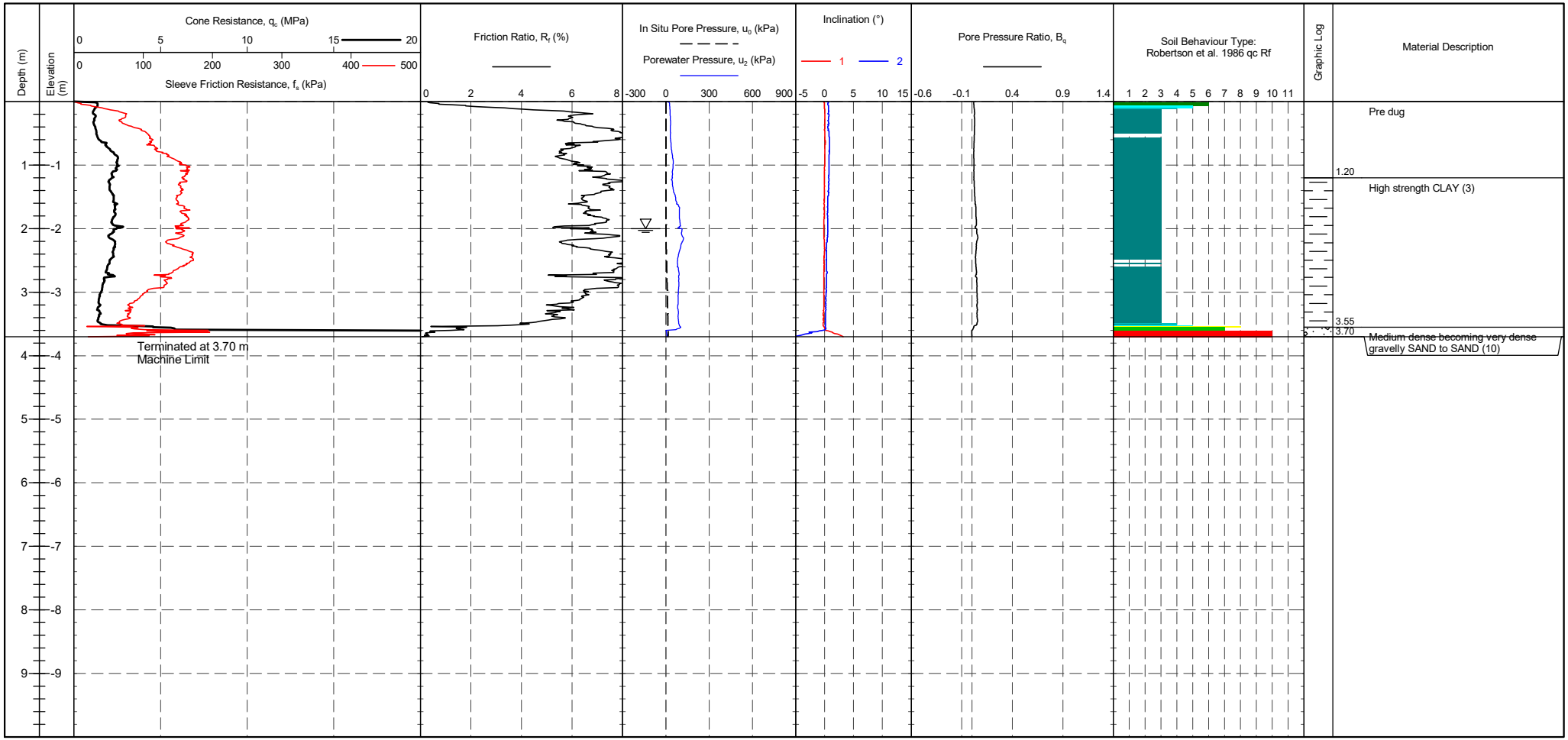
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 28A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28A WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	307 mV	310 mV	0.033 MPa
Sleeve	289 mV	287 mV	-0.001 kPa
Pore Pressure 2	256 mV	232 mV	-0.007 kPa
X-Y Inclinometer	2457 mV	2464 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

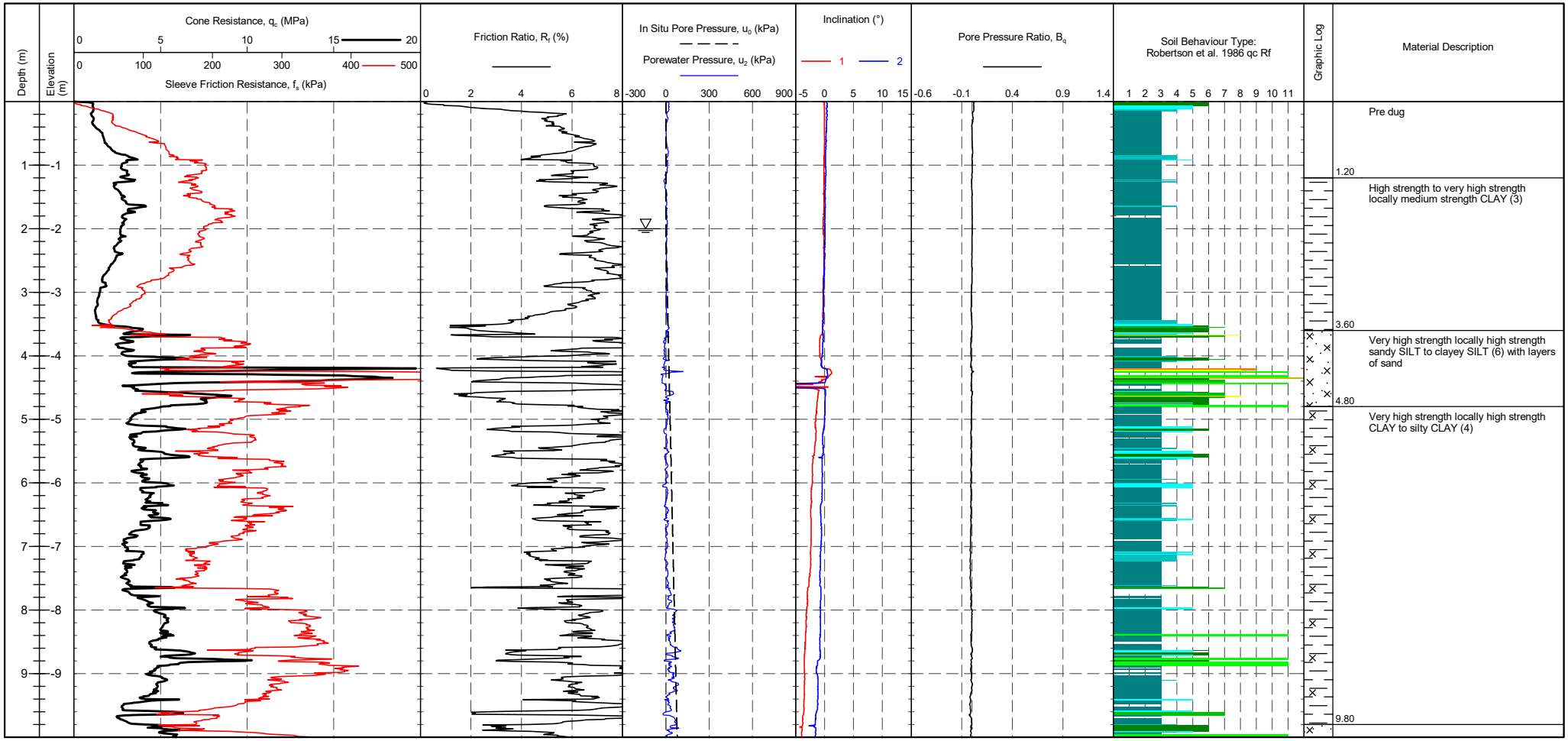
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 28B**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	307 mV	308 mV	0.011 MPa
Sleeve	270 mV	267 mV	-0.002 kPa
Pore Pressure 2	246 mV	236 mV	-0.003 kPa
X-Y Inclinometer	2411 mV	2420 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

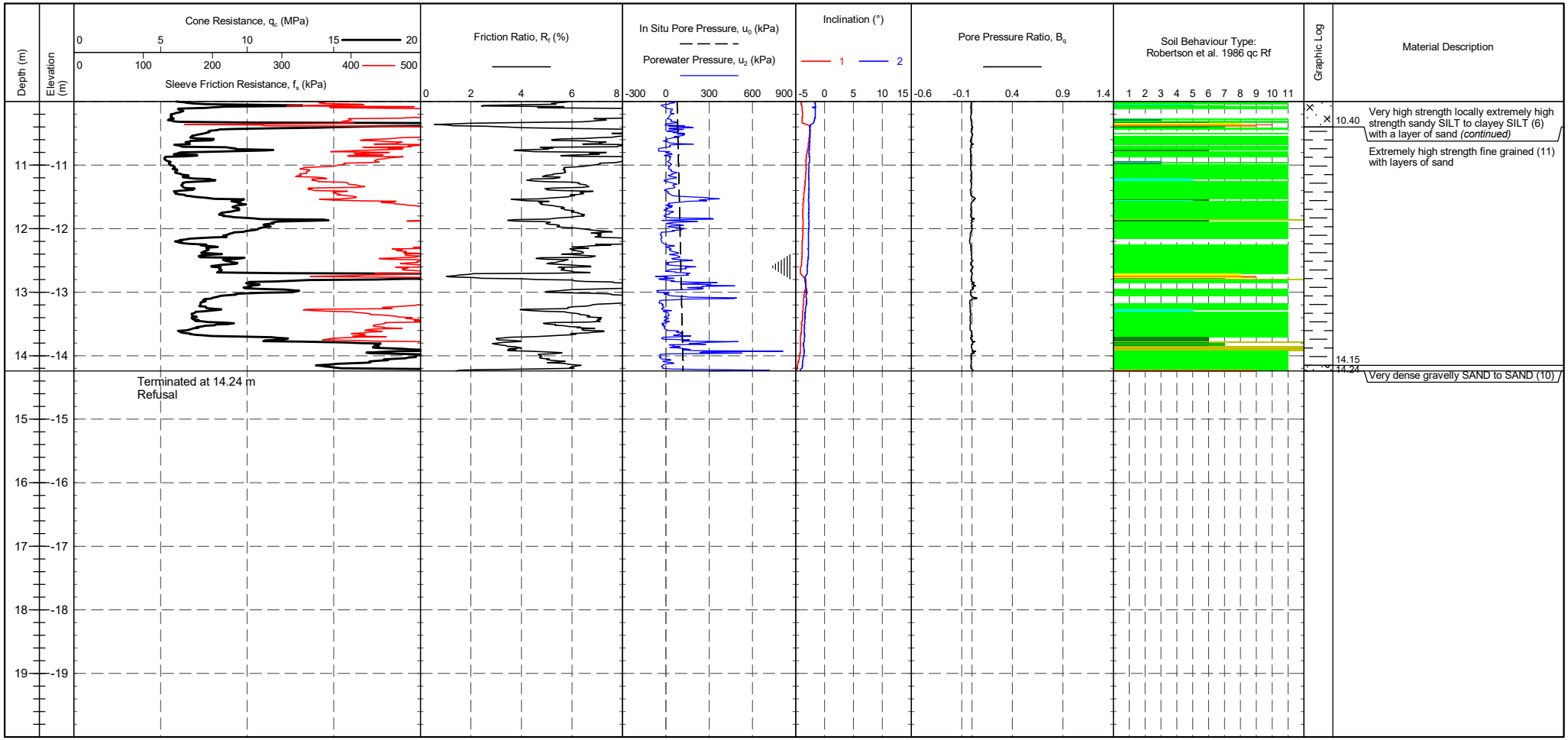
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



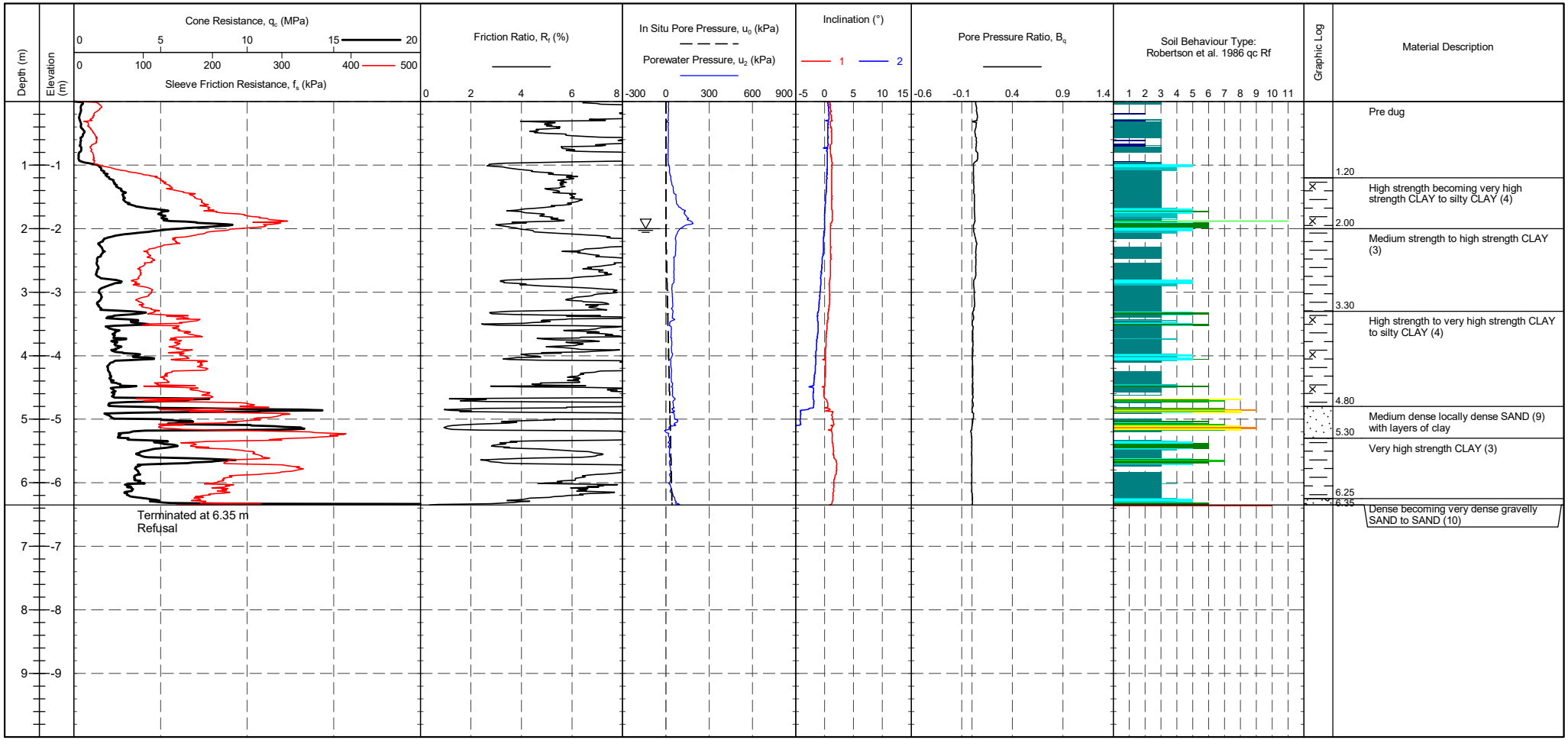
CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 307 mV / 308 mV / 0.011 MPa Sleeve: 270 mV / 267 mV / -0.002 kPa Pore Pressure 2: 246 mV / 236 mV / -0.003 kPa X-Y Inclinometer: 2411 mV / 2420 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand	Groundwater Level Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 29**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 29 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 281 mV / 280 mV / -0.001 kPa Pore Pressure 2 / 223 mV / 240 mV / 0.005 kPa X-Y Inclinometer / 2466 mV / 2429 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

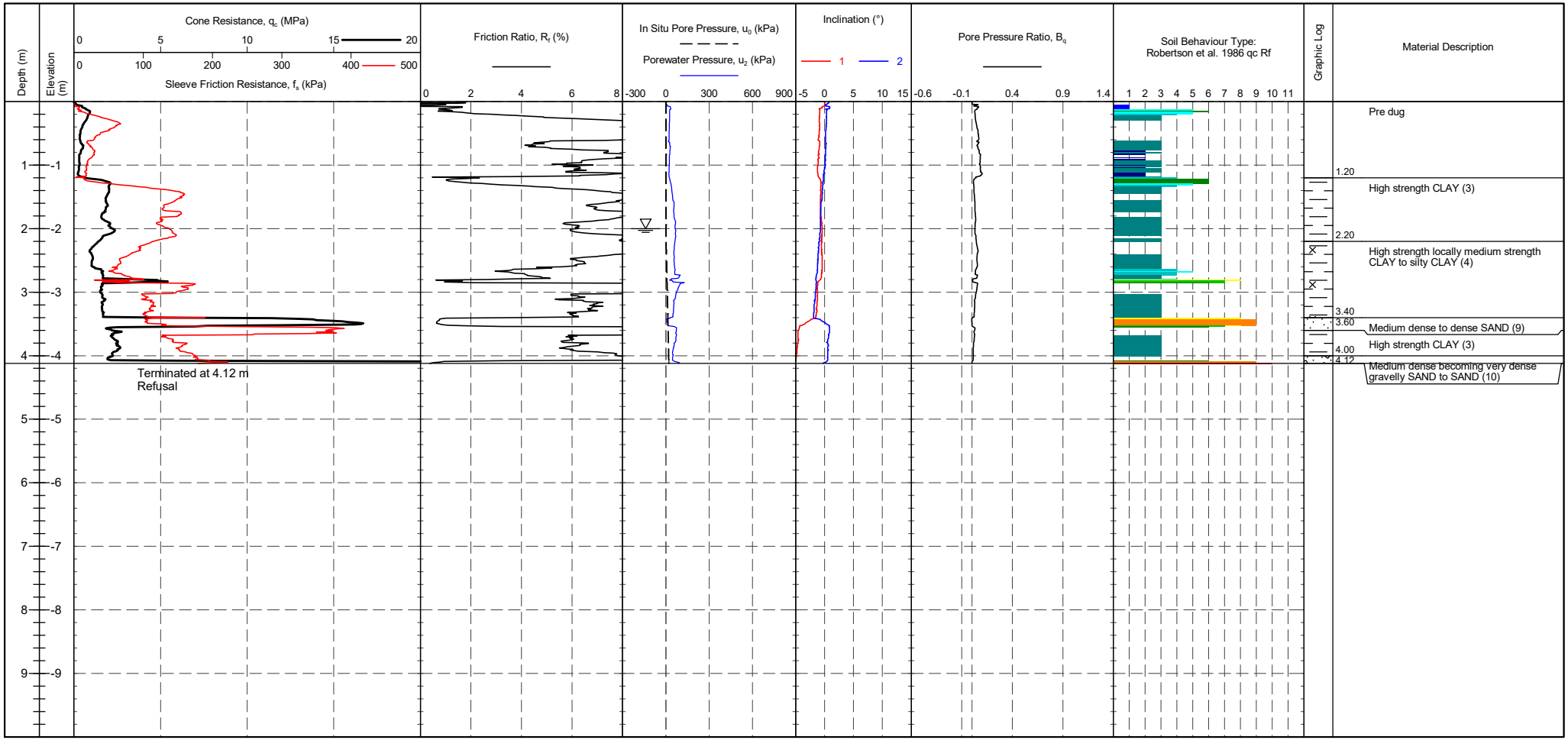
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 30

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 30 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 304 mV / 307 mV / 0.033 MPa Sleeve: 280 mV / 283 mV / 0.002 kPa Pore Pressure 2: 231 mV / 234 mV / 0.001 kPa X-Y Inclinometer: 2437 mV / 2466 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

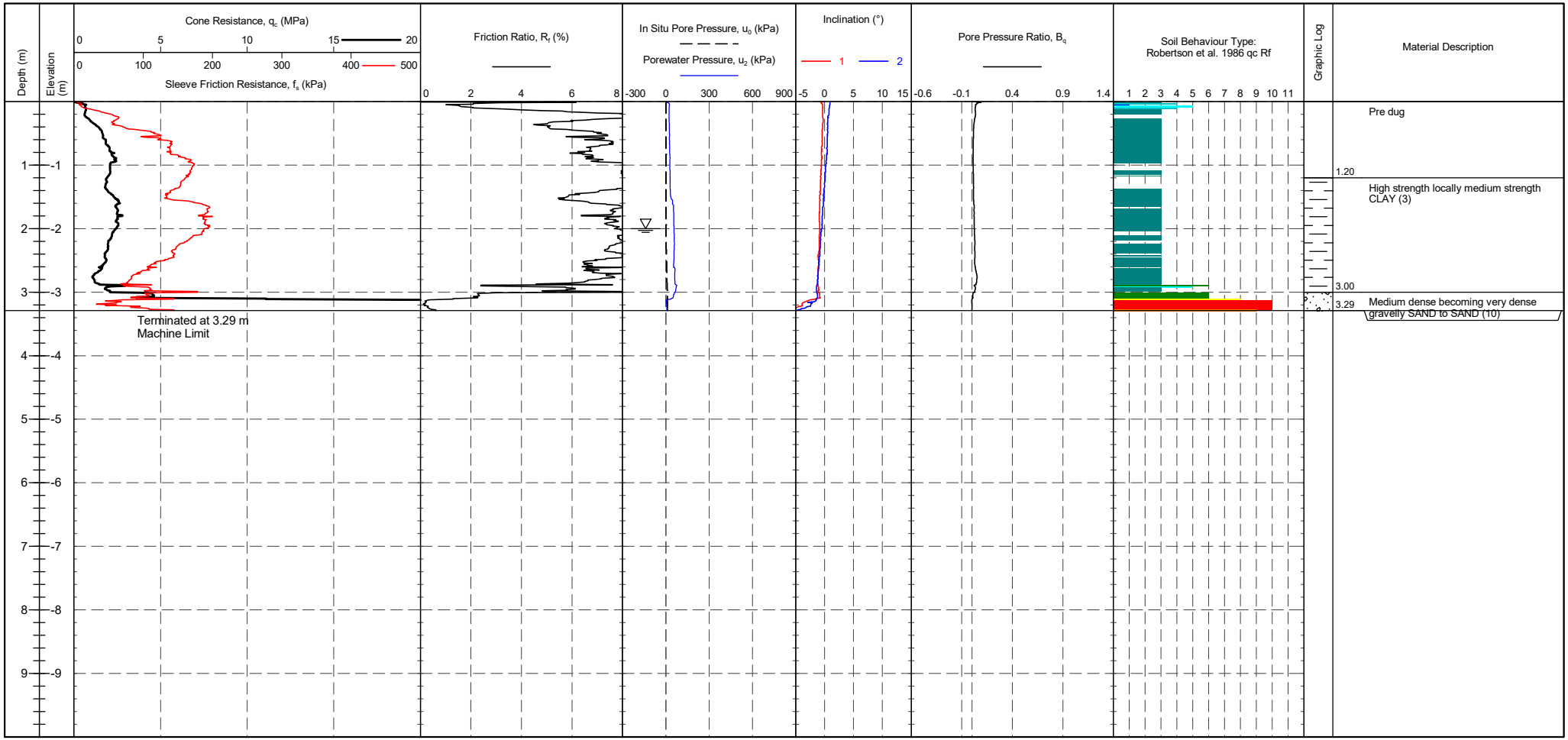
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 31**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	305 mV	309 mV	0.044 MPa
Sleeve	282 mV	285 mV	0.002 kPa
Pore Pressure 2	228 mV	230 mV	0.001 kPa
X-Y Inclinometer	2432 mV	2438 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

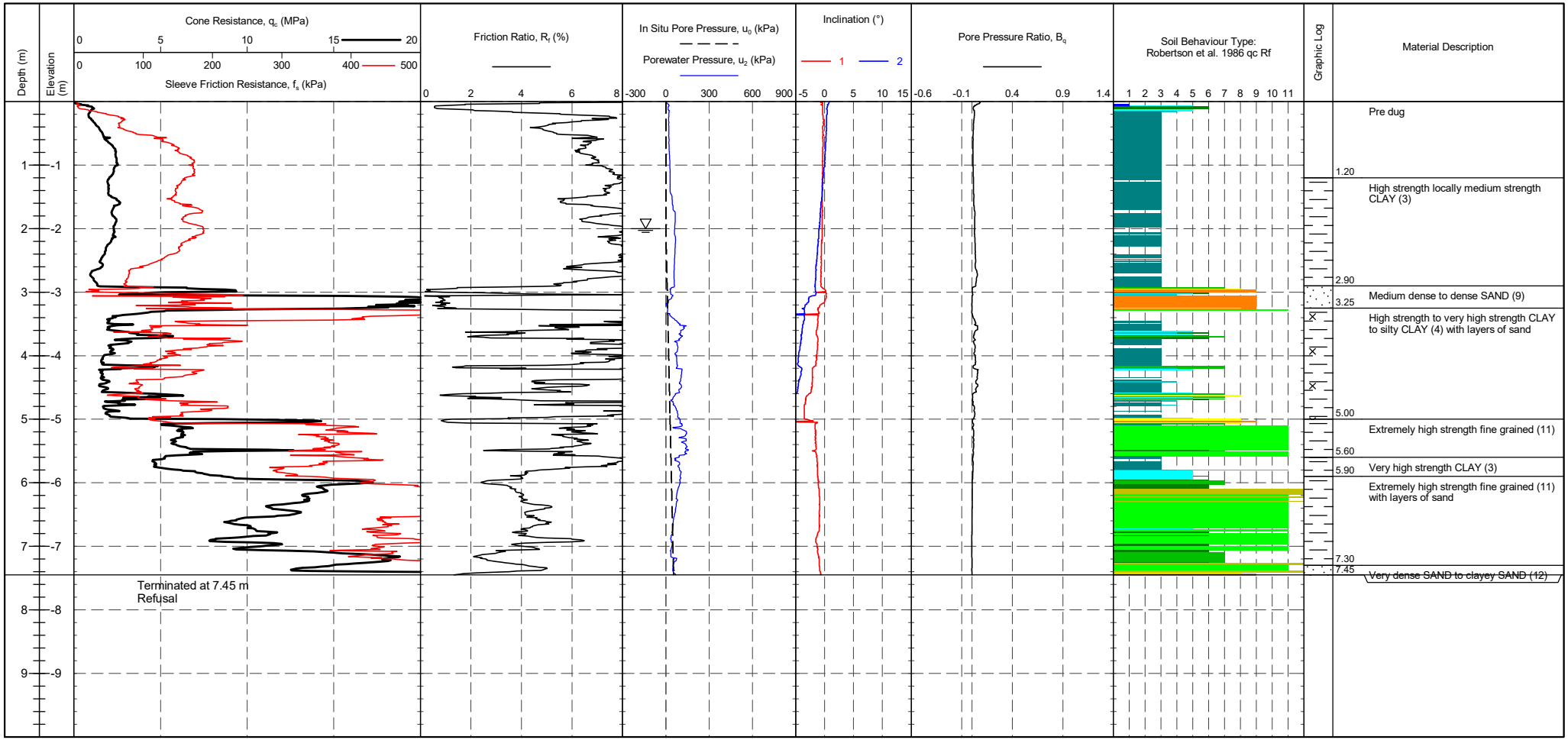
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 31A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31A WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	308 mV	305 mV	-0.033 MPa
Sleeve	284 mV	281 mV	-0.002 kPa
Pore Pressure 2	229 mV	211 mV	-0.005 kPa
X-Y Inclinometer	2439 mV	2453 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

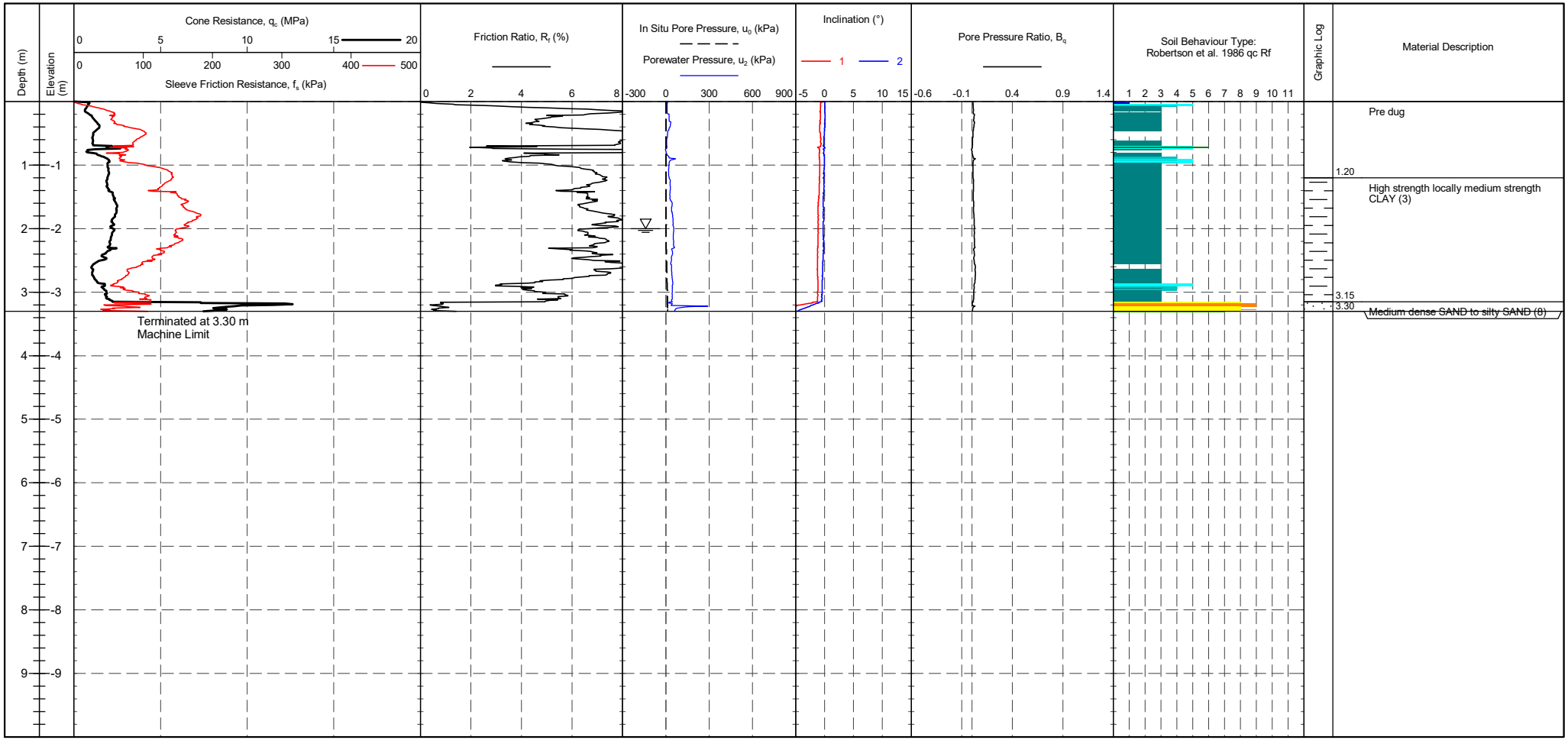
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 31B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31B WEATHER : Sunny & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	309 mV	312 mV	0.033 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	237 mV	282 mV	0.013 kPa
X-Y Inclinometer	2466 mV	2413 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

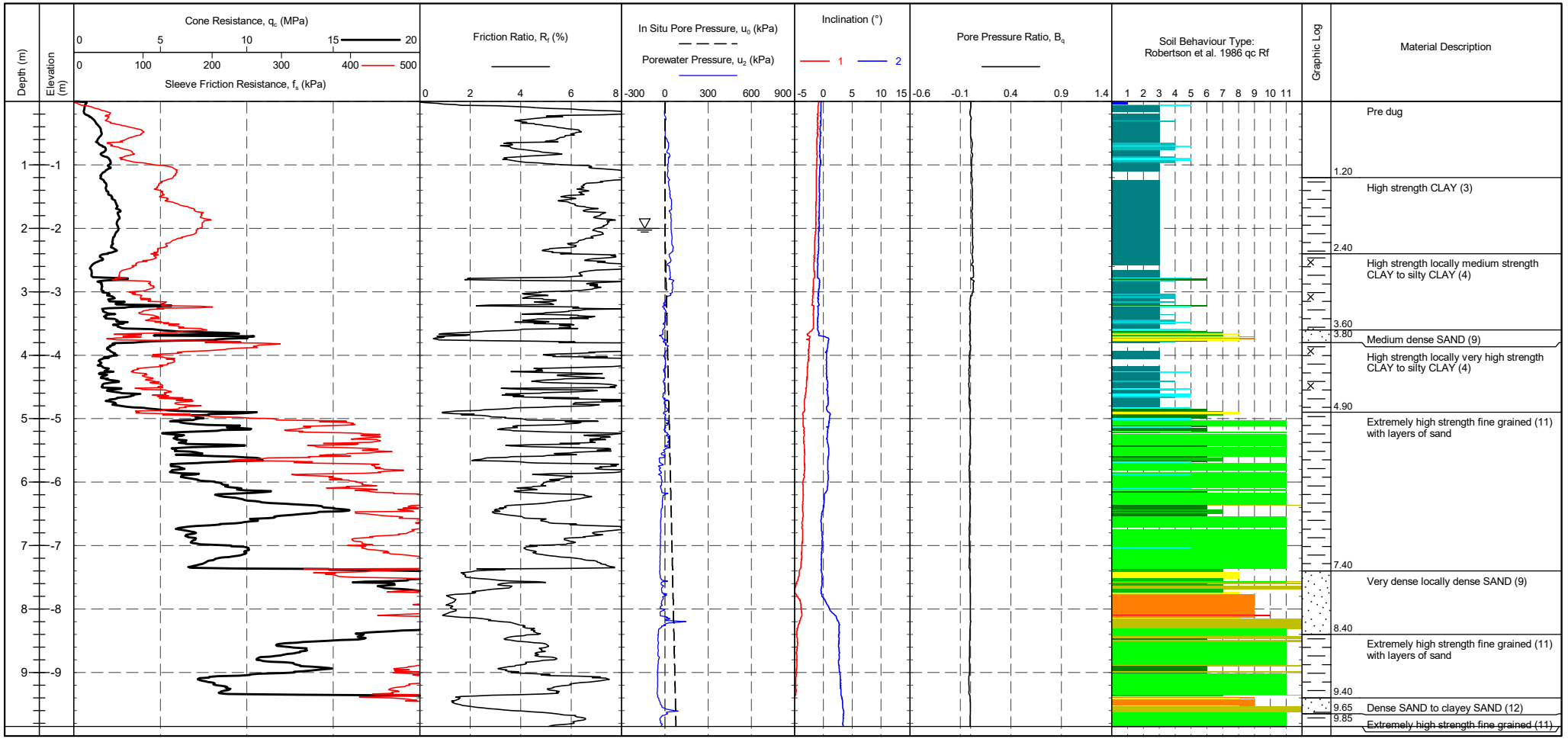
Groundwater Level
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	311 mV	308 mV	-0.033 MPa
Sleeve	273 mV	264 mV	-0.006 kPa
Pore Pressure 2	266 mV	99 mV	-0.047 kPa
X-Y Inclinometer	2405 mV	2420 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

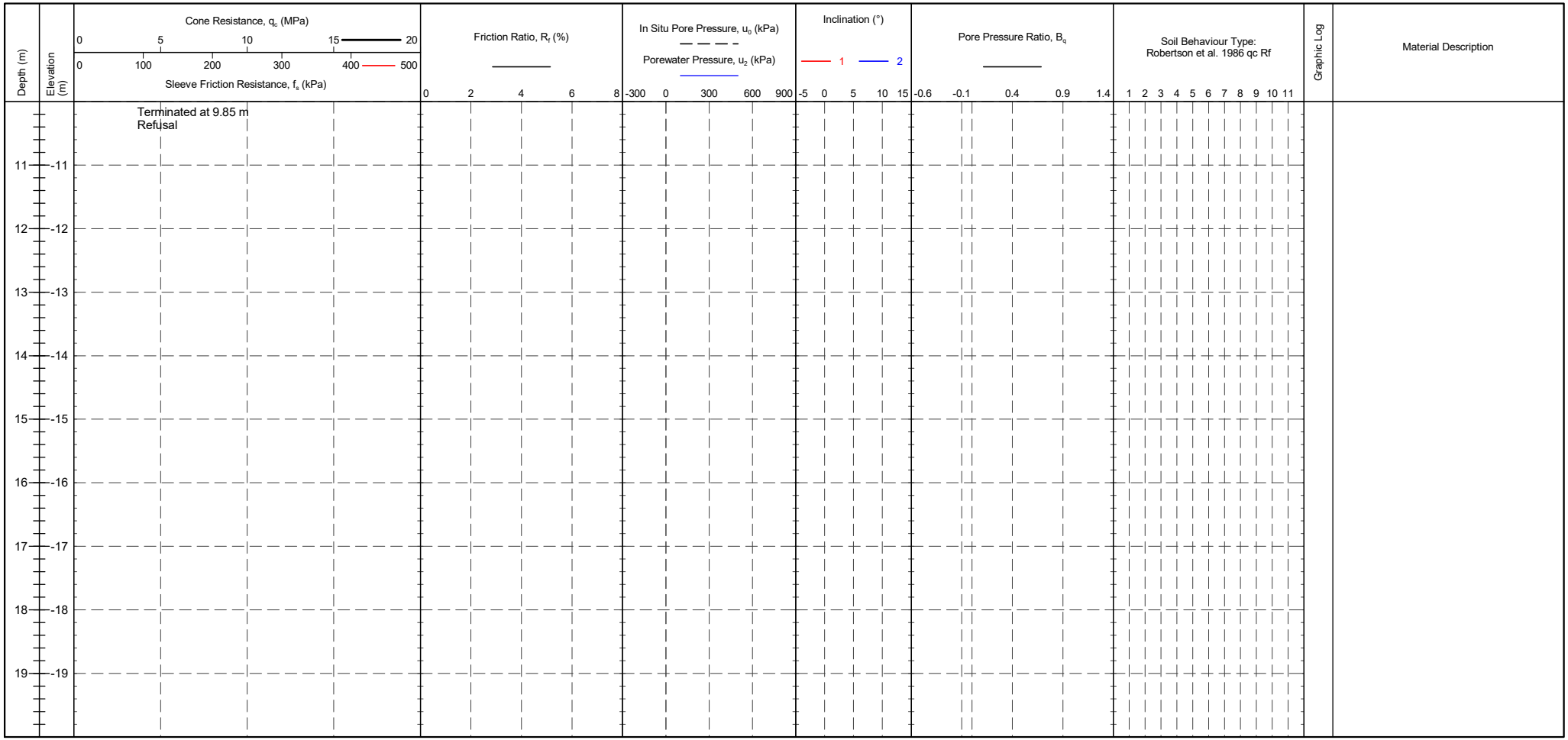
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 31C

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on sleeve friction.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31C WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 311 mV / 308 mV / -0.033 MPa Sleeve: 273 mV / 264 mV / -0.006 kPa Pore Pressure 2: 266 mV / 99 mV / -0.047 kPa X-Y Inclinometer: 2405 mV / 2420 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

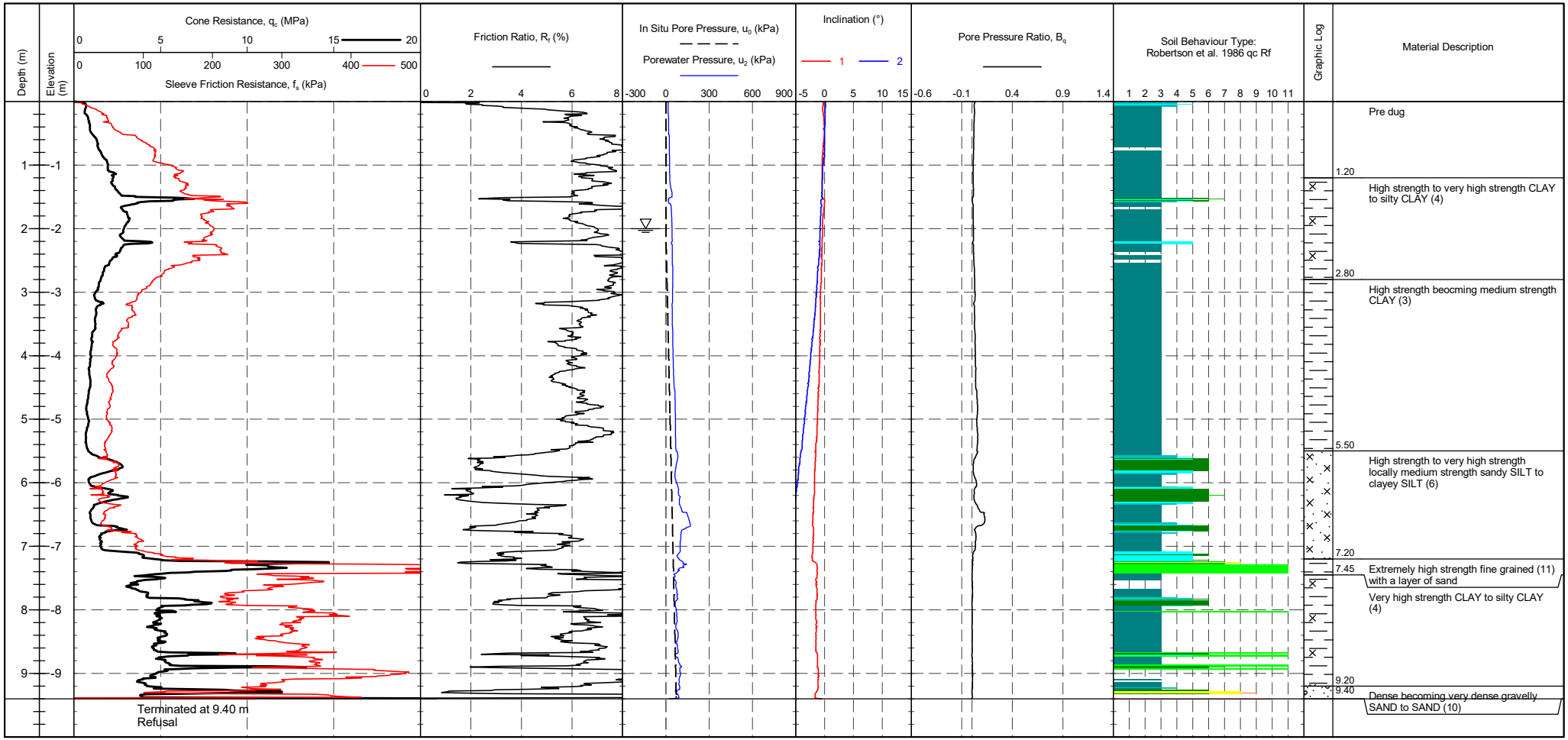
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 32

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32 WEATHER : Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	304 mV	310 mV	0.066 MPa
Sleeve	267 mV	275 mV	0.006 kPa
Pore Pressure 2	234 mV	300 mV	0.019 kPa
X-Y Inclinometer	2439 mV	2437 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

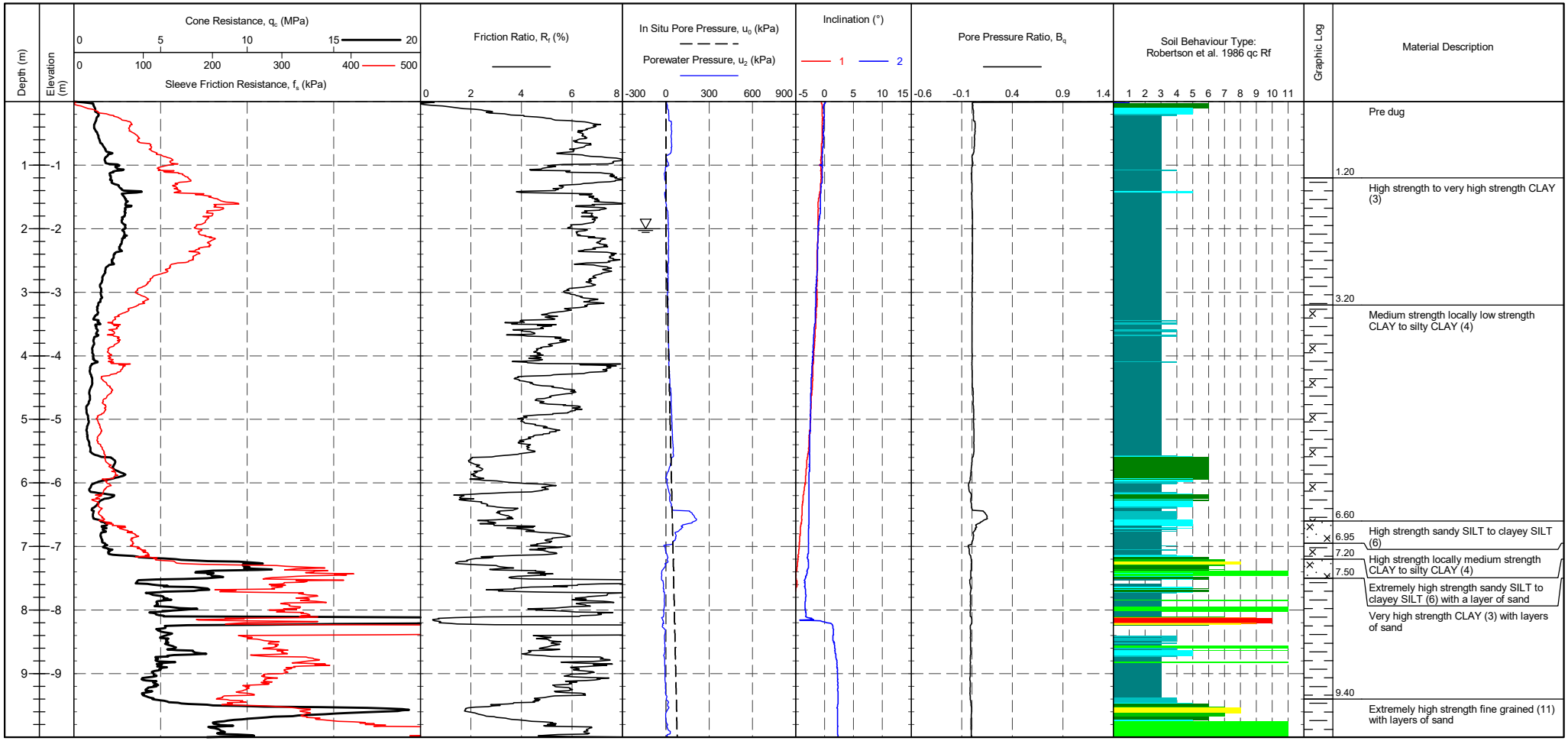
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 32B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	309 mV	307 mV	-0.022 MPa
Sleeve	266 mV	268 mV	0.001 kPa
Pore Pressure 2	170 mV	234 mV	0.018 kPa
X-Y Inclinometer	2408 mV	2483 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

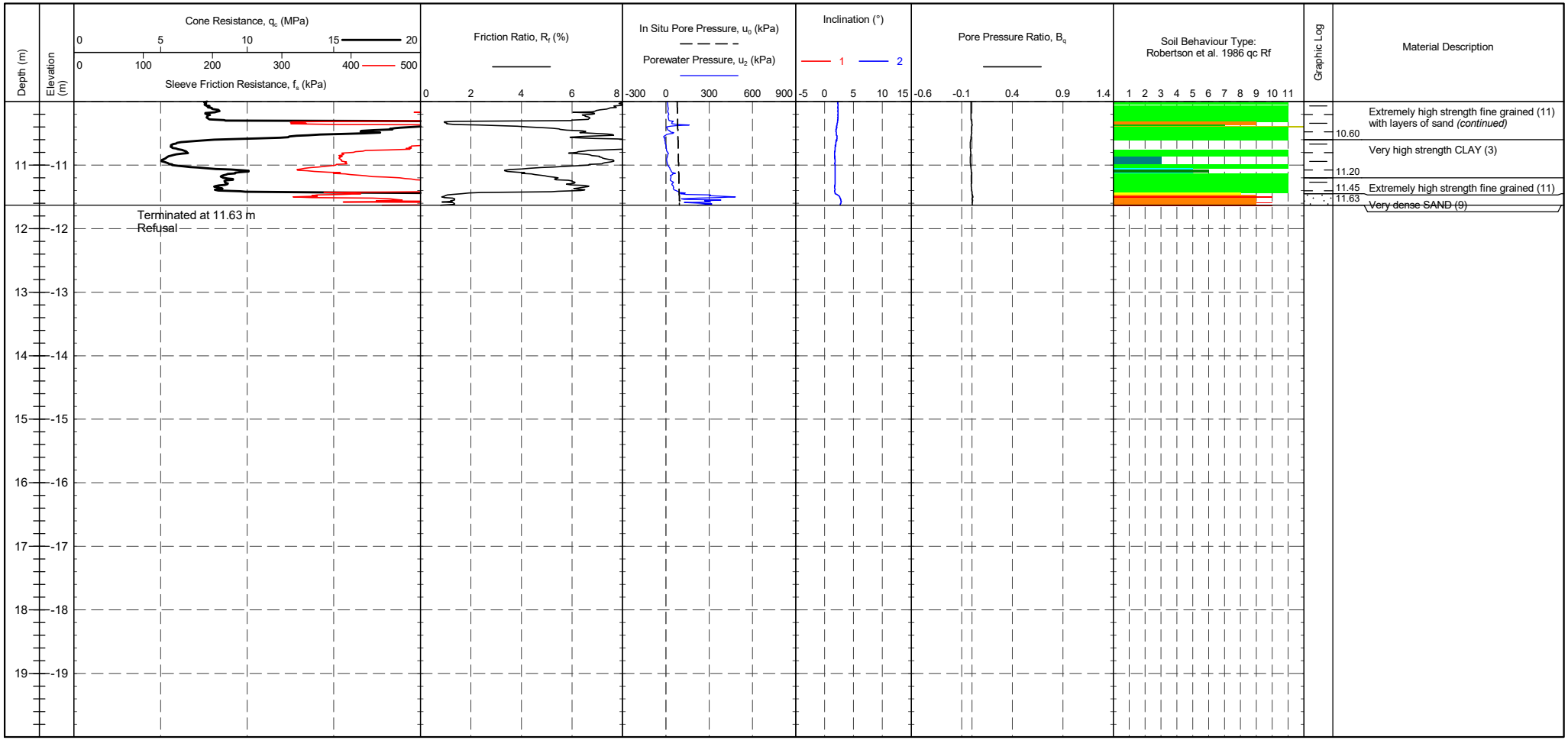
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 32B**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 32B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 309 mV / 307 mV / -0.022 MPa Sleeve: 266 mV / 268 mV / 0.001 kPa Pore Pressure 2: 170 mV / 234 mV / 0.018 kPa X-Y Inclinometer: 2408 mV / 2483 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION

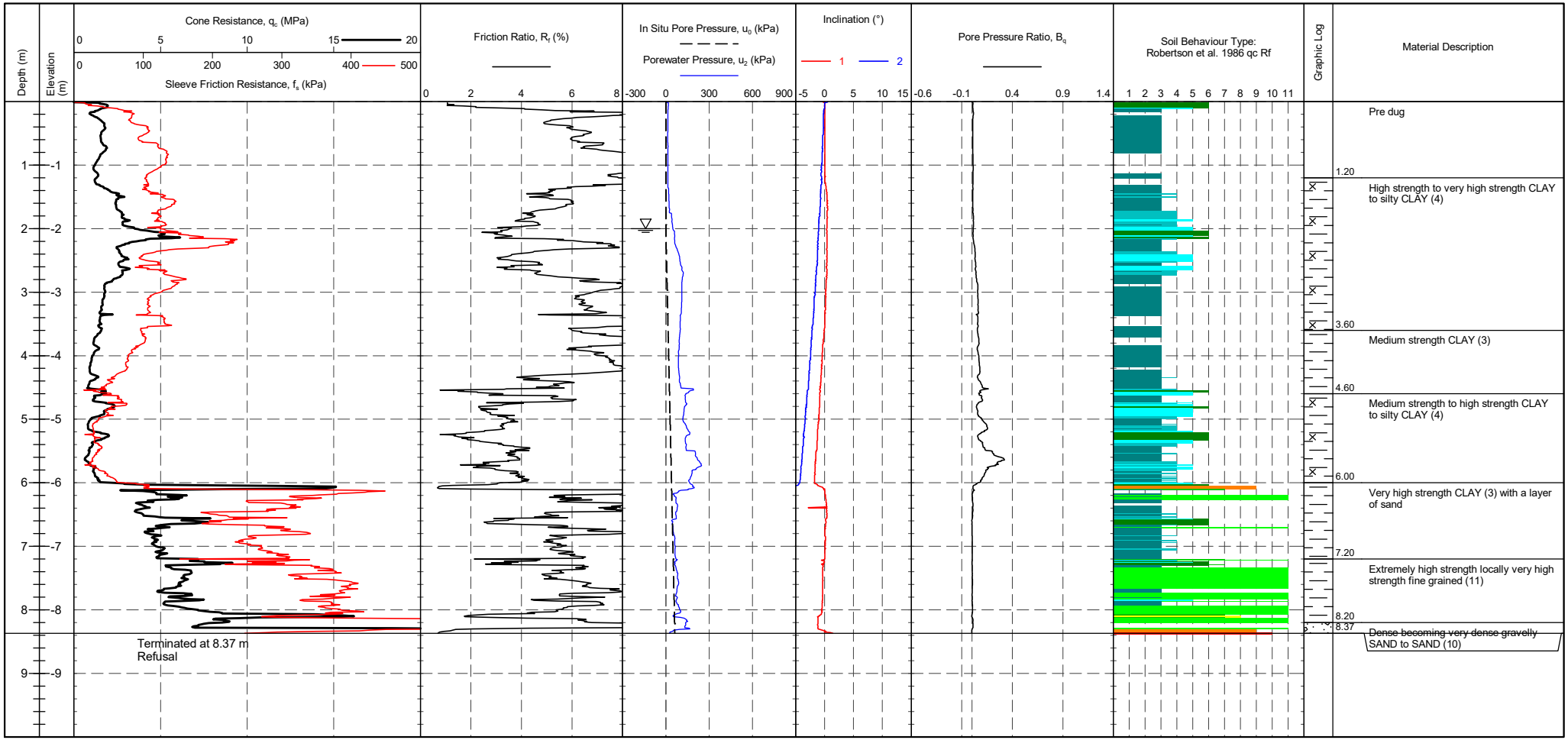
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 33

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 10/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 33 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	282 mV	268 mV	-0.01 kPa
Pore Pressure 2	225 mV	259 mV	0.01 kPa
X-Y Inclinometer	2530 mV	2436 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

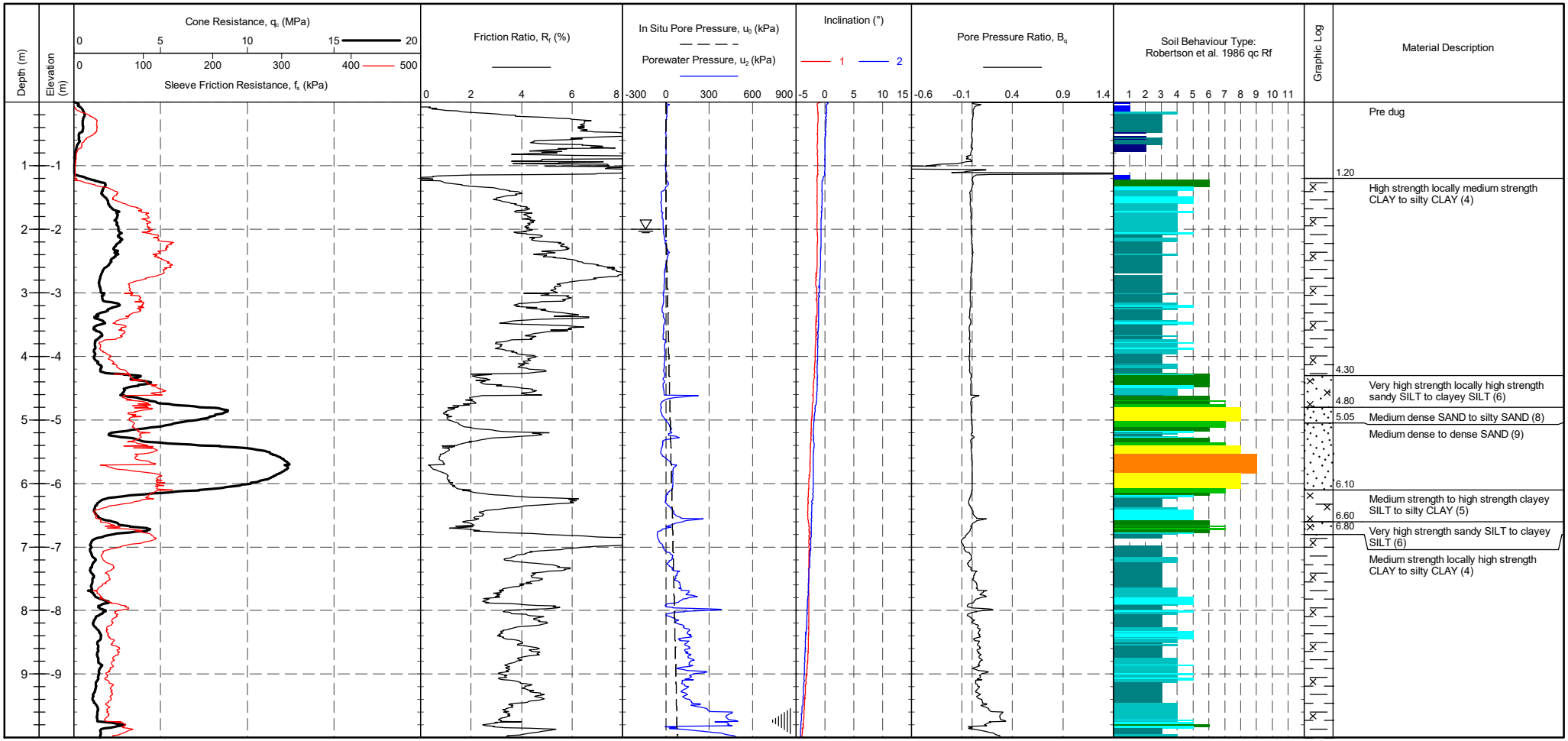
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 14**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	309 mV	308 mV	-0.011 MPa
Sleeve	277 mV	271 mV	-0.004 kPa
Pore Pressure 2	242 mV	271 mV	0.008 kPa
X-Y Inclinometer	2403 mV	2427 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

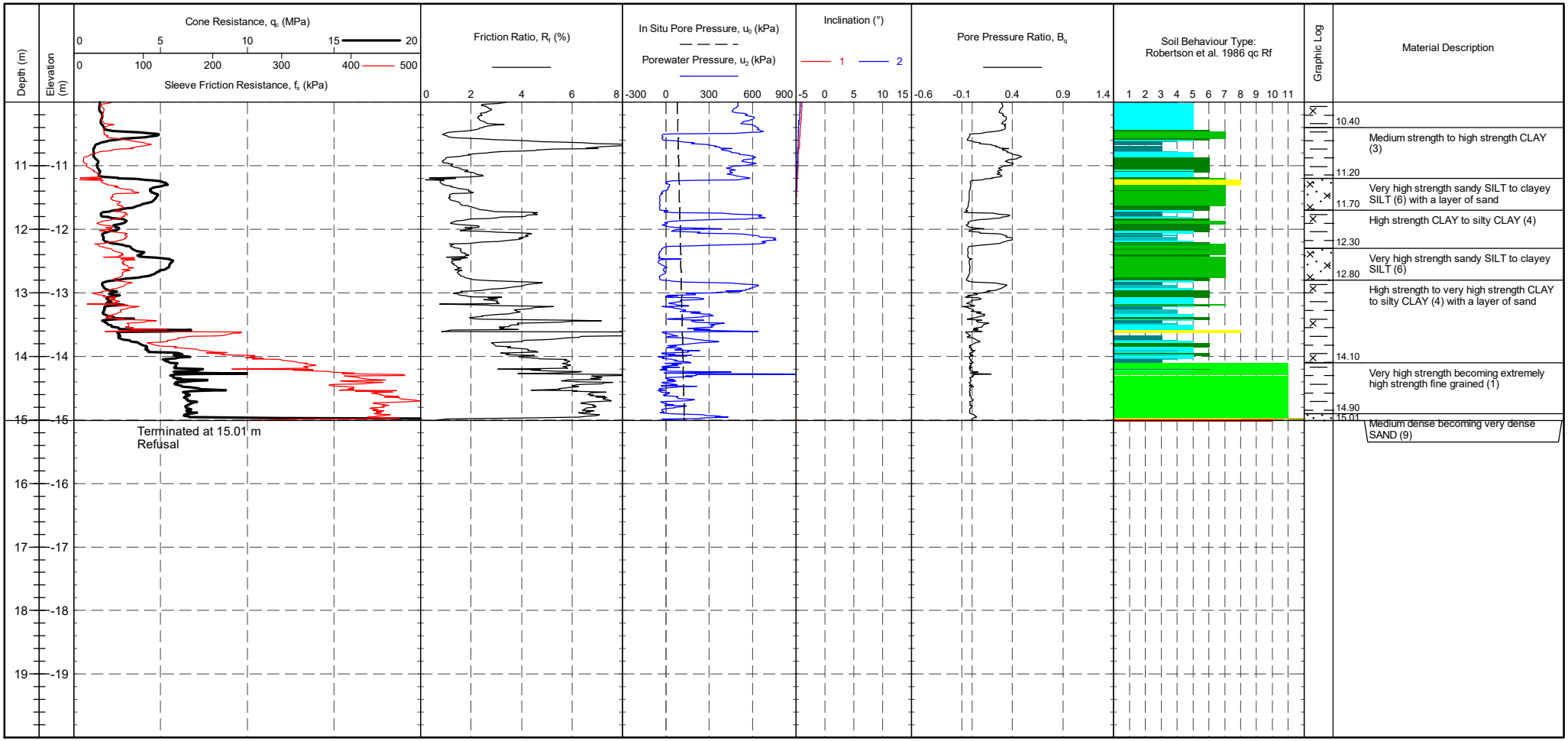
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 14

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 14 WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 309 mV / 308 mV / -0.011 MPa Sleeve / 277 mV / 271 mV / -0.004 kPa Pore Pressure 2 / 242 mV / 271 mV / 0.008 kPa X-Y Inclinometer / 2403 mV / 2427 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

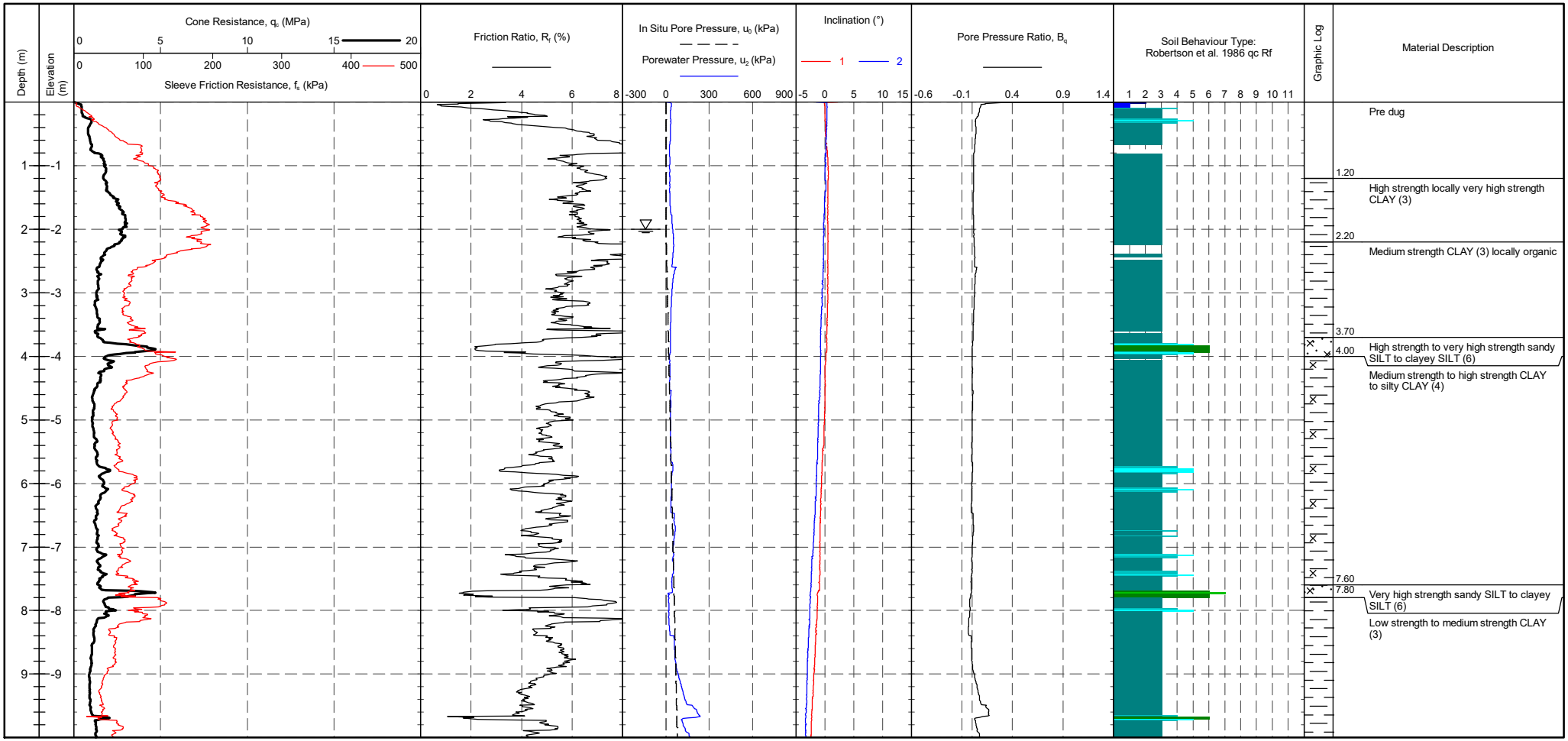
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	305 mV	306 mV	0.011 MPa
Sleeve	263 mV	266 mV	0.002 kPa
Pore Pressure 2	260 mV	235 mV	-0.007 kPa
X-Y Inclinometer	2427 mV	2439 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

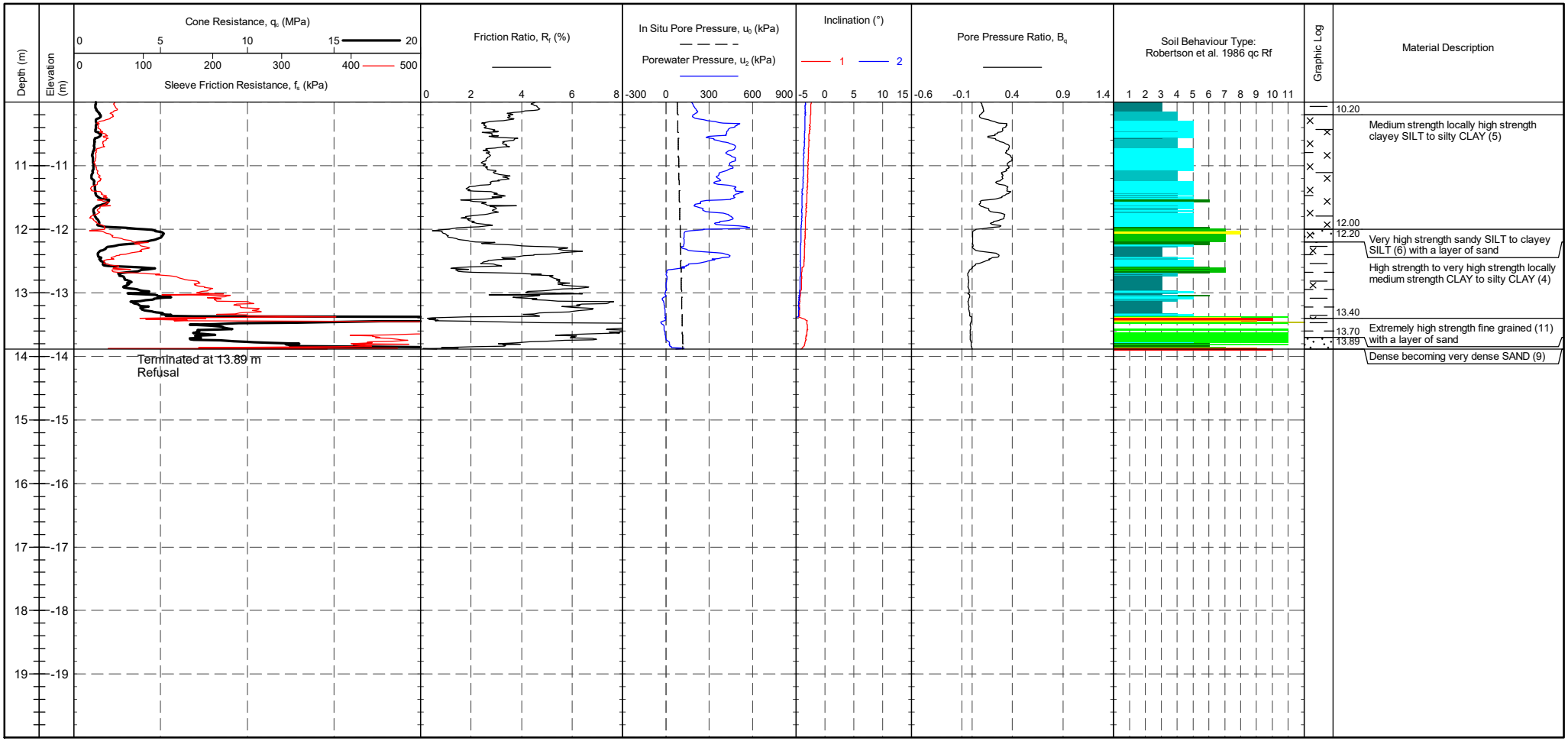
CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 15

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 15 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 306 mV / 0.011 MPa Sleeve / 263 mV / 266 mV / 0.002 kPa Pore Pressure 2 / 260 mV / 235 mV / -0.007 kPa X-Y Inclinometer / 2427 mV / 2439 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

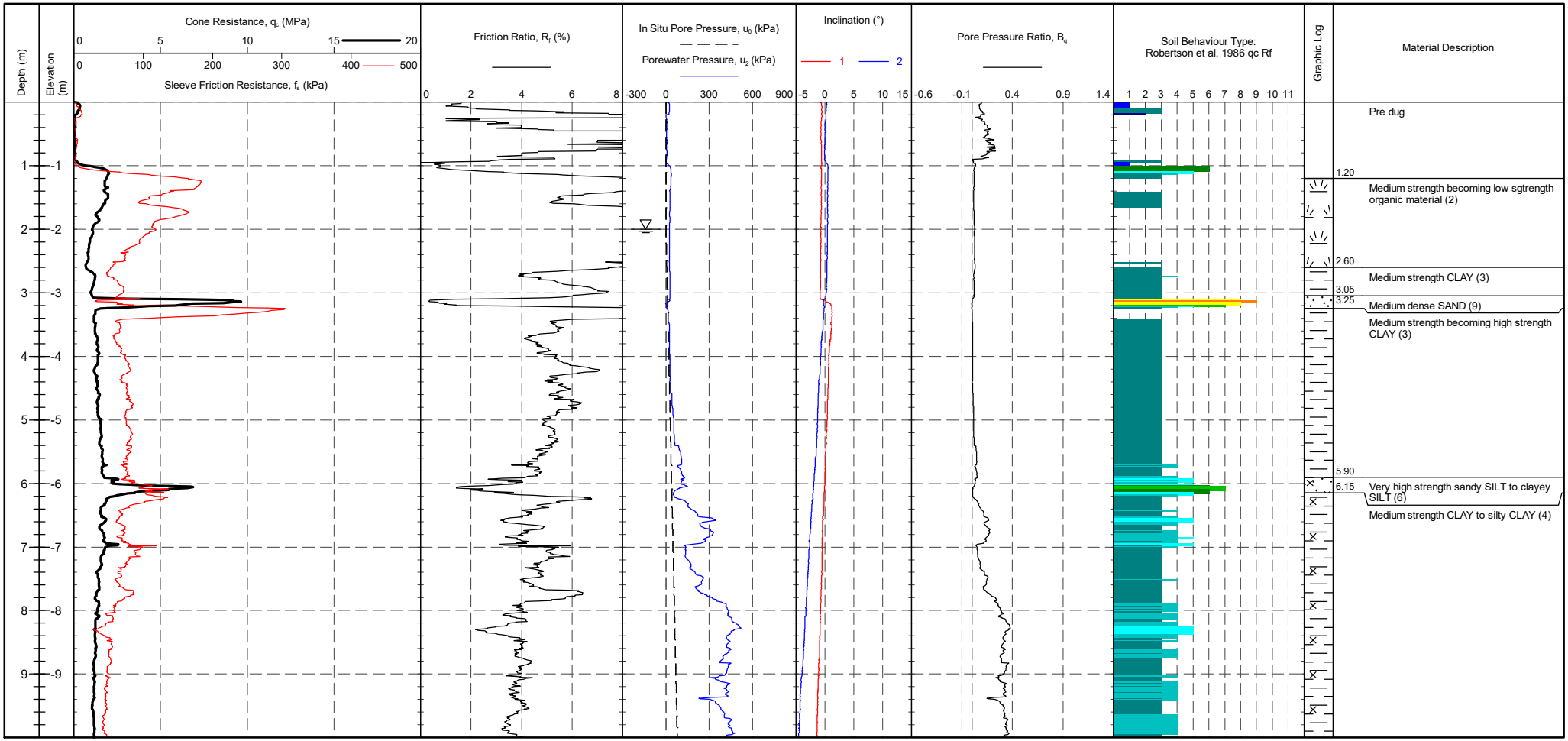
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 266 mV / 265 mV / -0.001 kPa Pore Pressure 2 / 227 mV / 262 mV / 0.01 kPa X-Y Inclinometer / 2411 mV / 2426 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

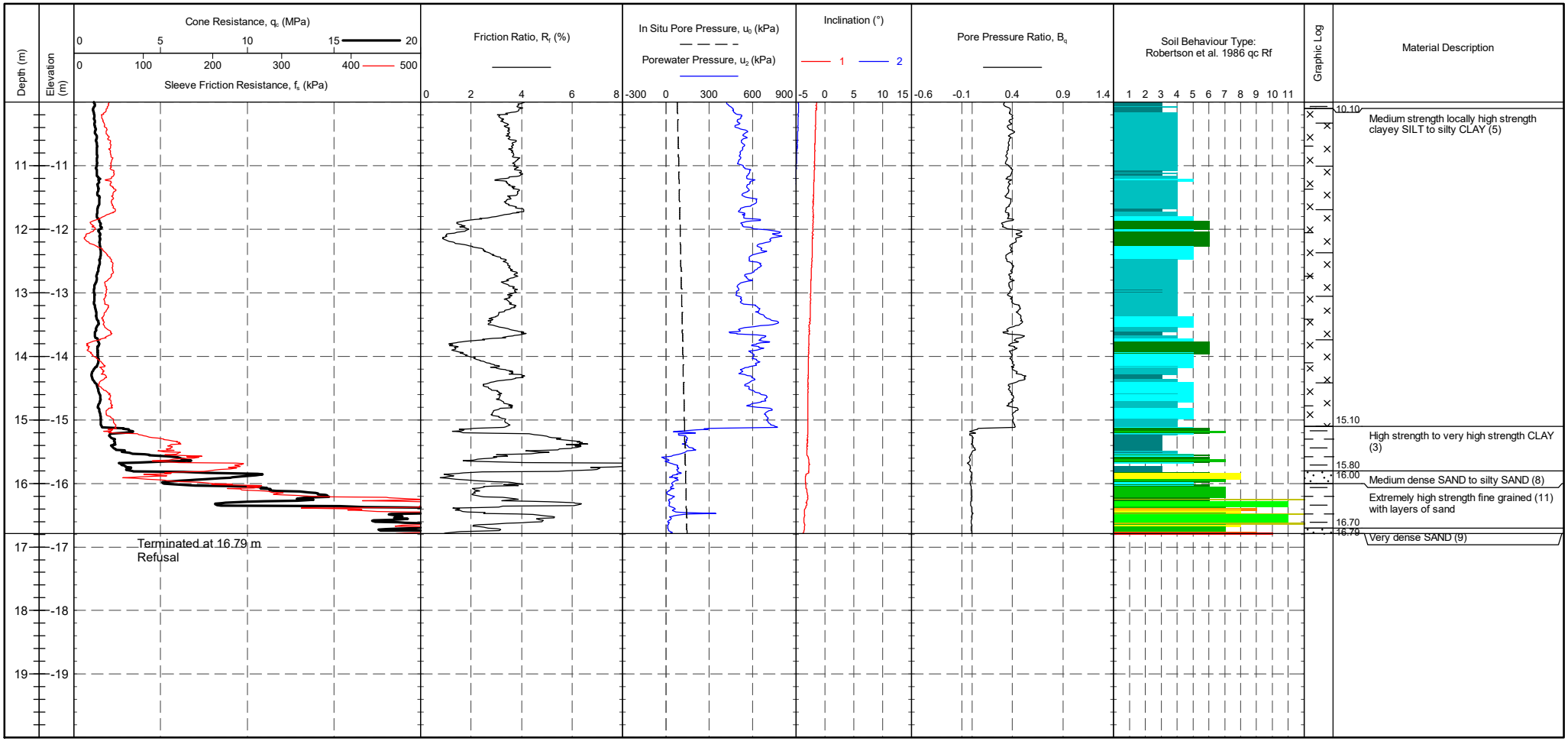
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 16

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 16 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 266 mV / 265 mV / -0.001 kPa Pore Pressure 2 / 227 mV / 262 mV / 0.01 kPa X-Y Inclinometer / 2411 mV / 2426 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

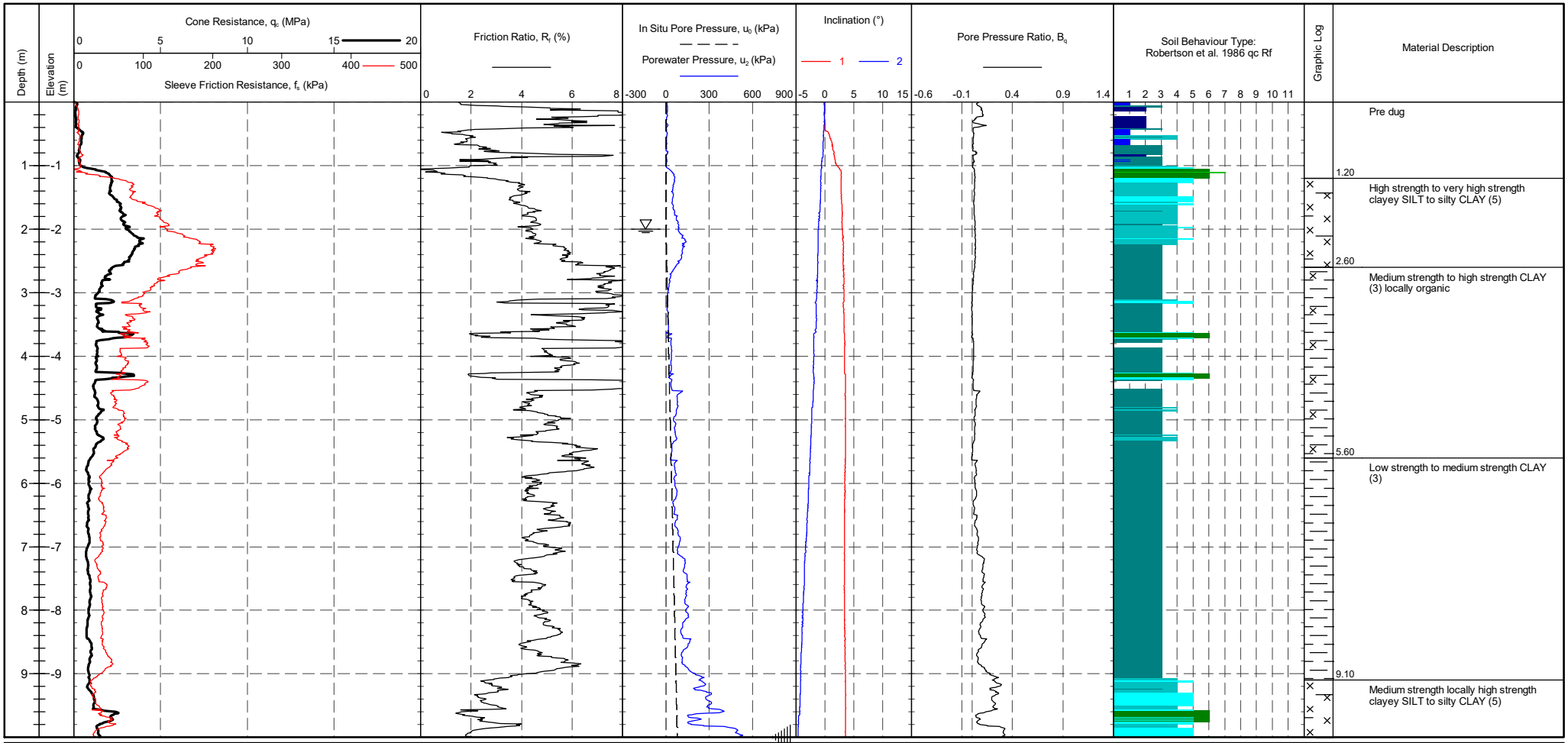
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	279 mV	273 mV	-0.004 kPa
Pore Pressure 2	238 mV	276 mV	0.011 kPa
X-Y Inclinometer	2446 mV	2466 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

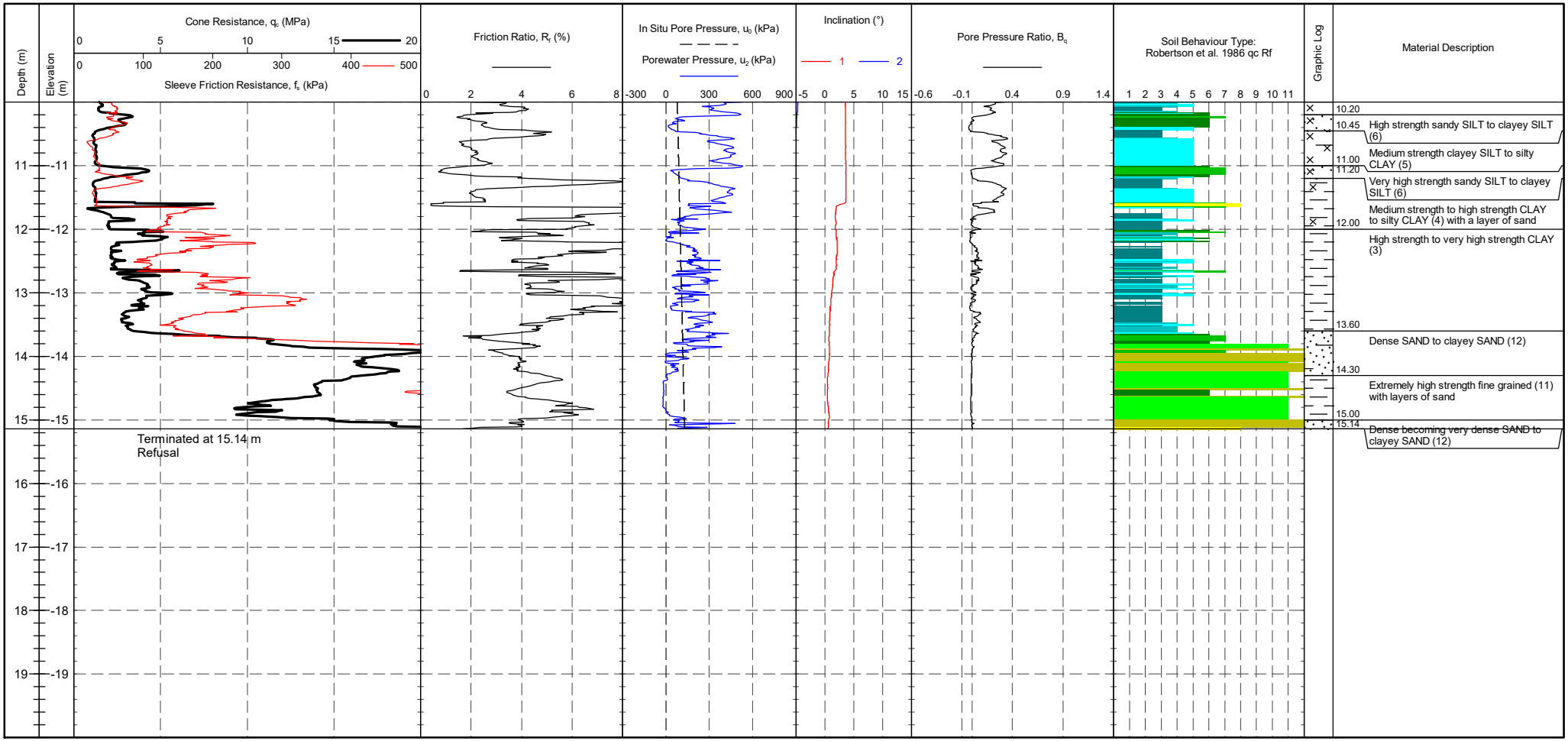
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 19

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 19 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 305 mV / 0 MPa Sleeve / 279 mV / 273 mV / -0.004 kPa Pore Pressure 2 / 238 mV / 276 mV / 0.011 kPa X-Y Inclinometer / 2446 mV / 2466 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

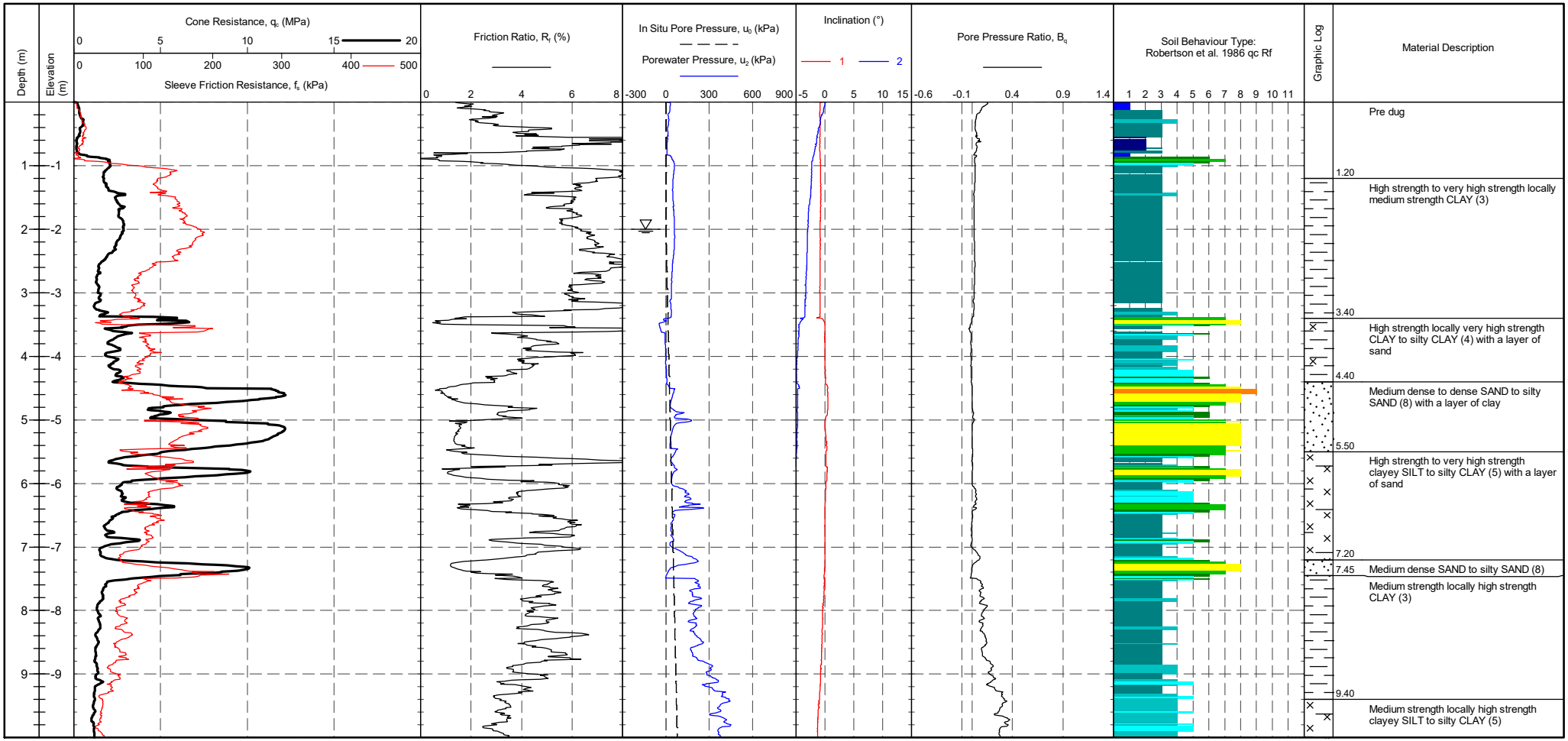
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 306 mV / 0 MPa Sleeve / 275 mV / 263 mV / -0.009 kPa Pore Pressure 2 / 278 mV / 269 mV / -0.003 kPa X-Y Inclinometer / 2428 mV / 2402 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

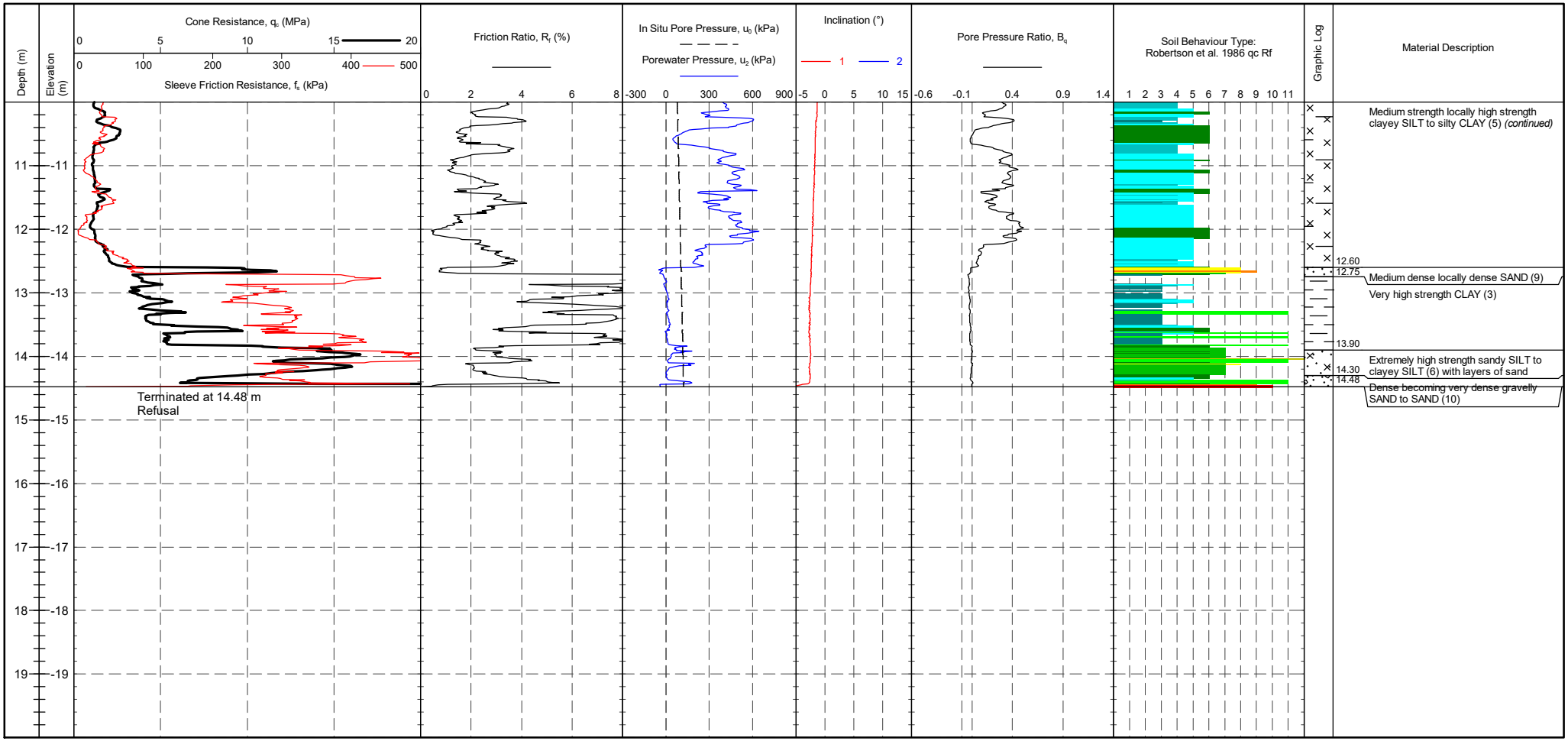
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 22

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 04/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 22 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 306 mV / 306 mV / 0 MPa Sleeve: 275 mV / 263 mV / -0.009 kPa Pore Pressure 2: 278 mV / 269 mV / -0.003 kPa X-Y Inclinometer: 2428 mV / 2402 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

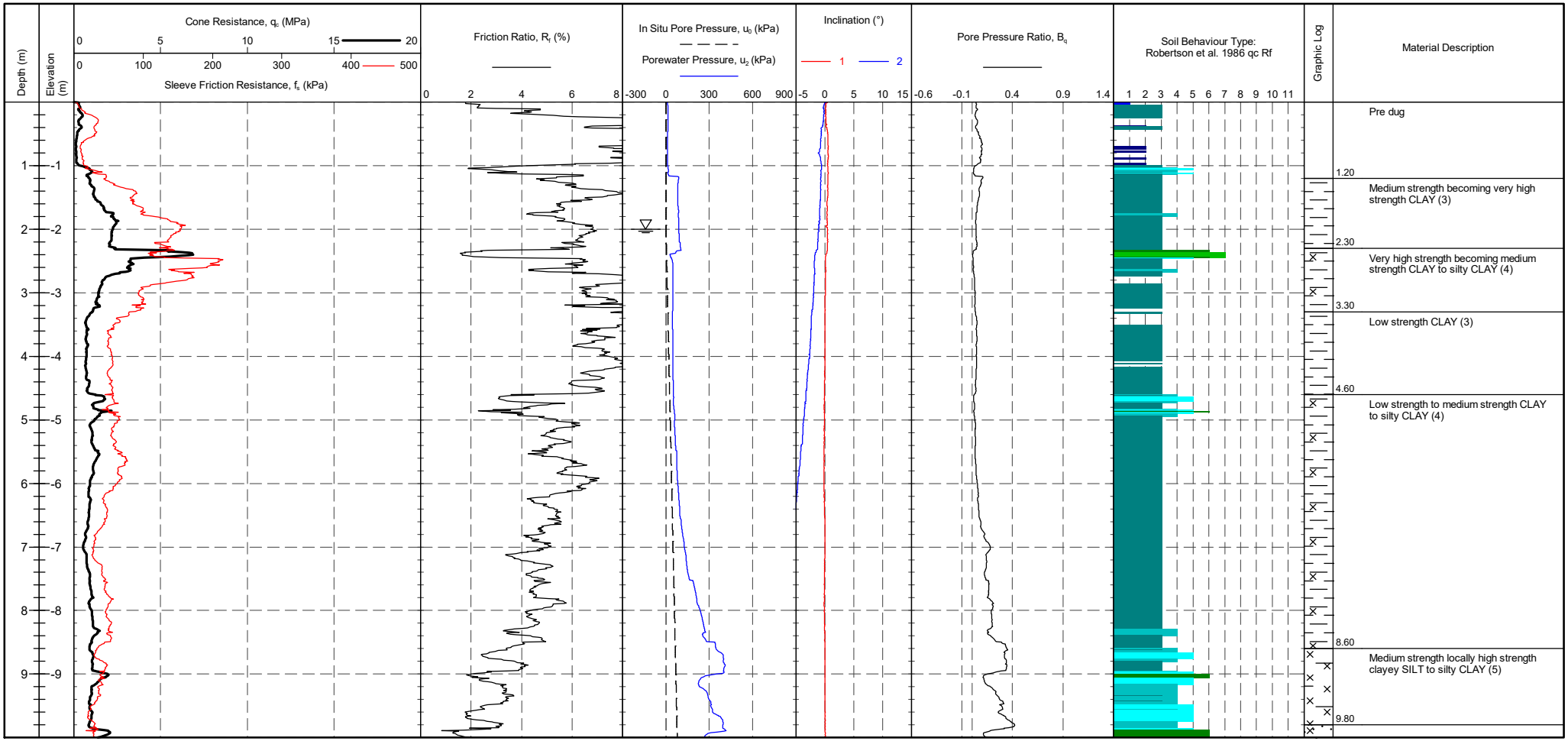
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	305 mV	305 mV	0 MPa
Sleeve	269 mV	269 mV	0 kPa
Pore Pressure 2	263 mV	361 mV	0.028 kPa
X-Y Inclinometer	2456 mV	2447 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

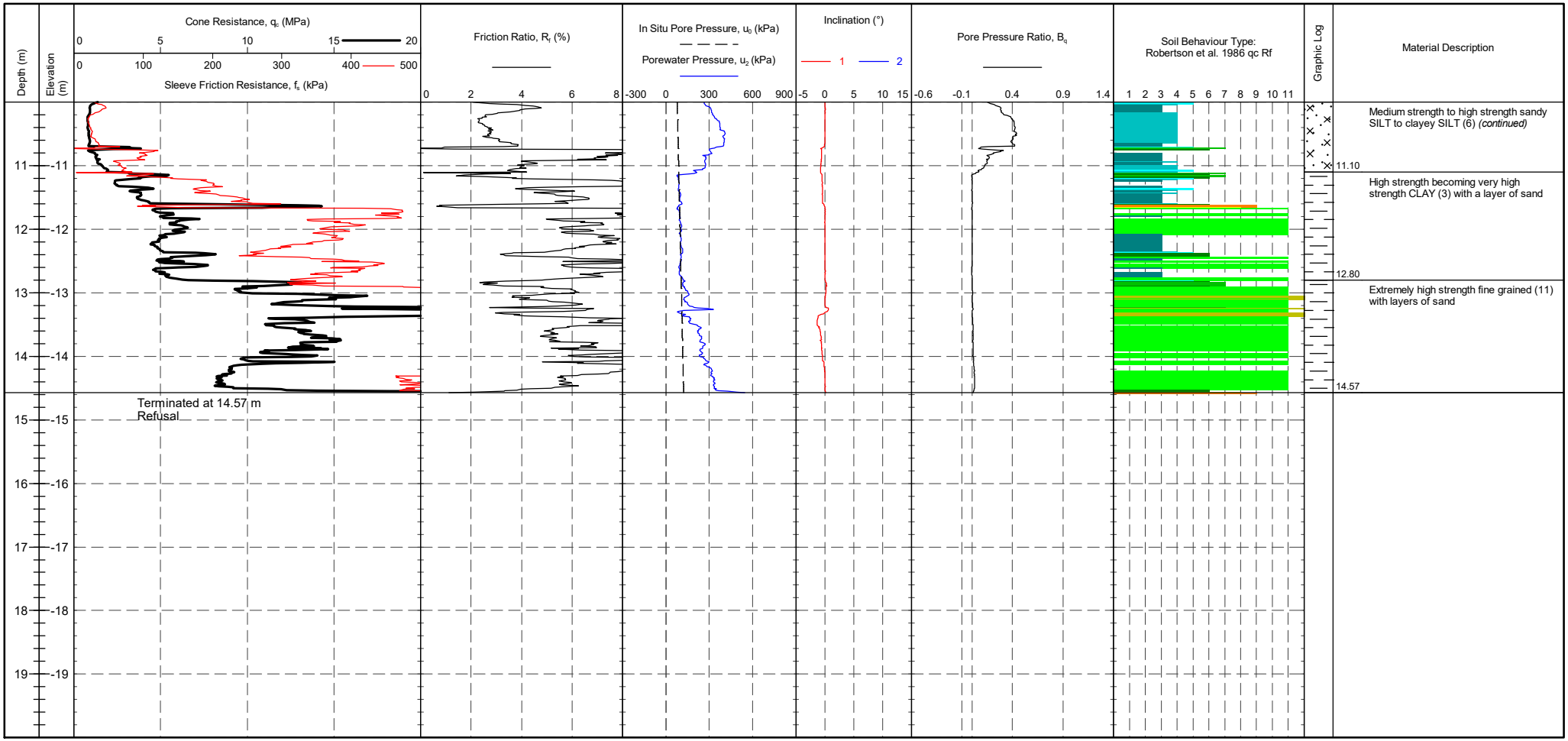
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 26

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 26 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 305 mV / 305 mV / 0 MPa Sleeve: 269 mV / 269 mV / 0 kPa Pore Pressure 2: 263 mV / 361 mV / 0.028 kPa X-Y Inclinometer: 2456 mV / 2447 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand	Groundwater Level Dissipation Test

IN SITU SITE INVESTIGATION

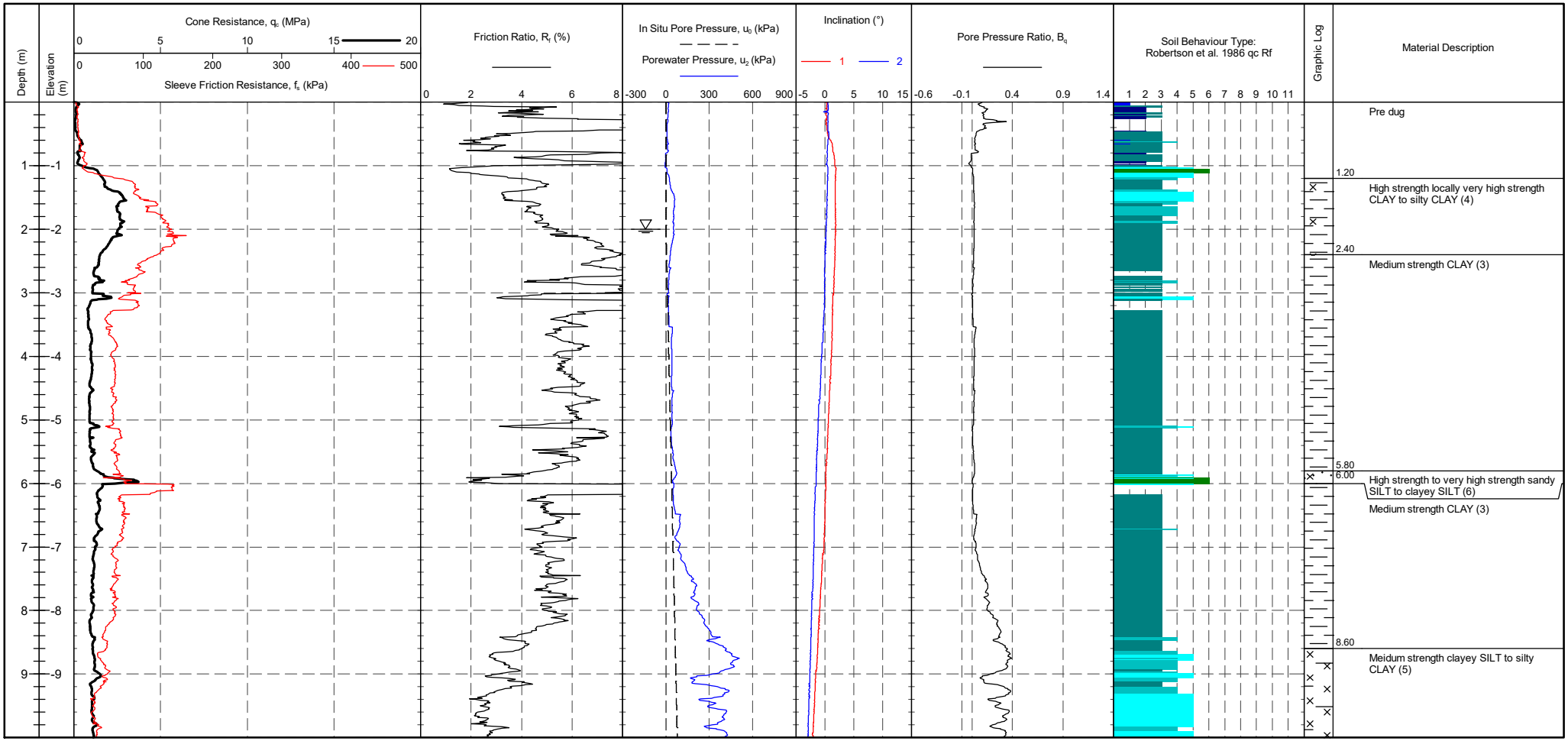
Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

CPT LOG 01

PointID

CPT 27

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



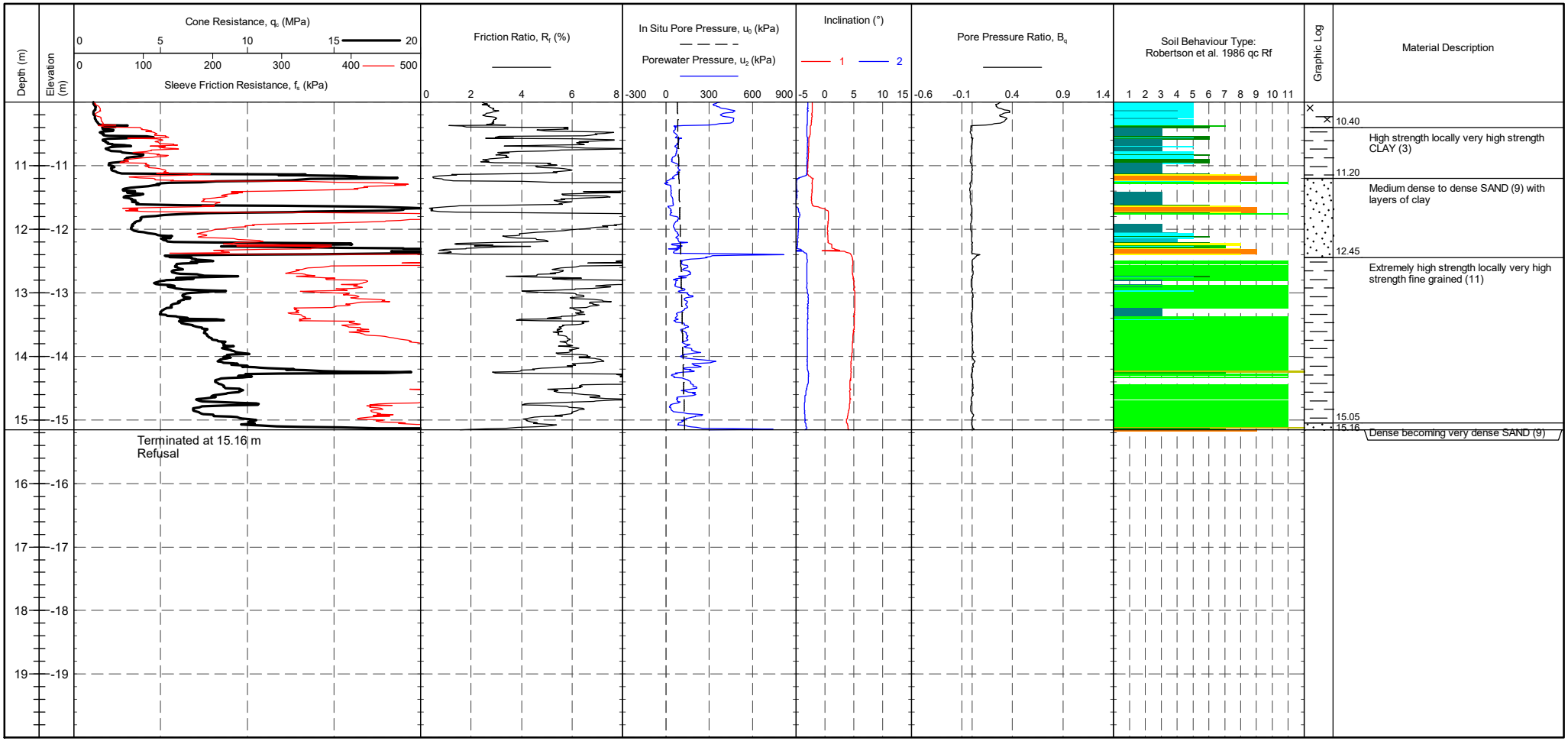
CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 301 mV / -0.055 MPa Sleeve / 292 mV / 284 mV / -0.006 kPa Pore Pressure 2 / 229 mV / 273 mV / 0.012 kPa X-Y Inclinometer / 2468 mV / 2511 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand	Groundwater Level Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 27**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 27 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 306 mV / 301 mV / -0.055 MPa Sleeve / 292 mV / 284 mV / -0.006 kPa Pore Pressure 2 / 229 mV / 273 mV / 0.012 kPa X-Y Inclinometer / 2468 mV / 2511 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

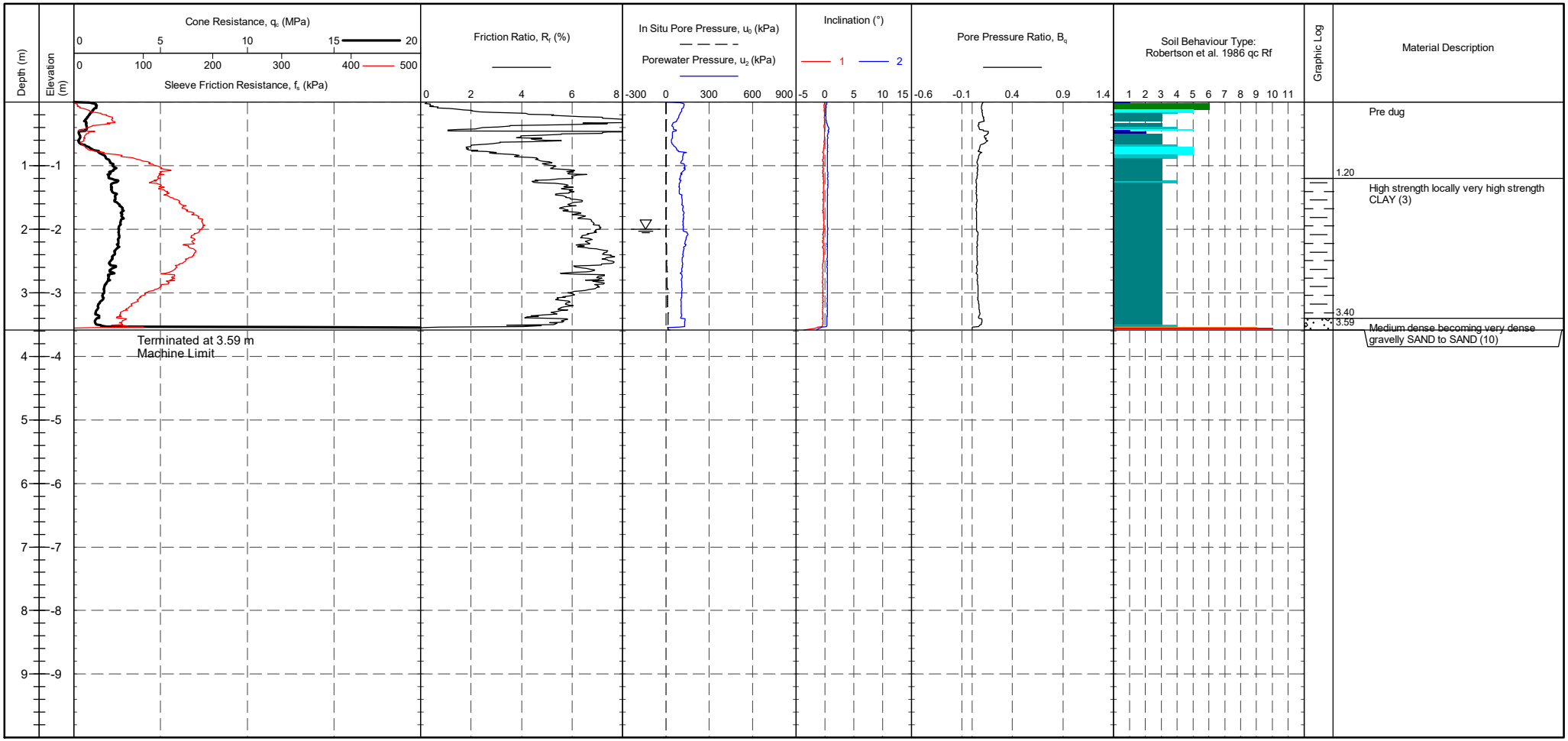
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 28

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 302 mV / 308 mV / 0.066 MPa Sleeve / 284 mV / 290 mV / 0.004 kPa Pore Pressure 2 / 258 mV / 257 mV / 0 kPa X-Y Inclinometer / 2457 mV / 2455 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

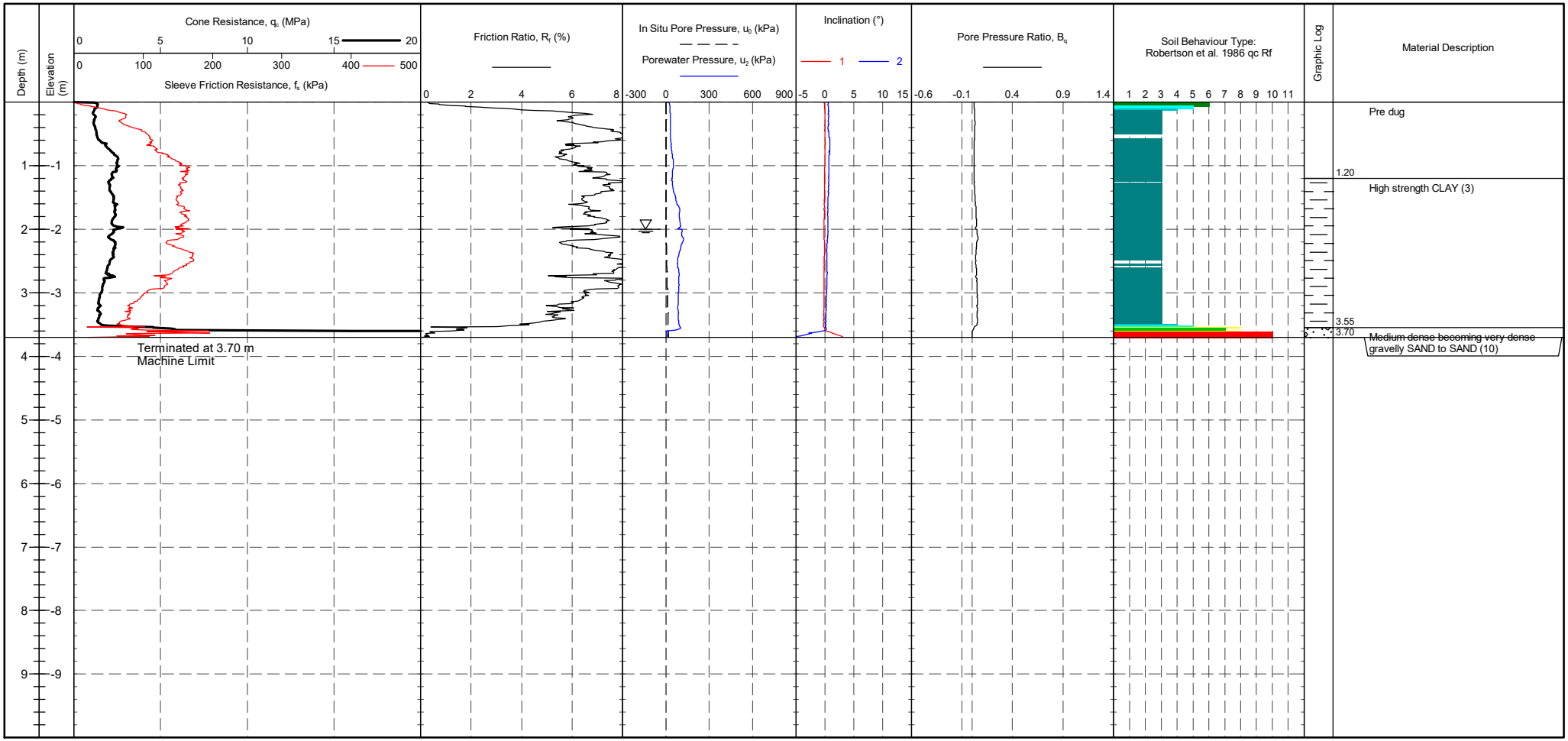
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID
CPT 28A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28A WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 307 mV / 310 mV / 0.033 MPa Sleeve: 289 mV / 287 mV / -0.001 kPa Pore Pressure 2: 256 mV / 232 mV / -0.007 kPa X-Y Inclinometer: 2457 mV / 2464 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

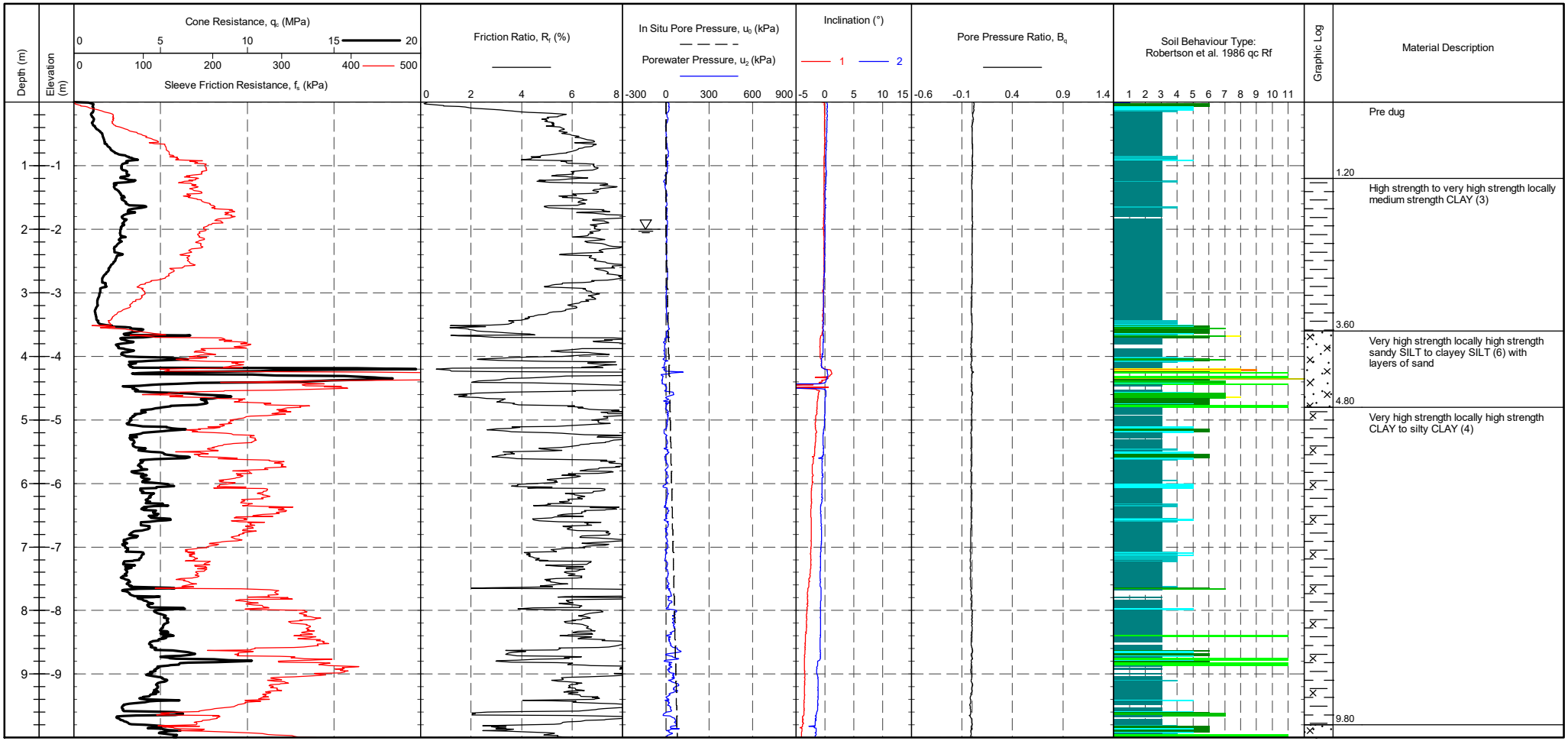
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 307 mV / 308 mV / 0.011 MPa Sleeve / 270 mV / 267 mV / -0.002 kPa Pore Pressure 2 / 246 mV / 236 mV / -0.003 kPa X-Y Inclinometer / 2411 mV / 2420 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

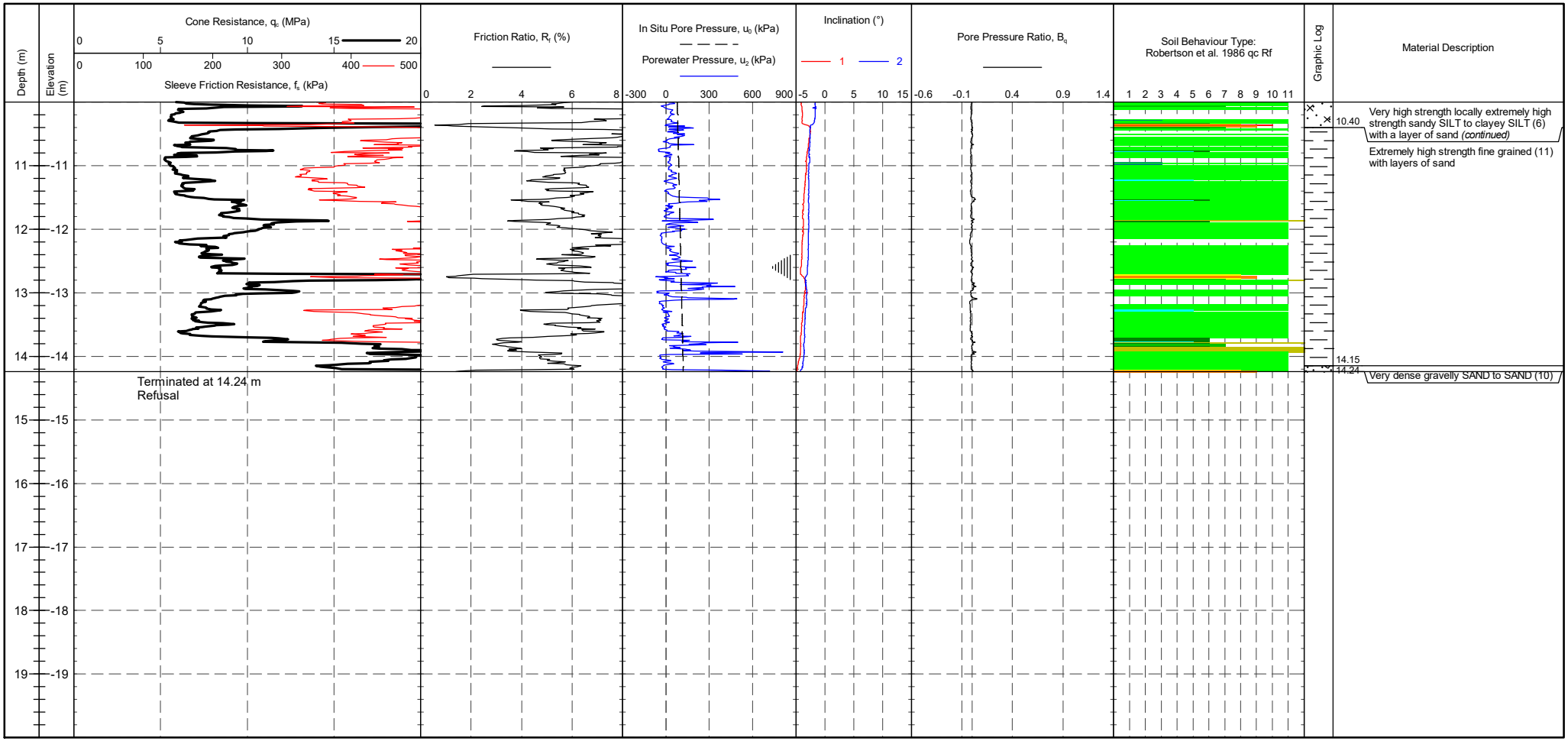
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 28B

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 2 OF 2 STATUS : Final TEST DATE : 07/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 28B WEATHER : Sunny & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip: 307 mV / 308 mV / 0.011 MPa Sleeve: 270 mV / 267 mV / -0.002 kPa Pore Pressure 2: 246 mV / 236 mV / -0.003 kPa X-Y Inclinometer: 2411 mV / 2420 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand	Groundwater Level Dissipation Test

CPT LOG 01

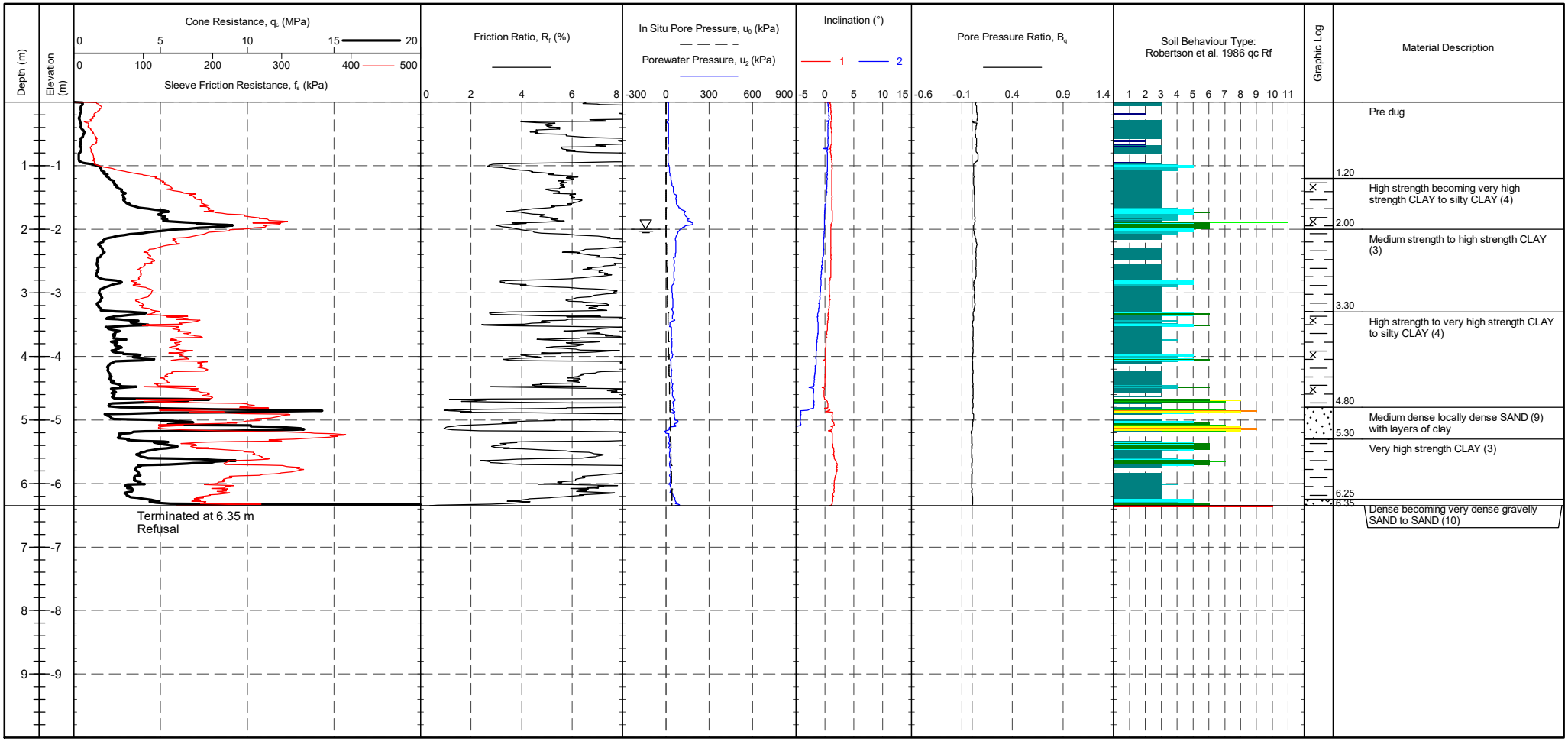
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 29

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 29 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 304 mV / -0.011 MPa Sleeve / 281 mV / 280 mV / -0.001 kPa Pore Pressure 2 / 223 mV / 240 mV / 0.005 kPa X-Y Inclinometer / 2466 mV / 2429 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

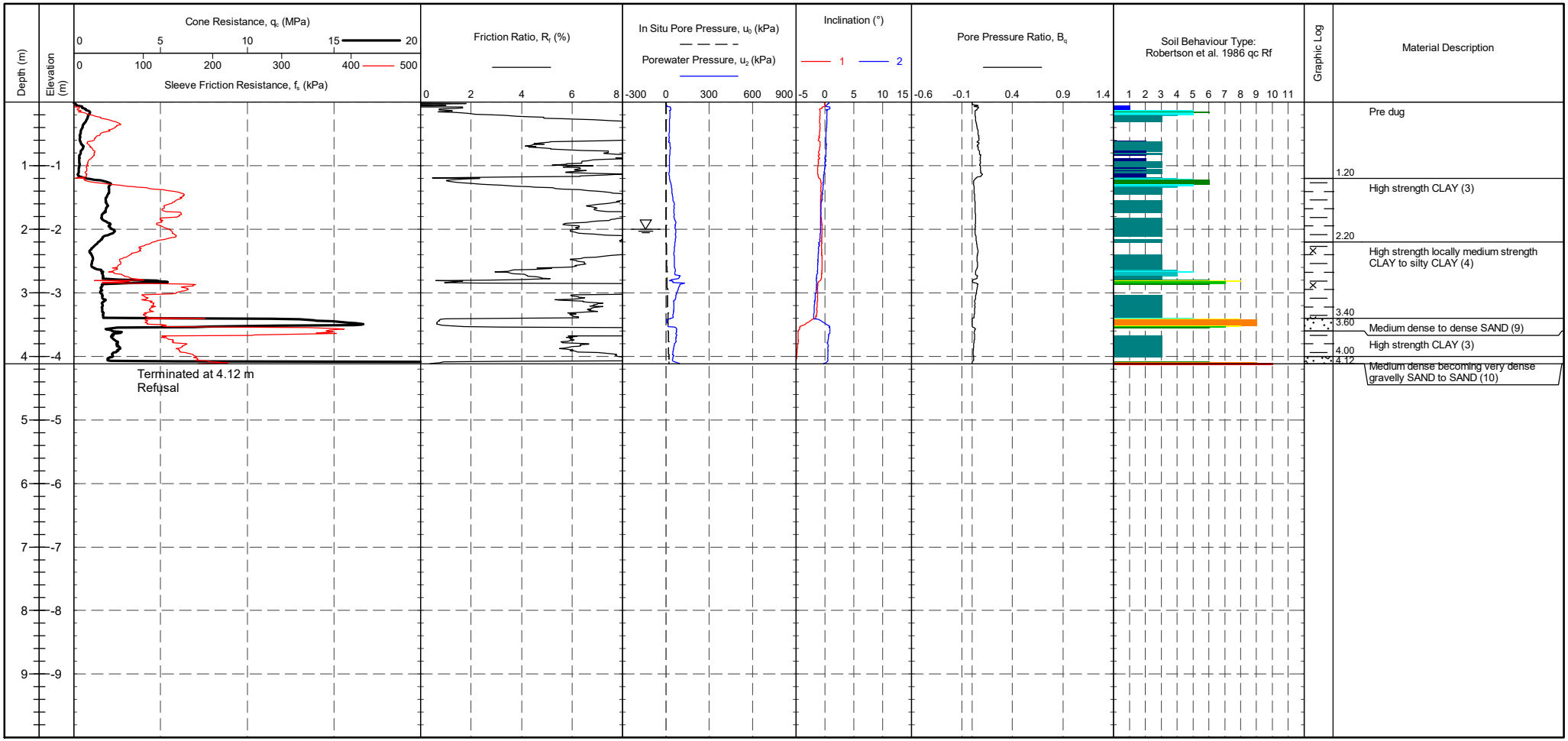
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 30**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 30 WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	304 mV	307 mV	0.033 MPa
Sleeve	280 mV	283 mV	0.002 kPa
Pore Pressure 2	231 mV	234 mV	0.001 kPa
X-Y Inclinometer	2437 mV	2466 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

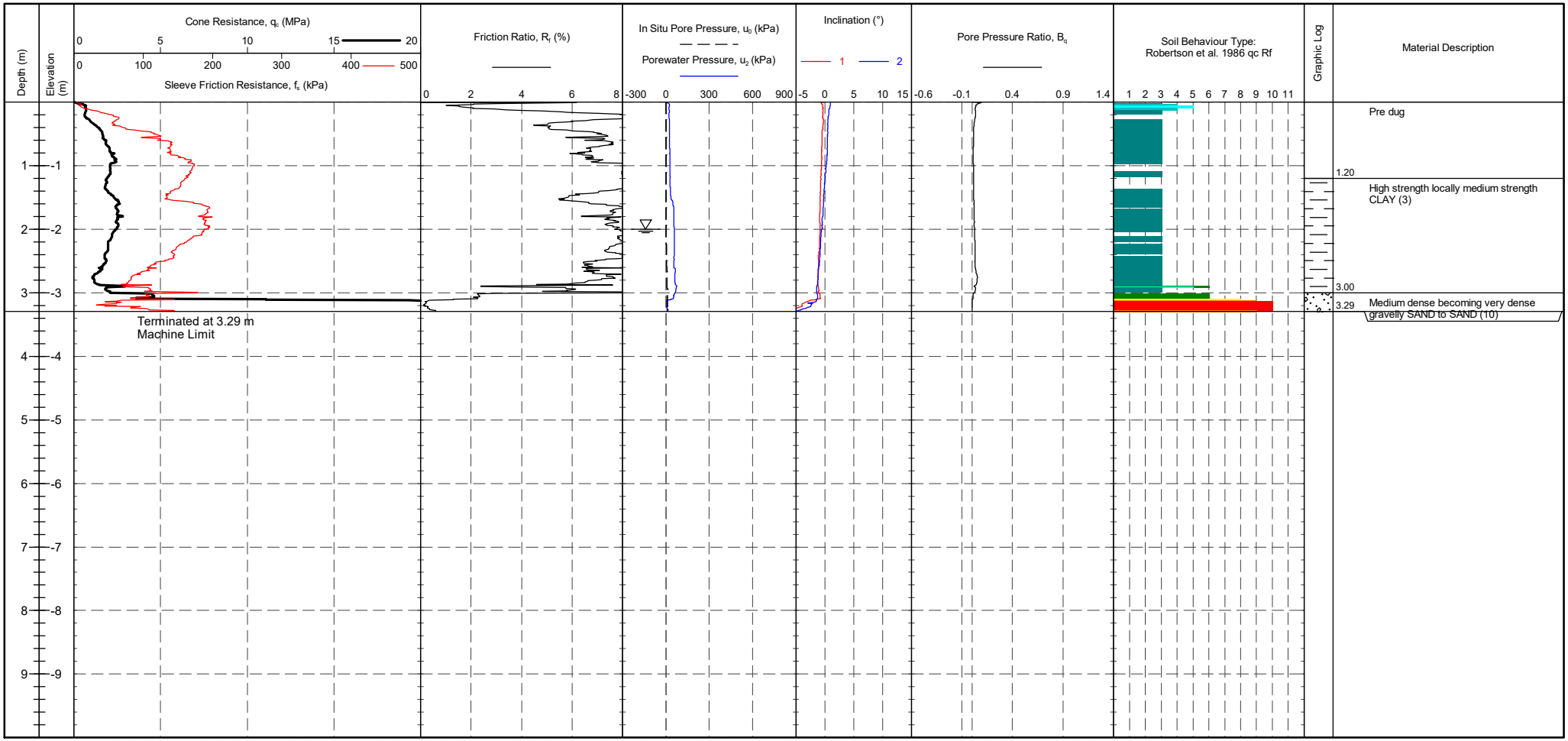
Dissipation Test

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID **CPT 31**

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Machine Limit	REMARK Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31 WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip / 305 mV / 309 mV / 0.044 MPa Sleeve / 282 mV / 285 mV / 0.002 kPa Pore Pressure 2 / 228 mV / 230 mV / 0.001 kPa X-Y Inclinometer / 2432 mV / 2438 mV	METHOD: Robertson et al. 1986 qc Rf 1 - Sensitive fine grained material 2 - Organic material 3 - Clay 4 - Silty clay to clay 5 - Clayey silt to silty clay 6 - Sandy silt to clayey silt 7 - Silty sand to sandy silt 8 - Sand to silty sand 9 - Sand 10 - Gravelly sand to sand 11 - Very stiff fine grained 12 - Sand to clayey sand

Groundwater Level

Dissipation Test

CPT LOG 01

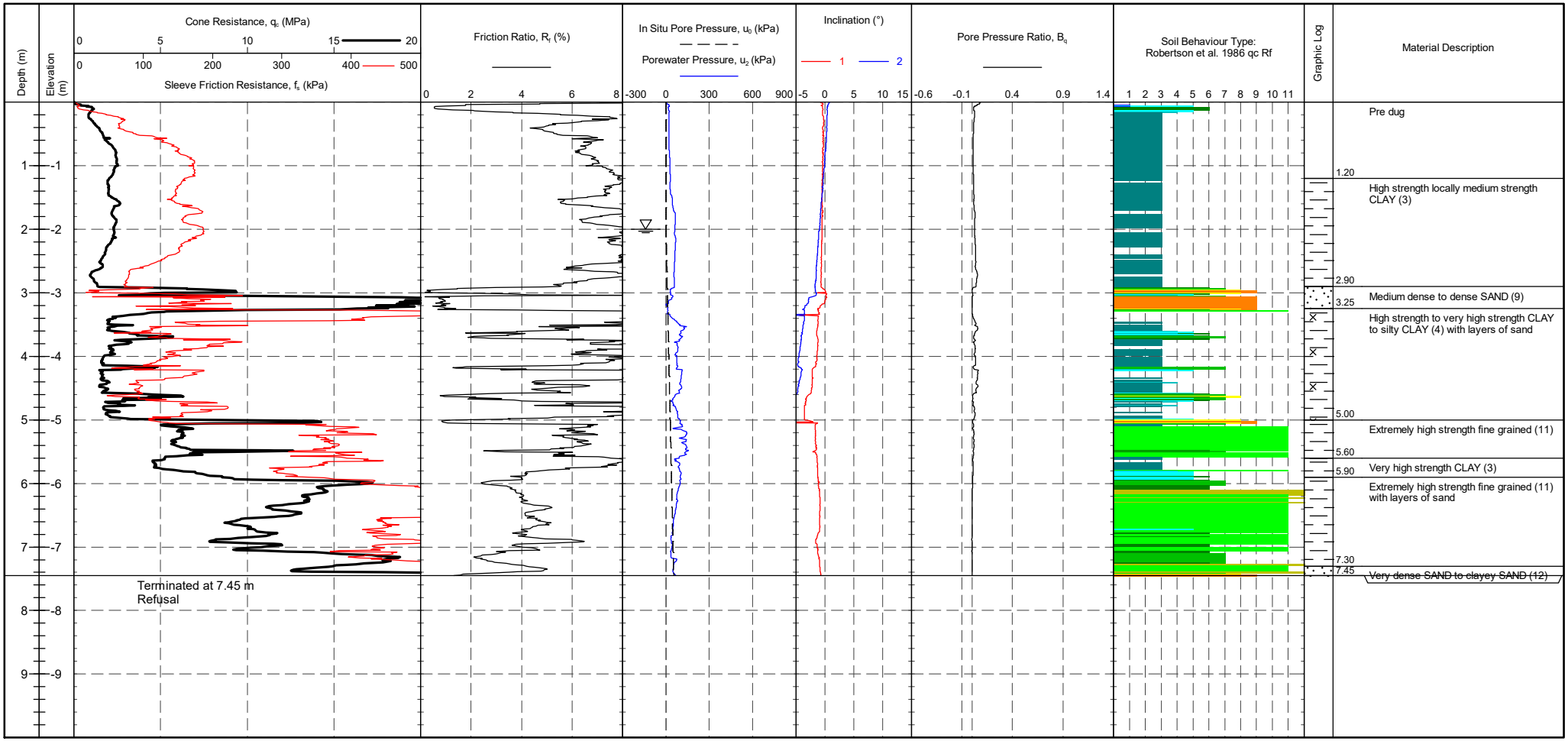
IN SITU SITE INVESTIGATION

Working with: DUNELM GEOTECHNICAL & ENVIRONMENTAL

PointID

CPT 31A

CLIENT : Dunelm Geotechnical PROJECT : Sunderland LOCATION : Sunderland PROJECT No. : 1170315	EASTING : NORTHING : ELEVATION : 0.00 m CHECKED BY : LD TERMINATION REASON : Refusal	REMARK Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 03/08/2017 PLOT DATE : 09/08/2017 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1488 CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE FRICTION REDUCER : None	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 007 OPERATOR : RS & PB FILE NAME : 1170315-CPT 31A WEATHER : Overcast & Mild	CPTU ZERO VALUES	METHOD: Robertson et al. 1986 qc Rf

Transducer	Pre	Post	Difference
Tip	308 mV	305 mV	-0.033 MPa
Sleeve	284 mV	281 mV	-0.002 kPa
Pore Pressure 2	229 mV	211 mV	-0.005 kPa
X-Y Inclinometer	2439 mV	2453 mV	

1 - Sensitive fine grained material
2 - Organic material
3 - Clay
4 - Silty clay to clay
5 - Clayey silt to silty clay
6 - Sandy silt to clayey silt
7 - Silty sand to sandy silt
8 - Sand to silty sand
9 - Sand
10 - Gravelly sand to sand
11 - Very stiff fine grained
12 - Sand to clayey sand

Groundwater Level

Dissipation Test