



**CAUSEWAY**  
— GEOTECH

## Concorde Residential Development – Ground Investigation

Client: Silvermount Ltd.

Client's Representative: Barrett Mahony Consulting Engineers

Report No.: 18-1234

Date: December 2018

Status: Final for Issue

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Document Control Sheet




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## Document Control Sheet

<b>Report No.:</b>		Concorde Residential Development			
<b>Project Title:</b>		18-1234			
<b>Client:</b>		Silvermount Ltd.			
<b>Client's Representative:</b>		Barrett Mahony Consulting Engineers			
<b>Revision:</b>	A00	<b>Status:</b>	Final for Issue	<b>Issue Date:</b>	12 December 2018
<b>Prepared by:</b>		<b>Reviewed by:</b>		<b>Approved by:</b>	
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The works were conducted in accordance with:

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

## METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
P	Nominal 100mm diameter undisturbed piston sample
B	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
C	Core sub-sample (displayed in the Field Records column on the logs)
L	Liner sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
x,x/x,x,x,x,x	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length. The length achieved is stated (mm) for any test increment less than 75mm
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm)
N=X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm)
V VR	Shear vane test (borehole)      Hand vane test (trial pit)      Shear strength stated in kPa V: undisturbed vane shear strength      VR: remoulded vane shear strength
dd/mm/yy: 1.0 dd/mm/yy: dry	Date & water level at the borehole depth at the end of shift and the start of the following shift
▽	Water strike: initial depth of strike
▼	Water strike: depth water rose to
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum).

## **Concorde Residential Development**

### **1 AUTHORITY**

On the instructions of Barrett Mahony Consulting Engineers Consulting Engineers, (“the Client’s Representative”), acting on the behalf of Silvermount Ltd. (“the Client”), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed residential development.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client’s Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

### **2 SCOPE**

The extent of the investigation, as instructed by the Client’s Representative, included boreholes, soil and rock sampling, in-situ and laboratory testing, and the preparation of a factual report on the findings.

### **3 DESCRIPTION OF SITE**

As shown on the site location plan in Appendix A, the works were on the site of the existing Concorde Industrial Estate, on the Naas Road, Dublin 12. The site is bounded by the Naas Road to the north, industrial units to the east and a car showroom to the south.

## 4 SITE OPERATIONS

### 4.1 Summary of site works

Site operations, which were conducted between 7<sup>th</sup> and 16<sup>th</sup> November 2018, comprised:

- Four light cable percussion boreholes, two of which were completed by rotary drilling methods;
- four boreholes by dynamic (windowless) sampling methods;
- a standpipe installation in two boreholes;
- two dynamic probes; and
- an infiltration test performed in two boreholes.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

### 4.2 Boreholes

A total of eight boreholes were put down in a minimum diameter of 150mm through soils and rock strata to their completion depths by a combination of methods, including light percussion boring using a Dando Terrier rig, light cable percussion boring using a Dando 2500 rig, and rotary drilling by a Comacchio 205 tracked rotary drilling rigs.

The borehole logs state the methodology and plant used for each location, as well as the appropriate depth ranges.

A summary of the boreholes, subdivided by category in accordance with the methods employed for their completion, is presented in the following sub-sections.

Appendix B presents the borehole logs.

#### 4.2.1 Light cable percussion boreholes

Two boreholes (BH02-BH03) were put down to completion in minimum 200mm diameter using a Dando 2500 light cable percussion boring rig. All boreholes were terminated on encountering virtual refusal on obstructions or in stiff deposits above their scheduled depth.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals within the overburden.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals using the split spoon sampler ( $SPT_{(s)}$ ) or solid cone attachment ( $SPT_{(c)}$ ). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix G.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded.

Where water was added to assist with boring, a note has been added to the log to account for same.

Appendix B presents the borehole logs.

#### **4.2.2 Boreholes by combined percussion boring and rotary follow-on drilling**

Two boreholes (BH01-BH03A) were put down by a combination of light cable percussion boring and rotary follow-on drilling techniques with core recovery in bedrock. Where the cable percussion borehole had not been advanced onto bedrock, rotary percussive methods were employed to advance the borehole to completion/bedrock. Symmetrix cased full-hole drilling was used, with SPTs carried out at standard intervals as required.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals within the overburden.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals throughout the overburden using the split spoon sampler ( $SPT_{(s)}$ ) or solid cone attachment ( $SPT_{(c)}$ ). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix G.

Where coring was carried out within bedrock strata, conventional coring methods were used with a metric T2-101 core barrel, which produced core of nominal 84mm diameter, and was placed in triple channel wooden core boxes.



The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the borehole logs, with core photographs presented in Appendix C.

#### **4.2.3 Dynamic sampled boreholes**

Four boreholes (WS01-WS04) were put down to completion by light percussion boring techniques using a Dando Terrier dynamic sampling rig. The boreholes were put down initially in 150mm diameter, reducing in diameter with depth as required, down to 50mm by use of the smallest sampler.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down clear of services or subsurface obstructions. The boreholes were taken to depths ranging between 2.80m and 3.00m where they were terminated at their scheduled depths, or else they were terminated on encountering virtual refusal on obstructions above this depth.

Disturbed (bulk and small bag) samples were taken within the encountered strata. Environmental samples were taken at standard intervals throughout the overburden.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded. Details of the water strikes are presented on the individual borehole logs.

Appendix B presents the borehole logs.

#### **4.3 Dynamic probes**

Two dynamic probes were conducted as a follow on from boreholes WS01 – WS02 using the DPSHB method as described in BS EN ISO 22476-2: 2005. The method entails a 63.5kg hammer falling 0.75m onto a 50.5mm diameter cone with an apex angle of 90°.

Appendix B provides the dynamic probe logs on the sheet following the relevant borehole log in the form of plots, against depth, of the number of blows per 100mm penetration.

#### **4.4 Standpipe installations**

A groundwater monitoring standpipe was installed in boreholes BH01 and BH03A.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.



#### 4.5 Infiltration tests

An infiltration/soakaway test was carried out in two boreholes (WS01- WS02) in accordance with BRE Digest 365 - Soakaways (BRE, 2016).

Appendix D presents the results and analysis of the infiltration test. The absence of the outflow from the borehole precluded calculation of infiltration coefficients.

#### 4.6 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

#### 4.7 Groundwater monitoring

Following completion of site works, groundwater monitoring was conducted on two rounds. Ground water monitoring was carried out using a water interface probe.

Details of groundwater and gas monitoring are presented in the Table 2 Section 6.3 of this report.

### 5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

#### 5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **soil chemistry:** pH and water soluble sulphate content

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990)*.

The test results are presented in Appendix E.

## 5.2 Environmental laboratory testing of soils

Environmental testing was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out according to Suite I of Engineer's Ireland Specification for Ground Investigation which includes testing for the following determinants:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- Cyanides
- Asbestos screen
- pH.

Waste acceptance criteria (WAC) testing was carried out on eight samples.

Results of environmental laboratory testing are presented in Appendix H.

## 6 GROUND CONDITIONS

### 6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Glacial Till. These deposits are underlain by limestones and shales of the Lucan Formation.

### 6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Paved surface:** all boreholes encountered macadam surfacing ranging in thickness between 50 – 150mm. Additionally concrete was encountered in BH01 and BH02 with a thickness of 300 – 350mm.
- **Made Ground (sub-base):** WS02 – WS04 encountered 200 – 850mm of subangular fine to coarse gravel.
- **Made Ground (fill):** reworked sandy gravelly clay fill/gravelly sand/sandy gravel encountered in WS01 and WS04, extending to a depth of 2.50m in both boreholes.

- **Glacial Till:** sandy gravelly clay/silt, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. Encountered to a maximum depth of 10.00m in BH01. Note, however that this was the maximum extent of the borehole. Therefore, the extent of this strata was unable to be determined at this location.
- **Bedrock (Limestone):** Rockhead was encountered at a depth of 8.50m in BH03A.

### 6.3 Groundwater

Groundwater was encountered during percussion boring as groundwater strikes as shown in Table 1 below.

**Table 1: Groundwater strikes encountered during ground investigation**

GI Ref.	Water Level (mbgl)	Comments
BH03A	8.20	No rise after 20 mins
WS04	1.20	Rose to 1.10 after 20 mins

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Groundwater was not noted during drilling at any of the other borehole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any/additional groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out.

It should be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

Subsequent groundwater monitoring of the standpipe installations recorded water levels as shown in Table 2.

**Table 2: Groundwater monitoring (mbgl)**

GI Ref.	BH01	BH03A
27/11/2018	2.38	2.45
11/12/2018	2.10	2.48

Seasonal variation in groundwater levels should also be factored into design considerations, and continued monitoring of the two installed standpipes will give an indication of the seasonal variation in groundwater level.

## 7 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

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

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

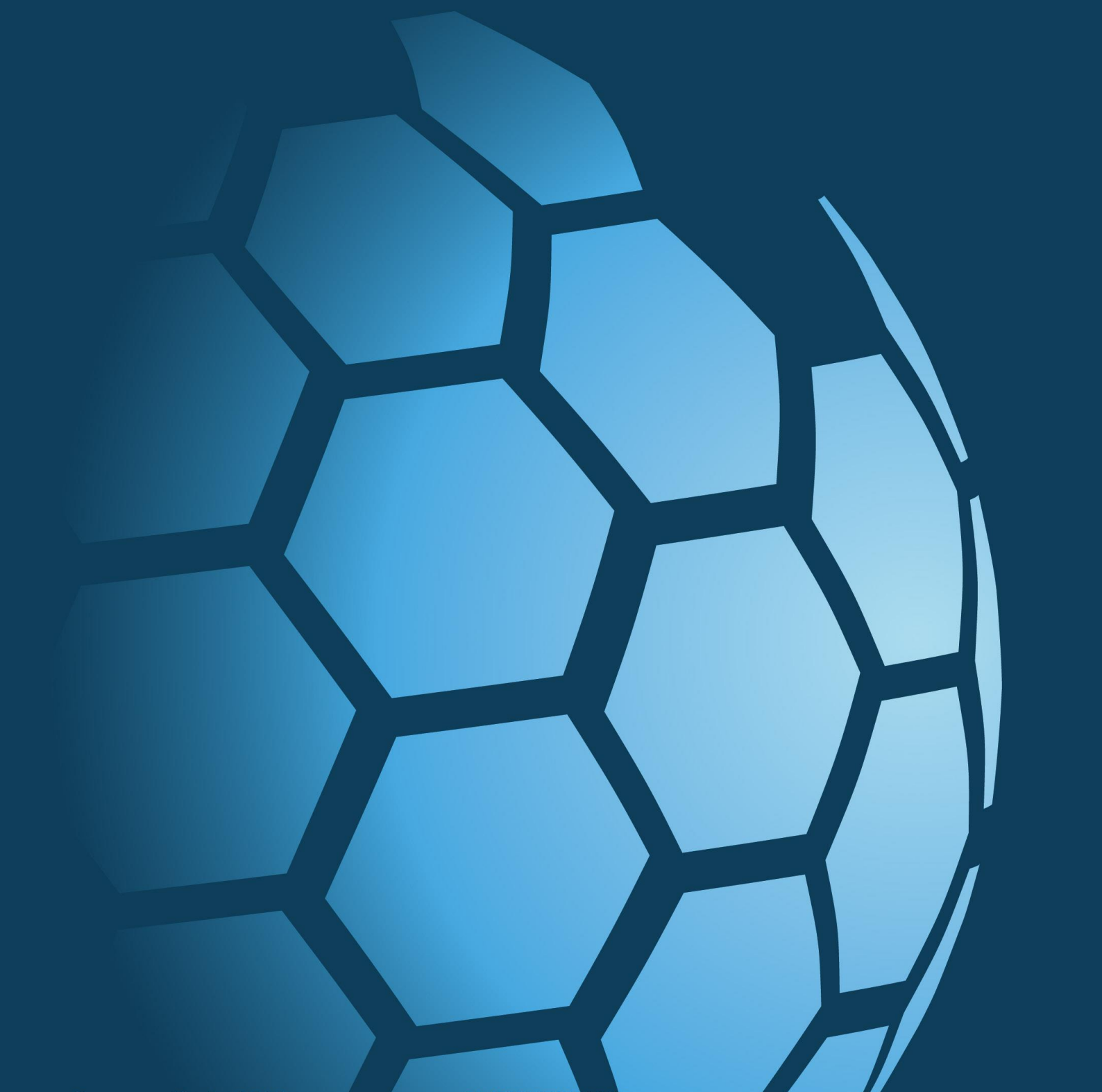
BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

Building Research Establishment (2007), BRE Digest 365: Soakaways.



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**APPENDIX A**  
**SITE AND EXPLORATORY HOLE LOCATION PLANS**

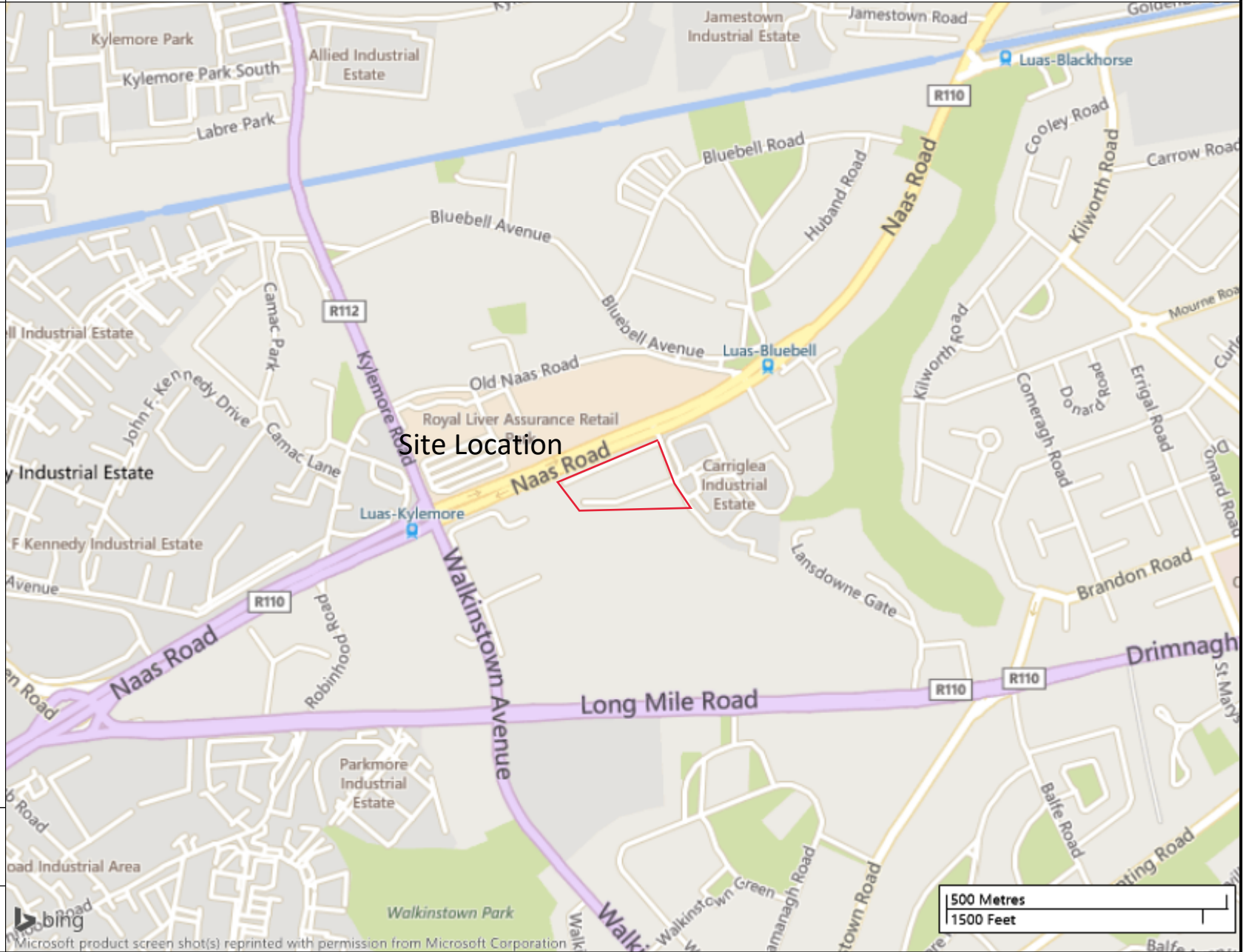




**Project No.:** 18-1234  
**Project Name:** Concorde Residential Development

**Client:** Silvermount Ltd.  
**Client's Representative:** Barrett Mahony Consulting Engineers

Legend Key



**Title:**  
Site Location Plan

**Last Revised:**  
12/12/2018

**Scale:**  
1:10000





**Project No.:** 18-1234

**Client:** Silvermount Ltd.

**Project Name:** Concorde Residential Development

**Client's Representative:** Barrett Mahony Consulting Engineers

**Legend Key**

- Locations By Type - CP
- Locations By Type - CP+RC



**Title:**  
Exploratory Hole Location Plan

**Last Revised:**  
12/12/2018

**Scale:**  
1:1000

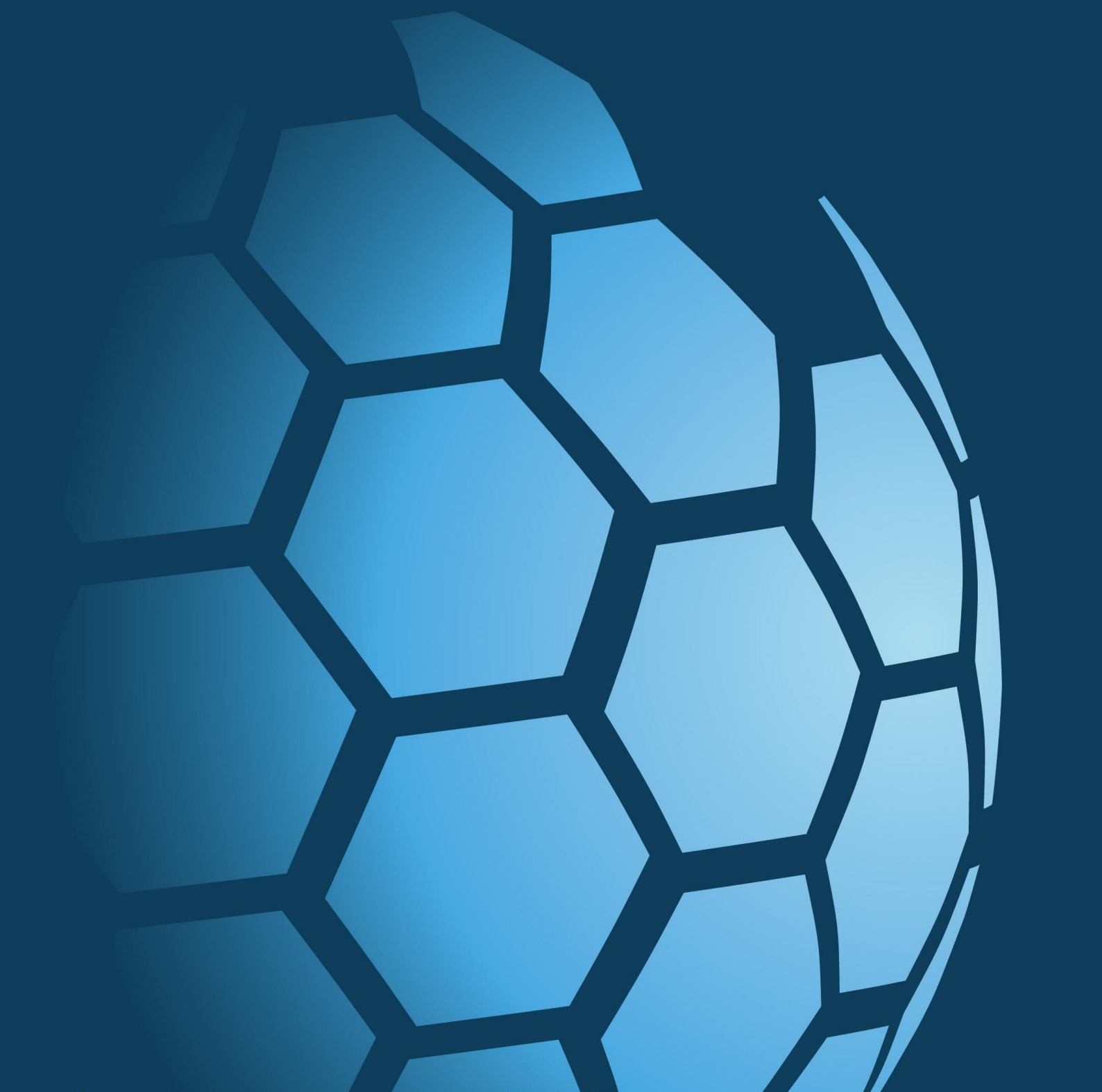




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**APPENDIX B**

**BOREHOLE AND DYNAMIC PROBE LOGS**





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<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> BH01
<b>Coordinates:</b> 310710.97 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
<b>Method</b> Cable Percussion Rotary Drilling Rotary Coring	<b>Plant Used</b> Dando 2500 Comacchio 205 Comacchio 205	<b>Top</b> 0.00 2.40 8.50
<b>Base</b> 2.40 8.50 10.00	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.78 mOD	<b>Dates:</b> 07/11/2018 - 12/11/2018	<b>Driller:</b> RN+KW <b>Logger:</b> SR+GH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.40 - 1.40	B1 D2 ES5				39.68 39.58 39.38	(0.18) (0.28) (0.20) 0.40	BITMAC CONCRETE Concrete with boulders			
0.50						(1.00)		Firm becoming stiff brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular		
1.00	ES6									
1.20 - 1.65	SPT (S) N=18	1.20		N=18 (2,3/3,5,4,6)						
1.40 - 2.00	B3 B4				38.38	1.40		Stiff becoming very stiff dark grey slightly sandy slightly gravelly CLAY . Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.		
2.00 - 2.40	B7 D8					(1.00)				
2.00 - 2.38	SPT (S)	2.00		N=50 (4,5/50 for 225mm)	37.38	2.40		Very stiff dark grey sandy gravelly CLAY with low cobble and boulder content. (Driller's description)		
2.40 - 2.42	SPT (S)	2.00	Dry	07-11-2018						
		2.00	Dry	08-11-2018						
		2.40		N=50 (25 for 10mm/50 for 5mm)						
		2.50	Dry	08-11-2018						
		2.50	Dry	12-11-2018						
4.00 - 4.02	SPT (S)	4.00	Dry	N=50 (15 for 10mm/50 for 10mm)						
						(6.10)				
7.00 - 7.22	SPT (S)	7.00	Dry	N=50 (25 for 75mm/50 for 150mm)						
					31.28	8.50		Stiff black slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of predominately limestone. Cobbles are subrounded.		
	85					(1.50)				
10.00					29.78	10.00		End of Borehole at 10.00m		
				12-11-2018						

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered.  Terminated at scheduled depth.	<b>Core Barrel</b> T2101	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b> Polymer	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			
	1.20	2.40	2.50	200				
	8.50	10.00	10.00	200				



# Probe Log

**Probe No:**  
**DPWS01**  
Sheet 1 of 1

**Project Name:** Concorde Residential Development

**Project No.**  
18-1234

**Co-ords:**

**Hole Type:**  
DP

**Client:** Silvermount Ltd.

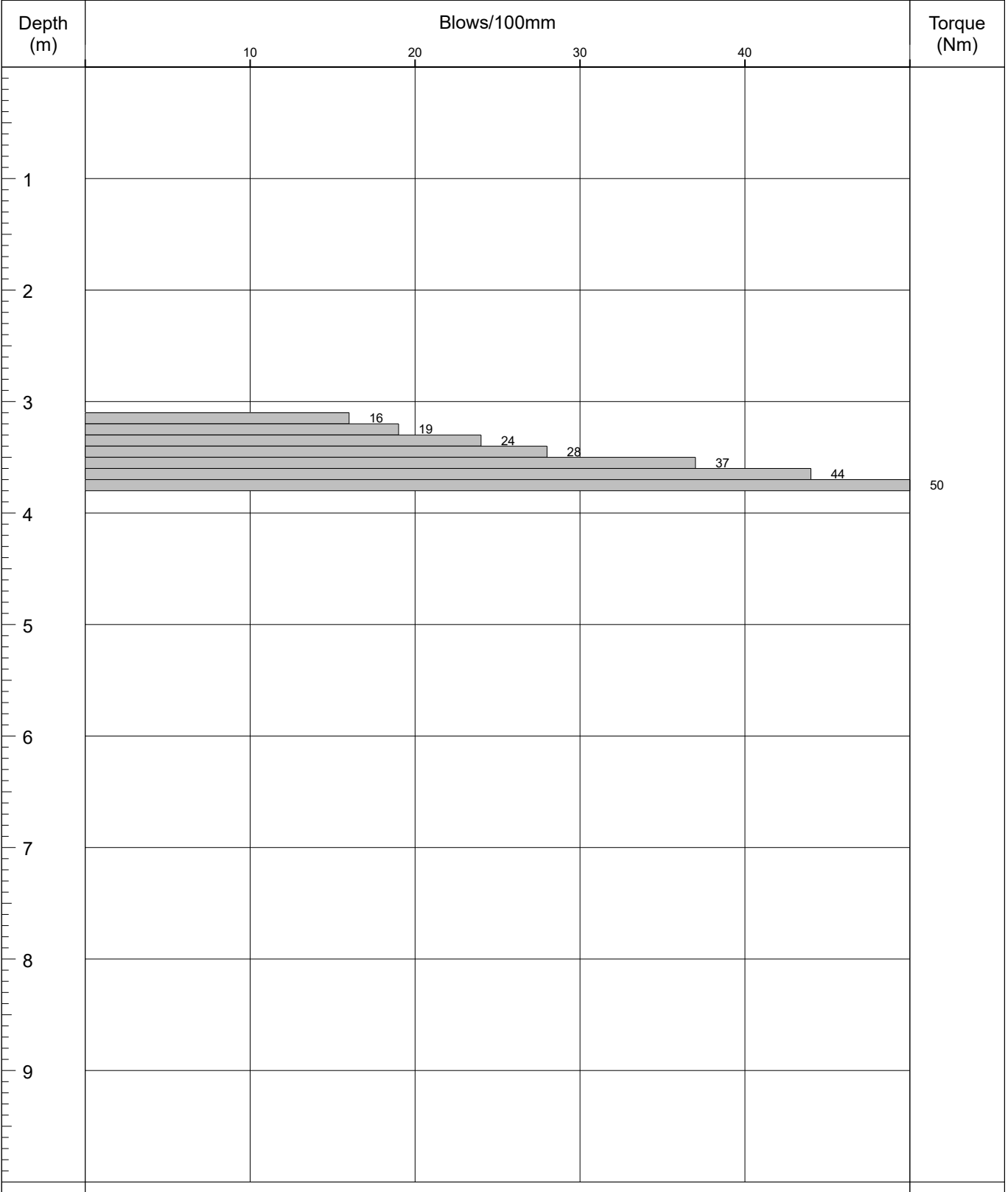
**Level:**

**Scale:**  
1:50

**Client's Rep:** Barrett Mahony Consulting Engineers

**Date:** 15/11/2018

**Operator:**  
JC



**Remarks:**

Fall Height 750

Cone Base Diameter

Hammer Wt 64

Final Depth 3.70

Probe Type DPSH-B





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<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> BH02
<b>Coordinates:</b> 310858.48 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
232117.42 N	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.68 mOD	<b>Dates:</b> 08/11/2018 - 08/11/2018	<b>Driller:</b> RN
		<b>Logger:</b> SR

<b>Method</b>	<b>Plant Used</b>	<b>Top</b>	<b>Base</b>
Cable Percussion	Dando 2500	0.00	2.40

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
					39.63	(0.00)		BITMAC		
						(0.35)		CONCRETE with rebar		
0.50	ES5				39.28	0.40		Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50 - 1.00	B1 D2									
1.00	ES6									
1.00 - 2.00	B3 D4									
1.20 - 1.65	SPT (C) N=16	1.20	Dry	N=16 (2,3/3,4,4,5)		(2.00)				
2.00	ES7							End of Borehole at 2.40m		
2.00 - 2.19	SPT (C)	2.00	Dry	N=50 (6,8/50 for 40mm)						
2.15 - 2.21	SPT (C)	2.15	Dry	N=50 (25 for 25mm/50 for 35mm)	37.28	2.40				
		2.20	Dry	08-11-2018						
		2.20	Dry	13-11-2018						
		8.50	5.00	13-11-2018						

**Remarks**  
Hand dug inspection pit excavated to 1.20m.  
No groundwater encountered.  
  
Terminated in stiff deposits.

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
				2.15	2.20	01:00
Water Added		Casing Details				
From (m)	To (m)	To (m)	Diam (mm)			
1.20	2.20	2.20	200			
8.50	10.00					



# Probe Log

**Probe No:**  
**DPWS02**  
Sheet 1 of 1

**Project Name:** Concorde Residential Development

**Project No.**  
18-1234

**Co-ords:**

**Hole Type:**  
DP

**Client:** Silvermount Ltd.

**Level:**

**Scale:**  
1:50

**Client's Rep:** Barrett Mahony Consulting Engineers

**Date:** 15/11/2018

**Operator:**  
JC

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1					50
2					
3					
	27		38		
4					
5					
6					
7					
8					
9					

Remarks:

Fall Height 750

Cone Base Diameter

Hammer Wt 64

Final Depth 3.30

Probe Type DPSH-B





**CAUSEWAY**  
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<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> <b>BH03</b>
<b>Coordinates:</b> 310905.50 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
<b>Method</b> Cable Percussion	<b>Plant Used</b> Dando 2500	<b>Top</b> 0.00
<b>Base</b> 0.50	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.08 mOD	<b>Dates:</b> 09/11/2018 - 09/11/2018	<b>Driller:</b> RN
		<b>Logger:</b> SR

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
38.98					38.98	0.10	BITMAC			
						0.40	MADE GROUND: Construction fill with cobbles, boulders and fragments of plastic			
38.58					38.58	0.50		End of Borehole at 0.50m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered.  Terminated on concrete obstruction. Moved to rebore position BH03A.	<b>Core Barrel</b>	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Flush Type</b>	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			



<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> BH03A
<b>Coordinates:</b> 310904.66 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
<b>Method</b> Cable Percussion Rotary Drilling Rotary Coring	<b>Plant Used</b> Dando 2500 Comacchio 205 Comacchio 205	<b>Top</b> 0.00 3.30 8.50
<b>Base</b> 3.30 8.50 10.00	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.22 mOD	<b>Dates:</b> 09/11/2018 - 12/11/2018	<b>Driller:</b> RN+KW <b>Logger:</b> SR+GH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.10 - 0.50	B7 D8				39.07	(0.15)	BITMAC	Firm becoming stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		
0.50 - 1.50	ES1 B9 D10					(1.35)				
1.00 - 1.20	ES2									
1.20 - 1.65	SPT (S) N=16	1.20	Dry	N=16 (,3/5,4,3,4) 09-11-2018						
		1.20	Dry	12-11-2018	37.72	1.50		Stiff grey slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular		
1.50 - 2.00	B11 D12					(0.50)				
2.00 - 2.00	ES3				37.22	2.00		Stiff becoming very stiff grey slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular		
2.00 - 2.45	B13 D14 SPT (S) N=20	2.00	Dry	N=20 (2,3/4,4,7,5)		(1.30)				
3.00 - 3.00	ES4									
3.00 - 3.30	B15 D16 SPT (S)	3.00	Dry	N=50 (4,7/50 for 155mm)	35.92	3.30		Very stiff brown sandy gravelly CLAY with medium cobble content (Driller's description)		
3.30 - 3.34	SPT (S)	3.30	Dry	N=50 (25 for 20mm/50 for 15mm) 12-11-2018						
4.00 - 4.45	SPT (S) N=37	3.30	Dry	N=37 (8,8/8,10,10,9)		(2.60)				
5.50 - 5.95	SPT (S) N=38	5.50	Dry	N=38 (10,8/8,9,9,12)	33.32	5.90		Very stiff dark grey sandy gravelly CLAY with high cobble and boulder content (Driller's description)		
7.00 - 7.02	SPT (S)	7.00	Dry	N=50 (25 for 10mm/ 50 for 10mm)		(2.60)				
10.00	100				30.72	8.50		Medium strong black argillaceous LIMESTONE. Partially weathered: slightly reduced strength, closer fracture spacing. Discontinuities: 1. 10 to 20 degree closely spaced fractures (40/90/170) undulating, rough. 2. 70 to 90 degree closely spaced joint, undulating, rough. 8.50m: Some clay infill		
					29.22	10.00		9.80m: Some clay infill		
								End of Borehole at 10.00m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m.  Terminated at scheduled depth.	<b>Core Barrel</b> T2101	<b>Water Strikes</b>				<b>Chiselling Details</b>		
		Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
		8.20		20	8.20	3.30	3.30	01:00
	<b>Flush Type</b> Polymer	<b>Water Added</b>		<b>Casing Details</b>				
		From (m)	To (m)	To (m)	Diam (mm)			
		1.20	3.30	3.30	200			
				10.00	200			





**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> WS01
<b>Coordinates:</b> 310751.01 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
232088.12 N	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 40.58 mOD	<b>Dates:</b> 15/11/2018 - 15/11/2018	<b>Driller:</b> JC
		<b>Logger:</b> SR

Method	Plant Used	Top	Base	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
Light Percussion	Dando Terrier	0.00	3.00							
0.00 - 0.20	B1			15-11-2018		(0.20)		MADE GROUND: Grey angular to subangular fine to coarse GRAVEL		
0.20 - 1.70	B2				40.38	0.20		MADE GROUND: Soft locally firm brown sandy gravelly CLAY with low cobble content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded		
0.50	ES5									
1.00	ES6						(1.50)			
1.70 - 2.50	B3				38.88	1.70		MADE GROUND: Brown slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to medium		
2.00	ES7						(0.80)			
2.50 - 3.00	B4				38.08	2.50		Stiff dark grey slightly sandy gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse		
3.00	ES8	2.00	Dry		37.58	3.00		End of Borehole at 3.00m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered.  Borehole continued by dynamic probing.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		2.00	150				



# CAUSEWAY GEOTECH

<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> WS02
<b>Coordinates:</b> 310798.13 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
232102.33 N	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.67 mOD	<b>Dates:</b> 15/11/2018 - 15/11/2018	<b>Driller:</b> JC
		<b>Logger:</b> SR

Method	Plant Used	Top	Base	Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
Light Percussion	Dando Terrier	0.00	3.00	0.15 - 0.60	B2				39.52	(0.15) 0.15	MADE GROUND: BITMAC			
				0.50	ES1					(0.45)	MADE GROUND: Grey angular to subangular fine to coarse GRAVEL			
				0.60 - 1.00	B3				39.07	0.60				
				1.00	ES4					(0.40)	MADE GROUND: Brown silty sandy subangular to subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded			
				1.00 - 1.90	B5				38.67	1.00		Stiff brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse		
				1.90 - 3.00	B6					(0.90)				
				2.00	ES7				37.77	1.90		Stiff dark grey slightly sandy silty gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse		
				3.00	ES8	2.00	Dry	15-11-2018	36.67	3.00		End of Borehole at 3.00m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered.  Borehole continued by dynamic probing.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hr:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
From (m)	To (m)	To (m)	Diam (mm)				
		2.00	150				



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> WS03
<b>Coordinates:</b> 310754.08 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
<b>Method</b> Light Percussion	<b>Plant Used</b> Dando Terrier	<b>Top</b> 0.00
<b>Base</b> 2.80	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 40.11 mOD	<b>Dates:</b> 15/11/2018 - 15/11/2018	<b>Driller:</b> JC
		<b>Logger:</b> SR

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.15 - 0.35	B1				39.96	(0.15)	[Pattern]	MADE GROUND: BITMAC		
0.35 - 1.70	B3 ES2				39.76	(0.20) 0.35	[Pattern]	MADE GROUND: Grey angular to subangular fine to coarse GRAVEL		
1.00	ES5					(1.35)	[Pattern]	Stiff brown sandy gravelly CLAY with low cobble content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded		
1.70 - 2.80	B4				38.41	1.70	[Pattern]	Stiff dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded		
2.00	ES6					(1.10)	[Pattern]			
2.80	ES7		Dry	15-11-2018	37.31	2.80		End of Borehole at 2.80m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered.  Terminated at scheduled depth.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
GEOTECH

<b>Project No.:</b> 18-1234	<b>Project Name:</b> Concorde Residential Development	<b>Borehole No.:</b> WS04
<b>Coordinates:</b> 310831.15 E	<b>Client:</b> Silvermount Ltd.	Sheet 1 of 1
<b>Method</b> Light Percussion	<b>Plant Used</b> Dando Terrier	<b>Top</b> 0.00
<b>Base</b> 3.00	<b>Client's Representative:</b> Barrett Mahony Consulting Engineers	<b>Scale:</b> 1:50
<b>Ground Level:</b> 39.73 mOD	<b>Dates:</b> 16/11/2018 - 16/11/2018	<b>Driller:</b> JC
		<b>Logger:</b> SR

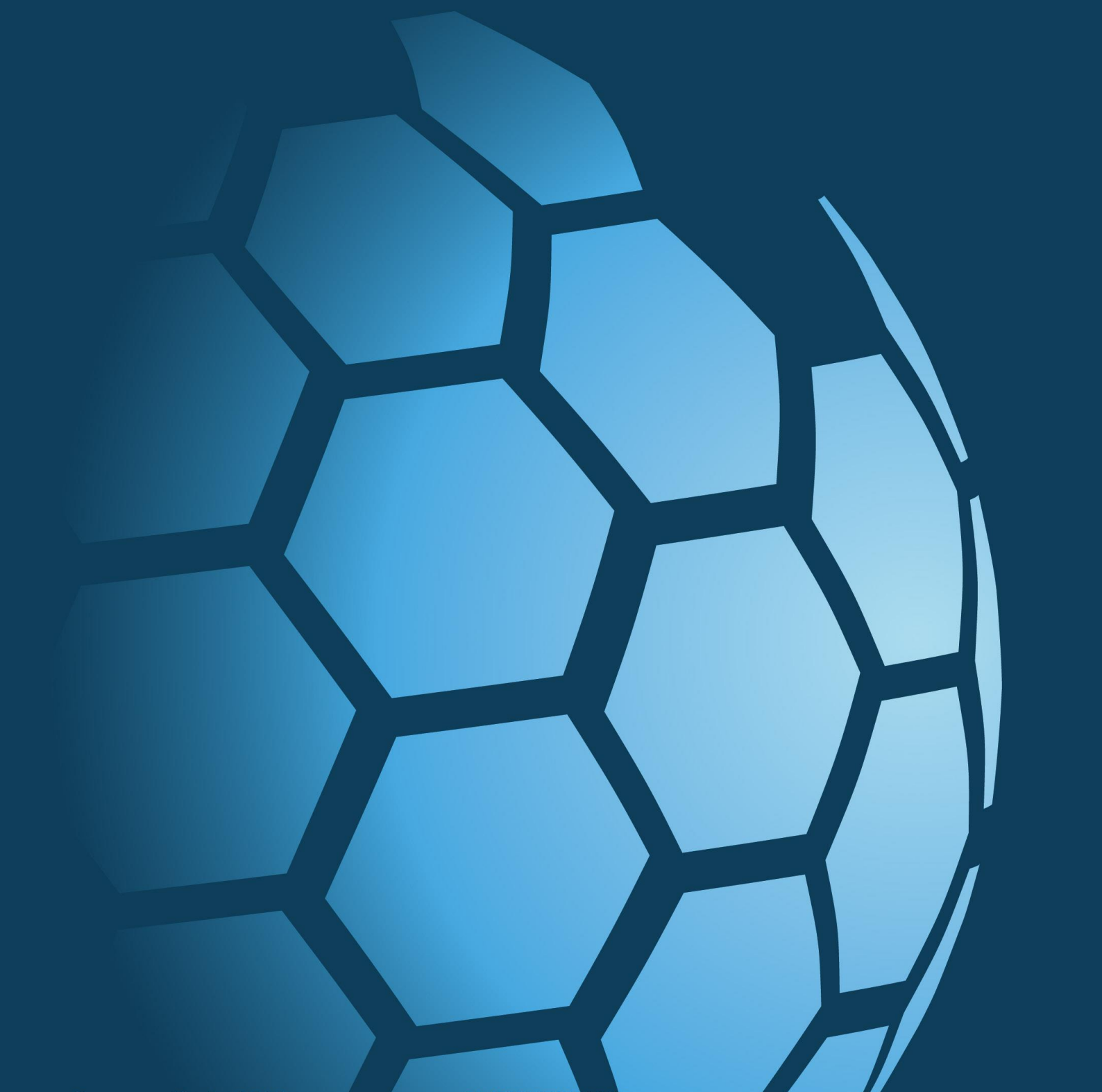
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.15 - 0.40	B1				39.58	(0.15) (0.15)		MADE GROUND: BITMAC		
						(0.25)		MADE GROUND: Grey angular to subangular fine to coarse GRAVEL		
0.50	ES2				39.33	0.40 (0.20)		MADE GROUND: Firm brown sandy gravelly CLAY with low cobble content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subangular to subrounded		
0.60 - 2.50	B3				39.13	0.60		Brown sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse.		
1.00	ES4			Water Strike at 1.20m		(1.90)				
2.00	ES5									
					37.23	2.50 (0.50)		Soft locally firm grey sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse		
3.00	ES6	1.00		16-11-2018	36.73	3.00		End of Borehole at 3.00m		

<b>Remarks</b> Hand dug inspection pit excavated to 1.20m. No groundwater encountered. Not enough sample to carry out B or D samples below 0.60m.  Terminated at scheduled depth.	<b>Water Strikes</b>				<b>Chiselling Details</b>		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
	1.20		20	1.10			
	<b>Water Added</b>		<b>Casing Details</b>				
	From (m)	To (m)	To (m)	Diam (mm)			



**CAUSEWAY**  
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**APPENDIX C**  
**CORE PHOTOGRAPHS**





BH01 Box 1 8.5 - 10.0m

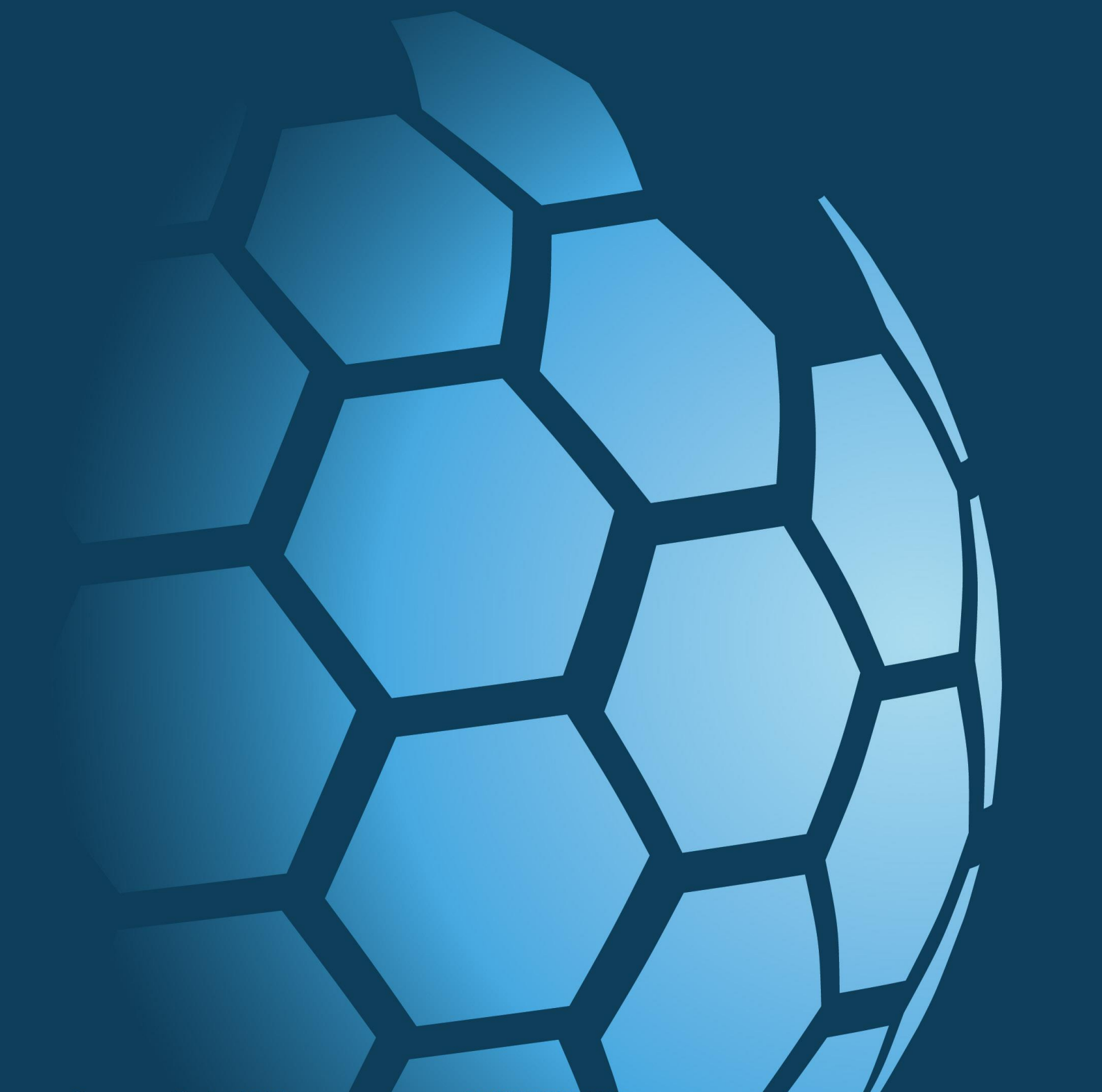


BH03 Box 1 8.5 - 10.0m



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**APPENDIX D**  
**INFILTRATION TEST RESULTS**





## Soakaway Infiltration Test

**Project No.:** 18-1234  
**Site:** Concorde, Naas Road  
**Test Location:** WS01  
**Test Date:** 15 November 2018



*Analysis using method as described in BRE Digest 365  
and CIRIA Report C697-The SUDS Manual*

Borehole diameter 0.125 m  
 Cross sectional Area 0.01 m<sup>2</sup>  
 Soakage Top depth 2.00 mbgl  
 Soakage Bottom depth 3.00 mbgl  
 Soakage Length 1.00 m  
 Soakage medium Boulder Clay

depth to groundwater before adding water (m) = Dry

time (mins)	depth to water surface (m)	depth of water in soakage section (m)
0	2.00	1.00
1	2.06	0.94
2	2.10	0.90
3	2.10	0.90
4	2.15	0.85
6	2.15	0.85
8	2.20	0.80
10	2.30	0.70
15	2.35	0.65
20	2.40	0.60
30	2.45	0.55
45	2.45	0.55
60	2.45	0.55
75	2.45	0.55
90	2.45	0.55

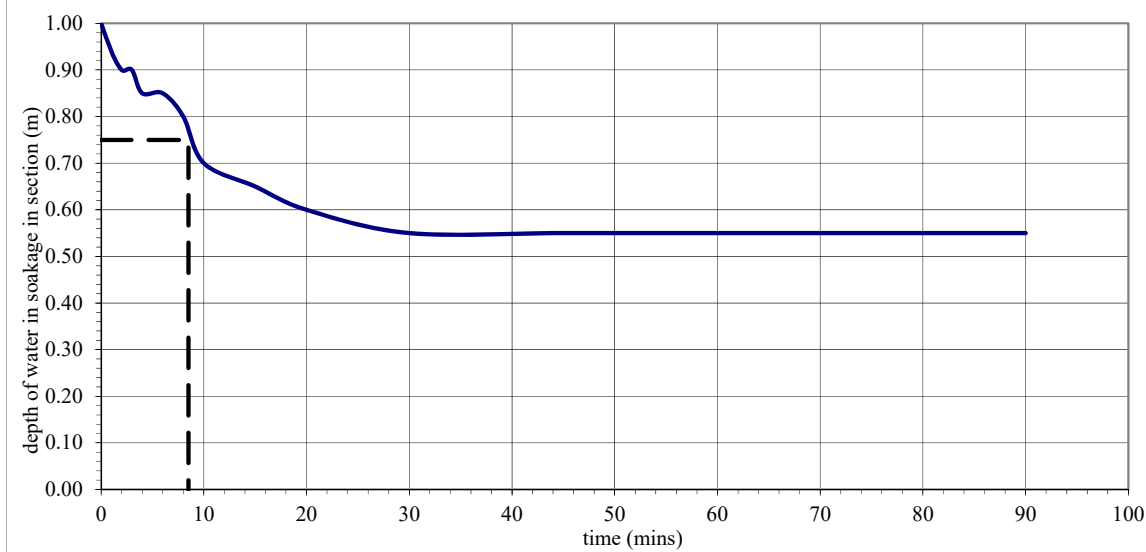
From graph below:

test start - 75% depth at  
0.75 m water depth  
time is 8.5 minutes

test end - 25% depth at  
0.25 m water depth  
time is not determined

**infiltration rate (q) is very low**

time (mins)	depth to water (m)	depth of water in pit (m)	time elapsed (mins)	volume of water lost (m <sup>3</sup> )	Area of walls and base at 50% drop (m <sup>2</sup> )	q (m/min)	q (m/h)
8.5	0.25	0.75					



## Soakaway Infiltration Test

**Project No.:** 18-1234  
**Site:** Concorde, Naas Road  
**Test Location:** WS02  
**Test Date:** 15 November 2018



*Analysis using method as described in BRE Digest 365  
and CIRIA Report C697-The SUDS Manual*

Borehole diameter      0.125 m  
 Cross sectional Area    0.01 m<sup>2</sup>  
 Soakage Top depth      2.00 mbgl  
 Soakage Bottom depth   3.00 mbgl  
 Soakage Length        1.00 m  
 Soakage medium        Boulder Clay

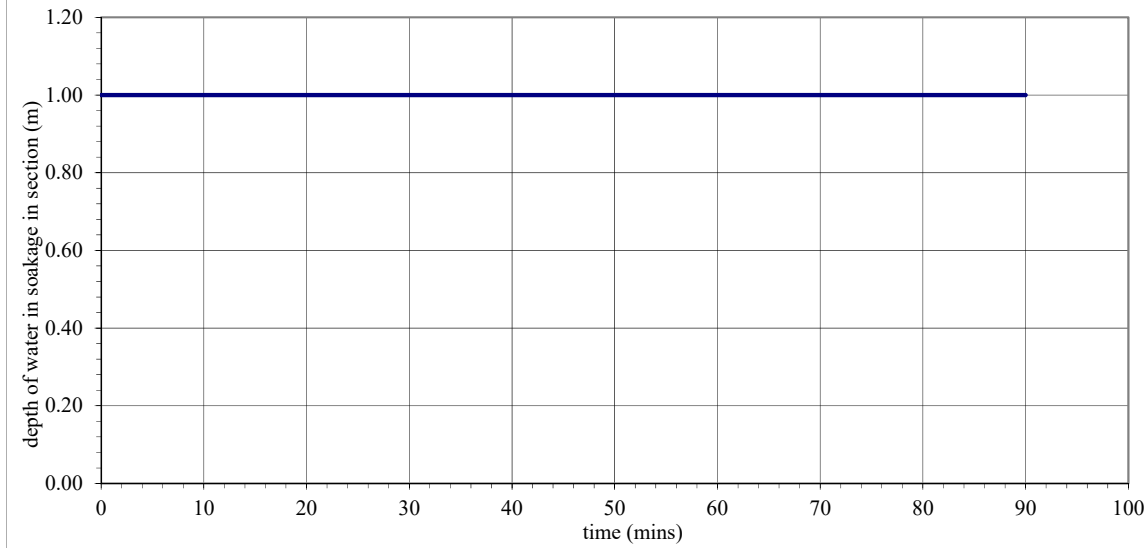
depth to groundwater before adding water (m) = Dry

time (mins)	depth to water surface (m)	depth of water in soakage section (m)
0	2.00	1.00
1	2.00	1.00
2	2.00	1.00
3	2.00	1.00
4	2.00	1.00
6	2.00	1.00
8	2.00	1.00
10	2.00	1.00
15	2.00	1.00
20	2.00	1.00
30	2.00	1.00
45	2.00	1.00
60	2.00	1.00
75	2.00	1.00
90	2.00	1.00

From graph below:  
 test start - 75% depth at  
                   0.75 m water depth  
                   time is not determined  
  
 test end - 25% depth at  
                   0.25 m water depth  
                   time is not determined

**infiltration rate (q) is very low**

time (mins)	depth to water (m)	depth of water in pit (m)	time elapsed (mins)	volume of water lost (m <sup>3</sup> )	Area of walls and base at 50% drop (m <sup>2</sup> )	q (m/min)	q (m/h)

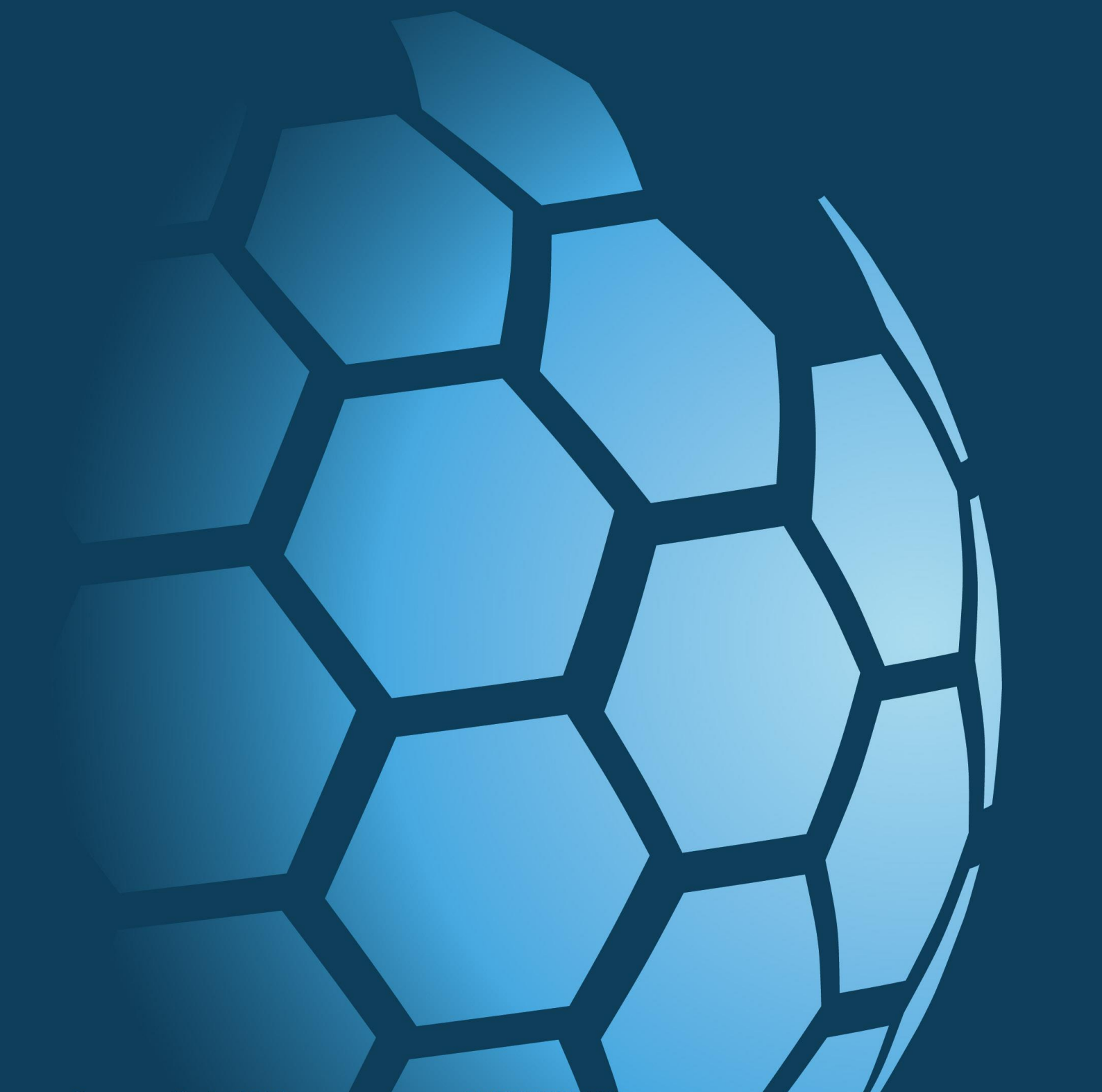




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**APPENDIX E**

**GEOTECHNICAL LABORATORY TEST RESULTS**





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**SOIL AND ROCK SAMPLE ANALYSIS  
LABORATORY TEST REPORT**

<b>Project Name:</b>	Concorde Residential Development
<b>Project No.:</b>	18-1234
<b>Client:</b>	Barrett Mahony Consulting Engineers
<b>Date:</b>	11/12/18

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory

Stephen Watson  
Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

**Causeway Geotech Ltd**  
8 Drumahiskey Road, Ballymoney  
Co. Antrim, N. Ireland, BT53 7QL

Registered in Northern Ireland. Company Number: NI610766





**Project Name:** Concorde Residential Development

**Report Reference:** Soil Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with\* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	10
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	7
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	7
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	7

### SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Pro Soils Limited (UKAS 2183)	pH Value of Soil		3
SOIL – Subcontracted to Chemtest Ltd (UKAS 2183)	Sulphate Content water extract		3


## Summary of Classification Test Results

Project No. 18-1234	Project Name Concorde Residential Development
------------------------	--

Hole No.	Sample				Soil Description	Density		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type		bulk	dry							
BH01	1	0.40		B	Brown slightly sandy gravelly silty CLAY with some cobbles.			8.2	62	29 -1pt	16	13		CL
BH01	3	1.40		B	Dark grey slightly sandy gravelly silty CLAY.			9.8						
BH01	7	2.00		B	Dark grey sandy gravelly silty CLAY.			15.0	57	29 -1pt	15	14		CL
BH02	1	0.50		B	Brown sandy gravelly silty CLAY.			14.0	60	29 -1pt	17	12		CL
BH02	3	1.00		B	Brown sandy gravelly silty CLAY.			14.0	68	31 -1pt	17	14		CL
BH03A	7	0.10		B	Brown sandy gravelly silty CLAY.			15.0	49	37 -1pt	22	15		CI
BH03A	8	0.10		D	Brown sandy gravelly silty CLAY.			19.0						
BH03A	11	1.50		B	Grey slightly sandy gravelly clayey SILT.			18.0	56	43 -1pt	28	15		MI
BH03A	14	2.00		D	Grey slightly sandy gravelly clayey SILT.			28.0						
BH03A	15	3.00		B	Grey slightly sandy gravelly SILT/CLAY.			15.0	54	46 -1pt	27	19		MI/CI

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 4

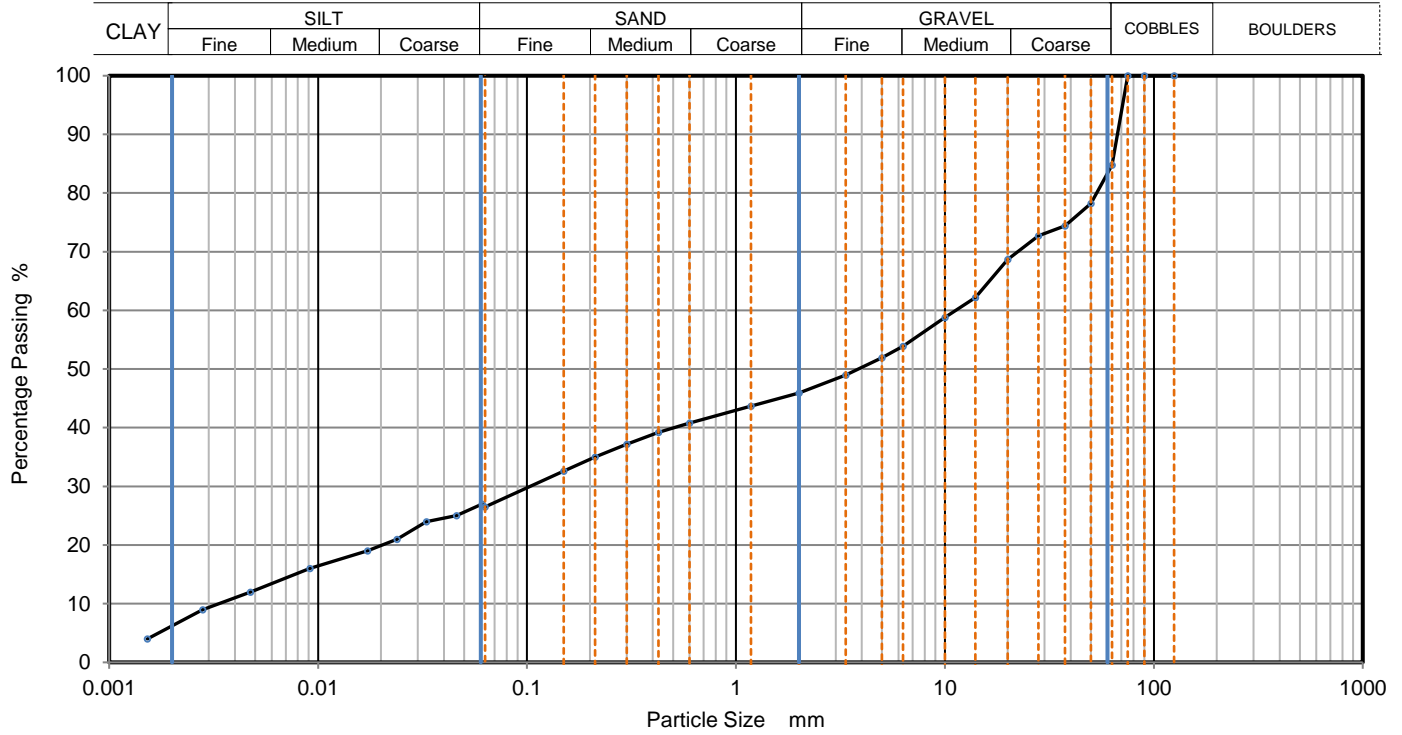
<b>Key</b>  Density test                      Liquid Limit                      Particle density  Linear measurement unless :      4pt cone unless :                      sp - small pyknometer  wd - water displacement              cas - Casagrande method              gj - gas jar  wi - immersion in water                      1pt - single point test	<b>Date Printed</b>  12/11/2018 00:00	<b>Approved By</b>  Stephen.Watson	
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# PARTICLE SIZE DISTRIBUTION

Job Ref	<b>18-1234</b>
Borehole/Pit No.	BH01
Sample No.	1
Depth, m	0.40
Sample Type	B
KeyLAB ID	Caus2018111912

Site Name	Concorde Residential Development		
Soil Description	Brown slightly sandy gravelly silty CLAY with some cobbles.		
Specimen Reference	6	Specimen Depth	0.4 m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0609	27
90	100	0.0460	25
75	100	0.0330	24
63	85	0.0239	21
50	78	0.0172	19
37.5	74	0.0091	16
28	73	0.0047	12
20	69	0.0028	9
14	62	0.0015	4
10	59		
6.3	54		
5	52		
3.35	49		
2	46		
1.18	44		
0.6	41	Particle density (assumed)	
0.425	39	2.65 Mg/m <sup>3</sup>	
0.3	37		
0.212	35		
0.15	33		
0.063	27		

Dry Mass of sample, g 11633

Sample Proportions	% dry mass
Cobbles	15
Gravel	39
Sand	19
Silt	21
Clay	6

Grading Analysis	
D100	mm
D60	mm 11.3
D30	mm 0.104
D10	mm 0.00363
Uniformity Coefficient	3100
Curvature Coefficient	0.26

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved
Stephen.Watson







# PARTICLE SIZE DISTRIBUTION

Job Ref **18-1234**

Borehole/Pit No. **BH01**

Site Name **Concorde Residential Development**

Sample No. **7**

Soil Description **Dark grey sandy gravelly silty CLAY.**

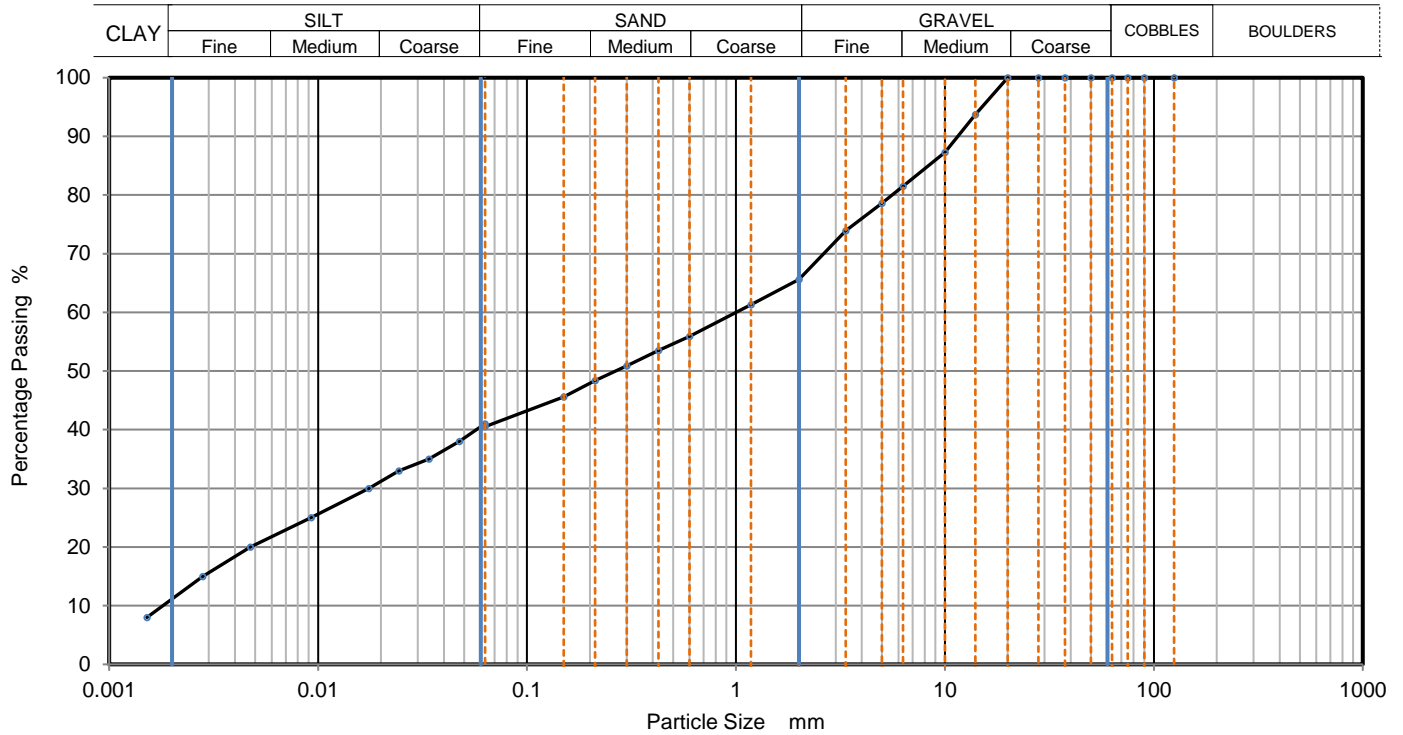
Depth, m **2.00**

Specimen Reference **6** Specimen Depth **2** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2018111914**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0628	41
90	100	0.0474	38
75	100	0.0340	35
63	100	0.0244	33
50	100	0.0175	30
37.5	100	0.0093	25
28	100	0.0047	20
20	100	0.0028	15
14	94	0.0015	8
10	87		
6.3	82		
5	79		
3.35	74		
2	66		
1.18	61		
0.6	56	Particle density (assumed)	
0.425	54	2.65 Mg/m <sup>3</sup>	
0.3	51		
0.212	48		
0.15	46		
0.063	41		

Dry Mass of sample, g **560**

Sample Proportions	% dry mass
Cobbles	0
Gravel	34
Sand	25
Silt	29
Clay	11

Grading Analysis		
D100	mm	
D60	mm	1
D30	mm	0.0171
D10	mm	0.00179
Uniformity Coefficient		560
Curvature Coefficient		0.16

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved  
  
Stephen.Watson

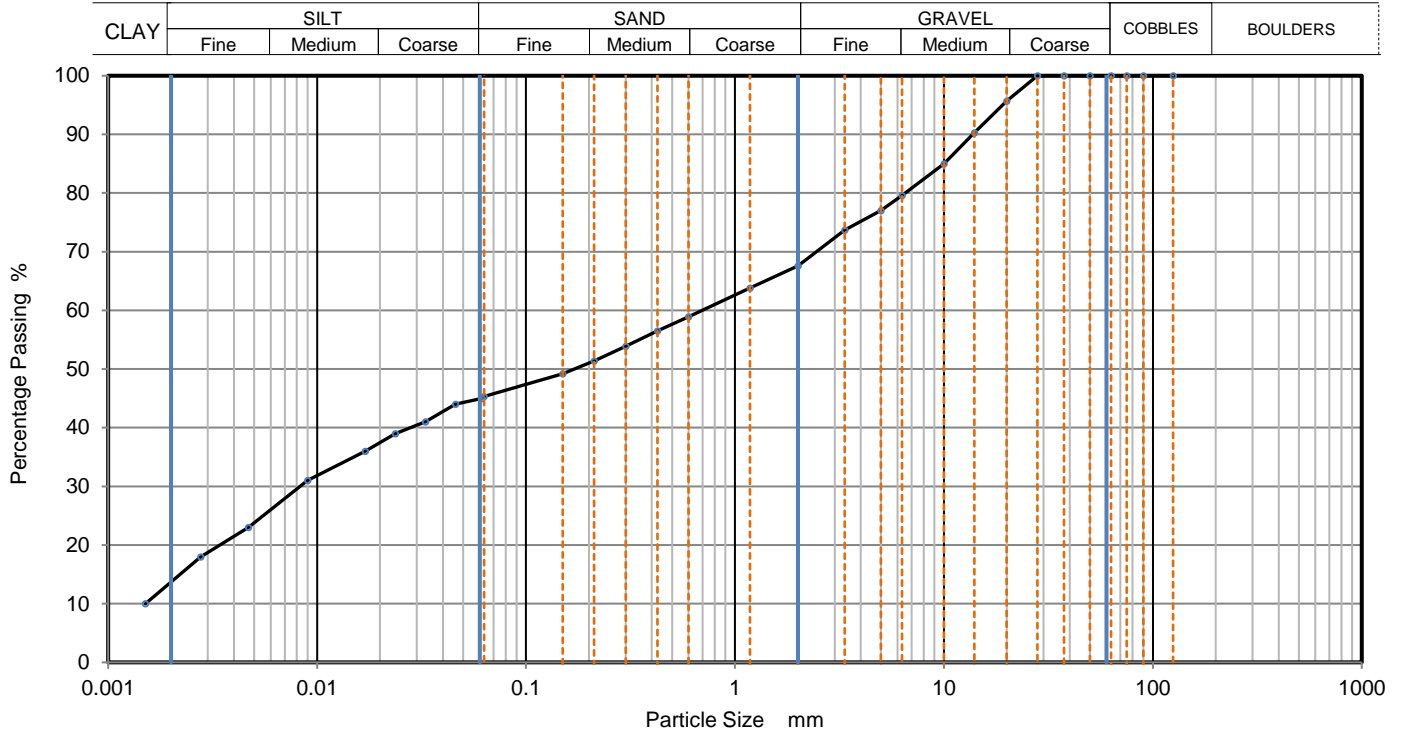




# PARTICLE SIZE DISTRIBUTION

Job Ref	<b>18-1234</b>
Borehole/Pit No.	BH02
Sample No.	1
Depth, m	0.50
Sample Type	B
KeyLAB ID	Caus2018111915

Site Name	Concorde Residential Development		
Soil Description	Brown sandy gravelly silty CLAY.		
Specimen Reference	6	Specimen Depth	0.5 m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0614	45
90	100	0.0460	44
75	100	0.0330	41
63	100	0.0237	39
50	100	0.0170	36
37.5	100	0.0090	31
28	100	0.0047	23
20	96	0.0028	18
14	90	0.0015	10
10	85		
6.3	80		
5	77		
3.35	74		
2	68		
1.18	64		
0.6	59	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	57		
0.3	54		
0.212	51		
0.15	49		
0.063	45		

Dry Mass of sample, g 605

Sample Proportions	% dry mass
Cobbles	0
Gravel	32
Sand	22
Silt	32
Clay	13

Grading Analysis		
D100	mm	
D60	mm	0.695
D30	mm	0.00843
D10	mm	0.00154
Uniformity Coefficient		450
Curvature Coefficient		0.066

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved
Stephen.Watson

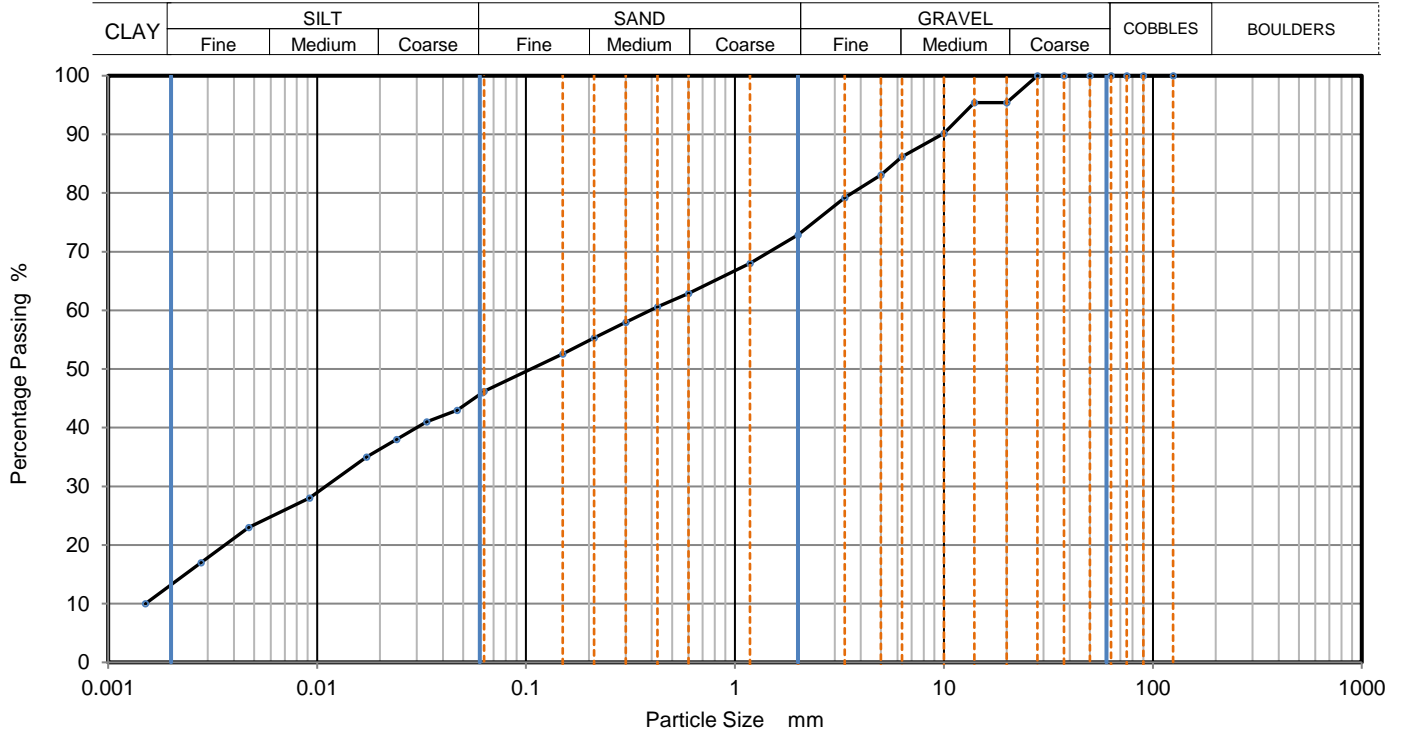




# PARTICLE SIZE DISTRIBUTION

Job Ref	<b>18-1234</b>
Borehole/Pit No.	BH02
Sample No.	3
Depth, m	1.00
KeyLAB ID	Caus2018111916

Site Name	Concorde Residential Development		
Soil Description	Brown sandy gravelly silty CLAY.		
Specimen Reference	6	Specimen Depth	1 m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0619	46
90	100	0.0467	43
75	100	0.0335	41
63	100	0.0240	38
50	100	0.0172	35
37.5	100	0.0092	28
28	100	0.0047	23
20	95	0.0028	17
14	95	0.0015	10
10	90		
6.3	86		
5	83		
3.35	79		
2	73		
1.18	68		
0.6	63	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.425	61		
0.3	58		
0.212	55		
0.15	53		
0.063	46		

Dry Mass of sample, g 941

Sample Proportions	% dry mass
Cobbles	0
Gravel	27
Sand	27
Silt	33
Clay	13

Grading Analysis	
D100	mm
D60	mm 0.394
D30	mm 0.0108
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved
Stephen.Watson

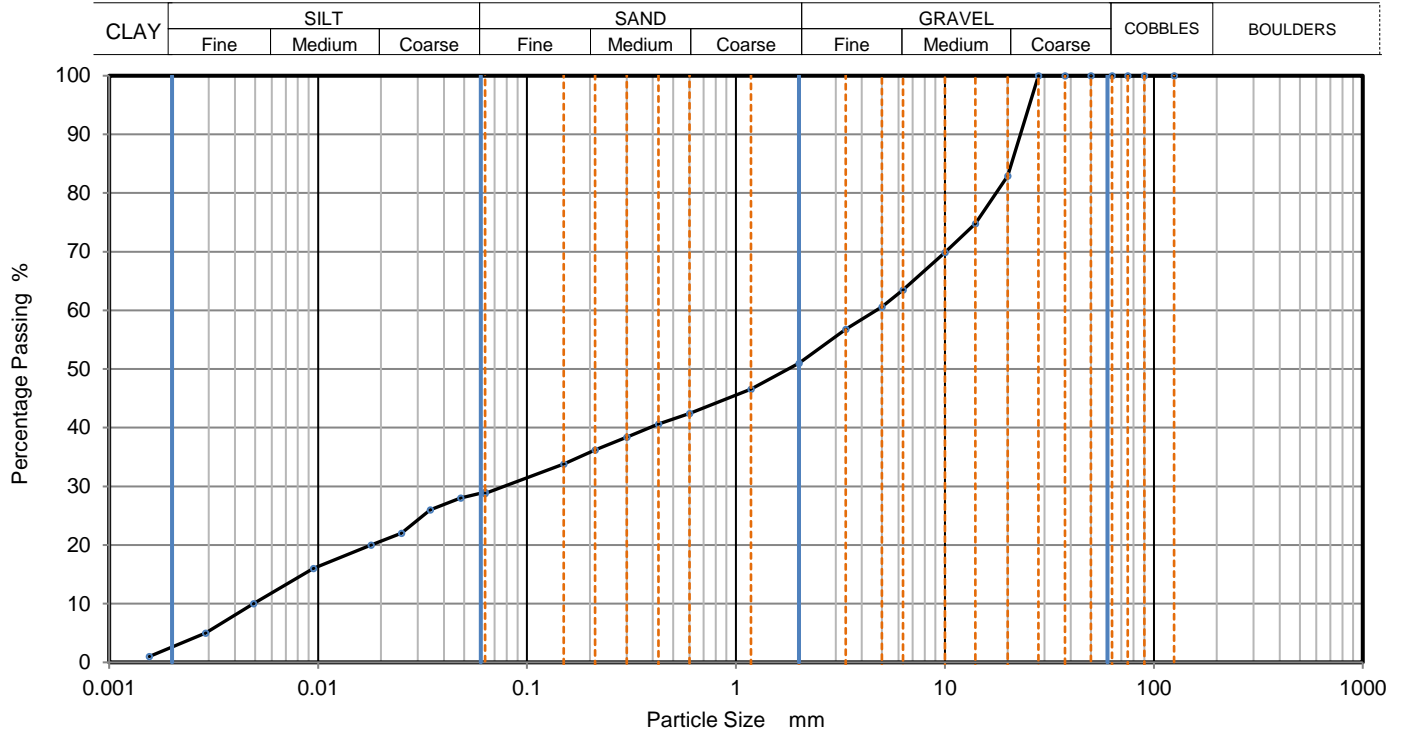




# PARTICLE SIZE DISTRIBUTION

Job Ref	<b>18-1234</b>
Borehole/Pit No.	BH03A
Sample No.	7
Depth, m	0.10
Sample Type	B
KeyLAB ID	Caus2018111917

Site Name	Concorde Residential Development		
Soil Description	Brown sandy gravelly silty CLAY.		
Specimen Reference	6	Specimen Depth	0.1 m
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	29
90	100	0.0481	28
75	100	0.0345	26
63	100	0.0250	22
50	100	0.0179	20
37.5	100	0.0095	16
28	100	0.0049	10
20	83	0.0029	5
14	75	0.0016	1
10	70		
6.3	64		
5	61		
3.35	57		
2	51		
1.18	47		
0.6	42		
0.425	41	Particle density (assumed) 2.65 Mg/m <sup>3</sup>	
0.3	38		
0.212	36		
0.15	34		
0.063	29		

Dry Mass of sample, g 2129

Sample Proportions	% dry mass
Cobbles	0
Gravel	49
Sand	22
Silt	26
Clay	3

Grading Analysis		
D100	mm	
D60	mm	4.7
D30	mm	0.0777
D10	mm	0.00516
Uniformity Coefficient		910
Curvature Coefficient		0.25

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **18-1234**

Borehole/Pit No. **BH03A**

Site Name **Concorde Residential Development**

Sample No. **11**

Soil Description **Grey slightly sandy gravelly clayey SILT.**

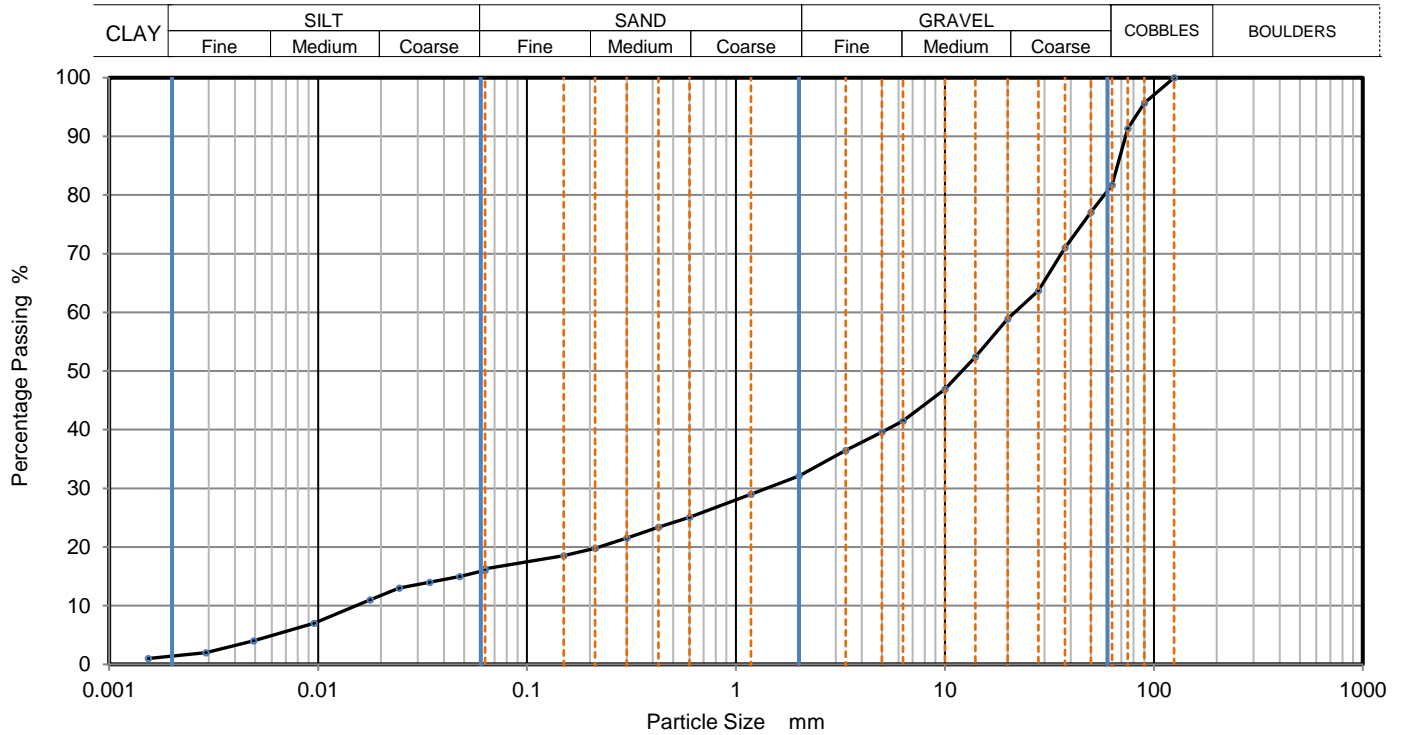
Depth, m **1.50**

Specimen Reference **6** Specimen Depth **1.5** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2018111919**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	16
90	96	0.0476	15
75	91	0.0341	14
63	82	0.0245	13
50	77	0.0177	11
37.5	71	0.0096	7
28	64	0.0049	4
20	59	0.0029	2
14	52	0.0015	1
10	47		
6.3	42		
5	40		
3.35	37		
2	32		
1.18	29		
0.6	25		
0.425	23	Particle density (assumed)	
0.3	22	2.65	Mg/m <sup>3</sup>
0.212	20		
0.15	19		
0.063	16		

Dry Mass of sample, g **10045**

Sample Proportions	% dry mass
Cobbles	18
Gravel	50
Sand	16
Silt	15
Clay	1

Grading Analysis		
D100	mm	125
D60	mm	21.6
D30	mm	1.4
D10	mm	0.0157
Uniformity Coefficient		1400
Curvature Coefficient		5.8

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved  
  
Stephen.Watson





# PARTICLE SIZE DISTRIBUTION

Job Ref **18-1234**

Borehole/Pit No. **BH03A**

Site Name **Concorde Residential Development**

Sample No. **15**

Soil Description **Grey slightly sandy gravelly SILT/CLAY.**

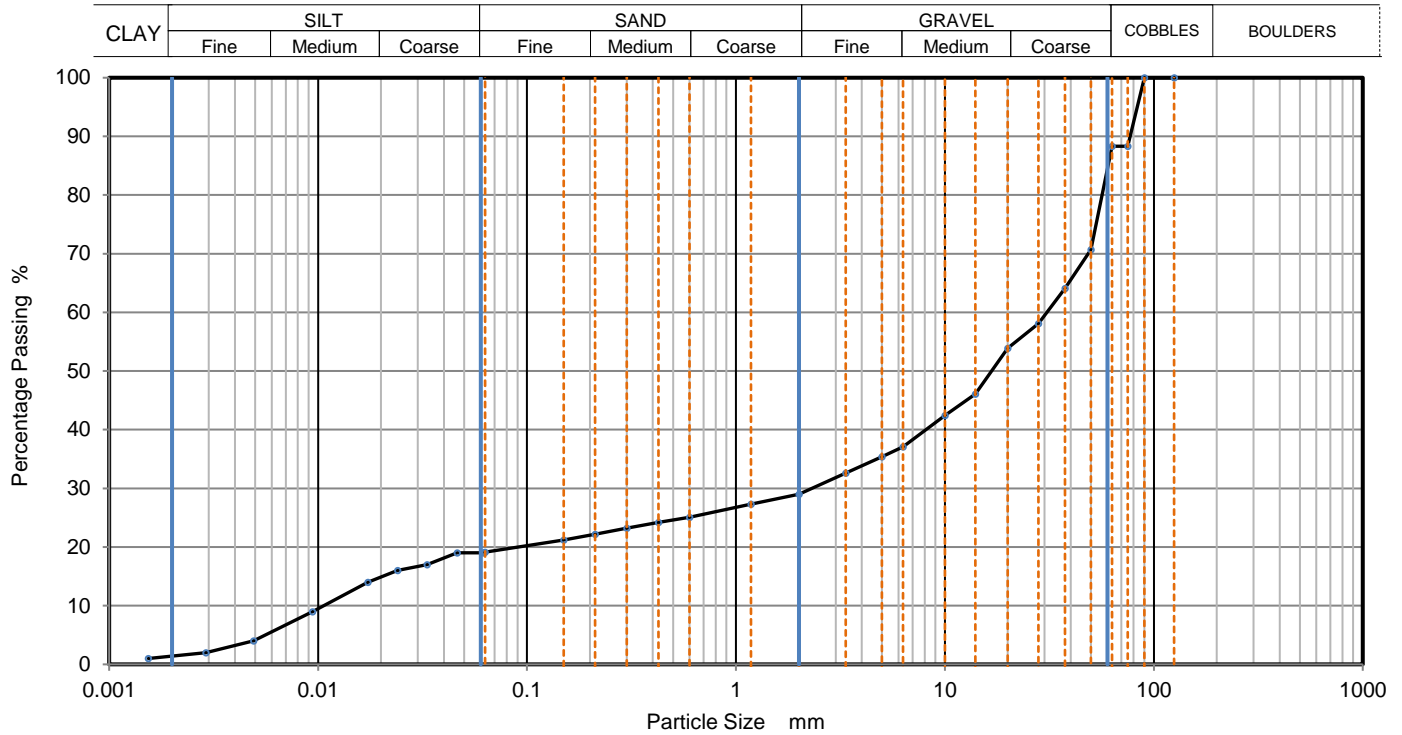
Depth, m **3.00**

Specimen Reference **6** Specimen Depth **3** m

Sample Type **B**

Test Method **BS1377:Part 2:1990, clauses 9.2 and 9.5**

KeyLAB ID **Caus2018111921**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0618	19
90	100	0.0463	19
75	88	0.0332	17
63	88	0.0240	16
50	71	0.0173	14
37.5	64	0.0094	9
28	58	0.0049	4
20	54	0.0029	2
14	46	0.0015	1
10	42		
6.3	37		
5	35		
3.35	33		
2	29		
1.18	27		
0.6	25	Particle density (assumed)	
0.425	24	2.65	Mg/m <sup>3</sup>
0.3	23		
0.212	22		
0.15	21		
0.063	19		

Dry Mass of sample, g **9981**

Sample Proportions	% dry mass
Cobbles	12
Gravel	59
Sand	10
Silt	18
Clay	1

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	2900
Curvature Coefficient	16

Remarks  
Preparation and testing in accordance with BS1377 unless noted below

Approved  
  
Stephen.Watson





## Final Report

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**Report No.:** 18-37527-1

**Initial Date of Issue:** 03-Dec-2018

**Client** Causeway Geotech Ltd

**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Carin Cornwall  
Ciaran Doherty  
Colm Hurley  
Darren O'Mahony  
Gabriella Horan  
John Cameron  
Lucy Newland  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Paul McNamara  
Sean Ross  
Sean Toomey  
Stephen Watson  
Stuart Abraham

**Project** 18-1234 Concorde Residential  
Development

**Quotation No.:** **Date Received:** 29-Nov-2018

**Order No.:** **Date Instructed:** 29-Nov-2018

**No. of Samples:** 3

**Turnaround (Wkdays):** 3 **Results Due:** 03-Dec-2018

**Date Approved:** 03-Dec-2018

**Approved By:**

**Details:**

Robert Monk, Technical Manager



The right chemistry to deliver results

**Chemtest Ltd.**

Depot Road

Newmarket

CB8 0AL

Tel: 01638 606070

Email: [info@chemtest.com](mailto:info@chemtest.com)



**Project: 18-1234 Concorde Residential Development**

<b>Client: Causeway Geotech Ltd</b>	<b>Chemtest Job No.:</b>				18-37527	18-37527	18-37527
Quotation No.:	<b>Chemtest Sample ID.:</b>				732979	732980	732981
Order No.:	Client Sample Ref.:				8	4	12
	Sample Location:				BH01	BH02	BH03A
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				2	1	1.5
	Date Sampled:				28-Nov-2018	28-Nov-2018	28-Nov-2018
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>			
Moisture	N	2030	%	0.020	11	12	24
pH	U	2010		N/A	8.3	8.6	7.9
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.13	< 0.010	0.45

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

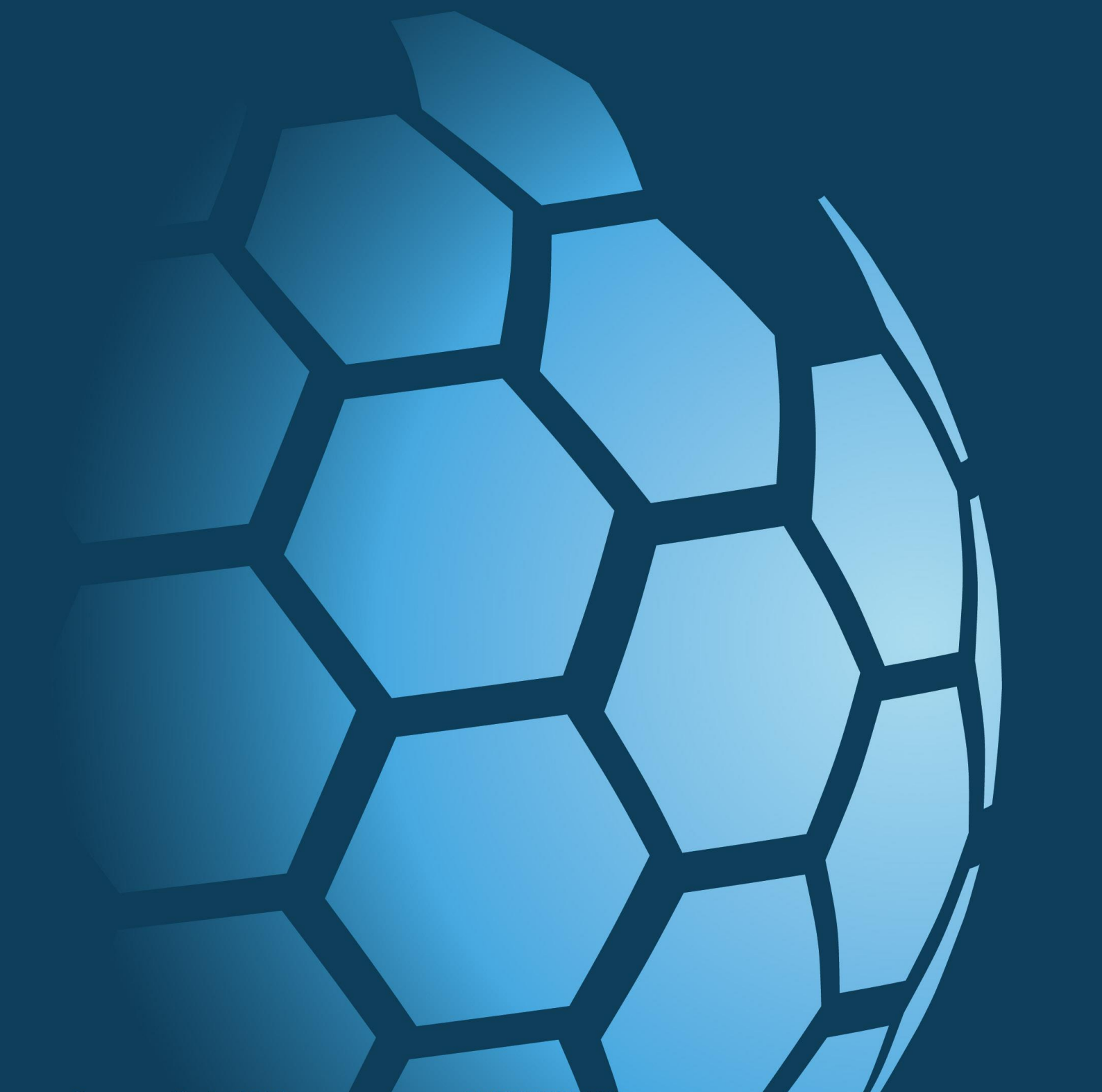
[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



**CAUSEWAY**  
— GEOTECH

**APPENDIX F**

**ENVIRONMENTAL LABORATORY TEST RESULTS**





## Final Report

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**Report No.:** 18-35678-1

**Initial Date of Issue:** 23-Nov-2018

**Client:** Causeway Geotech Ltd

**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabriella Horan  
John Cameron  
Lucy Peaker  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Paul McNamara  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham  
Lucy Newland

**Project:** 18-1234 Concorde Dublin

**Quotation No.:** Q18-13245      **Date Received:** 13-Nov-2018

**Order No.:**      **Date Instructed:** 16-Nov-2018

**No. of Samples:** 3

**Turnaround (Wkdays):** 4      **Results Due:** 21-Nov-2018

**Date Approved:** 23-Nov-2018

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager



**Project: 18-1234 Concorde Dublin**

Client: Causeway Geotech Ltd		Chemtest Job No.:			18-35678	18-35678	18-35678
Quotation No.: Q18-13245		Chemtest Sample ID.:			724616	724619	724621
Order No.:		Client Sample Ref.:			ES1	ES1	ES3
		Sample Location:			BH1	BH2	BH2
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			0.5	0.5	2.0
		Date Sampled:			07-Nov-2018	08-Nov-2018	08-Nov-2018
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	11	12	11
pH	U	2010		N/A	8.8	8.5	8.5
Arsenic	U	2450	mg/kg	1.0	17	17	19
Barium	U	2450	mg/kg	10	69	52	96
Cadmium	U	2450	mg/kg	0.10	1.9	2.4	2.5
Chromium	U	2450	mg/kg	1.0	12	14	14
Molybdenum	U	2450	mg/kg	2.0	4.8	4.3	5.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	21	28	33
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	39	51	53
Lead	U	2450	mg/kg	0.50	23	17	23
Selenium	U	2450	mg/kg	0.20	0.70	0.71	1.5
Zinc	U	2450	mg/kg	0.50	65	87	95
Chromium (Trivalent)	N	2490	mg/kg	1.0	12	14	14
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	0.74	0.89	0.39
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0

**Project: 18-1234 Concorde Dublin**

Client: Causeway Geotech Ltd		Chemtest Job No.:		18-35678	18-35678	18-35678	
Quotation No.: Q18-13245		Chemtest Sample ID.:		724616	724619	724621	
Order No.:		Client Sample Ref.:		ES1	ES1	ES3	
		Sample Location:		BH1	BH2	BH2	
		Sample Type:		SOIL	SOIL	SOIL	
		Top Depth (m):		0.5	0.5	2.0	
		Date Sampled:		07-Nov-2018	08-Nov-2018	08-Nov-2018	
		Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD			
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	< 0.10	< 0.10	< 0.10

## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-35678				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 724616				Limits			
Sample Ref: ES1					Inert Waste Landfill	Stable, Non- reactive hazardous waste in non- hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: BH1							
Top Depth(m): 0.5							
Bottom Depth(m):							
Sampling Date: 07-Nov-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.74	3	5	6
Loss On Ignition	2610	U	%	2.2	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		8.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.038	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0013	< 0.050	0.5	2	25
Barium	1450	U	0.0019	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0013	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0078	0.078	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.9	29	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	5.2	52	1000	20000	50000
Total Dissolved Solids	1020	N	44	440	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	13	130	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-35678				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 724619				Limits			
Sample Ref: ES1					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: BH2							
Top Depth(m): 0.5							
Bottom Depth(m):							
Sampling Date: 08-Nov-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.89	3	5	6
Loss On Ignition	2610	U	%	2.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.072	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0014	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0012	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	4.3	43	800	15000	25000
Fluoride	1220	U	0.13	1.3	10	150	500
Sulphate	1220	U	4.4	44	1000	20000	50000
Total Dissolved Solids	1020	N	46	460	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.4	84	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-35678				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 724621				Limits			
Sample Ref: ES3					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: BH2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Top Depth(m): 2.0							
Bottom Depth(m):					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sampling Date: 08-Nov-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.39	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.062	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0027	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0020	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.4	34	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	4.6	46	1000	20000	50000
Total Dissolved Solids	1020	N	48	470	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.6	66	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Report Information

### Key

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### Sample Retention and Disposal

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



## Final Report

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**Report No.:** 18-36454-1

**Initial Date of Issue:** 29-Nov-2018

**Client:** Causeway Geotech Ltd

**Client Address:** 8 Drumahiskey Road  
Balnamore  
Ballymoney  
County Antrim  
BT53 7QL

**Contact(s):** Carin Cornwall  
Colm Hurley  
Darren O'Mahony  
Gabiella Horan  
John Cameron  
Lucy Newland  
Matthew Gilbert  
Neil Haggan  
Paul Dunlop  
Paul McNamara  
Sean Ross  
Stephen Franey  
Stephen Watson  
Stuart Abraham

**Project:** 18-1234 Concorde Dublin

**Quotation No.:** Q18-13245      **Date Received:** 20-Nov-2018


**Order No.:**      **Date Instructed:** 22-Nov-2018

**No. of Samples:** 5

**Turnaround (Wkdays):** 4      **Results Due:** 27-Nov-2018

**Date Approved:** 29-Nov-2018

**Approved By:**



**Details:** Martin Dyer, Laboratory Manager

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**Project: 18-1234 Concorde Dublin**

Client: Causeway Geotech Ltd		Chemtest Job No.:		18-36454	18-36454	18-36454	18-36454	18-36454
Quotation No.: Q18-13245		Chemtest Sample ID.:		728229	728231	728233	728238	728242
Order No.:		Client Sample Ref.:		ES1	ES3	ES1	ES2	ES2
		Sample Location:		WS01	WS01	WS02	WS03	WS04
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.5	2.0	0.5	1.0	1.0
		Date Sampled:		15-Nov-2018	15-Nov-2018	15-Nov-2018	15-Nov-2018	16-Nov-2018
		Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	20	9.3	5.0	11
pH	U	2010		N/A	7.8	8.5	9.3	8.6
Arsenic	U	2450	mg/kg	1.0	21	17	20	19
Barium	U	2450	mg/kg	10	92	84	75	90
Cadmium	U	2450	mg/kg	0.10	1.9	2.1	0.37	2.2
Chromium	U	2450	mg/kg	1.0	21	19	13	17
Molybdenum	U	2450	mg/kg	2.0	2.7	3.2	< 2.0	4.1
Antimony	N	2450	mg/kg	2.0	2.6	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	41	27	16	33
Mercury	U	2450	mg/kg	0.10	0.46	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	53	53	18	59
Lead	U	2450	mg/kg	0.50	89	19	6.5	18
Selenium	U	2450	mg/kg	0.20	0.84	0.55	0.55	2.1
Zinc	U	2450	mg/kg	0.50	140	82	36	76
Chromium (Trivalent)	N	2490	mg/kg	1.0	21	19	13	17
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	4.4	1.0	5.0	0.68
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	80	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	80	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	250	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	250	< 5.0

Project: 18-1234 Concorde Dublin

Client: Causeway Geotech Ltd		Chemtest Job No.:		18-36454	18-36454	18-36454	18-36454	18-36454	
Quotation No.: Q18-13245		Chemtest Sample ID.:		728229	728231	728233	728238	728242	
Order No.:		Client Sample Ref.:		ES1	ES3	ES1	ES2	ES2	
		Sample Location:		WS01	WS01	WS02	WS03	WS04	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		0.5	2.0	0.5	1.0	1.0	
		Date Sampled:		15-Nov-2018	15-Nov-2018	15-Nov-2018	15-Nov-2018	16-Nov-2018	
		Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	Accred.	SOP	Units	LOD					
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	330	< 10	< 10
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2800	mg/kg	0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-36454				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 728229				Limits			
Sample Ref: ES1					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: WS01					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Top Depth(m): 0.5							
Bottom Depth(m):					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sampling Date: 15-Nov-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	4.4	3	5	6
Loss On Ignition	2610	U	%	8.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		7.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.039	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0030	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0032	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.1	21	800	15000	25000
Fluoride	1220	U	0.53	5.3	10	150	500
Sulphate	1220	U	14	140	1000	20000	50000
Total Dissolved Solids	1020	N	140	1400	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	27	270	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	20

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-36454				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 728231				Limits			
Sample Ref: ES3							
Sample ID:							
Sample Location: WS01							
Top Depth(m): 2.0							
Bottom Depth(m):							
Sampling Date: 15-Nov-2018							
Determinand	SOP	Accred.	Units		Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon	2625	U	%	1.0	3	5	6
Loss On Ignition	2610	U	%	2.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.078	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0041	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0096	0.096	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.3	13	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	14	140	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	11	110	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.3

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.



## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-36454 Chemtest Sample ID: 728233 Sample Ref: ES1 Sample ID: Sample Location: WS02 Top Depth(m): 0.5 Bottom Depth(m): Sampling Date: 15-Nov-2018				Landfill Waste Acceptance Criteria			
				Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	5.0	3	5	6
Loss On Ignition	2610	U	%	0.94	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	310	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		9.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.69	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.025	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	0.0011	0.011	0.01	0.2	2
Molybdenum	1450	U	0.0094	0.094	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0016	0.016	0.1	0.5	7
Zinc	1450	U	0.0025	< 0.50	4	50	200
Chloride	1220	U	5.7	57	800	15000	25000
Fluoride	1220	U	0.61	6.1	10	150	500
Sulphate	1220	U	170	1700	1000	20000	50000
Total Dissolved Solids	1020	N	270	2700	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.1	81	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	5.0

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

**Project: 18-1234 Concorde Dublin**

Chemtest Job No: 18-36454				Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 728238				Limits			
Sample Ref: ES2					Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID:							
Sample Location: WS03							
Top Depth(m): 1.0							
Bottom Depth(m):							
Sampling Date: 15-Nov-2018							
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	0.68	3	5	6
Loss On Ignition	2610	U	%	2.1	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.31	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0048	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.015	0.15	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.9	19	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	6.4	64	1000	20000	50000
Total Dissolved Solids	1020	N	85	840	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	12	120	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## Results - Single Stage WAC

Project: 18-1234 Concorde Dublin

Chemtest Job No: 18-36454 Chemtest Sample ID: 728242 Sample Ref: ES2 Sample ID: Sample Location: WS04 Top Depth(m): 1.0 Bottom Depth(m): Sampling Date: 16-Nov-2018				Landfill Waste Acceptance Criteria			
				Limits			
				Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	2.1	3	5	6
Loss On Ignition	2610	U	%	1.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0 < 2.0	100	--	--
pH	2010	U		9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.36	--	To evaluate	To evaluate
Eluate Analysis			10:1 Eluate mg/l	10:1 Eluate mg/kg	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0025	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0079	0.079	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.012	0.12	0.5	10	30
Nickel	1450	U	0.0019	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	6.9	69	800	15000	25000
Fluoride	1220	U	0.47	4.7	10	150	500
Sulphate	1220	U	8.1	81	1000	20000	50000
Total Dissolved Solids	1020	N	78	780	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	10	100	500	800	1000

### Solid Information

Dry mass of test portion/kg	0.090
Moisture (%)	4.3

### Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

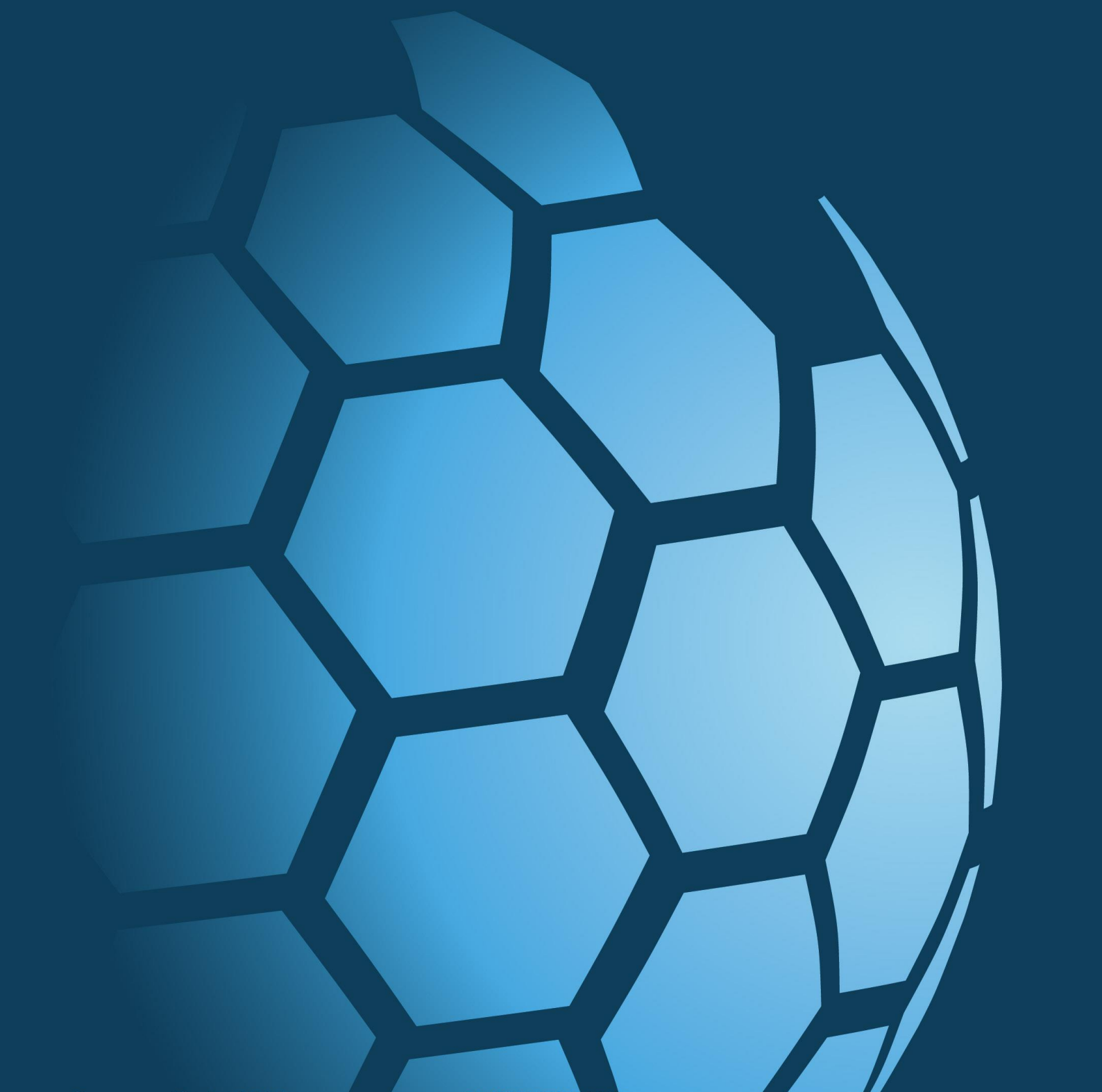
[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



**CAUSEWAY**  
— GEOTECH

**APPENDIX G**

**SPT HAMMER ENERGY MEASUREMENT REPORT**





**Neil Burrows**  
**Southern Testing Laboratories**  
**Unit 11**  
**Charwoods Road**  
**East Grinstead**  
**RH19 2HU**

SPT Hammer Ref: NT5.  
Test Date: 14/04/2018  
Report Date: 15/04/2018  
File Name: NT5..spt  
Test Operator: CAUSEWAY

### Instrumented Rod Data

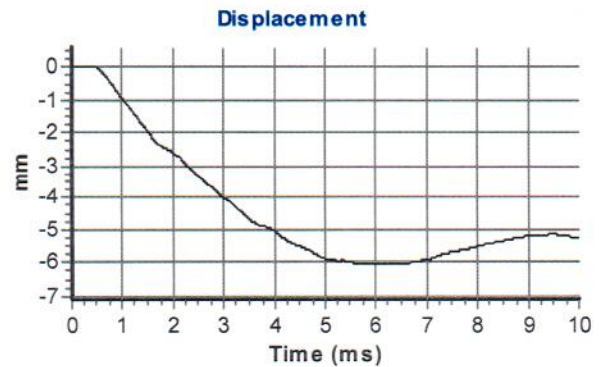
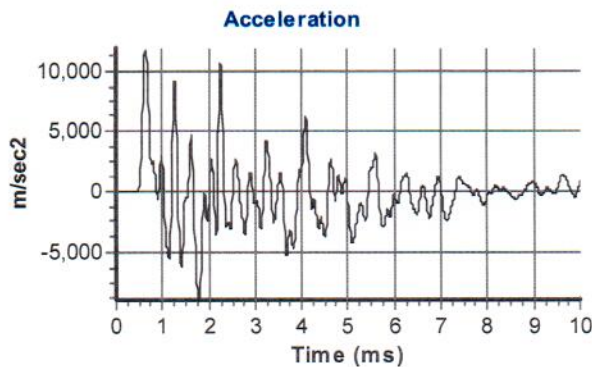
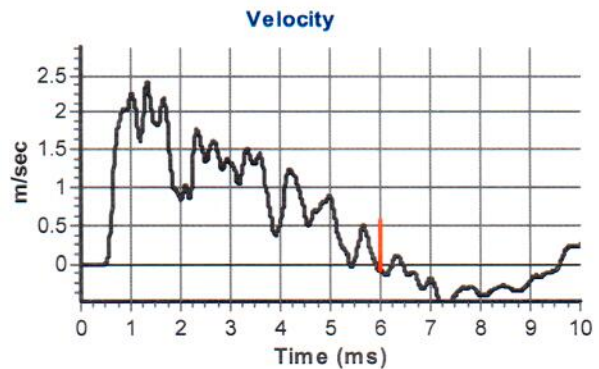
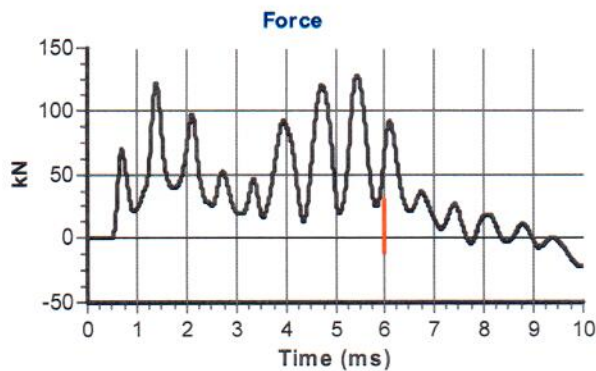
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 6458  
Accelerometer No.2: 9607

### SPT Hammer Information

Hammer Mass  $m$  (kg): 63.5  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 10.5

### Comments / Location

Causeway Yard



### Calculations

Area of Rod A (mm<sup>2</sup>): 905  
Theoretical Energy  $E_{theor}$  (J): 473  
Measured Energy  $E_{meas}$  (J): 299

**Energy Ratio  $E_r$  (%):** **63**



Signed: N P Burrows  
Title: Field Operations Manager

The recommended calibration interval is 12 months

**Neil Burrows**  
**Southern Testing Laboratories**  
**Unit 11**  
**Charlwoods Road**  
**East Grinstead**  
**RH19 2HU**

SPT Hammer Ref: NT4  
Test Date: 14/04/2018  
Report Date: 15/04/2018  
File Name: NT4.spt  
Test Operator: CAUSEWAY

### Instrumented Rod Data

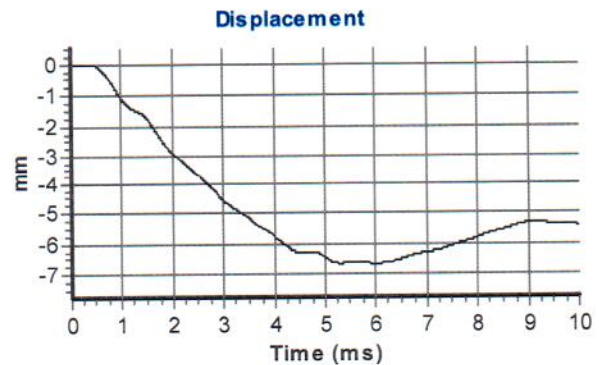
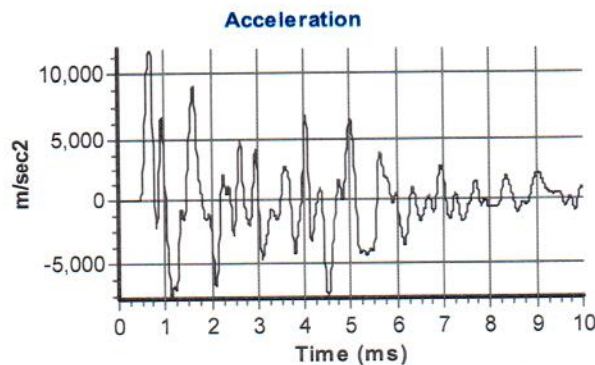
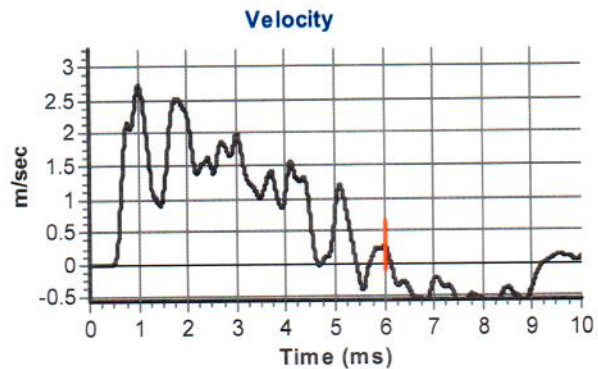
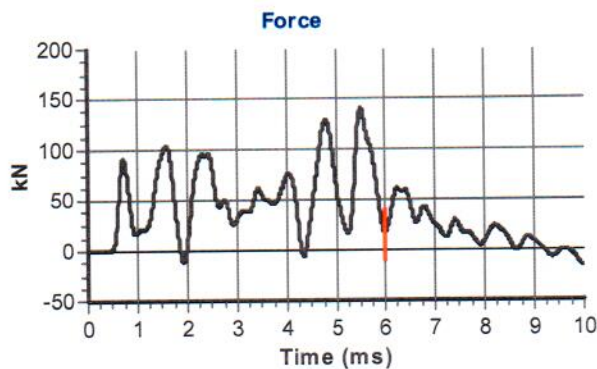
Diameter  $d_r$  (mm): 54  
Wall Thickness  $t_r$  (mm): 6.0  
Assumed Modulus  $E_a$  (GPa): 200  
Accelerometer No.1: 6458  
Accelerometer No.2: 9607

### SPT Hammer Information

Hammer Mass  $m$  (kg): 63.5  
Falling Height  $h$  (mm): 760  
SPT String Length  $L$  (m): 10.5

### Comments / Location

Causeway Yard



### Calculations

Area of Rod A (mm<sup>2</sup>): 905  
Theoretical Energy  $E_{theor}$  (J): 473  
Measured Energy  $E_{meas}$  (J): 307

**Energy Ratio  $E_r$  (%):** **65**



Signed: N P Burrows  
Title: Field Operations Manager

The recommended calibration interval is 12 months