



**GROUND INVESTIGATIONS IRELAND**  
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Ground Investigations Ireland

Churchfields

Waterman Moylan

Ground Investigation Report

April 2023





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## DOCUMENT CONTROL SHEET

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**APPENDICES**

<b>Appendix 1</b>	<b>Site Location Plan</b>
<b>Appendix 2</b>	<b>Slit Trenches</b>
<b>Appendix 3</b>	<b>Soakaway Testing</b>
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## 1.0 Preamble

On the instructions of Waterman Moylan Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between December 2022 and February 2023 at the site of the proposed Residential development in Mulhuddart, Dublin.

## 2.0 Overview

### 2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield however a portion in one corner of the site is occupied by a temporary site compound. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

### 2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 5 No. Trial Pits / Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 2 Slit trench to investigate existing services.
- Carry out 4 No. Window Sample Boreholes to recover soil samples
- Carry out 4 No. Dynamic Probes to determine soil strength/density characteristics
- Carry out 5 No. Rotary Core Boreholes to a maximum depth of 3.50m BGL
- Installation of 2 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

## 3.0 Subsurface Exploration

### 3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

### **3.2. Trial Pits**

The trial pits were excavated using a JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 3 of this Report.

### **3.3. Soakaway Testing**

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

### **3.4. Slit Trenching**

The slit trenches were excavated using JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The soil was slowly stripped using a spotter on the trench to alert the driver if any services were seen, to avoid damage to any underlying services. The slit trenches were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the slit trench records which are provided in Appendix 2 of this Report.

### **3.5. Window Sampling**

The window sampling was carried out at the locations shown in the location plan in Appendix 1 using a Tecopsa SPT Tec 10 percussion drilling rig. The window sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 50kg weight falling a height of 500mm. Upon completion of the 1m sample, the tube is withdrawn and the plastic liner removed and sealed for logging and sub sampling by a Geotechnical Engineer/Engineering Geologist. The tube is replaced in the borehole and a subsequent 1m sample can be recovered. Occasionally outer casing or a reduced diameter tube is utilised to enable the window sample to progress in difficult drilling conditions. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. The window sample records are provided in Appendix 4 of this Report.

### **3.6. Dynamic Probing (DPH)**

The dynamic probe tests (DPH) were carried out at the locations shown in the location plan in Appendix 1 in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 50kg weight in 100mm intervals and monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated by dividing the total number of blows over a 300mm drive length by 1.5. The dynamic probe logs are provided in Appendix 5 of this Report.

### **3.7. Rotary Boreholes**

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 6 of this Report.

### **3.8. Surveying**

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

### **3.9. Groundwater Monitoring Installations**

Groundwater Monitoring Installations were installed upon the completion of selected boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite

seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

### **3.10. Insitu Plate Bearing Test**

The plate bearing tests were carried out using a 457mm diameter plate at the locations shown on the site plan in Appendix 1. The plate was loaded in increments using a hydraulic jack and an excavator to provide a reaction and the displacement was monitored in accordance with BS1377 Part 9 using independently mounted digital strain gauges. The constrained modulus and equivalent CBR are calculated in accordance with HD29/75 and are provided on the test reports in Appendix 7 of this Report.

### **3.11. Laboratory Testing**

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Environmental & Chemical testing as required by the specification, including the Rilta Suite was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.

Rock strength testing including Point Load ( $Is_{50}$ ) and Unconfined Compressive Strength (UCS) testing was carried out in CMTL Geotechnical Laboratory in Portlaoise

The results of the laboratory testing are included in Appendix 8 of this Report.

## **4.0 Ground Conditions**

### **4.1. General**

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil
- Made Ground
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

**TOPSOIL:** Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL.

**MADE GROUND:** Made Ground deposits were encountered beneath the Topsoil in ST01 and ST02 and were present to depths of between 1.5m and 1.8m BGL, however made ground was deeper around the pipes where the base was not proven. These deposits were described generally as *brown sandy slightly gravelly CLAY with occasional cobbles and contained rare fragments of concrete, metal, rope, wood and plastic.*

**COHESIVE DEPOSITS:** Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown sandy gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was soft to firm generally becoming stiff below 1.0mBGL. These deposits had some, occasional or frequent cobble and boulder content, where noted on the exploratory hole logs.

**WEATHERED BEDROCK:** In the majority of exploratory holes weathered rock was encountered which was digable with a JBC 3CX excavator to a depth of up to 0.9m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as angular gravel and cobbles of Limestone/Mudstone however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

**BEDROCK:** The rotary core boreholes recovered Medium strong to strong dark grey fine grained laminated LIMESTONE. This is typical of the Calp Formation, which is noted on the geological mapping of the proposed site.

The depth to rock varies from 0.6m BGL in BH04 to a maximum of 2.2m BGL in BH06. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

#### 4.2. Insitu Strength Testing

The correlated DPH blow counts indicate that the overburden deposits are soft or soft to firm to depth of 1.0m to 1.2m BGL and become firm or firm to stiff with depth.

#### 4.3. Groundwater

No groundwater was noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH04 and BH08 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 9 of this Report.

## 4.4. Laboratory Testing

### 4.4.1. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

### 4.4.2. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The waste classification report is included under the cover of a separate report by Ground Investigations Ireland.

### 4.4.3. Rock Laboratory Testing

The rock testing carried out on samples recovered from the boreholes reported Unconfined Compressive Strength (UCS) values ranging between 21.3 MPa and 25.8 MPa while the point load testing gave  $I_{s50}$  values ranging between 1.68 to 2.80 MPa. The  $I_{s50}$  results correlate to the UCS values using a factor of approximately 20, giving values of 33.6 MPa and 56 MPa. These results correlate to the strength descriptions ranging between of Weak to Strong and confirming the variability of this stratum and the descriptions on the logs.

The results from the completed laboratory testing are included in Appendix 8 of this report.

## 5.0 Recommendations & Conclusions

### 5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

### 5.2. Foundations

An allowable bearing capacity of 500 kN/m<sup>2</sup> is recommended for conventional strip or pad foundations on the bedrock encountered at depths of 0.5m and 2.20m BGL. Where the bedrock is deeper, lean mix trench fill is recommended to achieve the recommended allowable bearing capacity.

In any part of the site, should part of the foundation be on rock we would recommend that all the foundations of the unit in question be lowered to the competent rock stratum to avoid differential settlement.

The possibility for variation in the depth of the bedrock in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

Table 1 below shows the depth that a bearing capacity of 125 kN/m<sup>2</sup> is achievable on the stiff cohesive deposits for conventional strip or pad foundations. However it should be noted that due to shallow rock being encountered it may be required that the foundations be taken to rock to ensure structure are founded on the same strata to avoid differential settlement.

**Table 1 - Allowable Bearing Capacities**

Allowable Bearing Capacities (ABC) kN/m <sup>2</sup>							
Dynamic Probe	ABC	Depth	Comment	Dynamic Probe	ABC	Depth	Comment
No.	kN/m <sup>2</sup>	m BGL		No.	kN/m <sup>2</sup>	m BGL	
DP06	125	1.1	Cohesive	DP12	125	1.5	Cohesive
DP08	125	1.0	Cohesive	DP13	125	0.8	Cohesive

A ground bearing floor slab is recommended to be based on the firm to stiff cohesive deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014 +A1:2016 and/or NRA SRW CL808 Type E granular stone fill.

### 5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendices of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.

The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

### 5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques. Based on the fracture spacing, the rock strength testing and Pettifer & Fookes (1994) Revised Excavatability Graph, the Calp Limestone ranges from hard digging to hard ripping, however the zones recovered as non-intact should be easy to hard digging. The JCB 3CX excavator was generally able to excavate to depths of up to 0.9m below the top of the weathered rock, and became difficult to excavate within the confines of the trial pit on encountering the more competent rock.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

The environmental testing completed during the ground investigation is reported under the cover of a separate GII Waste Classification/Subsoil Assessment Report.

### 5.5. Soakaway Design

Infiltration rates between  $f=1.123 \times 10^{-5}$  m/s and  $8.131 \times 10^{-6}$  m/s were calculated for the soakaway locations SA01 to SA05.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

# APPENDIX 1 - Site Location Plan



705000E

706000E

707000E

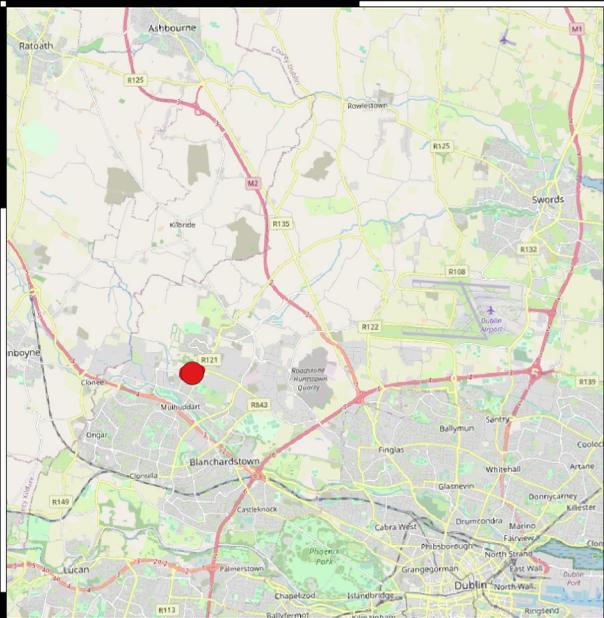
708000E

743000N

742000N

741000N

740000N



-  Indicative Site Boundary
-  Site Location

**Client:**



**Project Code:**

12314-10-22

**Project Title:**

Churchfields

**Drawing Title:**

Slit Trench Location



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Drawn By:  
MS

Date:  
30-12-2022

705000E

706000E

707000E

708000E

706350E 706400E 706450E 706500E 706550E 706600E 706650E 706700E 706750E 706800E 706850E 706900E 706950E 707000E 707050E 707100E 707150E 707200E

741100N 741150N 741200N 741250N 741300N 741350N 741400N 741450N 741500N 741550N 741600N 741650N 741700N 741750N 741800N



-  Slit Trench
-  Plate Test Location
-  Soakaways
-  Window Sample
-  Rotary Borehole

Client:



Project Code:

12314-10-22

Project Title:

Churchfields

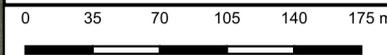
Drawing Title:

Slit Trench Locations



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Drawn By:  
MS

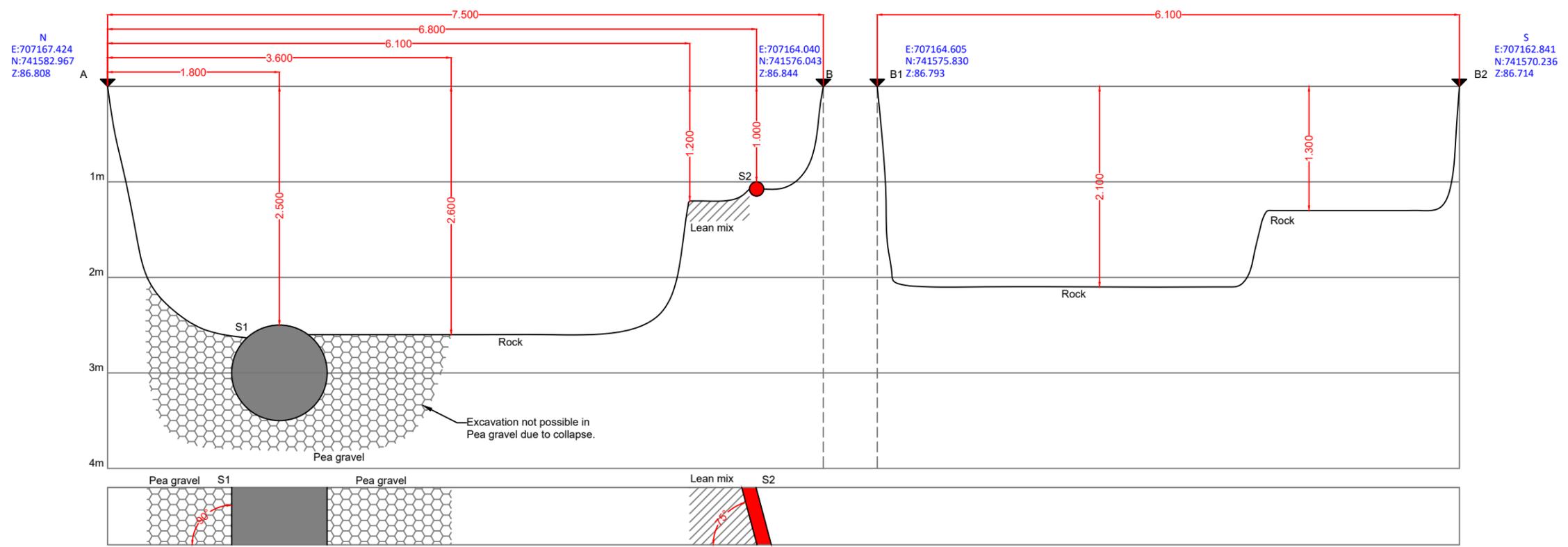
Date:  
29/03/2023

706350E 706400E 706450E 706500E 706550E 706600E 706650E 706700E 706750E 706800E 706850E 706900E 706950E 707000E 707050E 707100E 707150E 707200E

## APPENDIX 2 – Slit Trench Records



**ST-01**



Service No	ø (m)	Colour - Material	Utility	Angle to trench	Coordinates		Level	Notes
					East	North		
S1	1.000	Ductile Iron	Water	90°	707166.389	741581.020	86.776	No picture possible due to trench collapsed.
S2	0.150	Red PE	ESB	75°	707164.678	741576.531	85.728	-

From (m)	To (m)	Description	From (m)	To (m)	Description
0.00	2.60	MADE GROUND: Greyish brown slightly sandy gravelly CLAY with occasional fragments of wood and plastic.	0.00	1.50	MADE GROUND: Brown slightly sandy gravelly CLAY with rare fragments of wood and plastic.
2.60	2.70	Pea gravel.	1.50	2.10	Brown slightly sandy gravelly CLAY with some cobbles.

Surface from/to (m)	Surface type	Sample depth (m)	Sample type
0.00	7.50	-	

Groundwater	Y/N	Depth	Notes
	N		

Date of excavation: 29/11/2022



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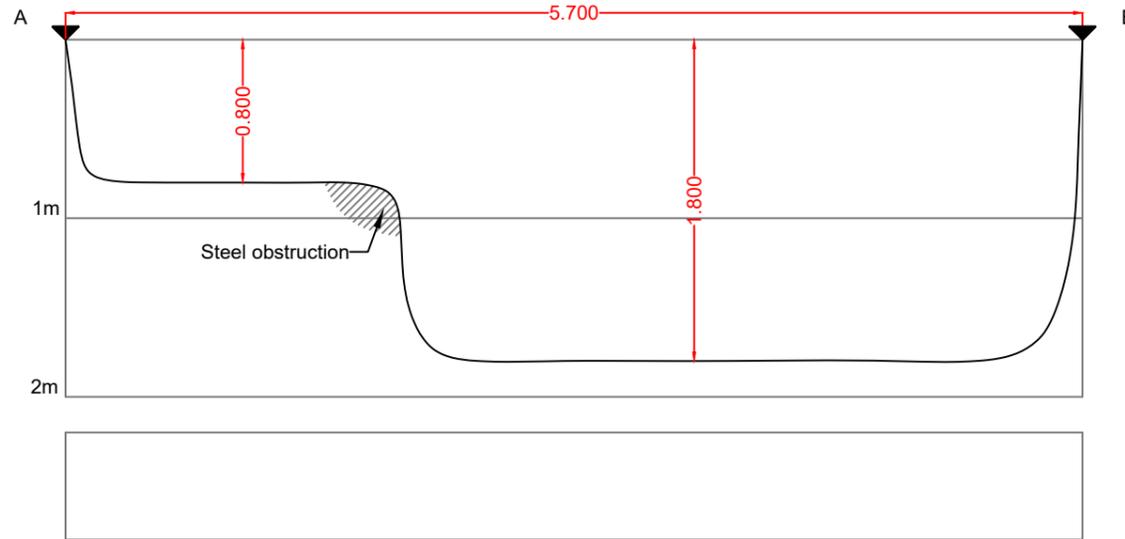
PROJECT:	12314-10-22 - Churchfields
DRAWING No.:	ST01
DATE:	29/11/2022
CLIENT:	Waterman Moylan
SCALE:	NTS

Version:	Date:	Drawn By:	Checked By:
0	16/01/2023	J.S.	M.S.

# ST-02

N  
E:707168.736  
N:741587.092  
Z:86.922

S  
E:707166.850  
N:741582.268  
Z:86.867



Service No	ø (m)	Colour - Material	Utility	Angle to trench	Coordinates		Level	Notes
					East	North		

Surface from/to (m)	Surface type	Sample depth (m)	Sample type
0.00 - 5.70	-		

From (m)	To (m)	Description
0.00	1.80	MADE GROUND: Brown slightly sandy gravelly CLAY with some cobbles and occasional fragments of metal, rope, plastic and wood.

Groundwater	Y/N	Depth	Notes
	N		



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PROJECT:	12314-10-22 - Churchfields
DRAWING No.:	ST01
DATE:	29/11/2022
CLIENT:	Waterman Moylan
SCALE:	NTS

Version:	Date:	Drawn By:	Checked By:
0	16/01/2023	J.S.	M.S.

Date of excavation: 29/11/2022

Churchfields - Slit Trench Photographs

ST01



Churchfields - Slit Trench Photographs

ST01



Churchfields - Slit Trench Photographs

ST02



Churchfields - Slit Trench Photographs

ST02



## **APPENDIX 3 – Soakaway Records**





**GROUND INVESTIGATIONS IRELAND**  
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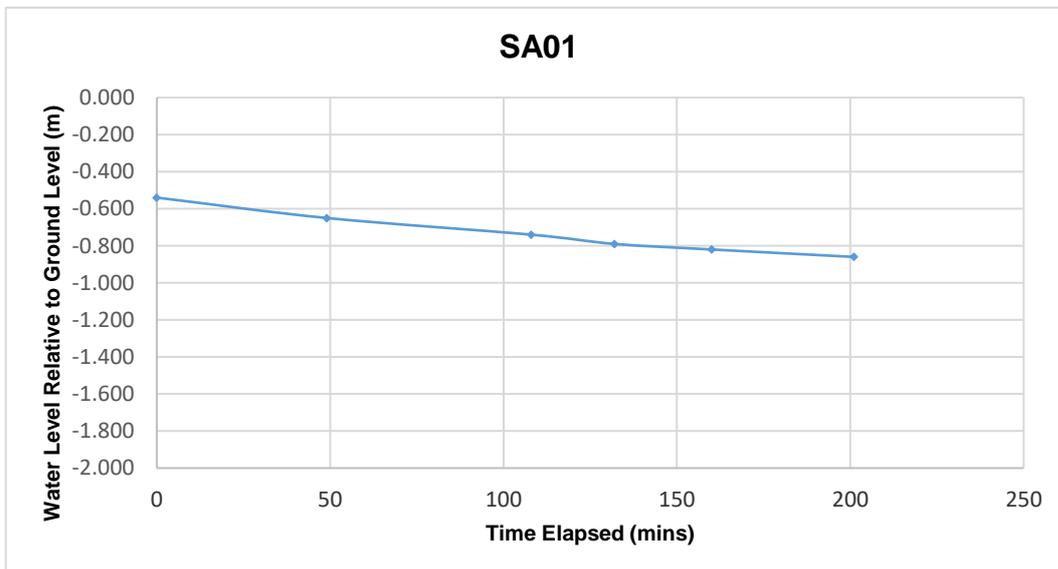
**SA01**

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.20m x 0.50m x 1.40m (L x W x D)

Date	Time	Water level (m bgl)
28/11/2022	0	-0.540
28/11/2022	49	-0.650
28/11/2022	108	-0.740
28/11/2022	132	-0.790
28/11/2022	160	-0.820
28/11/2022	201	-0.860

<b>Start depth</b> 0.54	<b>Depth of Pit</b> 1.400	<b>Diff</b> 0.860	<b>75% full</b> 0.755	<b>25%full</b> 1.185
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.200	0.500		0.430	0.47
Tp75-25 (from graph) (s)	<b>17000</b>		50% Eff Depth 0.430	ap50 (m2) 3.422
<b>f =</b>	<b>8.131E-06</b>	<b>m/s</b>		





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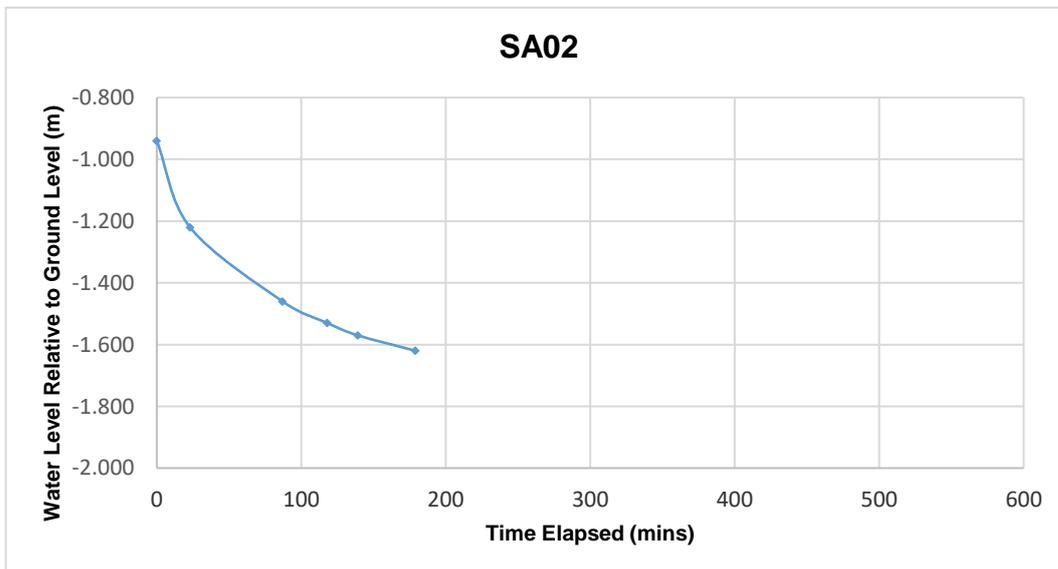
**SA02**

**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.20m x 0.50m x 1.40m (L x W x D)**

Date	Time	Water level (m bgl)
28/11/2022	0	-0.940
28/11/2022	23	-1.220
28/11/2022	87	-1.460
28/11/2022	118	-1.530
28/11/2022	139	-1.570
28/11/2022	179	-1.620

<b>Start depth</b> 0.94	<b>Depth of Pit</b> 2.000	<b>Diff</b> 1.060	<b>75% full</b> 1.205	<b>25%full</b> 1.735
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.200	0.450		0.530	0.52
Tp75-25 (from graph) (s)	<b>12300</b>		50% Eff Depth	ap50 (m2)
			0.530	3.799
<b>f =</b>	<b>1.123E-05</b>	<b>m/s</b>		





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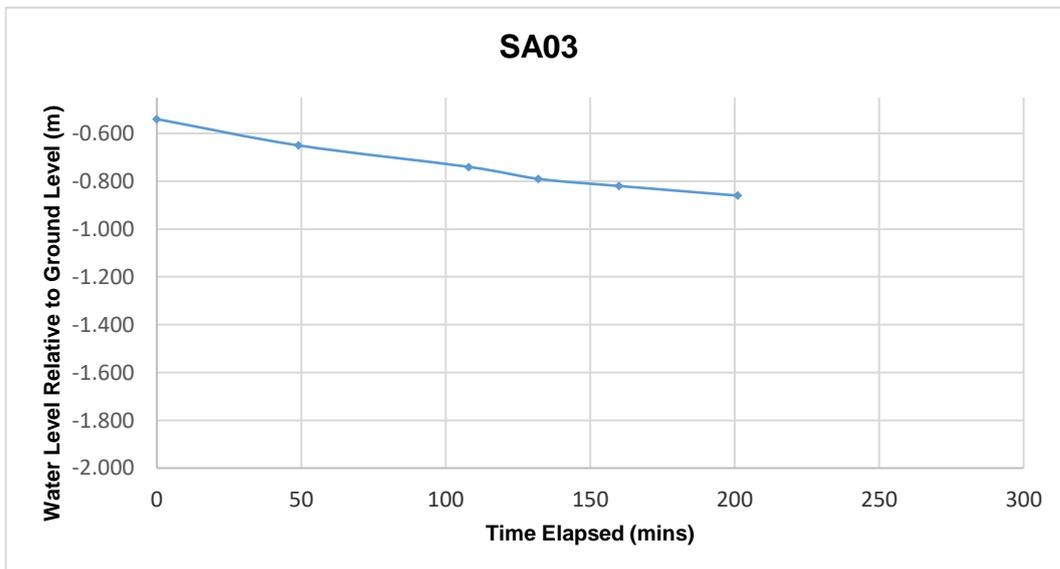
**SA03**

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.20m x 0.50m x 2.00m (L x W x D)

Date	Time	Water level (m bgl)
28/11/2022	0	-0.540
28/11/2022	49	-0.650
28/11/2022	108	-0.740
28/11/2022	132	-0.790
28/11/2022	160	-0.820
28/11/2022	201	-0.860

<b>Start depth</b> 0.54	<b>Depth of Pit</b> 2.000	<b>Diff</b> 1.460	<b>75% full</b> 0.905	<b>25%full</b> 1.635
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.200	0.500		0.730	0.80
Tp75-25 (from graph) (s)	<b>43800</b>		50% Eff Depth	ap50 (m2)
			0.730	5.042
<b>f =</b>	<b>3.636E-06</b>	<b>m/s</b>		





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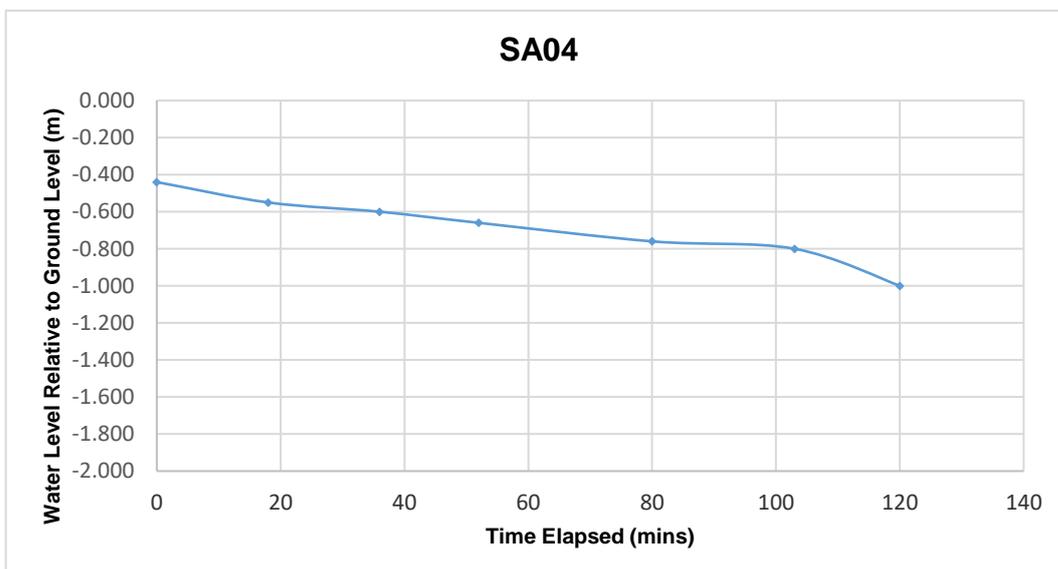
**SA04**

Soakaway Test to BRE Digest 365

Trial Pit Dimensions: 2.30m x 0.55m x 1.00m (L x W x D)

Date	Time	Water level (m bgl)
28/11/2022	0	-0.440
28/11/2022	18	-0.550
28/11/2022	36	-0.600
28/11/2022	52	-0.660
28/11/2022	80	-0.760
28/11/2022	103	-0.800
28/11/2022	120	-1.000

<b>Start depth</b> 0.44	<b>Depth of Pit</b> 1.000	<b>Diff</b> 0.560	<b>75% full</b> 0.58	<b>25%full</b> 0.86
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.300	0.550		0.280	0.35
Tp75-25 (from graph) (s)	<b>4300</b>		50% Eff Depth	ap50 (m2)
			0.280	2.861
<b>f =</b>	<b>2.879E-05</b>	<b>m/s</b>		





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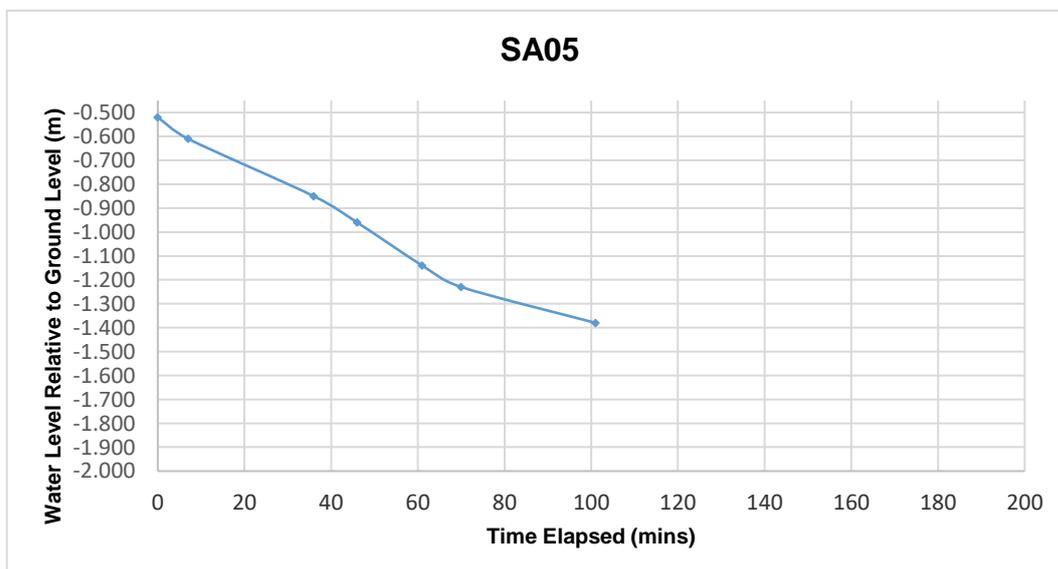
**SA05**

**Soakaway Test to BRE Digest 365**

**Trial Pit Dimensions: 2.10m x 0.45m x 1.70m (L x W x D)**

Date	Time	Water level (m bgl)
28/11/2022	0	-0.520
28/11/2022	7	-0.610
28/11/2022	36	-0.850
28/11/2022	46	-0.960
28/11/2022	61	-1.140
28/11/2022	70	-1.230
28/11/2022	101	-1.380

<b>Start depth</b> <b>0.52</b>	<b>Depth of Pit</b> <b>1.700</b>	<b>Diff</b> <b>1.180</b>	<b>75% full</b> <b>0.815</b>	<b>25%full</b> <b>1.405</b>
Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.100	0.450		0.590	0.56
Tp75-25 (from graph) (s)	<b>4100</b>		50% Eff Depth	ap50 (m2)
			0.590	3.954
<b>f =</b>	<b>3.439E-05</b>	<b>m/s</b>		





Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20 X 0.70 X 1.15	Ground Level (mOD) 84.43	Client	Job Number 12314-10-22
		Location 707042.3 E 741387.6 N	Dates 28/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
				84.18	0.25 (0.15)	Brownish grey slightly sandy gravelly CLAY.		
				84.03	0.40	Weathered Rock consisting of grey slightly sandy slightly clayey angular to sub-angular fine to coarse GRAVEL and COBBLES of Limestone.		
					(0.75)			
				83.28	1.15	Obstruction: Presumed Rock. Terminated at 1.15m		

<b>Plan</b> . . . . . . . . . .	<b>Remarks</b>  No Groundwater encountered during excavation. Trial pit sidewalls collapsing. Soakaway test completed in trial pit. Trial pit backfilled on completion of soakaway test.	
		<b>Scale (approx)</b> 1:25



Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20 X 0.45 X 2.00	Ground Level (mOD) 84.03	Client	Job Number 12314-10-22
		Location 706990.7 E 741444.1 N	Dates 28/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				83.78	0.25	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
				83.13	0.90	Firm brown slightly sandy gravelly CLAY with occasional cobbles.		
				82.83	1.20	Firm brownish grey slightly sandy gravelly CLAY.		
				82.53	1.50	Firm to stiff grey slightly sandy gravelly CLAY. (Possible Residual Soil)		
				82.03	2.00	Weathered Rock consisting of grey slightly sandy slightly clayey angular to sub-angular fine to coarse GRAVEL of Limestone.		
						Obstruction: Presumed Rock. Terminated at 2.00m		

<b>Plan</b> . . . . . . . . . .	<b>Remarks</b> No Groundwater encountered during excavation. Trial pit stable. Soakaway test completed in trial pit. Trial pit backfilled on completion of soakaway test.					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>Tmcl</td> <td>12314-10-22.SA02</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	Tmcl
Scale (approx)	Logged By	Figure No.				
1:25	Tmcl	12314-10-22.SA02				



Machine : JCB 3CX Method : Trial Pit		Dimensions 2.20 X 0.50 X 1.40	Ground Level (mOD) 78.95	Client	Job Number 12314-10-22
		Location 706867.6 E 741450.3 N	Dates 28/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				78.65	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
				77.65	0.30	Firm to stiff grey slightly sandy gravelly CLAY with occasional cobbles.(Possible Residual Soil)		
				77.55	1.30 (0.10)	Weathered Rock consisting of grey slightly sandy slightly clayey angular to sub-angular fine to coarse GRAVEL and COBBLES of Limestone. Obstruction: Presumed Rock.		
					1.40	Terminated at 1.40m		

<b>Plan</b> . . . . . . . . . .	<b>Remarks</b> No Groundwater encountered during excavation. Trial pit stable. Soakaway test completed in trial pit. Trial pit backfilled on completion of soakaway test.					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>Tmcl</td> <td>12314-10-22.SA03</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	Tmcl
Scale (approx)	Logged By	Figure No.				
1:25	Tmcl	12314-10-22.SA03				



Machine : JCB 3CX Method : Trial Pit		Dimensions 2.30 X 0.55 X 1.00	Ground Level (mOD) 75.76	Client	Job Number 12314-10-22
		Location 706779.8 E 741351.8 N	Dates 28/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
				75.51	0.25 (0.25)	Firm brownish grey slightly sandy slightly gravelly CLAY.		
				75.26	0.50 (0.50)	Weathered Rock consisting of slightly sandy slightly clayey angular to sub-angular fine to coarse GRAVEL of Limestone.		
				74.76	1.00	Obstruction: Presumed Rock. Terminated at 1.00m		

<b>Plan</b> . . . . . . . . . .	<b>Remarks</b> No Groundwater encountered during excavation. Trial pit stable. Soakaway test completed in trial pit. Trial pit backfilled on completion of soakaway test.		
	<b>Scale (approx)</b> 1:25	<b>Logged By</b> Tmcl	<b>Figure No.</b> 12314-10-22.SA05



Machine : JCB 3CX Method : Trial Pit		Dimensions 2.10 X 0.45 X 1.70	Ground Level (mOD) 74.36	Client	Job Number 12314-10-22
		Location 706736.4 E 741436.7 N	Dates 28/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				74.06	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
				73.56	(0.50)	Firm greyish brown slightly sandy gravelly CLAY with occasional cobbles.		
				72.66	(0.90)	Weathered Rock consisting of grey/brown slightly sandy very clayey angular to sub-angular fine to coarse GRAVEL and COBBLES of Limestone.		
					1.70	Obstruction: Presumed Rock. Terminated at 1.70m		

<b>Plan</b> . . . . . . . . . .	<b>Remarks</b> No Groundwater encountered during excavation. Trial pit stable. Soakaway test completed in trial pit. Trial pit backfilled on completion of soakaway test.					
	<table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>Tmcl</td> <td>12314-10-22.SA05</td> </tr> </table>	Scale (approx)	Logged By	Figure No.	1:25	Tmcl
Scale (approx)	Logged By	Figure No.				
1:25	Tmcl	12314-10-22.SA05				

## **APPENDIX 4 – Window Sample Records**





Machine : Tec 10		Dimensions 87mm to 1.00m 65mm to 1.40m		Ground Level (mOD) 0.00		Client		Job Number 12314-10-22	
Method : Drive-in Windowless Sampler		Location 706680.3 E 741477.6 N		Dates 29/11/2022		Engineer Waterman Moylan		Sheet 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	B				(0.20)	Brown TOPSOIL with roots.		
0.20-1.20	B			-0.20	0.20	Firm brown slightly sandy slightly gravelly CLAY.		
					(0.90)			
1.20-1.40	B			-1.10	1.10	Stiff brown slightly sandy slightly gravelly CLAY.		
				-1.20	1.20	Stiff greyish brown slightly sandy slightly gravelly CLAY.		
				-1.40	1.40	Refusal at 1.40m		

<b>Remarks</b> 0-1.0m BGL: 95% recovery. 1.0-1.40m BGL: 88% recovery. Refusal at 1.4m BGL on obstruction: Possible boulder or bedrock. Dynamic probe DP06 carried out adjacent to WS06	Scale (approx)	Logged By
	1:25	RM
<b>Figure No.</b> 12314-10-22.WS06		



Machine : Tec 10 Method : Drive-in Windowless Sampler	Dimensions 87mm to 0.90m	Ground Level (mOD) 76.47	Client	Job Number 12314-10-22
	Location 706803.5 E 741495.3 N	Dates 29/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	B			76.37	(0.10) 0.10	Brown TOPSOIL.		
0.10-0.90	B				(0.80)	Soft brown slightly sandy slightly gravelly CLAY.		
				75.57	0.90	Refusal at 0.90m		

<b>Remarks</b> 0-1.0m BGL: 85% recovery. Refusal at 1.0m BGL on obstruction: Possible boulder or bedrock. Dynamic probe DP08 carried out adjacent to WS08	Scale (approx) 1:25	Logged By RM
	<b>Figure No.</b> 12314-10-22.WS08	



<b>Machine :</b> Tec 10 <b>Method :</b> Drive-in Windowless Sampler	<b>Dimensions</b> 87mm to 1.00m	<b>Ground Level (mOD)</b> 83.31	<b>Client</b>	<b>Job Number</b> 12314-10-22
	<b>Location</b> 706956.3 E 741386.3 N	<b>Dates</b> 29/11/2022	<b>Engineer</b> Waterman Moylan	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.25	B				(0.25)	Brown TOPSOIL.		
0.25-0.56	B			83.06	0.25	Firm brown slightly sandy slightly gravelly CLAY.		
					(0.75)			
				82.31	1.00	Refusal at 1.00m		

<b>Remarks</b> 0-1.0m BGL: 56% recovery. Refusal at 1.0m BGL on obstruction: Possible boulder or bedrock. Dynamic probe DP12 carried out adjacent to WS12	<b>Scale (approx)</b> 1:25	<b>Logged By</b>
	<b>Figure No.</b> 12314-10-22.WS12	



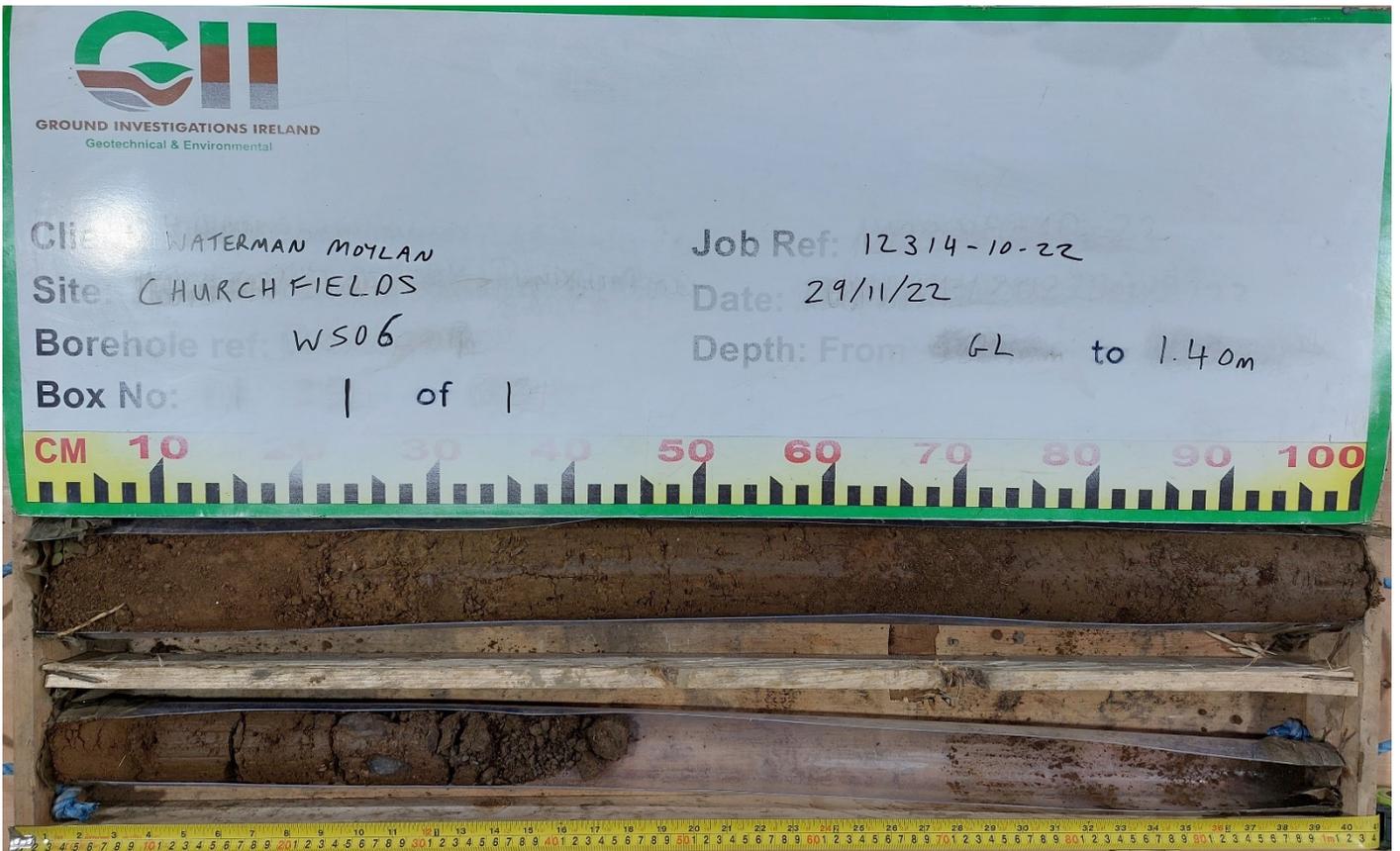
Machine : Tec 10		Dimensions 87mm to 1.00m 65mm to 1.60m		Ground Level (mOD) 85.02		Client		Job Number 12314-10-22	
Method : Drive-in Windowless Sampler		Location 707063.4 E 741541.1 N		Dates 29/11/2022		Engineer Waterman Moylan		Sheet 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	B				(0.20)	Brown TOPSOIL with grass.		
0.20-1.10	B			84.82	0.20	Soft brown slightly sandy slightly gravelly CLAY.		
					(0.60)			
				84.22	0.80	Stiff brown slightly sandy slightly gravelly CLAY.		
					(0.30)			
1.10-1.50	B			83.92	1.10	Stiff brownish grey slightly gravelly slightly sandy CLAY.		
					(0.40)			
1.50-1.60	B			83.52	1.50	Stiff brown slightly sandy slightly gravelly CLAY.		
				83.42	(0.10) 1.60	Refusal at 1.60m		

<b>Remarks</b> 0-1.0m BGL: 95% recovery. 1.0-1.60m BGL: 100% recovery. Refusal at 1.6m BGL on obstruction: Possible boulder or bedrock. Dynamic probe DP13 carried out adjacent to WS13	Scale (approx)	Logged By
	1:25	RM
<b>Figure No.</b> 12314-10-22.WS13		

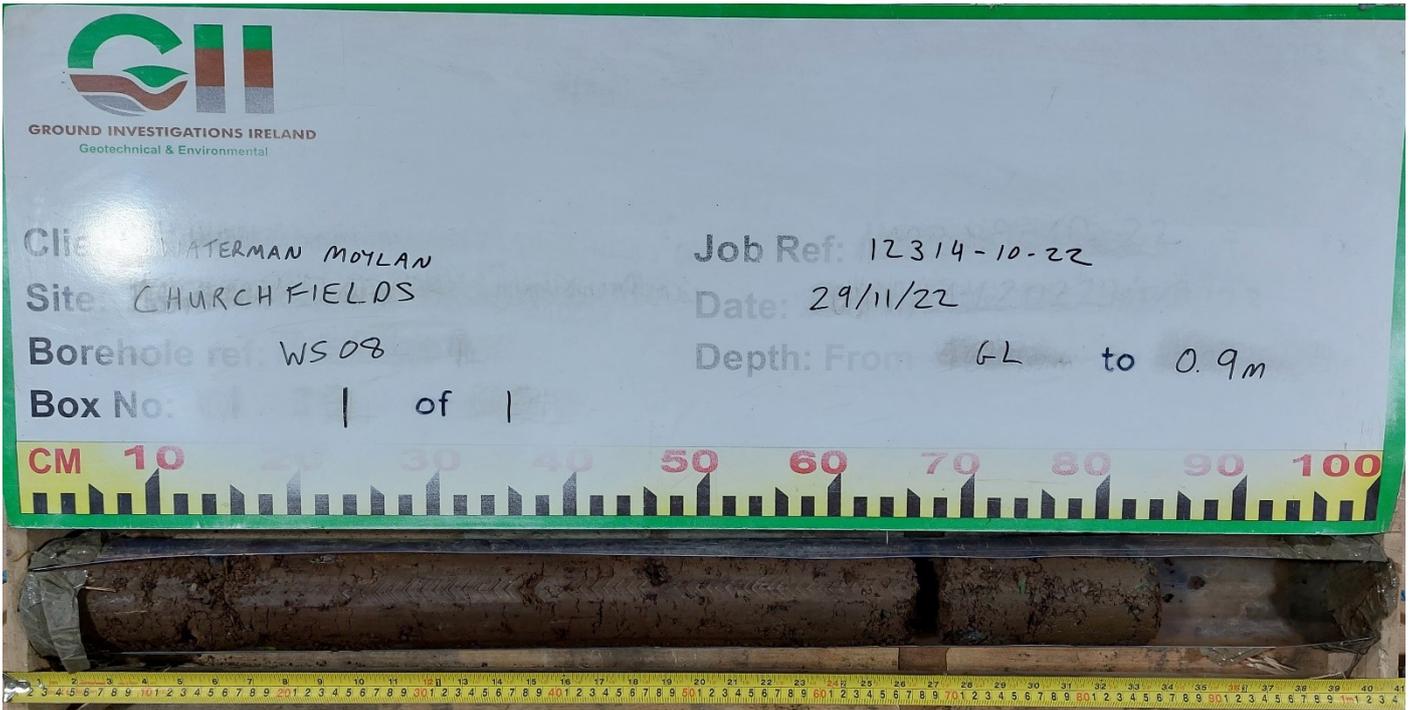
# Churchfields – Window Sample Photographs

WS06



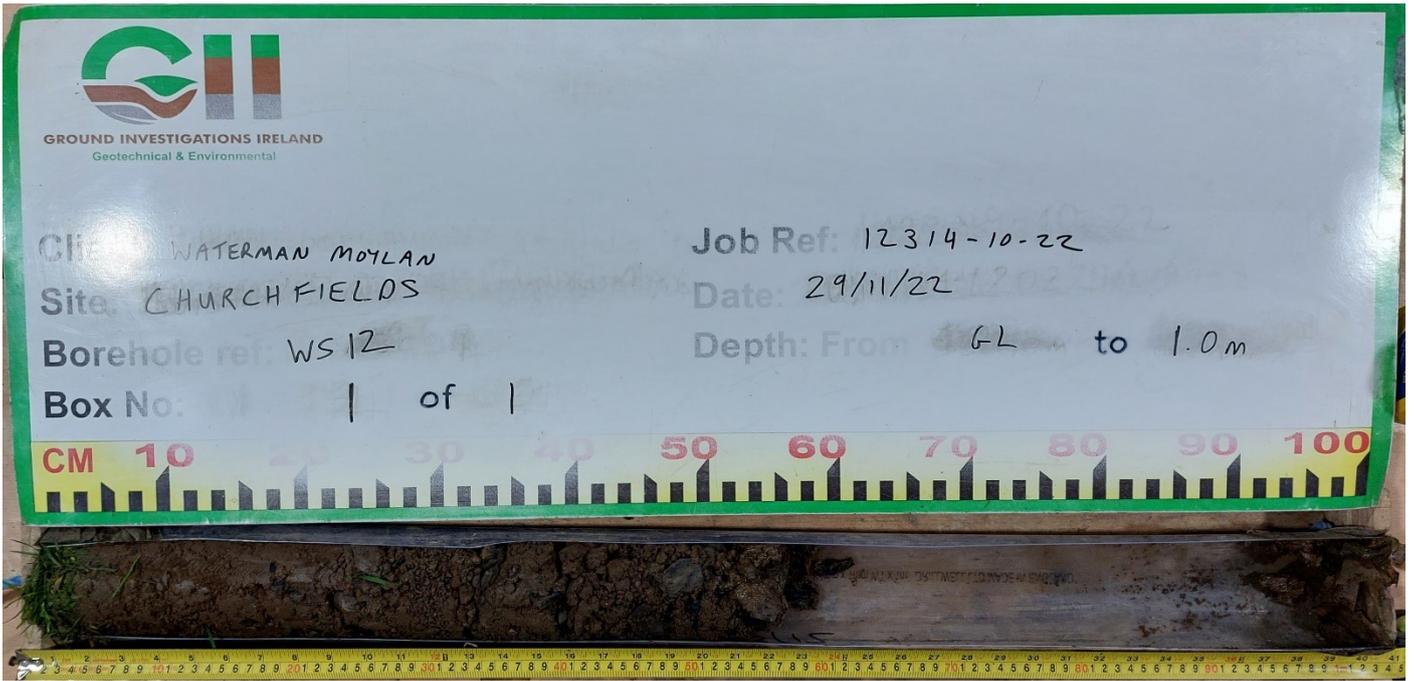
# Churchfields – Window Sample Photographs

WS08



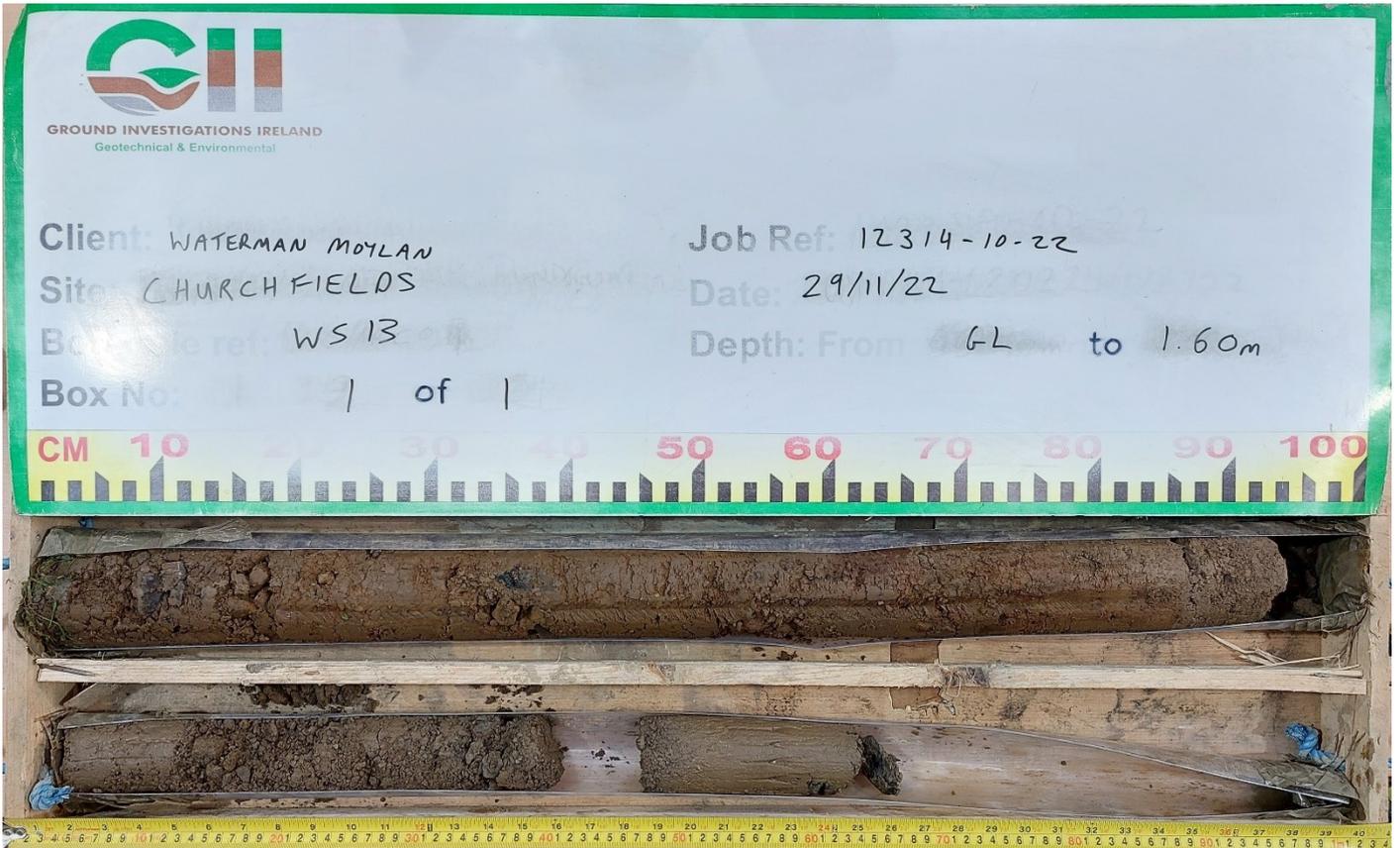
# Churchfields – Window Sample Photographs

## WS12



# Churchfields – Window Sample Photographs

WS13

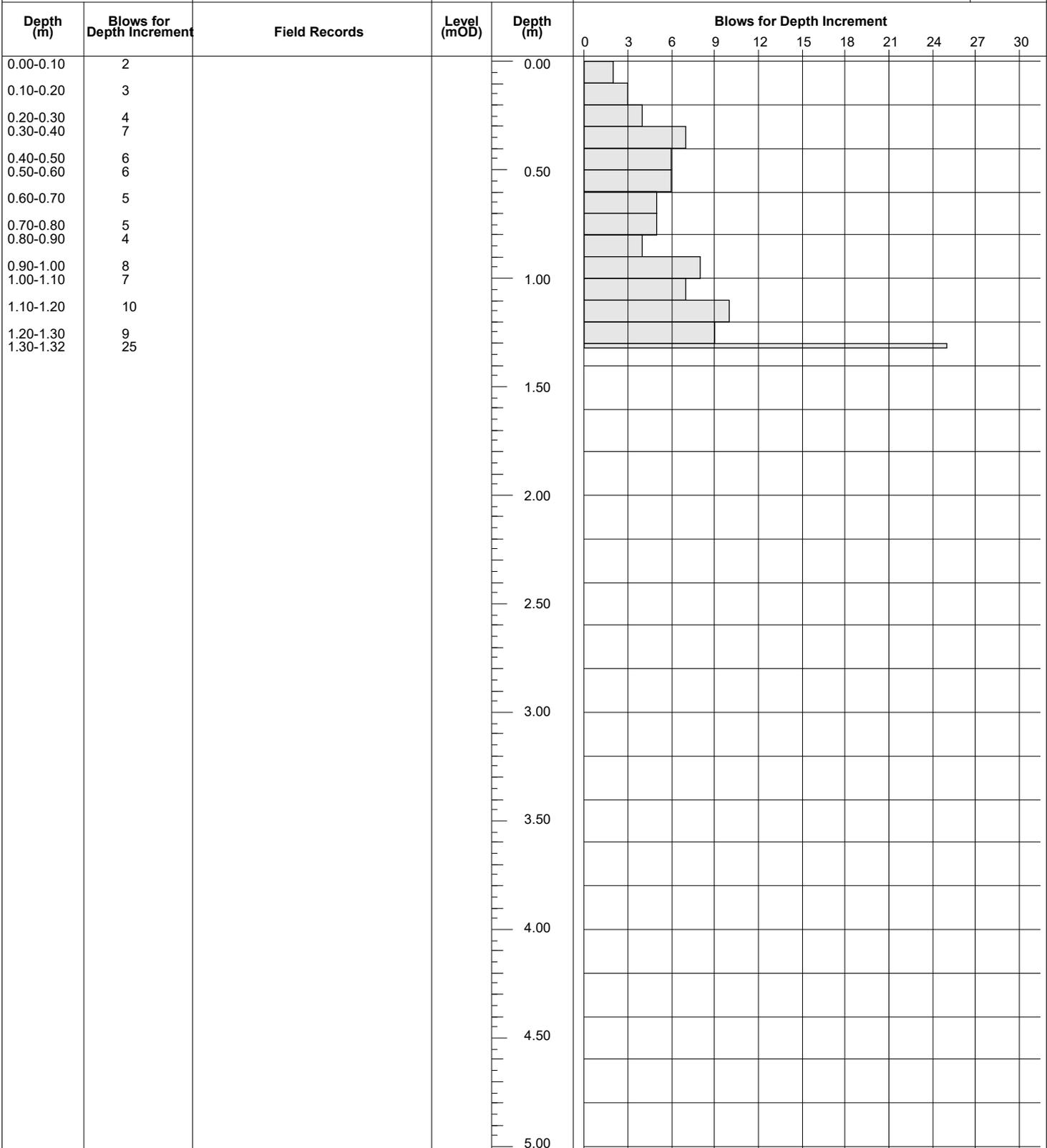


## **APPENDIX 5 – Dynamic Probe Records**





Method 50kg Weight 500mm Drop Height	Cone Dimensions Diameter 43.7mm	Ground Level (mOD)	Client	Job Number 12314-10-22
	Location 706680.3 E 741477.6 N	Dates 29/11/2022	Engineer Waterman Moylan	Sheet 1/1



Remarks	Scale (approx)	Logged By
	1:25	RM
	Figure No. 12314-10-22.DP06	



Method 50Kg Weight 500mm Drop Height	Cone Dimensions Diameter 43.7mm	Ground Level (mOD) 76.47	Client	Job Number 12314-10-22
	Location 706803.5 E 741495.3 N	Dates 29/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment												
					0	3	6	9	12	15	18	21	24	27	30		
0.00-0.10	0		76.47	0.00	[Bar chart showing 0 blows]												
0.10-0.20	2				[Bar chart showing 2 blows]												
0.20-0.30	3				[Bar chart showing 3 blows]												
0.30-0.40	2				[Bar chart showing 2 blows]												
0.40-0.50	3				[Bar chart showing 3 blows]												
0.50-0.60	2		75.97	0.50	[Bar chart showing 2 blows]												
0.60-0.70	3				[Bar chart showing 3 blows]												
0.70-0.80	3				[Bar chart showing 3 blows]												
0.80-0.90	4				[Bar chart showing 4 blows]												
0.90-1.00	3				[Bar chart showing 3 blows]												
1.00-1.10	14		75.47	1.00	[Bar chart showing 14 blows]												
1.10-1.11	25				[Bar chart showing 25 blows]												
					[Bar chart showing 0 blows]												
			74.97	1.50	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			74.47	2.00	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			73.97	2.50	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			73.47	3.00	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			72.97	3.50	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			72.47	4.00	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			71.97	4.50	[Bar chart showing 0 blows]												
					[Bar chart showing 0 blows]												
			71.47	5.00	[Bar chart showing 0 blows]												

Remarks	Scale (approx)	Logged By
	1:25	RM
	Figure No. 12314-10-22.DP08	



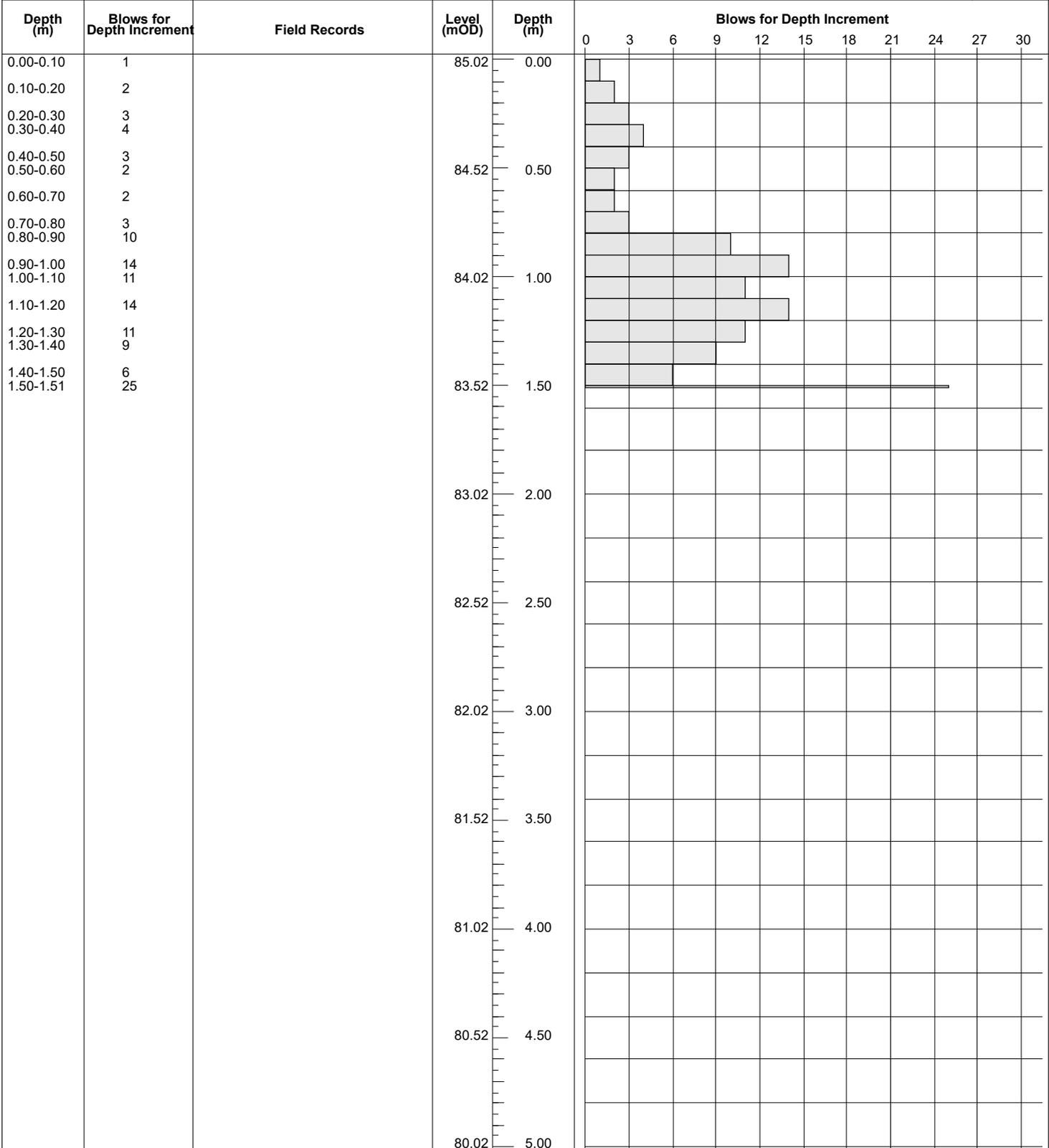
Method 50Kg Weight 500mm Drop Height	Cone Dimensions Diameter 43.7mm	Ground Level (mOD) 83.31	Client	Job Number 12314-10-22
	Location 706956.3 E 741386.3 N	Dates 29/11/2022	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)	Blows for Depth Increment																			
					0	3	6	9	12	15	18	21	24	27	30									
0.00-0.10	0		83.31	0.00																				
0.10-0.20	2																							
0.20-0.30	8																							
0.30-0.40	8																							
0.40-0.50	6																							
0.50-0.60	6		82.81	0.50																				
0.60-0.70	4																							
0.70-0.80	9																							
0.80-0.90	9																							
0.90-1.00	7																							
1.00-1.10	3		82.31	1.00																				
1.10-1.20	3																							
1.20-1.30	3																							
1.30-1.40	3																							
1.40-1.50	4																							
1.50-1.60	10		81.81	1.50																				
1.60-1.70	16																							
1.70-1.71	25																							
			81.31	2.00																				
			80.81	2.50																				
			80.31	3.00																				
			79.81	3.50																				
			79.31	4.00																				
			78.81	4.50																				
			78.31	5.00																				

Remarks	Scale (approx)	Logged By
	1:25	RM
	Figure No. 12314-10-22.DP12	



Method 50Kg Weight 500mm Drop Height	Cone Dimensions Diameter 43.7mm	Ground Level (mOD) 85.02	Client	Job Number 12314-10-22
	Location 707063.4 E 741541.1 N	Dates 29/11/2022	Engineer Waterman Moylan	Sheet 1/1



Remarks	Scale (approx)	Logged By
	1:25	RM
	Figure No. 12314-10-22.DP13	

# APPENDIX 6 - Rotary Borehole Records





Machine : Beretta T44  
Flush : Water  
Core Dia: 64 mm  
Method : Rotary Cored

Casing Diameter  
96mm cased to 2.70m

Ground Level (mOD)  
73.93

Client

Job Number  
12314-10-22

Location  
706721.4 E 741381.7 N

Dates  
09/02/2023

Engineer  
Waterman Moylan

Sheet  
1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00						73.78	(0.15)	Brown TOPSOIL.			
							(0.45)	Brown slightly sandy slightly gravelly CLAY.			
0.60	95	0	0	NI		73.33	0.60	Weak to medium strong dark grey fine grained LIMESTONE. Highly weathered. Mostly Non intact			
							(1.40)				
2.00	100	50	0	23		71.93	2.00	Medium strong dark grey fine grained LIMESTONE. Slightly weathered to highly weathered.			
							(0.70)	(2.0 - 2.70m BGL) 2 fracture sets. F1: 10-20 degrees. Very closely spaced. Undulating, rough with occasional brown clay staining. F2: 70-85 degrees. Extremely closely to medium spaced. Undulating, rough with occasional brown clay staining.			
2.70						71.23	2.70	Complete at 2.70m			

**Remarks**

Borehole complete at 2.70m BGL.  
Slotted standpipe installed from 2.70m BGL to 0.70m BGL with plain pipe from 0.70m BGL to GL. Finished with concrete and a raised cover.

Scale (approx)

1:50

Logged By

Figure No.

12314-10-22.BH04



Machine : Beretta T44 Flush : Water Core Dia: 64 mm Method : Rotary Cored	Casing Diameter 96mm cased to 3.50m	Ground Level (mOD) 78.49	Client	Job Number 12314-10-22
	Location 706857.7 E 741557.3 N	Dates 09/02/2023	Engineer Waterman Moylan	Sheet 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00						78.39	0.10	Brown TOPSOIL. Brown slightly sandy slightly gravelly CLAY.		
	53	0	0				(1.50)			
1.60						76.89	1.60	Medium strong dark grey fine grained LIMESTONE. Slightly weathered to highly weathered.		
2.00				NI			(1.90)	(1.60 - 3.50m BGL) 2 fracture sets. F1: 20-40 degrees. Extremely closely to closely spaced. Undulating, rough. F2: 80-90 degrees. Extremely closely spaced. Undulating, rough.		
2.65	100	12	0	26						
3.10				NI						
3.50						74.99	3.50	Complete at 3.50m		

<b>Remarks</b> Borehole complete at 3.50m BGL. Borehole backfilled on Completion	Scale (approx)	Logged By
	1:50	
Figure No.		
12314-10-22.BH06		



Machine : Beretta T44		Casing Diameter 96mm cased to 3.50m		Ground Level (mOD) 80.64		Client		Job Number 12314-10-22	
Flush : Water		Location 706925.2 E 741480 N		Dates 09/02/2023		Engineer Waterman Moylan		Sheet 1/1	
Core Dia: 64 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00						80.46	(0.18) 0.18	Brown TOPSOIL. Brown slightly sandy slightly gravelly CLAY.		
	32						(1.82)			
2.00						78.64 78.44	2.00 (0.20) 2.20	Grey clayey angular to sub-angular fine to coarse GRAVEL. (Possible weathered rock)		
2.45	95	57	24	8			(1.30)	Medium strong dark grey fine grained LIMESTONE. Fresh to slightly weathered. (2.45 - 3.50m BGL) 2 fracture sets. F1: 10-30 degrees. Extremely closely to medium spaced. Undulating, rough with brown clay staining. F2: 80-90 degrees. Extremely closely to medium spaced. Undulating, rough with brown clay staining.		
3.50						77.14	3.50	Complete at 3.50m		

<b>Remarks</b> Borehole complete at 3.50m BGL. Borehole backfilled on Completion	Scale (approx)	Logged By
	1:50	
Figure No.		
12314-10-22.BH06		



Machine : Beretta T44		Casing Diameter 96mm cased to 3.50m		Ground Level (mOD) 84.35		Client		Job Number 12314-10-22	
Flush : water		Location 707061.6 E 741576.2 N		Dates 10/02/2023		Engineer Waterman Moylan		Sheet 1/1	
Core Dia: 64 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00						84.25	0.10	Brown TOPSOIL. Brown slightly sandy slightly gravelly CLAY.			
	37						(2.00)				
2.00 2.10						82.25	2.10	Medium strong dark grey fine grained LIMESTONE. Highly weathered. Mostly Non Intact (2.20 - 3.50m BGL) 3 fracture set. F1: 20-30 degrees. Extremely closely to closely spaced. Undulating, rough. F2: 80-90 degrees. Undulating, rough. F3: 70-80 degrees. Extremely closely to medium spaced. Undulating, rough with occasional brown clay staining.			
	100	2	0	NI			(1.40)				
3.50						80.85	3.50	Complete at 3.50m			

<b>Remarks</b> Borehole complete at 3.50m BGL. Slotted standpipe installed from 3.50m BGL to 2.0m BGL with plain pipe from 2.0m BGL to GL. Finished with concrete and a raised cover.									Scale (approx)	Logged By
									1:50	RM
									Figure No. 12314-10-22.BH07	



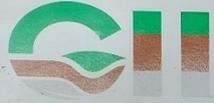
Machine : Beretta T44		Casing Diameter 96mm cased to 3.50m		Ground Level (mOD) 81.18		Client		Job Number 12314-10-22	
Flush : water		Location 706914.8 E 741323.9 N		Dates 09/02/2023		Engineer Waterman Moylan		Sheet 1/1	
Core Dia: 64 mm									
Method : Rotary Cored									

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.00	63						(1.80)	Brown slightly sandy slightly gravelly CLAY.			
1.80								79.38	1.80	Medium strong dark grey fine grained LIMESTONE. Highly weathered. Mostly Non Intact.	
2.00	97	34	19	9			(1.25)	Medium strong to strong dark grey fine grained LIMESTONE. Slightly weathered. (2.25 - 3.50m BGL) 2 fracture sets. F1: 20-30 degrees. Closely spaced. Undulating, rough. Open to incipient with some grey clay infill. F2: 50-65 degrees. Planar, rough. Open to incipient.			
2.25								78.93	2.25		
3.50							77.68	3.50	Complete at 3.50m		

<b>Remarks</b> Borehole complete at 3.50m BGL. Borehole backfilled on Completion	Scale (approx)	Logged By
	1:50	
Figure No.		
12314-10-22.BH08		

# Churchfields – Rotary Core Photographs

BH04



GROUND INVESTIGATIONS IRELAND  
Geotechnical & Environmental

Client: WATERMAN MOYLAN

Job Ref: 12314-10-22

Site: CHURCHFIELDS

Date: 9/2/23

Borehole ref: BH04

Depth: From 0 m to 2.70 m

Box No: 1 of 1

CM 10 20 30 40 50 60 70 80 90 100



# Churchfields – Rotary Core Photographs

BH05



GROUND INVESTIGATIONS IRELAND  
Geotechnical & Environmental

Client: WATERMAN MOYLAN

Job Ref: 12314-10-22

Site: CHURCHFIELDS

Date: 10/2/23

Borehole ref: BH05

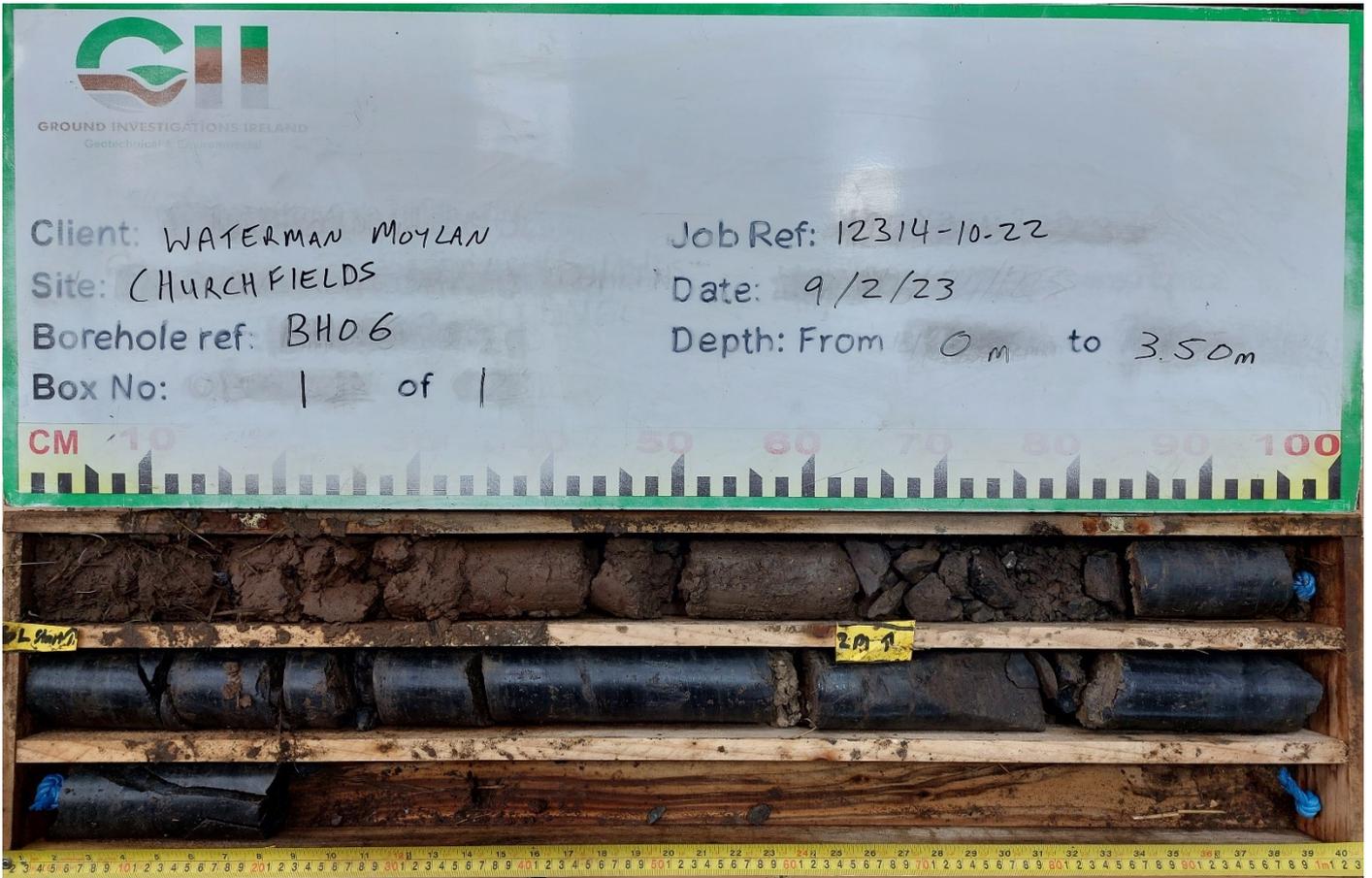
Depth: From 0 m to 3.50 m

Box No: 1 of 1



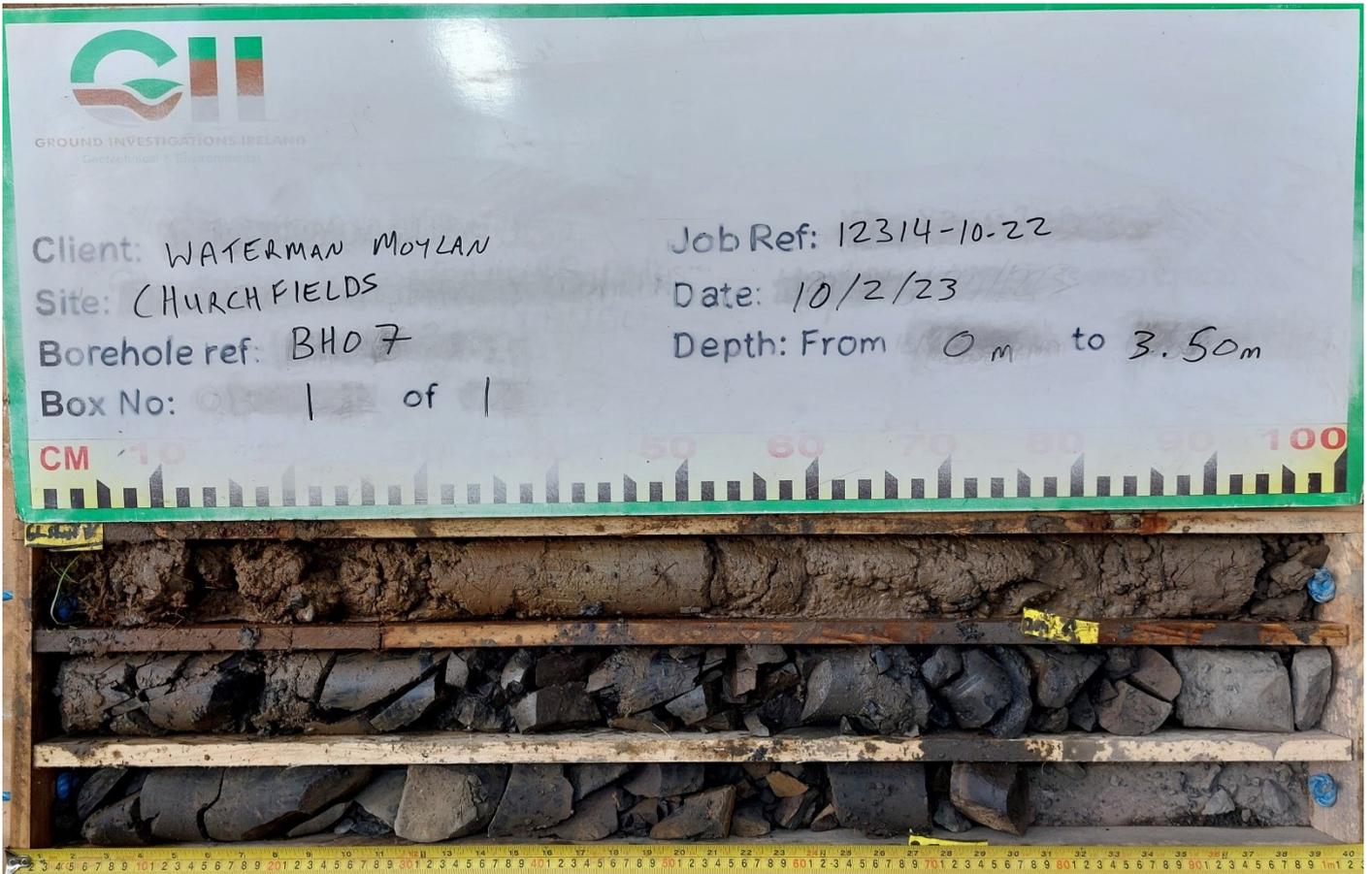
# Churchfields – Rotary Core Photographs

BH06



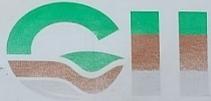
# Churchfields – Rotary Core Photographs

BH07



# Churchfields – Rotary Core Photographs

BH08



GROUND INVESTIGATIONS IRELAND  
Geotechnical & Environmental Engineering

Client: WATERMAN MOYLAN

Job Ref: 12314-10-22

Site: CHURCHFIELDS

Date: 19/2/23

Borehole ref: BH08A

Depth: From 0 m to 3.50 m

Box No: 1 of 1



6L 1000



## **APPENDIX 7 – Plate Bearing Test Records**

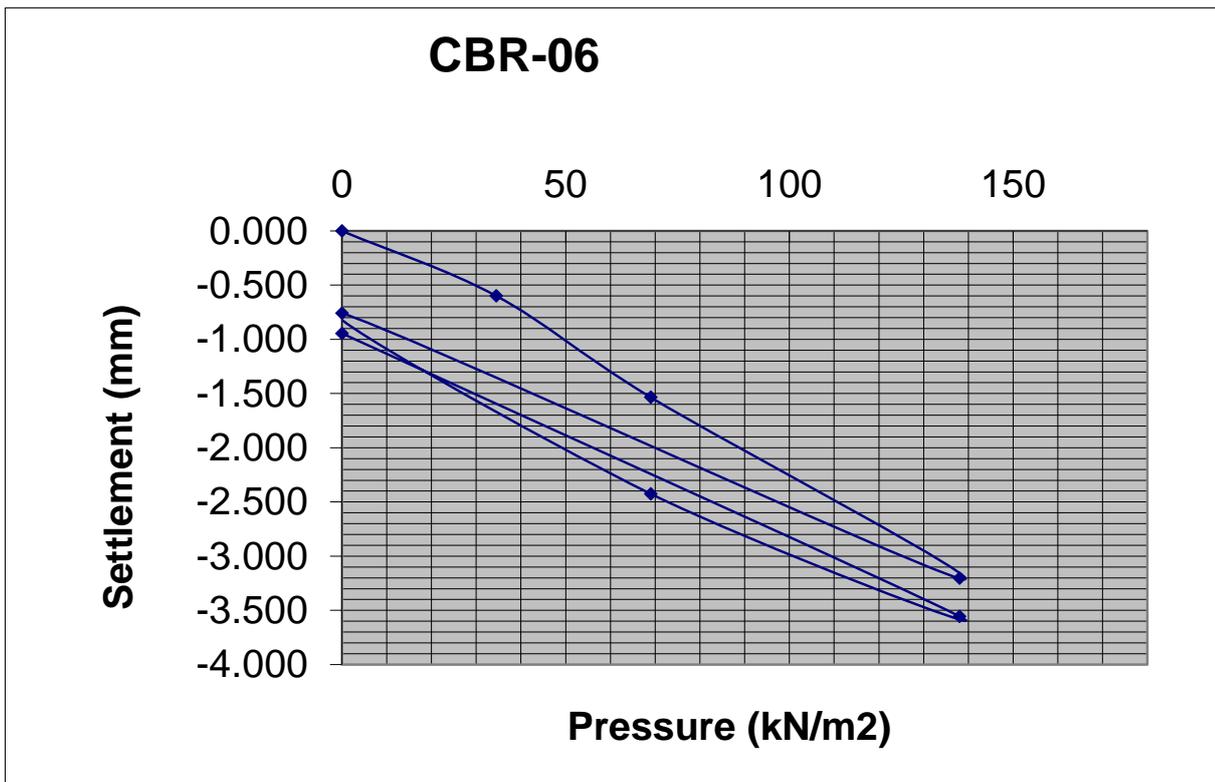


Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.6
69	-1.535
138	-3.205
0	-0.76
69	-2.425
138	-3.555
0	-0.945



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.3
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-06	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) = **30.37 MN/m<sup>2</sup>/m**  
 Modulus of subgrade reaction, K (Reload) = **28.00 MN/m<sup>2</sup>/m**

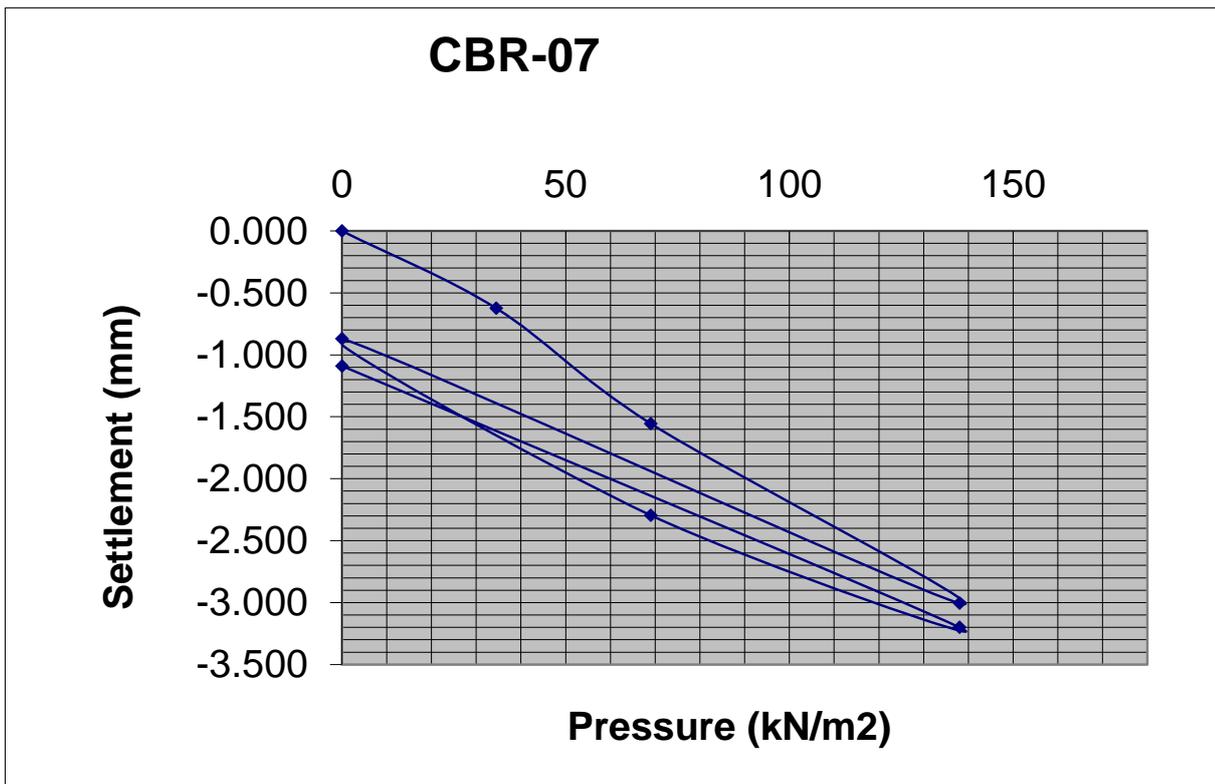
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **3.58 %**  
 Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.11 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.625
69	-1.555
138	-3.005
0	-0.87
69	-2.295
138	-3.2
0	-1.09



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.3
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-07	<b>SAMPLES</b>	



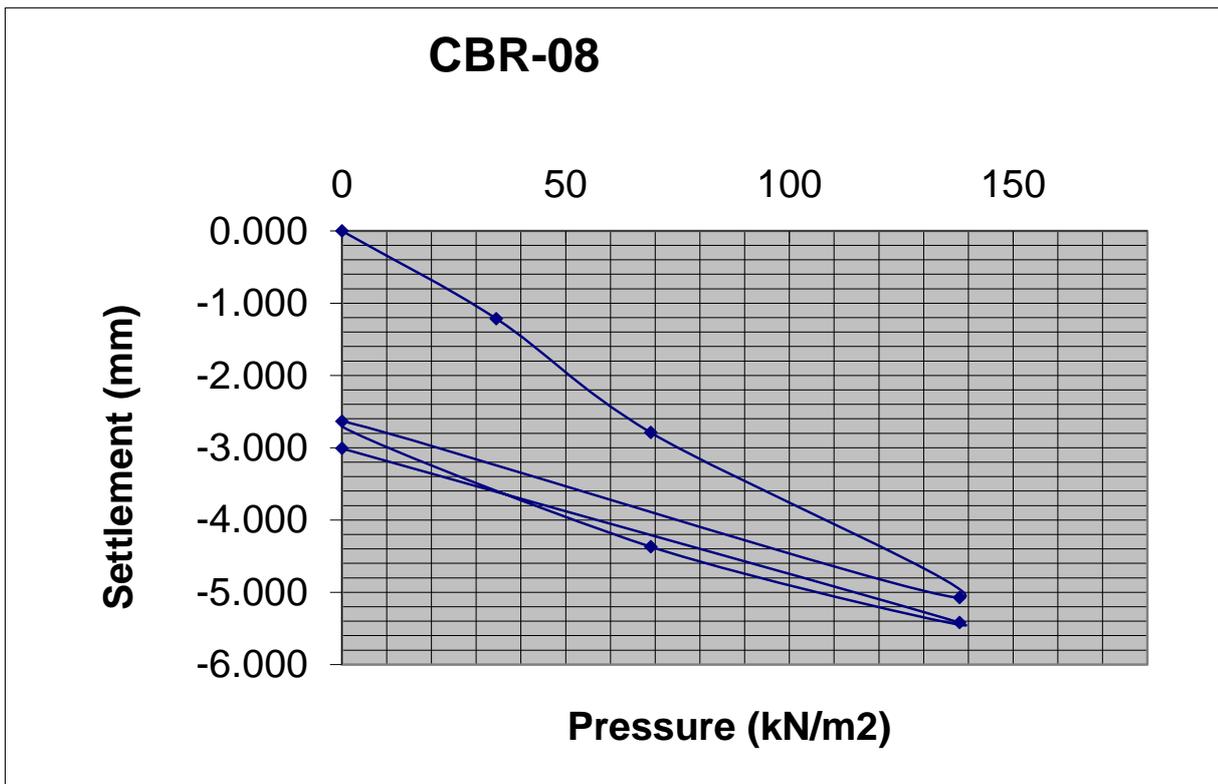
Modulus of subgrade reaction, K (Initial) =	<b>29.98 MN/m<sup>2</sup>/m</b>
Modulus of subgrade reaction, K (Reload) =	<b>32.72 MN/m<sup>2</sup>/m</b>

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	<b>3.50 %</b>
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	<b>4.07 %</b>

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-1.215
69	-2.79
138	-5.075
0	-2.635
69	-4.37
138	-5.42
0	-3.01



<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sandy slightly gravelly CLAY.
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.3
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-08	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) =	<b>16.71 MN/m<sup>2</sup>/m</b>
Modulus of subgrade reaction, K (Reload) =	<b>26.87 MN/m<sup>2</sup>/m</b>

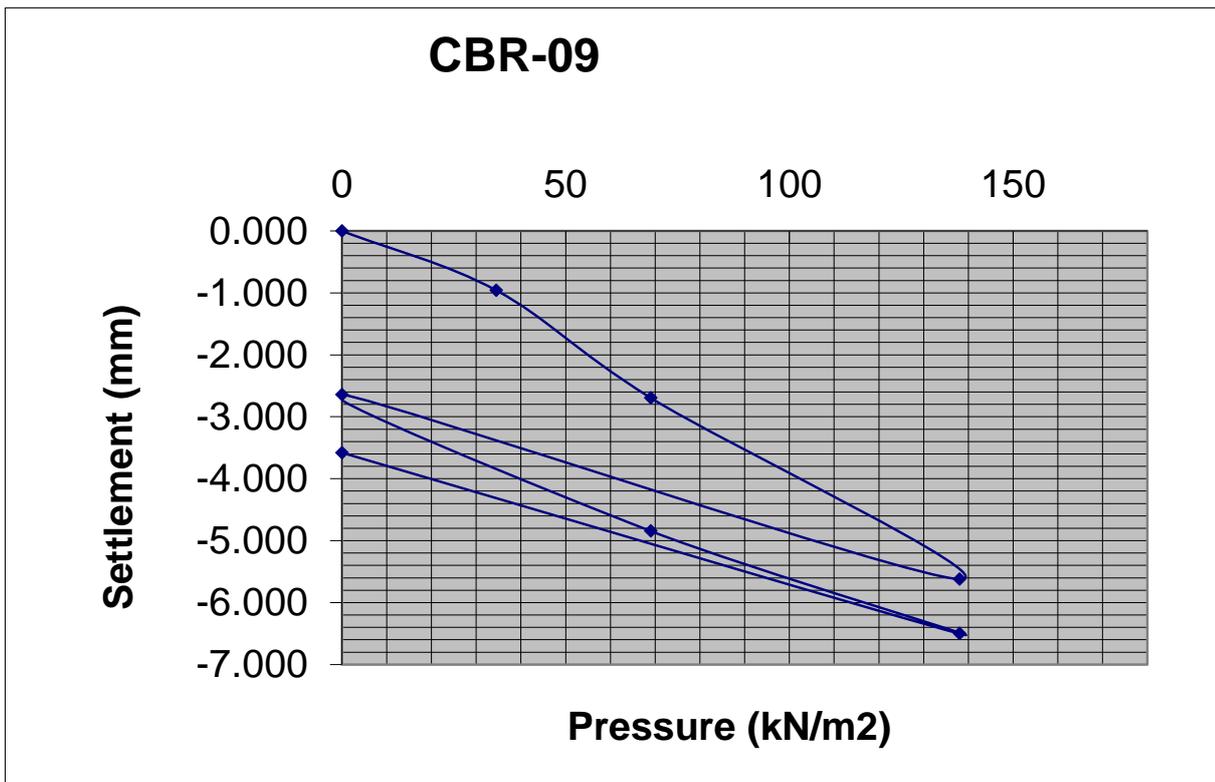
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	<b>1.27 %</b>
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	<b>2.89 %</b>

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.96
69	-2.695
138	-5.62
0	-2.64
69	-4.845
138	-6.5
0	-3.58



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.5
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-09	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) = **17.30 MN/m<sup>2</sup>/m**

Modulus of subgrade reaction, K (Reload) = **21.14 MN/m<sup>2</sup>/m**

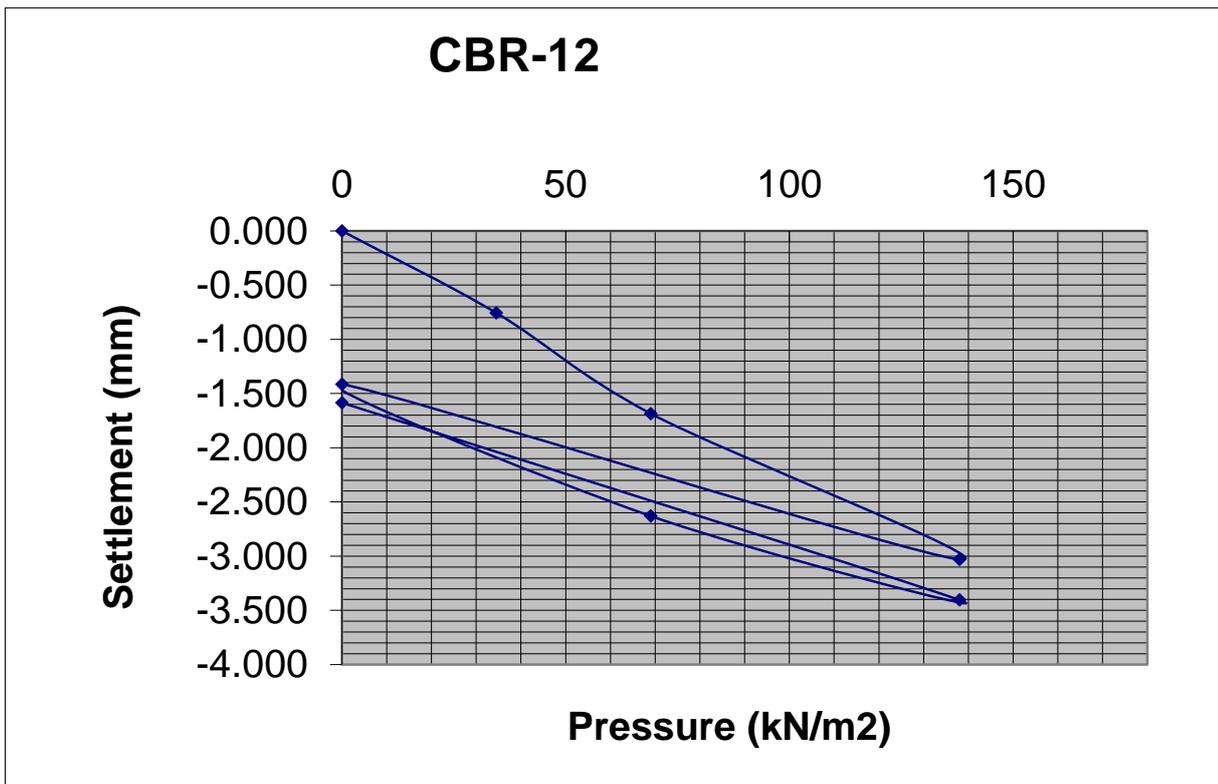
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.35 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.91 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.7565
69	-1.685
138	-3.03
0	-1.415
69	-2.63
138	-3.405
0	-1.585



<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sandy slightly gravelly CLAY.
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.25
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-12	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) =	<b>27.67 MN/m<sup>2</sup>/m</b>
Modulus of subgrade reaction, K (Reload) =	<b>38.37 MN/m<sup>2</sup>/m</b>

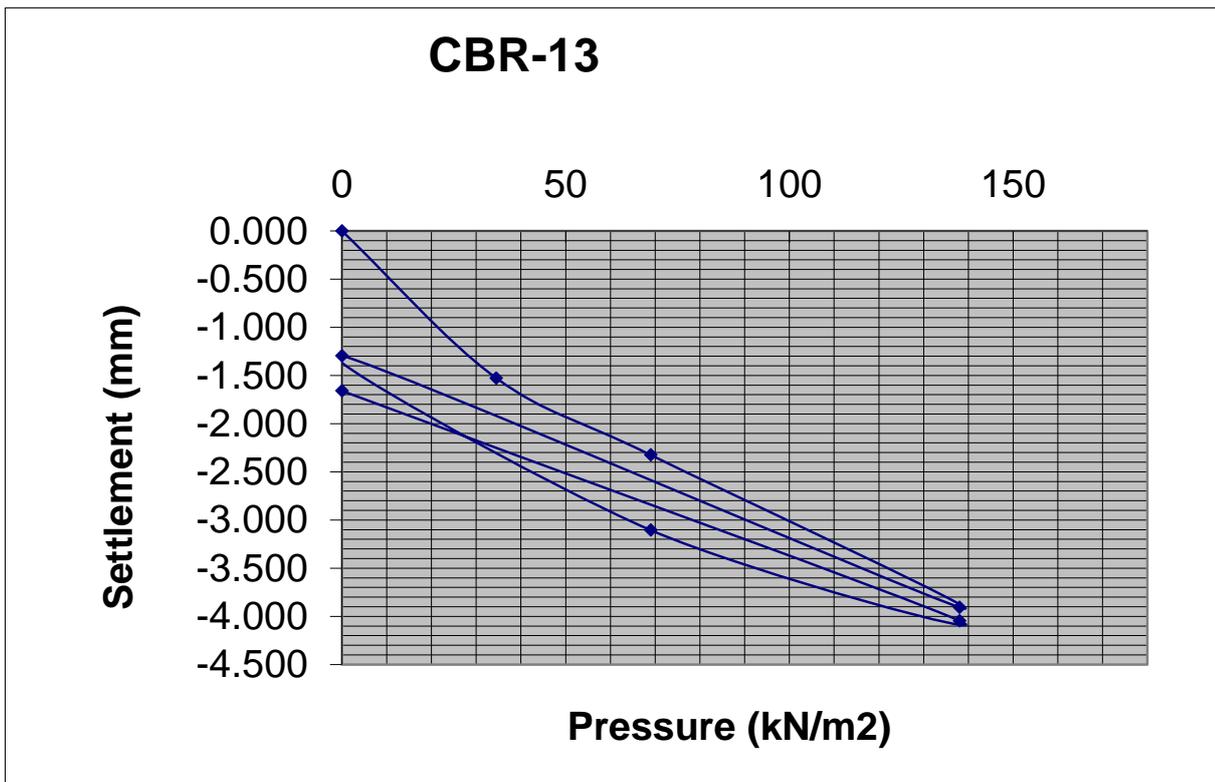
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	<b>3.04 %</b>
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	<b>5.36 %</b>

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-1.5275
69	-2.325
138	-3.905
0	-1.295
69	-3.105
138	-4.045
0	-1.66



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sandy slightly gravelly CLAY.
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.3
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-13	<b>SAMPLES</b>	



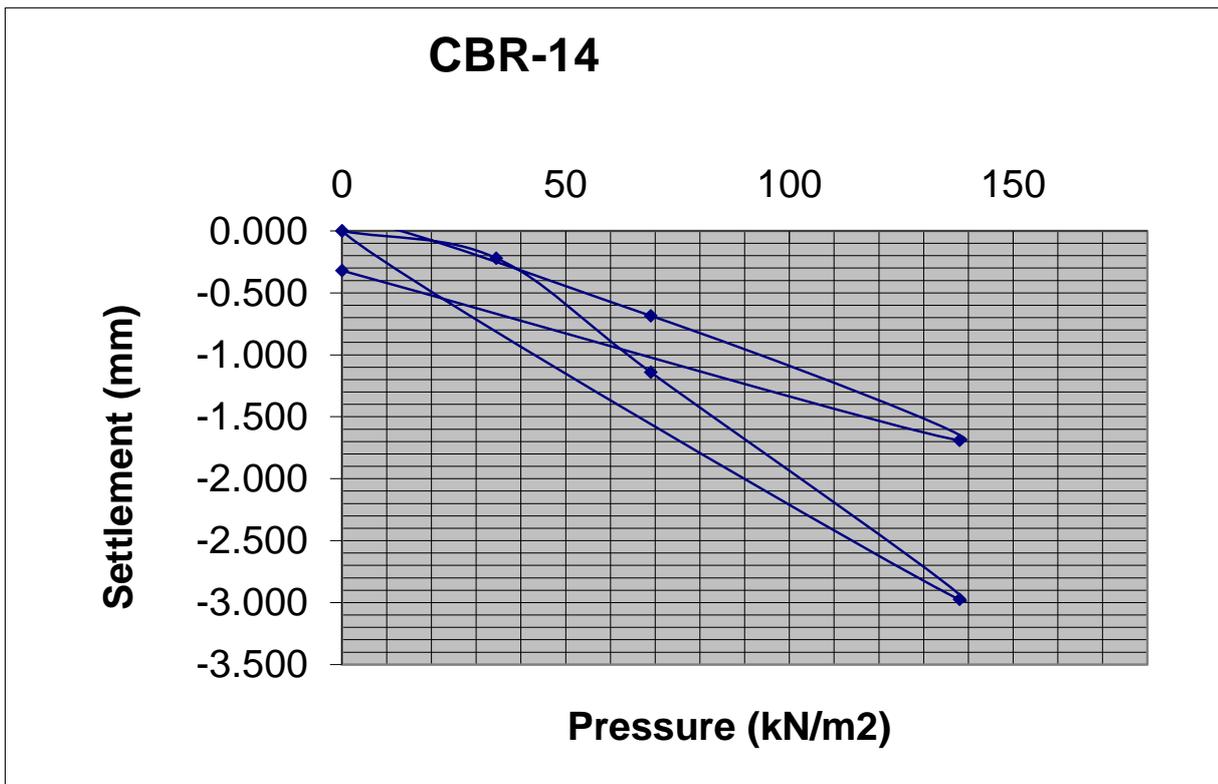
Modulus of subgrade reaction, K (Initial) = **20.05 MN/m<sup>2</sup>/m**  
 Modulus of subgrade reaction, K (Reload) = **25.76 MN/m<sup>2</sup>/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.74 %**  
 Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **2.69 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.22
69	-1.14
138	-2.975
0	0
69	-0.685
138	-1.69
0	-0.32



<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.5
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-14	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) =	<b>40.90 MN/m<sup>2</sup>/m</b>
Modulus of subgrade reaction, K (Reload) =	<b>68.06 MN/m<sup>2</sup>/m</b>

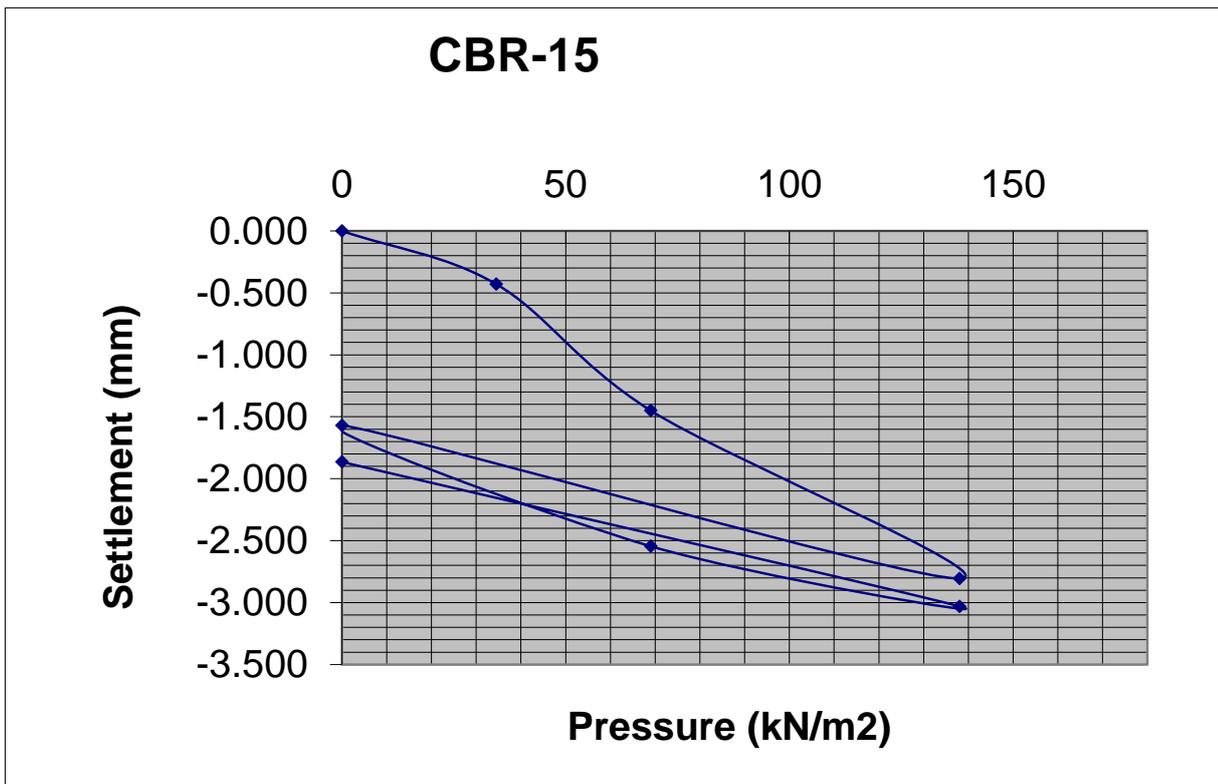
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	<b>5.99 %</b>
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	<b>14.48 %</b>

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.43
69	-1.45
138	-2.805
0	-1.57
69	-2.545
138	-3.03
0	-1.865



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.3
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-15	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) = **32.15 MN/m<sup>2</sup>/m**  
 Modulus of subgrade reaction, K (Reload) = **47.82 MN/m<sup>2</sup>/m**

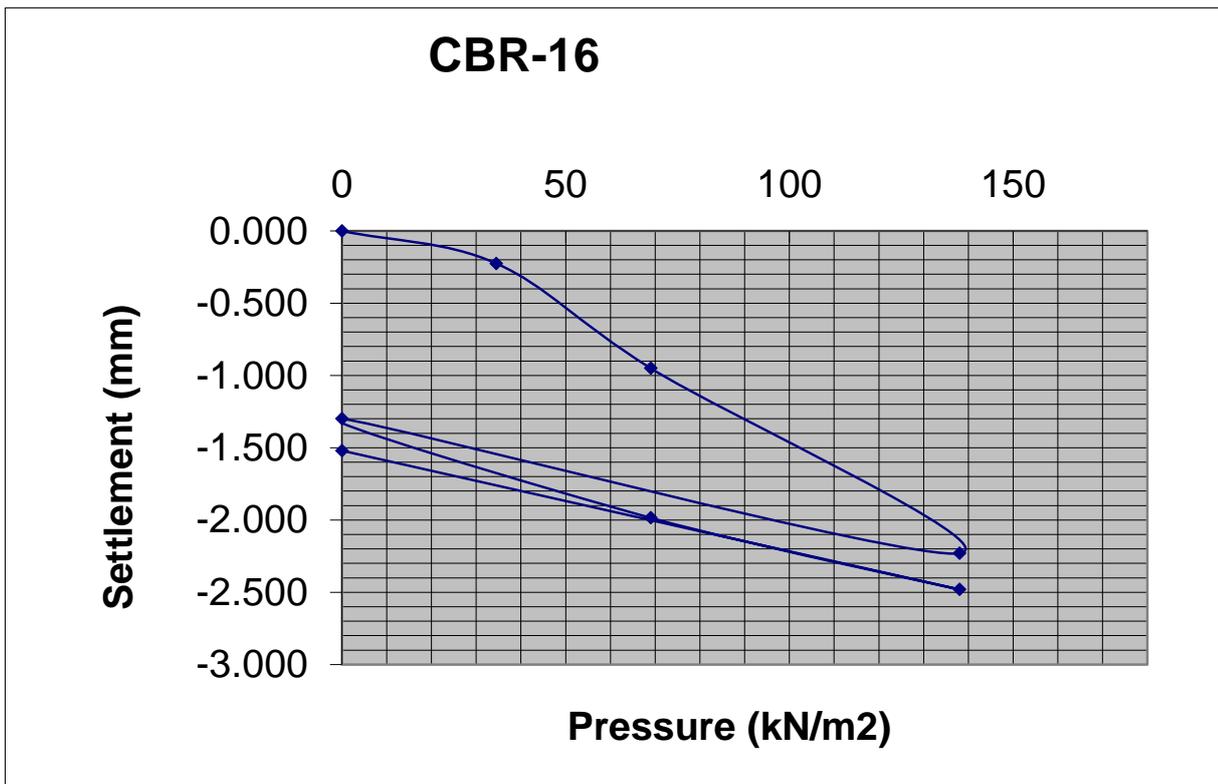
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **3.95 %**  
 Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **7.85 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.225
69	-0.95
138	-2.23
0	-1.3
69	-1.985
138	-2.48
0	-1.52



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.2
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-16	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) = **49.08 MN/m<sup>2</sup>/m**  
Modulus of subgrade reaction, K (Reload) = **68.06 MN/m<sup>2</sup>/m**

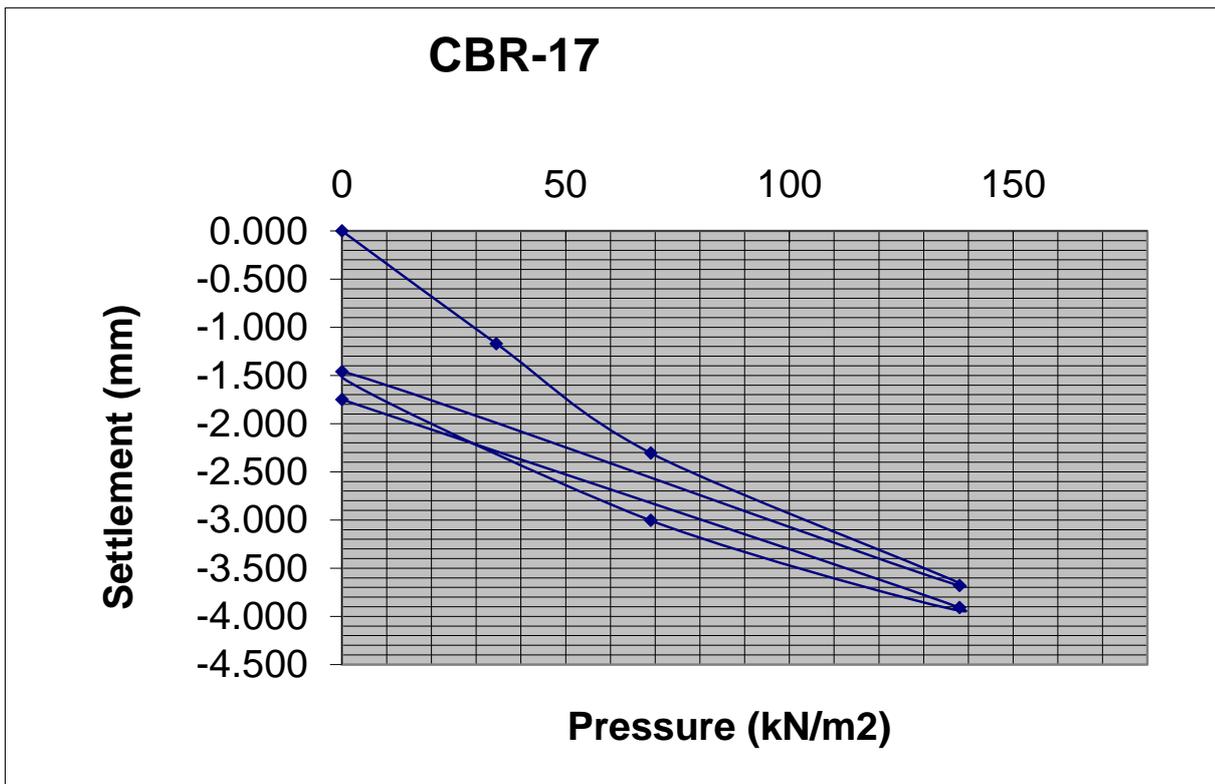
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **8.22 %**  
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **14.48 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-1.17
69	-2.305
138	-3.68
0	-1.46
69	-3.005
138	-3.91
0	-1.75



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sandy slightly gravelly CLAY.
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.25
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-18	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) = **20.23 MN/m<sup>2</sup>/m**  
 Modulus of subgrade reaction, K (Reload) = **30.18 MN/m<sup>2</sup>/m**

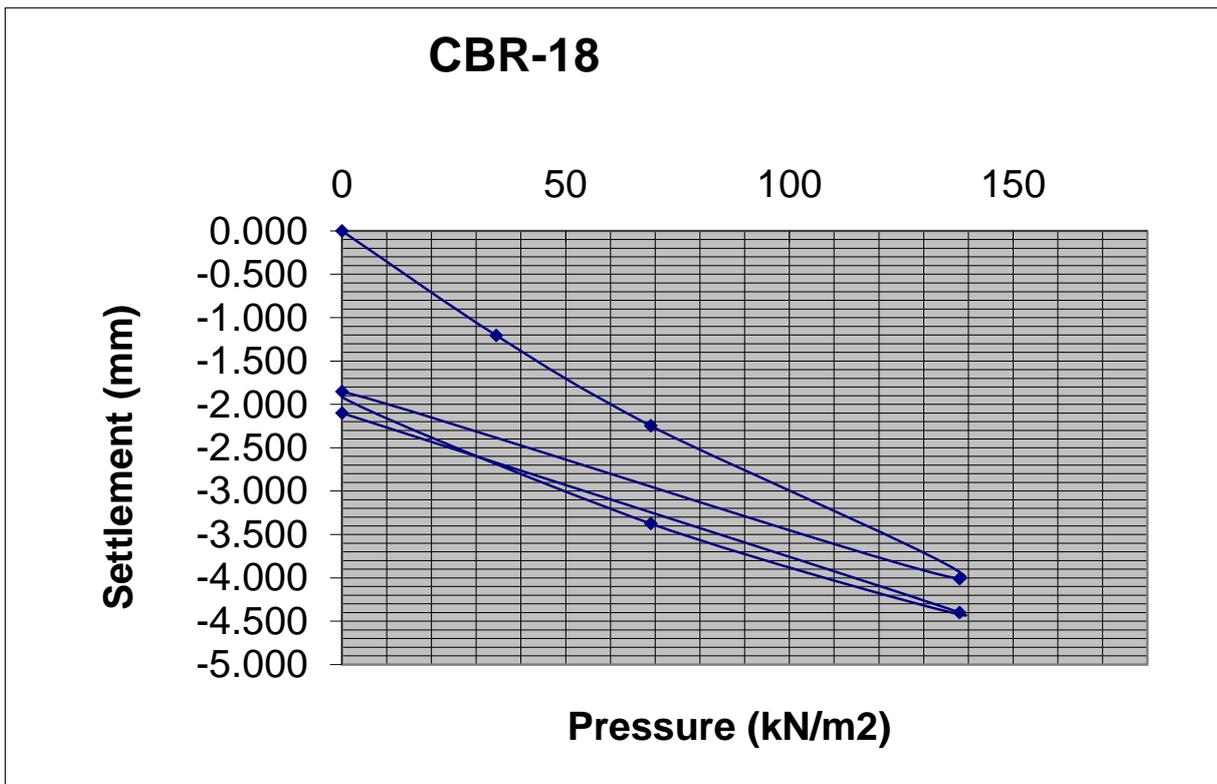
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.77 %**  
 Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.54 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-1.205
69	-2.247
138	-4.01
0	-1.855
69	-3.375
138	-4.4
0	-2.1



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sandy slightly gravelly CLAY.
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.25
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-18	<b>SAMPLES</b>	



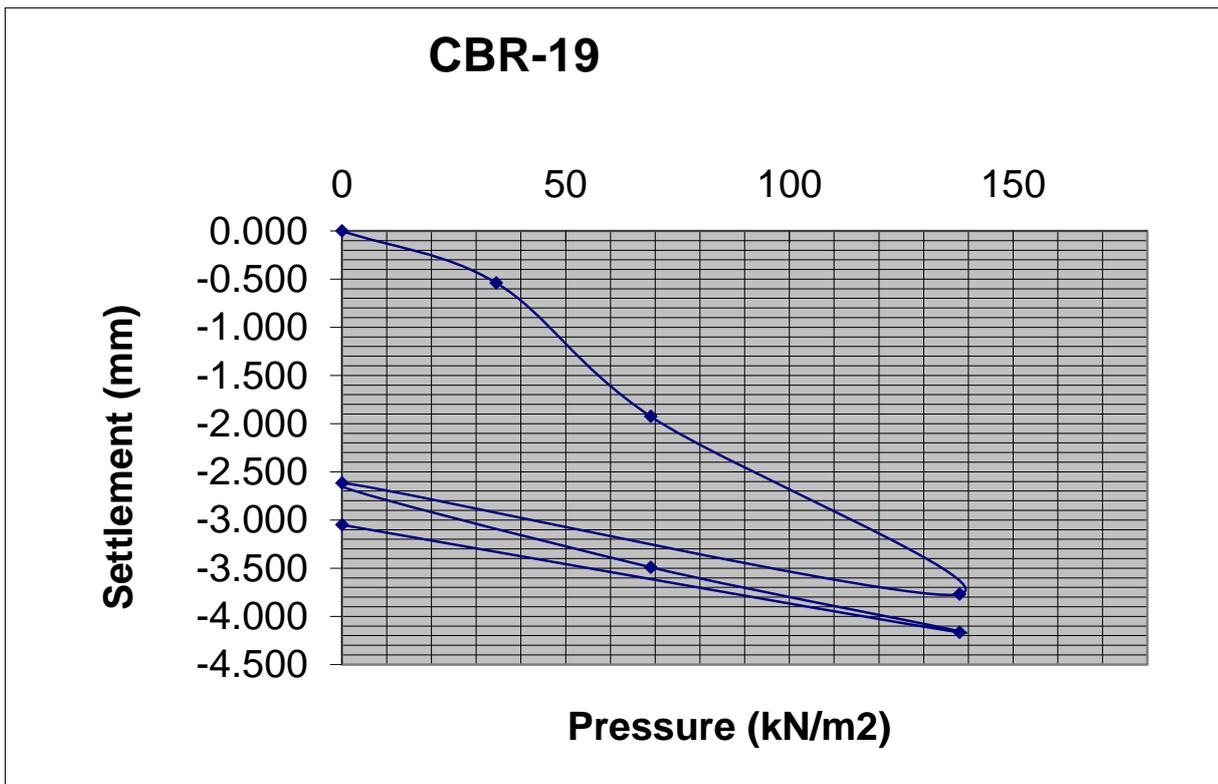
Modulus of subgrade reaction, K (Initial) = **20.75 MN/m<sup>2</sup>/m**  
 Modulus of subgrade reaction, K (Reload) = **30.67 MN/m<sup>2</sup>/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **1.85 %**  
 Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **3.64 %**

Applied Load	Gauge settlement
0	<b>0.000</b>
34.5	-0.54
69	-1.925
138	-3.77
0	-2.615
69	-3.49
138	-4.165
0	-3.05



<b>LOCATION</b>	Churchfields, Mulhuddar	<b>MATERIAL</b>	Brown slightly sand gravelly CLAY with occasional cobbles
<b>CONTRACT NO.</b>	12314-10-22		
<b>DATE</b>	02/12/2022		
<b>CLIENT</b>	Waterman Moylan	<b>DEPTH</b>	0.25
<b>PLATE DIAMETER</b>	457mm	<b>NOTES</b>	
<b>TEST NO.</b>	CBR-19	<b>SAMPLES</b>	



Modulus of subgrade reaction, K (Initial) =	<b>24.22 MN/m<sup>2</sup>/m</b>
Modulus of subgrade reaction, K (Reload) =	<b>53.28 MN/m<sup>2</sup>/m</b>

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	<b>2.42 %</b>
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 =	<b>9.47 %</b>

# APPENDIX 8 – Laboratory Testing



Ground Investigations Ireland  
Catherinstown House  
Hazelhatch Road  
Newcastle  
Co. Dublin  
Ireland



**Attention :** James Cashen  
**Date :** 29th December, 2022  
**Your reference :** -  
**Our reference :** Test Report 22/20475 Batch 1  
**Location :** Churchfields  
**Date samples received :** 12th December, 2022  
**Status :** Final Report  
**Issue :** 1

Ten samples were received for analysis on 12th December, 2022 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Authorised By:**



**Liza Klebe**

Project Co-ordinator

Please include all sections of this report if it is reproduced









# Element Materials Technology

Client Name: Ground Investigations Ireland  
 Reference: -  
 Location: Churchfields  
 Contact: James Cashen  
 EMT Job No: 22/20475

Report : EN12457\_2  
 Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12	13-16	17-20	25-28	29-32										
Sample ID	WS06	WS08	WS12	WS13	CBR06	CBR10	CBR12										
Depth	0.20-1.20	0.10-0.90	0.25-0.56	0.20-1.10	0.50	0.50	0.50										
COC No / misc																	
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T										
Sample Date	08/12/2022	08/12/2022	08/12/2022	08/12/2022	08/12/2022	08/12/2022	08/12/2022										
Sample Type	Soil																
Batch Number	1	1	1	1	1	1	1										
Date of Receipt	12/12/2022	12/12/2022	12/12/2022	12/12/2022	12/12/2022	12/12/2022	12/12/2022										
								Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.				
Please see attached notes for all abbreviations and acronyms																	
<b>Solid Waste Analysis</b>																	
Total Organic Carbon #	0.15	0.75	0.26	1.26	1.13	0.27	0.96					3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025					6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035					1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30	<30	<30	<30	<30					500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22					-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64					100	-	-	<0.64	mg/kg	TM4/PM8
<b>CEN 10:1 Leachate</b>																	
Arsenic #	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025					0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005					0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015					0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07					2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	<350	700	490	520	800	<350	600					4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	<20	<20	<20	<20	<20	<20					500	800	1000	<20	mg/kg	TM60/PM0
Dry Matter Content Ratio	77.4	76.9	84.7	78.5	78.0	72.9	76.5					-	-	-	<0.1	%	NONE/PM4
Moisture Content 105C (% Dry Weight)	29.2	30.1	18.0	27.5	28.2	37.2	30.8					-	-	-	<0.1	%	PM4/PM0
pH #	7.56	8.22	8.55	8.15	8.08	7.55	7.87					-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	<3	3	3	5	8	<3	5					10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	16	<5	14	<5	8	16	<5					1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	<3	5	<3	<3	3	<3	<3					800	15000	25000	<3	mg/kg	TM38/PM0



**Client Name:** Ground Investigations Ireland  
**Reference:** -  
**Location:** Churchfields  
**Contact:** James Cashen

**Note:**

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/20475	1	WS06	0.20-1.20	3	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	WS08	0.10-0.90	7	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	WS12	0.25-0.56	11	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	WS13	0.20-1.10	15	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	CBR06	0.50	19	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	CBR10	0.50	27	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD
22/20475	1	CBR12	0.50	31	Simon Postlewhite	29/12/2022	<b>General Description (Bulk Analysis)</b>	Brown soil/stones
					Simon Postlewhite	29/12/2022	<b>Asbestos Fibres</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos ACM</b>	NAD
					Simon Postlewhite	29/12/2022	<b>Asbestos Type</b>	NAD



# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/20475

## SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

## WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

## STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

## DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

## SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

## DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

## BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

**Customer Provided Information**

Sample ID and depth is information provided by the customer.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

## HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/20475

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

EMT Job No: 22/20475

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes

EMT Job No: 22/20475

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	

Ground Investigations Ireland  
Catherinstown House  
Hazelhatch Road  
Newcastle  
Co. Dublin  
Ireland



**Attention :** Mike Sutton  
**Date :** 26th April, 2023  
**Your reference :** 12314-10-22  
**Our reference :** Test Report 23/6173 Batch 1  
**Location :** Churchfields  
**Date samples received :** 20th April, 2023  
**Status :** Final Report  
**Issue :** 1

Four samples were received for analysis on 20th April, 2023 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Authorised By:**



**Bruce Leslie**  
Project Manager

Please include all sections of this report if it is reproduced





# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/6173

## SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

## WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

## STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

## DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

## SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

## DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

## BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

**Customer Provided Information**

Sample ID and depth is information provided by the customer.

**ABBREVIATIONS and ACRONYMS USED**

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

## HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.



**Laboratory Test Report  
 Point Load Strength Index**

<b>Project :</b> Churchfields	<b>Job Number</b> 12314-10-22
<b>Client :</b> Ground Investigations Ireland	<b>Lab Ref No</b> ST 23432
Catherinestown House, Hazelhatch Road	<b>Date Received</b> 06/04/2023
Newcastle, Co. Dublin	<b>Date Tested</b> 06/04/2023
<b>Originator</b> Mike Sutton	<b>Date Reported</b> 07/04/2023

**Point Load Strength Index**

Sample No:-	Depth (m)	Description	Type	Orientation	W (mm)	D (mm)	P (kN)	De <sup>2</sup> (mm <sup>2</sup> )	De (mm)	I <sub>s</sub>	F	I <sub>s(50)</sub> MN/m <sup>2</sup>
BH06	3.14-3.27	2	D	⊥	64.0	63.0	6.00	3969	63.0	1.512	1.11	1.68
BH08	3.14-3.27	2	D	⊥	65.0	63.0	10.00	3969	63.0	2.520	1.11	2.80
Description 1 : Black/Grey Rock												
Description 2 : Black/Grey Rock with cracks												
Description 3 :												

I <sub>s(50)</sub> MN/m <sup>2</sup> for	Description 1&2		
Min	1.68		
Mean	2.24		
Max	2.80		

**Test**

A = axial  
 D = diametrical

**Relationship to planes of weakness**

IL = irregular lump      ⊥ = perpendicular  
 || = parallel

	I <sub>s(50)</sub> MN/m <sup>2</sup>	U.C.S. MN/m <sup>2</sup>
Extremely Weak	<0.05	0.6-1.0
Very Weak	0.05-0.20	1.0-5.0
Weak	0.20-0.50	5.0-25.0
Medium Strong	0.50-2.00	25-50
<b>Strong</b>	<b>2.00-4.50</b>	<b>50-100</b>
Very Strong	4.50-9.00	100-250
Extremely Strong	9.00 +	>250



The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

**Approved Signature**  
**James Ward, Operations Manager**  
 CMTL Ireland Limited

**Laboratory Test Report**  
**Uniaxial Compressive Strength**

<b>Project:</b>	Churchfields	<b>Job Number</b>	12314-10-22
<b>Client:</b>	Ground Investigations Ireland Catherinstown House, Hazelhatch Road Newcastle. Co. Dublin	<b>Lab Ref No</b>	ST 23433
<b>Originator:</b>	Mike Sutton	<b>Date Received</b>	06/04/2023
		<b>Date Tested</b>	07/04/2023
		<b>Date Reported</b>	12/04/2023

Sample Reference	Moisture Content	Density (Mg/m <sup>3</sup> )	Uniaxial Compressive Strength (N/mm <sup>2</sup> )
BH06 2.35-2.5m	2.0	2625	21.3
BH08A 2.35-2.5m	2.6	2640	25.8



Approved Signature  
James Ward, Operations Manager  
CMTL Ireland Limited

# APPENDIX 9 – Groundwater Monitoring



