



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinstown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Ground Investigations Ireland
Dalymount Stadium Redevelopment
Dublin City Council
Ground Investigation Report
August 2022





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DOCUMENT CONTROL SHEET

Project Title	Dalymount Stadium Redevelopment
Engineer	IDOM
Client	Dublin City Council
Project No	11772-04-22
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
B	Final	C Ess	S Kealy	C Finnerty	Dublin	16 August 2022

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1.0 Preamble

On the instructions of IDOM Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between May and June 2022 at the site of the proposed redevelopment at Dalymount Stadium in Phibsboro, Co. Dublin.

2.0 Overview

2.1. Background

It is proposed to redevelop the current site and construct a new stadium with associated services, access roads and car parking. The site is currently occupied by a stadium and associated commercial buildings and is situated in Phibsboro Co. Dublin. 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 a Desk Study
- Carry out 1 No. Dynamic Probe to determine soil strength/density characteristics
- Carry out 4 No. Cable Percussion boreholes to a maximum depth of 10m BGL
- Carry out 3 No. Follow-on Rotary Core Boreholes to a maximum depth of 20m BGL
- Installation of 2 No. Groundwater monitoring wells
- Geotechnical and Chemical Laboratory testing
- Factual Report

2.3. Desk Study

GII obtained information relating to the local and regional geology as part of the desk study phase. GII reviewed the Geological Survey of Ireland (GSI) geology databases which are outlined below.

Information was collected from several sources including the Geological Survey of Ireland (GSI). The following sources of published geological information produced by the GSI were examined to obtain information on the geological setting of the area of the proposed site, shown in Figure 1:

- GSI Online Mapping – Quaternary Sediments Mapping
- GSI Online Mapping – 1:100,000 Bedrock Geology Map
- GSI Online Mapping – Karst Database
- GSI Online Mapping – Geotechnical Database

The published geological information, as shown in Figure 2, indicates that the site is underlain by quaternary sediments comprising Till derived from Limestones. North of the site, Urban sediment deposits can be found.

The published geological information, as shown in Figure 3, indicates that the site is underlain by solid strata comprising of dark Limestone and Shales, which is typical of the regional Lucan Formation.

Karst features are present regionally within the bedrock geology however not within or near the area of the proposed site. The nearest karst feature is present approximately 8km West of the proposed site, near Leixlip.

The Geotechnical Database available through the GSI was consulted and two reports comprising a total of 5 exploratory holes were found detailing works done within or near the proposed site, as seen in Figure 4. One report details that a borehole was carried out just southwest of the proposed site on behalf of the Bohemian Football Club in 1938. The second report shows details of four boreholes that were carried out by The Cementation Company Ltd in February 1967, on what is now the site of the Phibsboro Shopping Centre, just East of the proposed site. A single BH was drilled to the east of the proposed site in 2018 by GII for the Metro Route Options Assessment Study. The ground model for the proposed site is detailed below;

- Made Ground
- Upper Cohesive Deposits (Brown Boulder Clay)
- Lower Cohesive Deposits (Black Boulder Clay)
- Granular Deposits (Lenses within the Glacial Till)
- Bedrock (Lucan Formation)

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing and were present to a relatively consistent depth of between 2 ft (>1m) and 9 ft (2.75m) BGL in the Shopping

Centre GI and to a depth of 1.5m to 2.1m BGL in the Metro Options GI log. These deposits were described generally as filling of clay brick & delph in the Shopping Centre report and as *black mottled brown sandy gravelly CLAY which contained occasional fragments of metal, red brick, glass and ceramic*.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown sandy gravelly CLAY with occasional cobbles and boulders* overlying a *stiff dark grey sandy gravelly CLAY with occasional cobbles and boulders*. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs. The shopping centre GI BH's terminated at a depth of 30 ft (9.5m) BGL in the cohesive deposits.

BEDROCK: The rotary core borehole completed to the east of the site for the Metro Options Project encountered bedrock at a depth of 17.3m BGL. This stratum was recovered as strong dark grey fine LIMESTONE interbedded with weak black laminated Mudstone. This is typical of the Calp Formation, which is noted on the geological mapping below the proposed site. The borehole completed to the west of the site, within the footprint of the current stadium notes that Limestone was encountered at a depth of 76 ft (~23m) BGL.

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 were 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. Dynamic Probing

The dynamic probe test (DPSH) was carried out at the location 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 63.5kg weight in 100mm intervals and monitoring the number of blows required. drive length by 1.5. The dynamic probe logs are provided in Appendix 2 of this Report.

3.3. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.

The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non-cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.

Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60° cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density

at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 3 of this Report.

3.4. 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 base of the cable percussion boreholes 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 3 of this Report.

3.5. Surveying

The exploratory hole locations will be 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.

3.6. Groundwater

Groundwater Installations were installed upon the completion of A_BH01 and A_BH03 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.

3.7. Laboratory Testing

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

Chemical testing as required by the specification, including aggressive groundwater ground testing have been carried out by Element Materials Technology Laboratory in the UK.

Geotechnical testing consisting of Moisture content, Atterberg limits, Particle Size Distribution (PSD) by wet sieving and particle density were carried out in NMTL's Geotechnical Laboratory in Carlow.

The results of the laboratory testing are included in Appendix 4 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to in situ 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/Surfacing
- Made Ground
- Cohesive Deposits

TOPSOIL/SURFACING: Topsoil was encountered in A_BH04 and was present to a depth of 0.10m BGL. The remainder of the exploratory holes had Tarmac surfacing present to a depth of 0.10m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing and were present to a relatively consistent depth of between 1.20m and 1.70m BGL in the majority boreholes, and up to a maximum depth of 2.50m BGL in A_BH01. These deposits were described generally as *dark brownish grey sandy gravelly CLAY with fragments of concrete, red brick, glass, and metal.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown slightly sandy gravelly CLAY* overlying *grey slightly sandy gravelly CLAY*. The secondary sand and gravel constituents varied with depth. The strength of the cohesive deposits increased with depth and was firm to stiff or stiff below 3.0m BGL in the majority of the exploratory holes. These deposits had rare cobble content where noted on the exploratory hole logs.

4.2. In situ Strength Testing

The DPSH blow counts indicate that the overburden deposits are soft or soft to firm from depth of 1.20m to 1.90m BGL and become firm or stiff with depth.

4.3. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. 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 A_BH01 and A_BH03 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 5 of this Report.

4.1. Geotechnical Design Parameters

Preliminary geotechnical design parameters for the materials encountered during the ground investigation have been summarised in Table 1 Geotechnical Design Parameters. Both laboratory test and SPT N results, using standard empirical relationships, have been used to determine the geotechnical parameters of the overburden strata.

Shear strength parameters have been determined using laboratory testing and established empirical relationships for the relevant materials. Based on the relationship published by Stroud, the correlation of $C_u = f_1 \times N$ is used to estimate the undrained shear strength of the cohesive deposits, where f_1 is determined using a correlation with the plasticity index.

The shear strength parameters from the granular stratum are provided using the effective shear strength parameters determined from the uncorrected SPT N values after Peck et al. reported by Tomlinson Foundation Design and Construction 7th Ed. (2001).

A range is provided for the compressibility parameter m_v based on correlations with the SPT N value based on the relationship published by Stroud, the correlation of $M_v = 1/(f_2 \times N)$ where f_2 is determined using a correlation with the plasticity index.

A plasticity index of $PI = 20$ has been used for the Firm to Stiff Upper cohesive deposits indicating an f_1 value of 5 and $f_2 = 0.55$ where with the stiff to very stiff cohesive deposits present below 3.0m BGL a $PI = 15$ has been used to derive an f_1 value of 6 and $f_2 = 0.6$.

Table 2 Recommended Geotechnical Parameters based on GII GI Data

Stratum	Bulk Density (kN/m ³)	SPT 'N' Correlated	Undrained Shear Strength C _u (kN/m ²)	Effective Strength Parameters		Poisson's Ratio ν (ν _u)	Co-efficient of Compressibility
				Cohesion c' (kN/m ²)	φ' degrees		m _v (m ² /MN)
Cohesive Made Ground Deposits	16 – 20 ^{*1}	1 - 20	5 – 100 ^{*2}	0	25 - 30 ^{*4}	0.2 (0.5)	0.1-1.5 ^{*3}
Soft Cohesive Deposits	16 – 20 ^{*1}	1 - 8	5 - 40 ^{*2}	0 - 1	25 - 28 ^{*4}	0.2 (0.5)	0.1 – 1.5 ^{*3}
Firm Cohesive Deposits	18 – 20 ¹	8 – 15	40 - 75 ^{*2}	0 - 3	28 – 30 ^{*4}	0.2 (0.5)	0.1 – 0.3 ^{*3}
Stiff Cohesive Deposits	19 – 20 ^{*1}	15 – 25	75 - 150 ^{*2}	0 - 5	30 - 33 ^{*4}	0.2 (0.5)	0.05 – 0.1 ^{*3}
Very Stiff Cohesive Deposits	20 – 22	25+	150+	0 – 5	30 – 33+ ^{*4}	0.2 (0.5)	0.02 – 0.05 ^{*3}

*1 Values for bulk density assumed

*2 Based on correlated SPT N values, PI value of 20 used above 3.0m for firm to stiff cohesive deposits and PI=15 for below 3.0m in the stiff to very stiff deposits.

*3 Based on correlated SPT N values and published data. Caution should be exercised when selecting design values for the variable Made Ground Stratum.

*4 Testing on undisturbed samples is recommended to determine the design value of this parameter for detailed design.

NOTE: The values in Table 1 represent a range of recommended values based on the typical soil types, insitu testing and laboratory testing scheduled.. The values presented are recommended for outline guidance only and specific designs should derive design values based on the exploratory hole logs and lab testing for each specific site. To determine specific design values relevant to the design being undertaken in a particular area, reference should be made to the relevant specific exploratory hole logs. Further testing is recommended to determine the specific geotechnical parameters required for foundation design and temporary works design

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. 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 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 5 of this Report.

4.3. Laboratory Testing

4.3.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The results indicate an upper softer cohesive deposit underlain by a stiffer stratum with a lower moisture content and plasticity results. The grading of the samples is similar and well graded throughout.

4.3.2. Classification Testing

Eight Moisture Content and Atterberg limit tests were carried out on samples from the overburden deposits at depths of 2.0m BGL to 8.0m BGL. The moisture content of the upper brown boulder clays tended to be higher with values of between 14.8% and 22% recorded at depths ranging from 0.0m to 2.0m BGL. These samples also tended to have higher plasticity results however were still within the low plasticity CLAY classification. The Plasticity Index results ranged from 13% to 17% with an average of 14.5% for this stratum.

The deeper samples ranging from depths of 2.0m to 8.0m BGL representing the stiffer brown and very stiff dark grey or black boulder Clay had moisture contents ranging between 11.8% and 13%. The Atterberg limit results from these deposits confirmed the primary constituent to be a CLAY of low plasticity. The Plasticity Index results ranged from 11 to 15 with an average of 13%.

The Particle Size Distribution tests confirm that generally the cohesive deposits are similarly well-graded with percentages of sands and gravels ranging between 16% and 49% generally with fines contents of 31% to 43%.

4.3.3. Chemical Laboratory Testing

The pH and sulphate test carried out on the cohesive deposits indicate that the pH results are near neutral and that the water soluble sulphate results are 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. This is equivalent to an XA1 classification in accordance with EN1992.

The results from the completed laboratory testing are included in Appendix 5 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

The proposed foundations are envisaged to consist of discrete columns on the main stands with loading of up to 3000 kN/m² and a linear strip loading on a wall type support for the smaller north and south stands with a loading of 150 kN/m.

Due to the depth to an appropriate bearing capacity for the loading envisaged for the main stands, piled foundations are recommended. Based on the paper by Gavin et al (2008) "Axial resistance of CFA piles in Dublin Boulder Clay" the piles are recommended to be sized on the design values advised below, with shaft friction and base resistance calculated in accordance with EC7. A conservative approach has been adopted and consultation with a Piling Contractor is recommended to verify the design assumptions made.

- Shaft friction = $a C_u$ (kPa)
- Base Resistance = $N_c C_u$ (kPa)

The cohesion C_u can vary between 60 kPa and 120 kPa over the top 5m and from 200 kPa to 300 kPa below this depth. The Made Ground and upper soft cohesive deposits should be discounted from the capacity calculations.

The design value of the adhesion factor for calculating the skin friction is conservatively recommended to be taken as a value between 0.35 and 0.45.

The design value of the bearing factor N_c is conservatively recommended to be taken as 9 for end bearing if required in the calculations.

Based on the skin friction a group of 4 no 600mm diameter CFA piles to 15m BGL should be sufficient to take the maximum loading (3000 kN) from the main stands. Piles should be utilised below each of the columns to maintain a similar stiffness however a lesser depth or number of piles may be utilised to support the lower loading at these points. A higher capacity would be available for piles taken to bedrock or where pile testing is utilised to determine the design values. The piles are recommended to be designed by the piling contractor to ensure that an efficient design is achieved, specific to the method of installation.

The smaller south and north stands are envisaged to consist of shallow strip foundations founded on the firm to stiff brown boulder clay deposits, typically at a depth of 3.0m BGL. On the firm to stiff brown cohesive deposits an allowable bearing capacity of 125 kN/m² is recommended. This is based on a design SPT N value of 12 and f_1 & f_2 values representing the higher bound of the plasticity data from the laboratory testing of PI = 20%. An undrained cohesive strength of 60 kN/m² has been determined and the proposed loading on a conventional pad foundation is anticipated to undergo between 10mm and 15mm of settlement for immediate and for consolidation settlement. An m_v value of 0.12 MN/m² has been assumed and these parameters have been assumed as present to a depth of 5.0m BGL in these calculations below which a stiffer overconsolidated boulder clay has been assumed.

The values selected for the stiff glacial till stratum have been derived from the laboratory testing and published data as no suitable undisturbed samples were recovered due to the gravel content in this stratum. It should be noted that the underlying very stiff glacial till is heavily overconsolidated and the use of a geological factor of 0.2 is considered appropriate for m_v values derived from laboratory testing. The actual footing size and the loading should be used to determine the bearing capacity and the anticipated settlement in the foundation design report.

5.3. 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. 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. A temporary batter of 2(H):1(V) is recommended in the Made Ground and firm brown cohesive deposits. A steeper batter of 1(H):1(V) is possible in the very stiff dark grey cohesive deposits for excavations of a duration of less than six months, subject to regular inspection. Any seepage from the slope should be addressed with the installation of drainage and a reduction in the batter to maintain face stability.

Where an existing road is adjacent to the proposed excavation, a batter of 2(H):1(V) is recommended with a minimum set back of 2m from the edge of the slope to any footpath or carriageway for the entire slope depth. A global stability check would be required to demonstrate the stability of the slope where loading is imposed from any walkways, traffic, or plant. A kingpost or piled retaining wall may be more appropriate solutions for the temporary retention of the excavation sides where traffic, loading or space constraints are expected. Any battered slopes should be covered to prevent erosion and to protect from moisture ingress. The groundwater and stability noted on the trial pit and borehole logs should be consulted when determining the most appropriate construction methods for excavations.

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



714700E

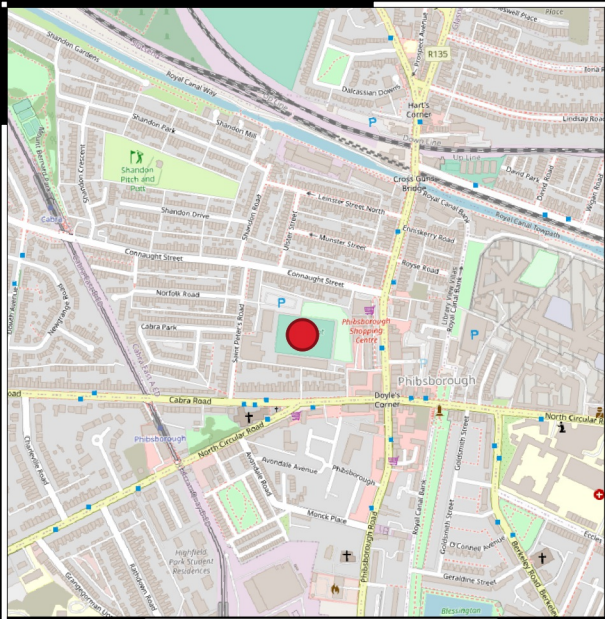
714770E

714840E

736120N

736050N

735980N



- Dynamic Probe
- ⊕ Cable Percussion - Rotary Core Borehole
- Site Boundary
- Site Location

Client:



Project Code:

11772-04-22

Project Title:

Dalymount Stadium Redevelopment

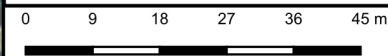
Drawing Title:

Figure 1 Site Location Plan



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Geotechnical & Environmental

Ground Investigations Ireland Ltd.
 Catherinstown House,
 Hazelhatch Road,
 Newcastle, Co. Dublin
 www.gii.ie 01-6015175/5176



Drawn By:
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Date:
16/06/2022

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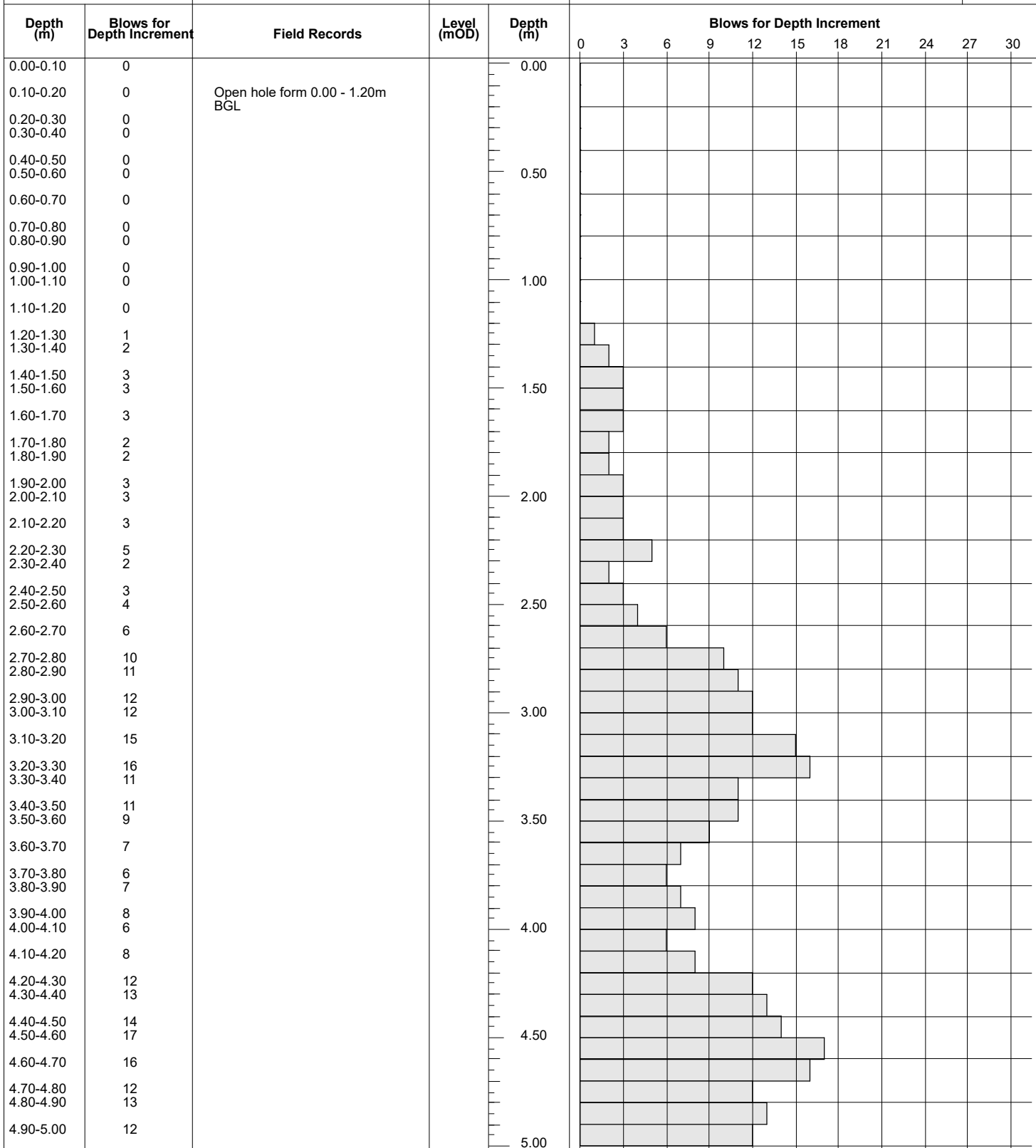
714840E

APPENDIX 2 – Dynamic Probe Records





Method Dynamic Probe Super Heavy DPSH, Fall Height 760mm, Hammer weight 63.5Kg	Cone Dimensions 50.5mm	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 09/05/2022	Engineer	Sheet 1/2



Remarks
Refusal at 5.10m BGL for 25 blows

Scale (approx)
1:25
Logged By
CF
Figure No.
11772-04-22.DPSH06



Method Dynamic Probe Super Heavy DPSH, Fall Height 760mm, Hammer weight 63.5Kg	Cone Dimensions 50.5mm	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 09/05/2022	Engineer	Sheet 2/2

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	
5.00-5.10	18			5.00	[Bar chart showing 18 blows for the 5.00-5.10m depth increment]											
				5.50												
				6.00												
				6.50												
				7.00												
				7.50												
				8.00												
				8.50												
				9.00												
				9.50												
				10.00												

Remarks	Scale (approx)	Logged By
	1:25	CF
	Figure No. 11772-04-22.DPSH06	

APPENDIX 3 – Borehole Records





Machine : Dando 2000 & Berretta T44 Method : Cable Percussion with Rotary Core follow-on		Casing Diameter 200mm cased to 7.70m 96mm cased to 20.00m		Ground Level (mOD)		Client Dublin City Council		Job Number 11772-04-22	
		Location		Dates 10/05/2022- 13/05/2022		Engineer		Sheet 1/2	

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10 (0.20) 0.30							TARMACADAM			
0.50 0.50	B T						Grey angular fine to coarse crushed rock FILL			
1.00-1.45 1.00 1.00	SPT(C) N=5 B T			1,2/2,1,1,1		(2.20)	MADE GROUND: Dark brownish grey sandy gravelly Clay with concrete, red brick and metal fragments			
2.00-2.45 2.00 2.00	SPT(C) N=7 B T			1,2/2,1,2,2		2.50	Soft to firm brown mottled grey slightly sandy gravelly CLAY			
3.00-3.45 3.00 3.00	SPT(C) N=19 B T			2,3/3,5,5,6		3.00	Stiff brown mottled grey slightly sandy gravelly CLAY			
4.00-4.45 4.00 4.00	SPT(C) N=22 B T			2,4/6,5,6,5		3.80	Stiff grey slightly sandy gravelly CLAY			
5.00-5.45 5.00 5.00	SPT(C) N=38 B T			4,7/10,9,9,10		5.00	Very stiff grey slightly sandy gravelly CLAY			
6.00-6.45 6.00 6.00	SPT(C) N=46 B T			3,8/9,11,12,14		(2.75)				
7.00 7.00 7.60-7.75 7.00-7.43	B T SPT(C) 50/275			25,25/50 SPT(C) 50/0 Water strike(1) at 7.00m, rose to 6.90m in 20 mins. 5,9/12,15,14,9						
7.75	TCR	SCR	RQD	FI		7.75	Very stiff grey slightly sandy gravelly CLAY			
8.10-8.55 8.10	100	-				(0.35) 8.10	Poor recovery driller notes gravelly boulder Clay recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse gravel (Very stiff)			
9.60-10.05 9.60	20	-				(1.50) 9.60	Very stiff brownish grey slightly sandy gravelly CLAY			

Remarks Inspection pit carried out to 1.20m BGL Cable percussion terminated at 7.60m BGL due to an obstruction probable boulder Rotary follow on completed at 20.00m BGL Standpipe installed in borehole upon completion - slotted from 20.00m BGL to 1.00m BGL and plain from 1.00m BGL to ground level with bentonite seal and flush cover								Scale (approx) 1:50	Logged By M.Sheehan
Figure No. 11772-04-22.A_BH01									



Machine : Dando 2000 & Berretta T44 Flush : Water Core Dia: 64 mm Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 7.70m 96mm cased to 20.00m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 10/05/2022-13/05/2022	Engineer	Sheet 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
11.10-11.25 11.10	60	-			25,25/50 SPT(C) 50/0						
12.60-12.75 12.60	80	-			25,25/50 SPT(C) 50/0						
14.10-14.25 14.10	93	-			25,25/50 SPT(C) 50/0		(9.00)				
15.60-15.75 15.60	93	-			25,25/50 SPT(C) 50/0						
17.10-17.25 17.10	100	-			25,25/50 SPT(C) 50/0						
18.60-18.75 18.60	46	-			25,25/50 SPT(C) 50/0		18.60	Poor recovery driller notes large cobbles and grey sands. Recovery consists of dense brownish grey slightly clayey sandy subangular to rounded fine to coarse GRAVEL			
							(1.40)				
							20.00				

Remarks	Scale (approx)	Logged By
	1:50	M.Sheehan
	Figure No. 11772-04-22.A_BH01	



Machine : Dando 2000 & Beretta T44 Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 8.10m 96mm cased to 19.50m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 09/05/2022-12/05/2022	Engineer	Sheet 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B					(0.30)	MADE GROUND: Dark brownish grey sandy gravelly CLAY with concrete and red brick fragments		
0.50	T					0.30 (0.20) 0.50	CONCRETE SLAB		
1.00-1.45	SPT(C) N=13			2,4/4,3,4,2		(1.20)	MADE GROUND: Dark brownish grey sandy gravelly CLAY with concrete and red brick fragments		
1.00	B								
1.00	T								
2.00-2.45	SPT(C) N=15			2,2/3,3,4,5		1.70	Firm to stiff brown mottled grey slightly sandy gravelly CLAY		
2.00	B								
2.00	T					(1.30)			
3.00-3.45	SPT(C) N=24			1,3/3,5,7,9		3.00	Stiff brown mottled grey slightly sandy gravelly CLAY		
3.00	B								
3.00	T					(0.70)			
4.00-4.45	SPT(C) N=18			2,4/4,4,5,5		3.70	Stiff grey slightly sandy gravelly CLAY		
4.00	B								
4.00	T					(1.30)			
5.00-5.45	SPT(C) N=37			2,6/9,8,10,10		5.00	Very stiff grey slightly sandy gravelly CLAY		
5.00	B								
5.00	T								
6.00-6.45	SPT(C) N=31			4,7/8,7,7,9					
6.00	B								
6.00	T					(3.45)			
7.00-7.45	SPT(C) N=49			3,8/9,11,13,16					
7.00	B								
7.00	T								
8.00	B			T					
8.00				4,9/12,15,16,7					
8.00-8.42				SPT(C) 50/270					
8.20	TCR	SCR	RQD	FI					
8.20	20	-				8.45	Very stiff brownish grey slightly sandy gravelly CLAY		
9.50-9.88									
9.50						(1.55)			
				8,12/17,17,16					
				SPT(C) 50/225					

Remarks No groundwater encountered Inspection pit carried out to 1.20m BGL Cable percussion terminated at 8.10m BGL due to an obstruction probable boulder Follow on rotary coring carried out to 19.50m BGL Chiselling from 0.30m to 0.50m for .4 hours.	Scale (approx) 1:50	Logged By M.Sheehan
	Figure No. 11772-04-22.A_BH02	



Machine : Dando 2000 & Beretta T44 Flush : Core Dia: mm Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 8.10m 96mm cased to 19.50m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 09/05/2022-12/05/2022	Engineer	Sheet 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
11.00-11.23 11.00	33	-			13,13/18,32 SPT(C) 50/75		10.00 (1.00)	Poor recovery driller notes gravelly boulder Clay. Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse Gravel (Very stiff)		
12.50-12.65 12.50	87	-			25,25/50 SPT(C) 50/0		11.00	Very stiff brownish grey slightly sandy gravelly CLAY with rare subangular to subrounded cobbles		
14.00-14.15 14.00	90	-			25,25/50 SPT(C) 50/0		(8.00)			
15.50-15.65 15.50	100	-			25,25/50 SPT(C) 50/0					
17.00-17.15 17.00	100	-			25,25/50 SPT(C) 50/0					
18.50-18.65 18.50	59	-			25,25/50 SPT(C) 50/0		19.00 (0.50)	Poor recovery driller notes gravelly boulder Clay. Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse Gravel (Very stiff)		
19.50							19.50	Terminated at 19.50m		

Remarks	Scale (approx) 1:50	Logged By M.Sheehan
	Figure No. 11772-04-22.A_BH02	



Machine : Dando 2000 & Berretta T44 Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 7.00m 94mm cased to 20.00m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 12/05/2022	Engineer	Sheet 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10						0.10	TARMACADAM			
0.50 0.50	B T					(1.10)	MADE GROUND: Dark brownish grey sandy gravelly Clay with red brick fragments			
1.00 1.00 1.20-1.65	B T SPT(C) N=10			1,1/2,4,2,2		1.20 (0.60)	Firm light brown slightly sandy gravelly CLAY			
2.00-2.45 2.00 2.00	SPT(C) N=10 B T			1,2/2,3,2,3		1.80 (1.00)	Firm brown mottled grey slightly sandy gravelly CLAY			
3.00-3.45 3.00 3.00	SPT(C) N=14 B T			1,2/3,4,4,3		2.80	Firm grey slightly sandy gravelly CLAY			
4.00-4.45 4.00 4.00	SPT(C) N=13 B T			1,2/2,3,4,4		(2.20)				
5.00-5.45 5.00 5.00	SPT(C) N=20 B T			2,4/5,5,4,6		5.00	Stiff grey slightly sandy gravelly CLAY			
6.00 6.00 6.30-6.60	B T SPT(C) 50/145			2,5/4,46		6.00 (1.00)	Very stiff grey slightly sandy gravelly CLAY			
7.00 7.00-7.45 7.00 7.00	TCR SCR	RQD	FI	3,5/6,8,7,9 B SPT(C) N=30 T		7.00 (1.00)	Poor recovery driller notes gravelly boulder Clay. Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse Gravel (Very stiff)			
8.00-8.15 8.00	30	-		16,22/50 SPT(C) 50/0		8.00	Very stiff brownish grey slightly sandy gravelly CLAY with rare subangular to subrounded cobbles			
9.50-9.65 9.50	67	-		25,25/50 SPT(C) 50/0						

Remarks No groundwater encountered Inspection pit carried out to 1.20m BGL Cable percussion terminated at 7.00m BGL due to an obstruction probable boulder Rotary follow on completed at 20.00m BGL Standpipe installed in borehole upon completion - slotted from 20.00m BGL to 1.00m BGL and plain from 1.00m BGL to ground level with bentonite seal and flush cover Chiselling from 5.60m to 5.80m for .3 hours. Chiselling from 6.50m to 6.60m for .3 hours.	Scale (approx) 1:50	Logged By M.Sheehan
	Figure No. 11772-04-22.A_BH03	



Machine : Dando 2000 & Berretta T44 Flush : Water Core Dia: 64 mm Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 7.00m 94mm cased to 20.00m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 12/05/2022	Engineer	Sheet 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
11.00-11.15 11.00	73	-			25,25/50 SPT(C) 50/0						
12.50-12.65 12.50	100	-			25,25/50 SPT(C) 50/0		(7.90)				
14.00-14.15 14.00	100	-			25,25/50 SPT(C) 50/0						
15.50-15.65 15.50	100	-			25,25/50 SPT(C) 50/0						
17.00-17.15 17.00	47	-			25,25/50 SPT(C) 50/0		15.90 (1.10)	Poor recovery driller notes gravelly boulder Clay. Recovery consists of grey slightly clayey slightly sandy subangular to subrounded fine to coarse Gravel (Very stiff)			
18.50-18.65 18.50	60	-			25,25/50 SPT(C) 50/0		17.00	Very stiff brownish grey slightly sandy gravelly CLAY			
20.00	100	-			25,25/50 SPT(C) 50/0		(3.00) 20.00				

Remarks	Scale (approx)	Logged By
	1:50	M.Sheehan
	Figure No. 11772-04-22.A_BH03	



Machine : Dando 2000 & Berretta T44 Method : Cable Percussion with Rotary Core follow-on	Casing Diameter 200mm cased to 9.20m	Ground Level (mOD)	Client Dublin City Council	Job Number 11772-04-22
	Location	Dates 09/05/2022-11/05/2022	Engineer	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10						0.10	Brown slightly sandy slightly gravelly Clay TOPSOIL with grass and rootlets		
0.50 0.50	B T					(1.20)	MADE GROUND: Dark brownish grey sandy gravelly Clay with glass and red brick fragments		
1.00 1.00 1.20-1.65	B T SPT(C) N=3			0,1/0,1,1,1		1.30 (0.70)	Very soft brown mottled grey slightly sandy gravelly CLAY		
2.00-2.45 2.00 2.00	SPT(C) N=10 B T			1/2,2,3,3		2.00 (1.00)	Firm brown mottled grey slightly sandy gravelly CLAY		
3.00-3.45 3.00 3.00	SPT(C) N=19 B T			2,4/4,5,4,6		3.00 (0.40) 3.40 (0.60)	Stiff brown mottled grey slightly sandy gravelly CLAY Stiff grey slightly sandy gravelly CLAY		
4.00-4.45 4.00 4.00	SPT(C) N=12 B T			1,2/2,3,3,4		4.00 (2.00)	Firm grey slightly sandy gravelly CLAY		
5.00-5.45 5.00 5.00	SPT(C) N=14 B T			1,2/3,4,3,4		6.00 (3.20)	Stiff grey slightly sandy gravelly CLAY		
6.00-6.45 6.00 6.00	SPT(C) N=27 B T			3,5/6,6,7,8		9.20	Complete at 9.20m		
7.00-7.45 7.00 7.00	SPT(C) N=30 B T			7,8/8,7,6,9					
8.00-8.45 8.00 8.00	SPT(C) N=29 B T			2,3/4,4,8,13					
9.00 9.00 9.20-9.65	B T SPT(C) 50/295			6,11/12,12,13,13					

Remarks No groundwater encountered Inspection pit carried out to 1.20m BGL Cable percussion terminated at 9.20m BGL due to an obstruction probable boulder	Scale (approx) 1:50	Logged By M.Sheehan
	Figure No. 11772-04-22.A_BH04	

APPENDIX 4 – Laboratory Testing



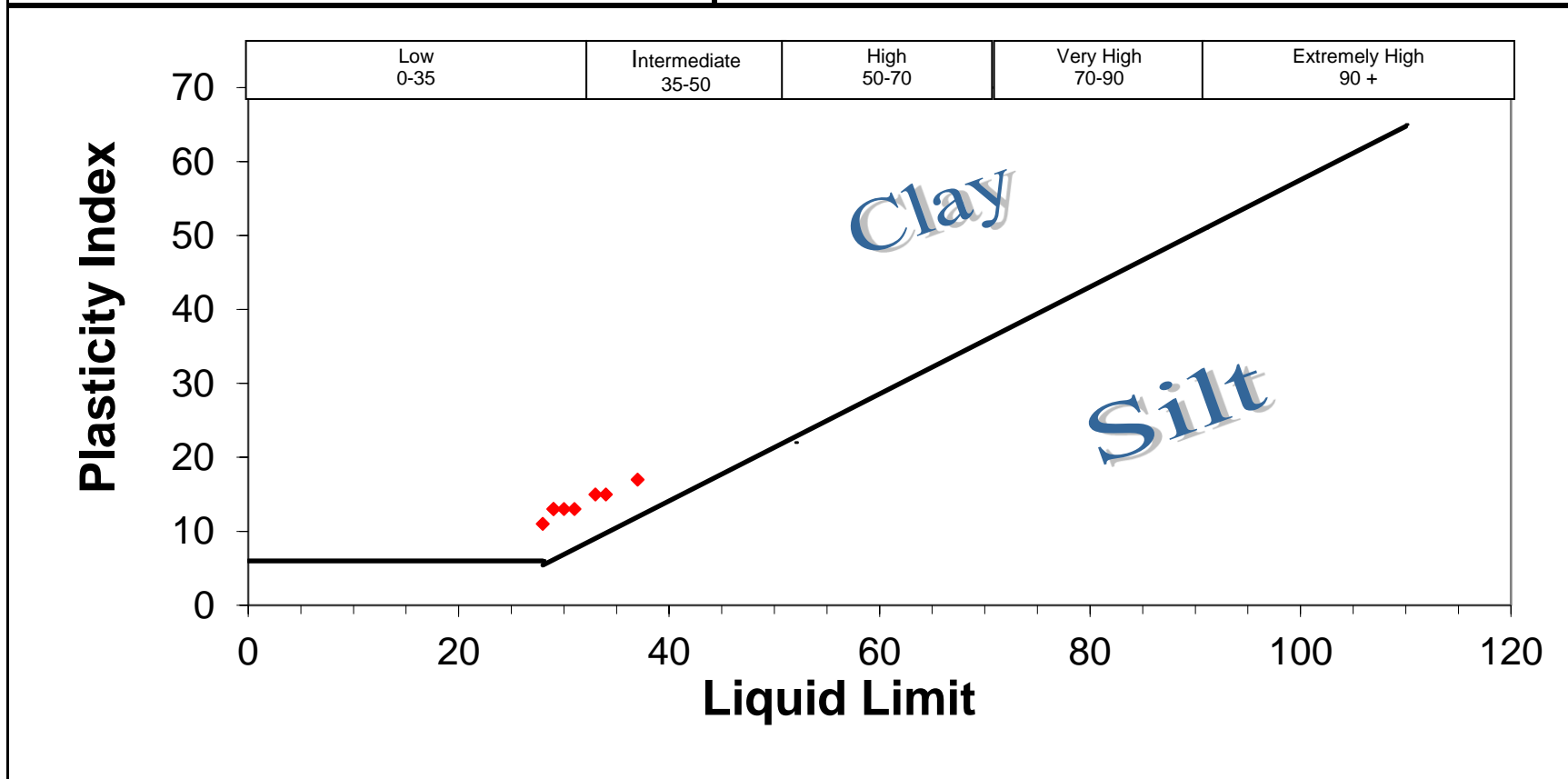
National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

BH/TP No	Depth m	sample No.	Moisture %	Particle			Index Properties			Bulk Density Mg/m3	Cell Pressure kPa	Undrained Triaxial Tests		Lab Vane kPa	Remarks
				Density Mg/m3	<425um %	LL %	PL %	PI %	Compressive Stress kPa			Strain at Failure %			
BH01	3.00	B	14.8	2.67	54.5	30	17	13							
BH01	4.00	B	1.5	2.69	40.7	33	18	15							
BH02	2.00	B	21.9	2.66	58.1	37	20	17							
BH02	3.00	B	14.5	2.68	44.7	29	16	13							
BH03	2.00	B	13.6	2.67	55.1	34	19	15							
BH03	6.00	B	11.8	2.69	40.6	28	17	11							
BH04	2.00	B	13.5	2.67	49.0	31	18	13							
BH04	8.00	B	13.0	2.68	42.1	29	16	13							
NMTL		Notes :									Job ref No.	NMTL 3553	GII Project ID:	11772-04-22	
		1. All BS tests carried out using preferred (definitive) method unless otherwise stated.									Location	Dalymount Stadium Redevelopment			

NMTL LTD
Unit 18c, Tullow Industrial Estate
Tullow
County Carlow
Tel: 00353 59 9180822
Mob: 00353 872575508
billa@nmtl.ie

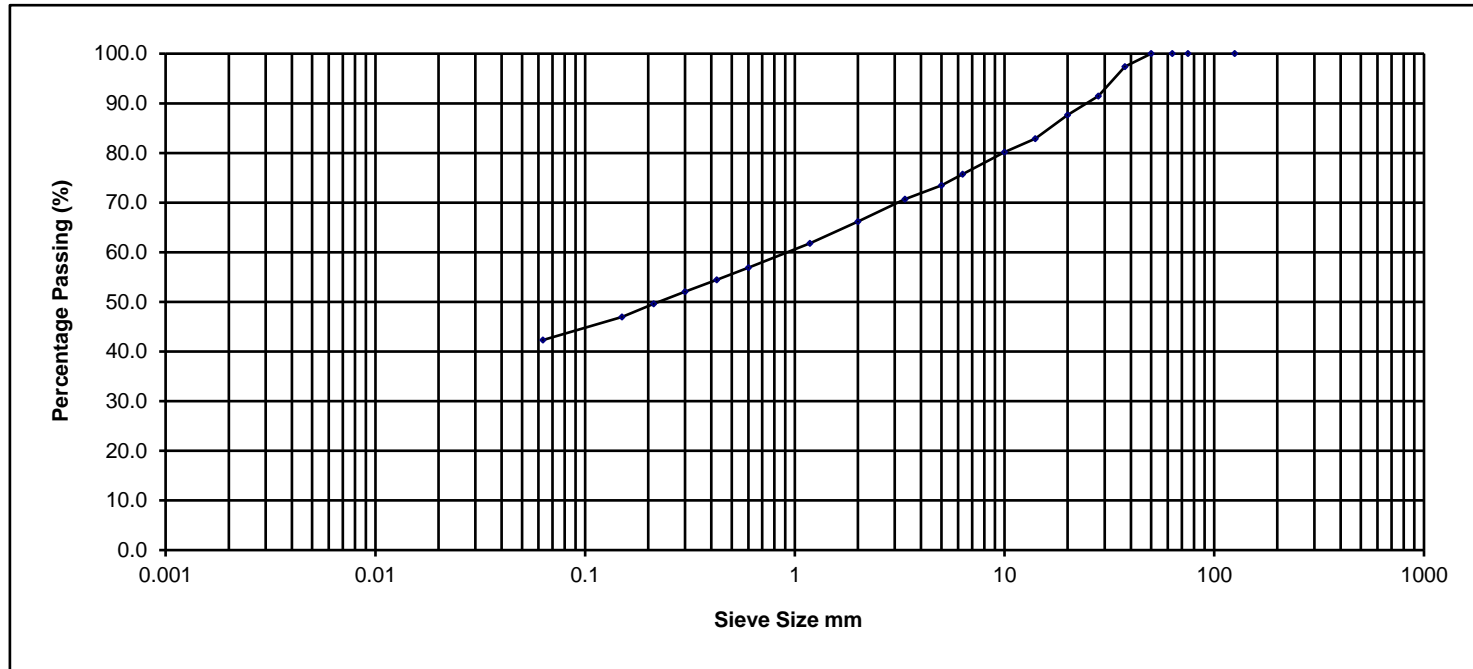
Contract: Dalymount Stadium Redevelopment
Client: Ground Investigations Ireland Ltd
Engineer: Stephen Kealy
GII Project ID 11772-04-22
Date: 24/06/2022
Tested By: Sb **Checked:** Bc
Job ref No. NMTL 3553



NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	97.4
28.000	91.5
20.000	87.7
14.000	82.9
10.000	80.2
6.300	75.7
5.000	73.4
3.350	70.7
2.000	66.2
1.180	61.8
0.600	56.9
0.425	54.5
0.300	52.0
0.212	49.6
0.150	47.0
0.063	42.3

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
	42.3			23.9			33.8			0.0	0.0

Sample Description Brown/grey slightly sandy slightly gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH01

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

**NM
TL**

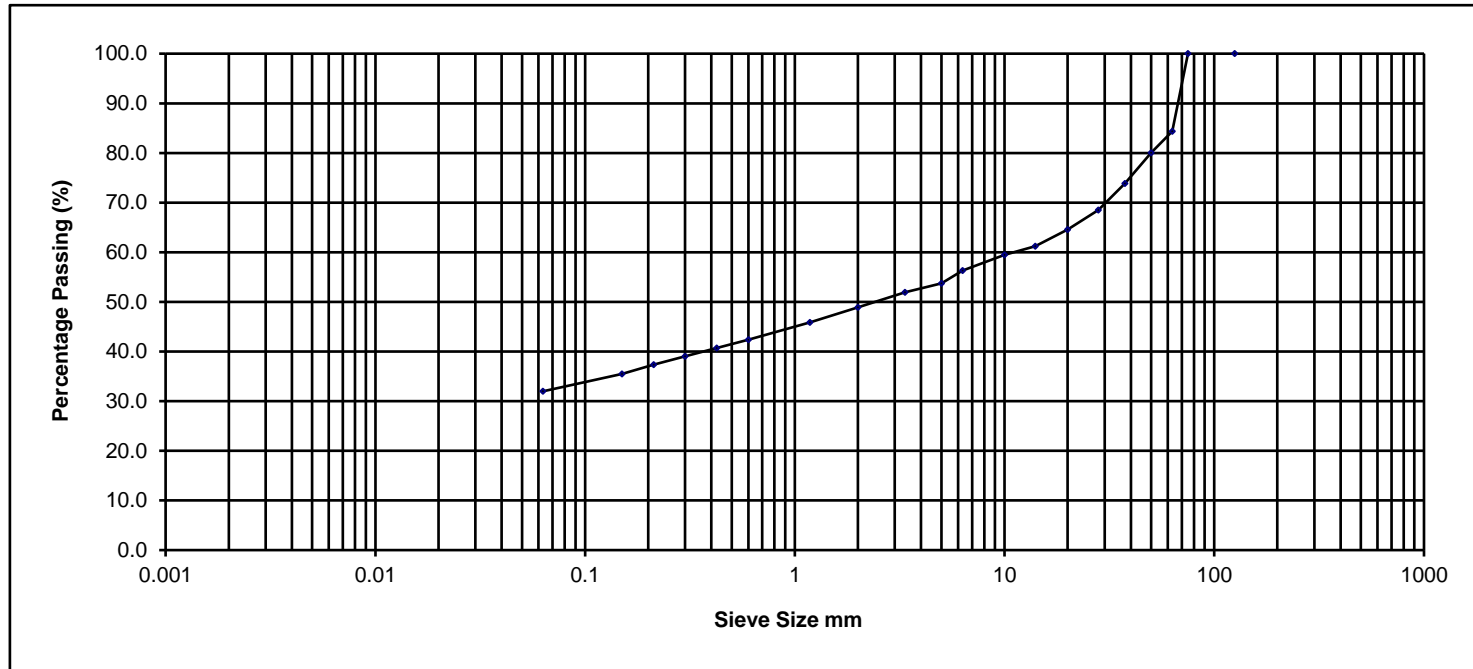
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Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	3.00m
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NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	84.4
50.000	80.0
37.500	73.9
28.000	68.5
20.000	64.6
14.000	61.2
10.000	59.4
6.300	56.3
5.000	53.8
3.350	51.9
2.000	48.9
1.180	45.9
0.600	42.4
0.425	40.7
0.300	39.0
0.212	37.3
0.150	35.5
0.063	32.0

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	32.0			16.9			35.5			15.6	0.0

Sample Description Dark grey/black slightly sandy gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH01

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

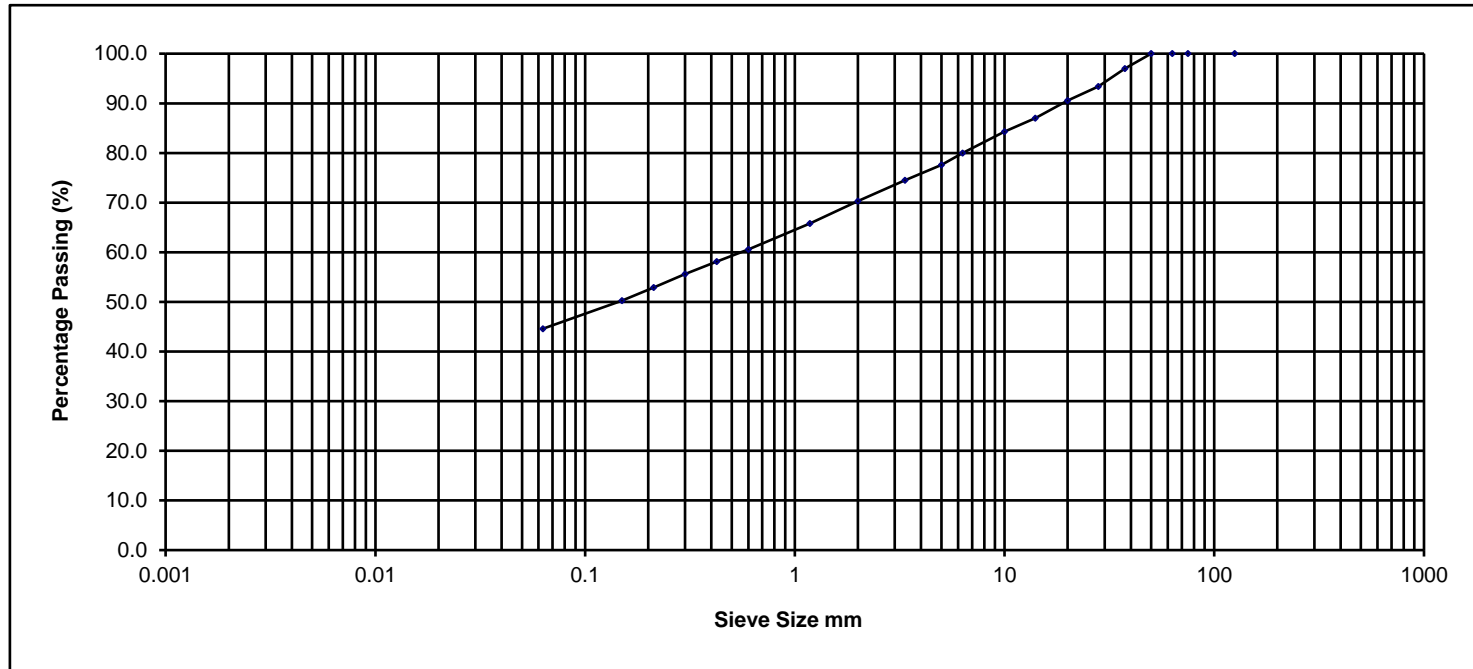
NMTL Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	4.00m
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NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	97.0
28.000	93.4
20.000	90.5
14.000	87.0
10.000	84.3
6.300	80.0
5.000	77.6
3.350	74.5
2.000	70.3
1.180	65.8
0.600	60.6
0.425	58.1
0.300	55.6
0.212	52.9
0.150	50.2
0.063	44.6

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	44.6			25.7			29.7			0.0	0.0

Sample Description Brown/grey slightly sandy slightly gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH02

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

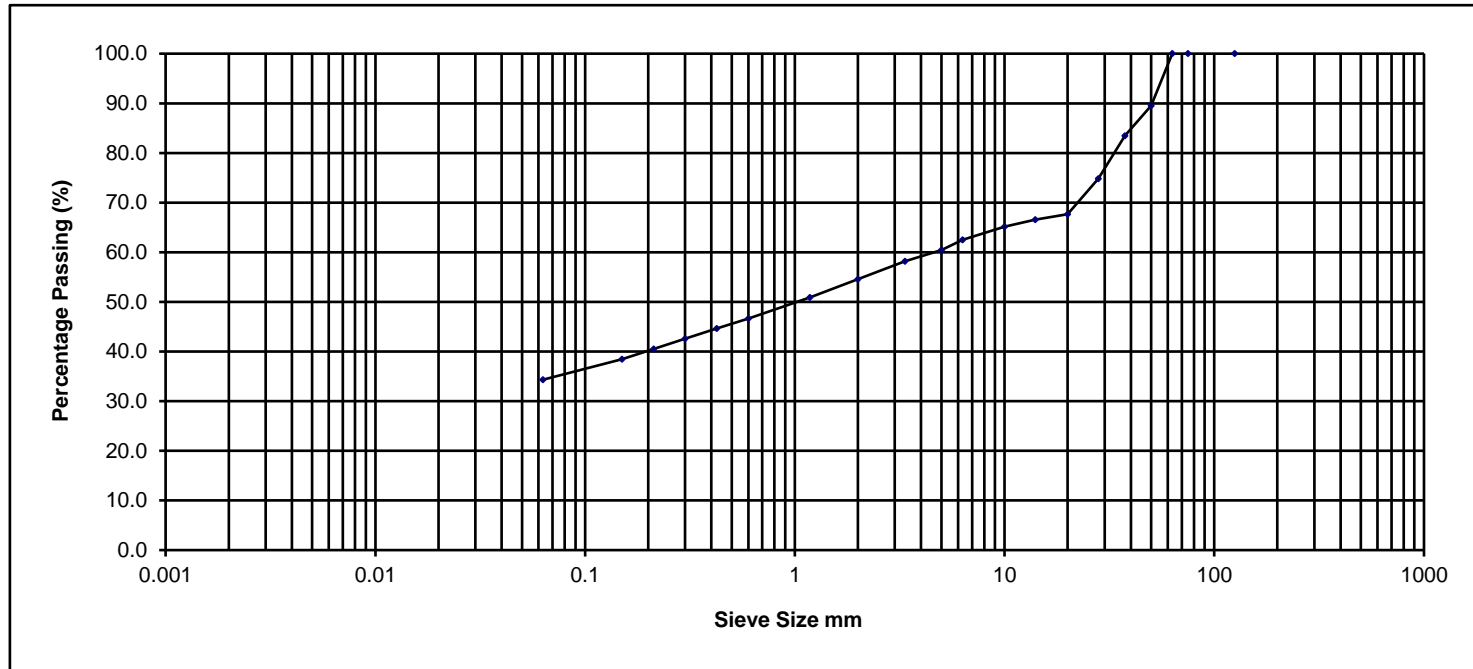
NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	2.00m
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NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	89.5
37.500	83.4
28.000	74.8
20.000	67.7
14.000	66.5
10.000	65.1
6.300	62.5
5.000	60.4
3.350	58.2
2.000	54.6
1.180	50.9
0.600	46.6
0.425	44.7
0.300	42.6
0.212	40.5
0.150	38.4
0.063	34.3

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	34.3			20.3			45.4			0.0	0.0

Sample Description Dark grey/black slightly sandy gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH02

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

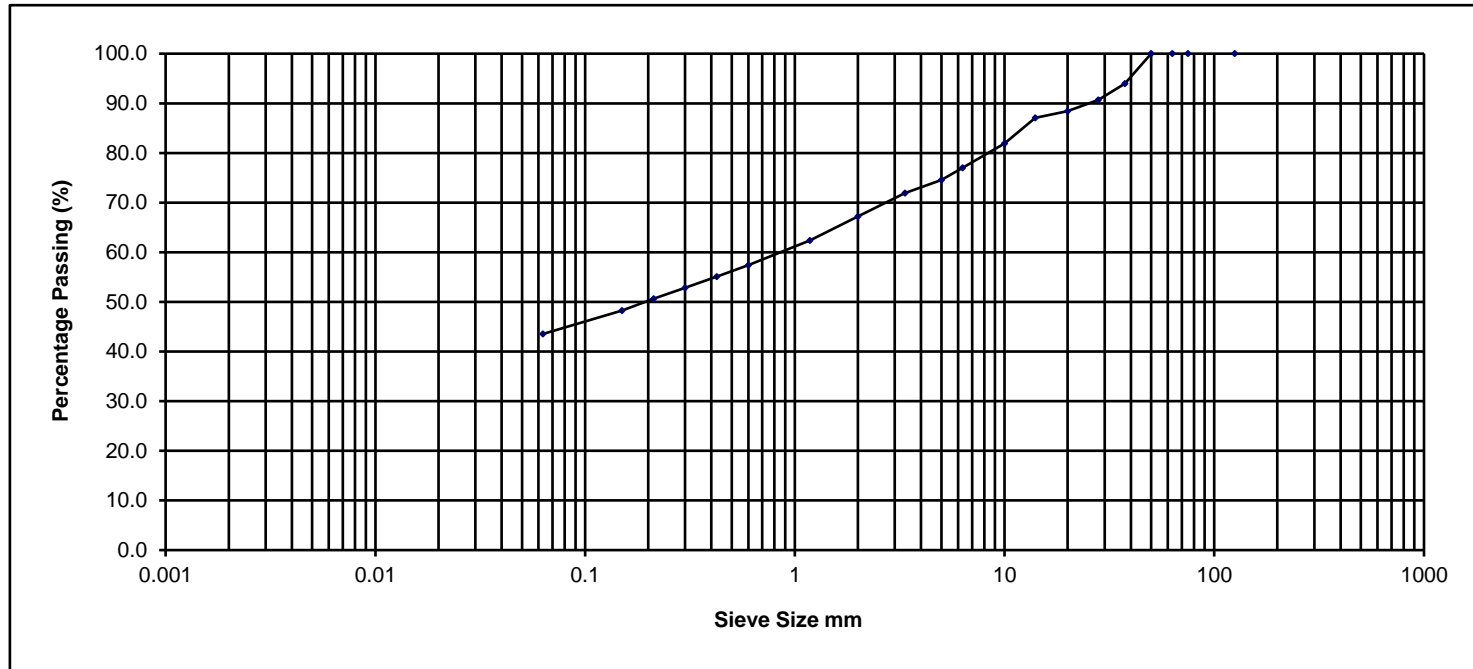
NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	3.00m
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NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	94.0
28.000	90.7
20.000	88.4
14.000	87.0
10.000	81.9
6.300	77.0
5.000	74.6
3.350	71.9
2.000	67.2
1.180	62.4
0.600	57.4
0.425	55.1
0.300	52.8
0.212	50.6
0.150	48.3
0.063	43.5

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	43.5			23.7			32.8			0.0	0.0

Sample Description Brown slightly sandy slightly gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH03

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

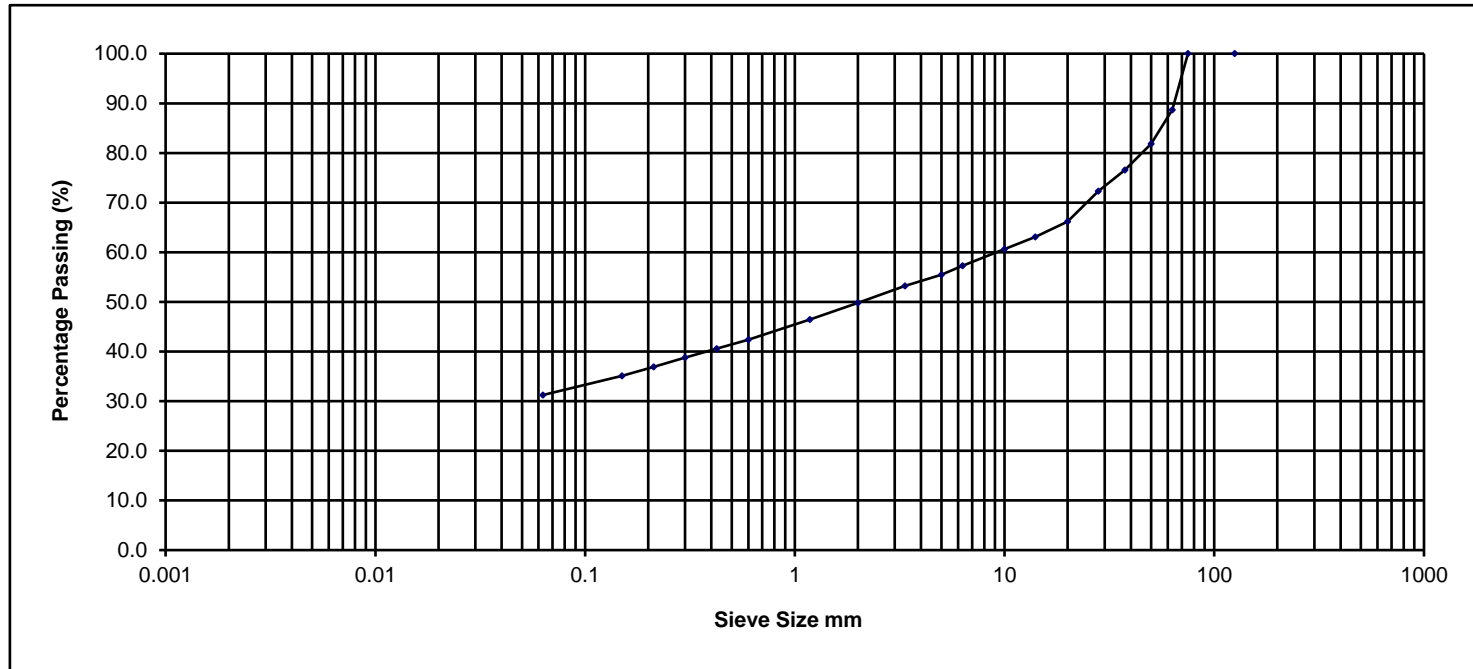
NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	2.00m
----------	----	---------	----	----------	----	--------------------	------------	-------	-------

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	88.7
50.000	81.9
37.500	76.5
28.000	72.3
20.000	66.2
14.000	63.1
10.000	60.6
6.300	57.3
5.000	55.5
3.350	53.2
2.000	49.8
1.180	46.5
0.600	42.4
0.425	40.6
0.300	38.8
0.212	36.9
0.150	35.1
0.063	31.2

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	31.2			18.6			38.9			11.3	0.0

Sample Description Dark grey slightly sandy gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH03

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

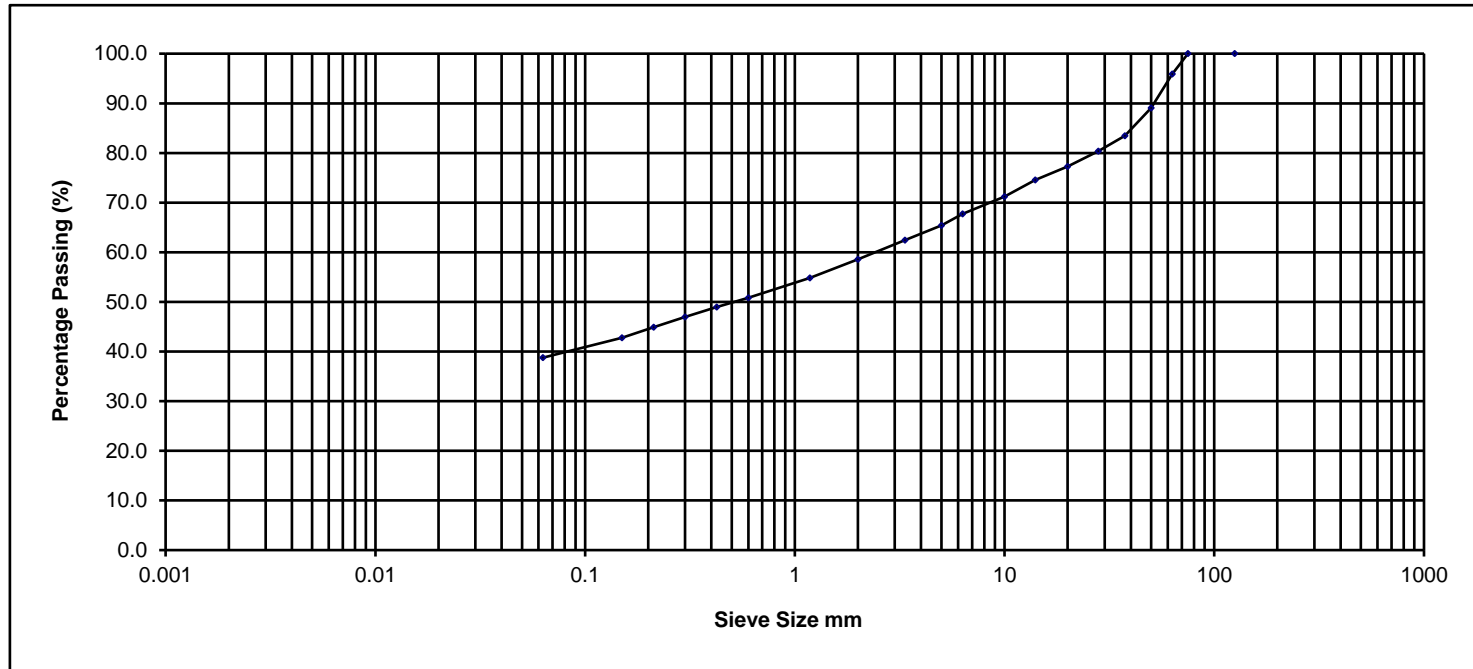
NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	6.00m
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NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	95.9
50.000	89.0
37.500	83.4
28.000	80.3
20.000	77.3
14.000	74.6
10.000	71.2
6.300	67.7
5.000	65.4
3.350	62.4
2.000	58.6
1.180	54.8
0.600	50.8
0.425	49.0
0.300	47.0
0.212	44.9
0.150	42.8
0.063	38.8

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	38.8			19.8			37.3			4.1	0.0

Sample Description Brown/grey slightly sandy gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH04

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

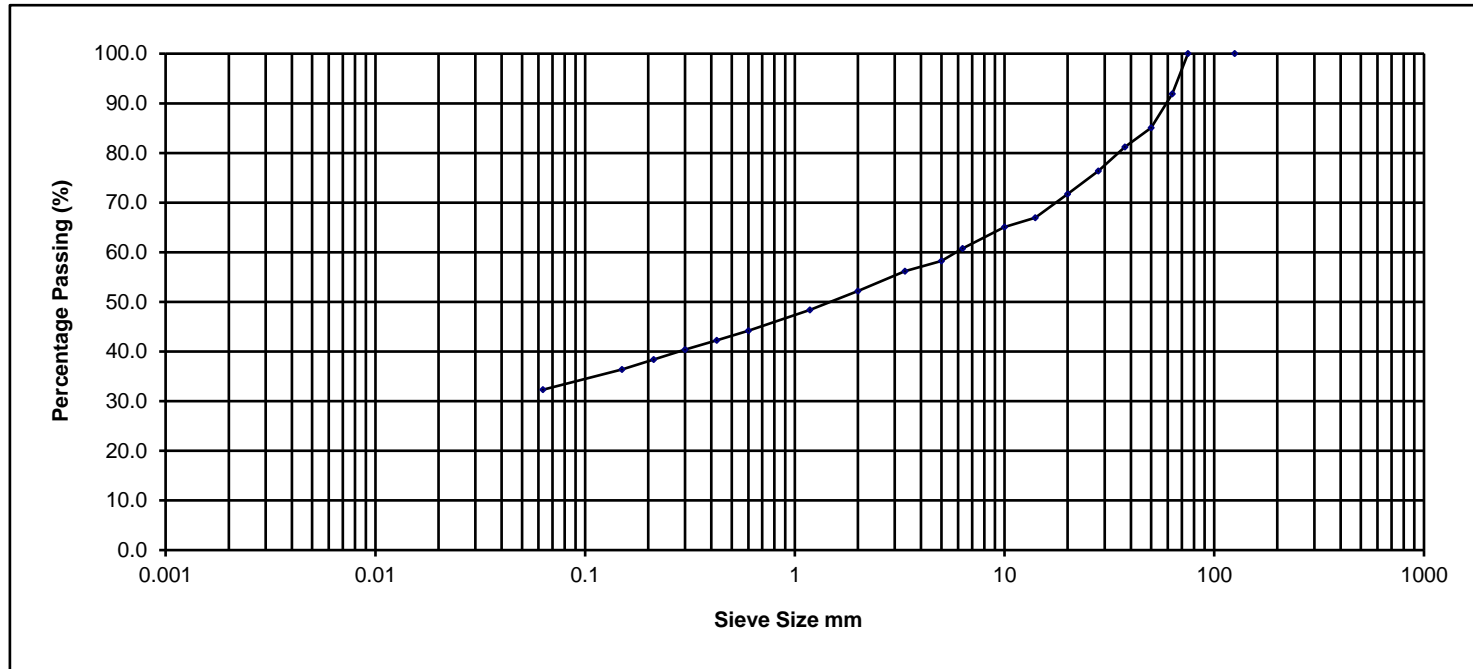
NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	2.00m
----------	----	---------	----	----------	----	--------------------	------------	-------	-------

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	91.9
50.000	85.1
37.500	81.2
28.000	76.4
20.000	71.7
14.000	67.0
10.000	65.1
6.300	60.7
5.000	58.2
3.350	56.2
2.000	52.2
1.180	48.4
0.600	44.2
0.425	42.2
0.300	40.4
0.212	38.4
0.150	36.4
0.063	32.3

Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt			Sand			Gravel				
	32.3			19.9			39.7			8.1	0.0

Sample Description Dark grey slightly sandy gravelly silty CLAY.

Project No. NMTL 3553

BH/TP No. BH04

Project Dalymount Stadium Redevelopment

GII PROJECT ID:11772-04-22

Sample No. B

NM
TL
Ltd

Operator	Sb	Checked	Nc	Approved	Bc	Date sample tested	21/06/2022	Depth	8.00m
----------	----	---------	----	----------	----	--------------------	------------	-------	-------

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



Attention : Stephen Kealy
Date : 28th June, 2022
Your reference : 11772-04-22
Our reference : Test Report 22/10146 Batch 1
Location : Dalymount Stadium
Date samples received : 21st June, 2022
Status : Final Report
Issue : 1

Three samples were received for analysis on 21st June, 2022 of which three 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.: 22/10146

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.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

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: 22/10146

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
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: 2013I	PM0	No preparation is required.	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: 2013I	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		AD	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.	PM0	No preparation is required.	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

APPENDIX 5 – Groundwater Monitoring





Installation Type Single Installation	Dimensions Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 100 mm		Client Dublin City Council	Job Number 11772-04-22
	Location	Ground Level (mOD)	Engineer	Sheet 1/1

Legend	Water	Instr (A) (B)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling										
						Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)	
				1.00	Cement/Bentonite Grout	10/05/22		7.00							6.90	
						Groundwater Observations During Drilling										
						Start of Shift					End of Shift					
						Date	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
						Instrument Groundwater Observations										
						Inst. [A] Type :					Inst. [B] Type : Slotted Standpipe					
						Instrument [A]			Instrument [B]			Remarks				
						Date	Time	Depth (m)	Level (mOD)	Time	Depth (m)				Level (mOD)	
				20.00	Slotted Standpipe	17/06/22	09:00	8.46								Groundwater sample taken

Remarks



Installation Type
Single Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

Client
Dublin City Council

Job Number
11772-04-22

Location

Ground Level (mOD)

Engineer

Sheet
1/1

Legend	Water	Instr (A) (B)	Level (mOD)	Depth (m)	Description	Groundwater Strikes During Drilling										
						Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings				Depth Sealed (m)	
						Groundwater Observations During Drilling										
						Date	Start of Shift					End of Shift				
							Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)
						Instrument Groundwater Observations										
						Inst. [A] Type :					Inst. [B] Type : Slotted Standpipe					
						Date	Instrument [A]			Instrument [B]			Remarks			
							Time	Depth (m)	Level (mOD)	Time	Depth (m)	Level (mOD)				
						17/06/22	09:30	3.93							Groundwater sample taken	
						20.00										

Remarks

APPENDIX 6 – Desk Study Information



714720E

714800E

714880E

714960E

736120N

736050N

735980N



714720E

714800E

714880E

714960E



-  Site Boundary
-  Till derived from Limestones

Client:
 Comhairle Cathrach
 Bhaile Átha Cliath
 Dublin City Council

Project Code:
 11772-04-22

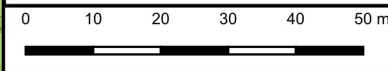
Project Title:
 Dalymount Stadium
 Redevelopment

Drawing Title:
 Figure 2 - Quaternary
 Sediments



GROUND INVESTIGATIONS IRELAND
 Geotechnical & Environmental

Ground Investigations Ireland Ltd.
 Catherinstown House,
 Hazelhatch Road,
 Newcastle, Co. Dublin
 www.gii.ie 01-6015175/5176



Drawn By: CE	Date: 15/06/2022
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714720E

714800E

714880E

714960E

736120N

736050N

735980N



714720E

714800E

714880E

714960E



-  Site Boundary
-  Lucan Formation - Dark Limestone & Shale



Client:
 Comhairle Cathrach
 Bhaile Átha Cliath
 Dublin City Council

Project Code:
 11772-04-22

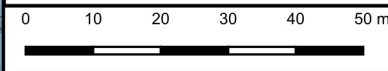
Project Title:
 Dalymount Stadium
 Redevelopment

Drawing Title:
 Figure 3 - Bedrock Geology



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 Hazelhatch Road,
 Newcastle, Co. Dublin
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Drawn By: CE	Date: 15/06/2022
------------------------	----------------------------

714720E

714800E

714880E

714960E

736120N

736050N

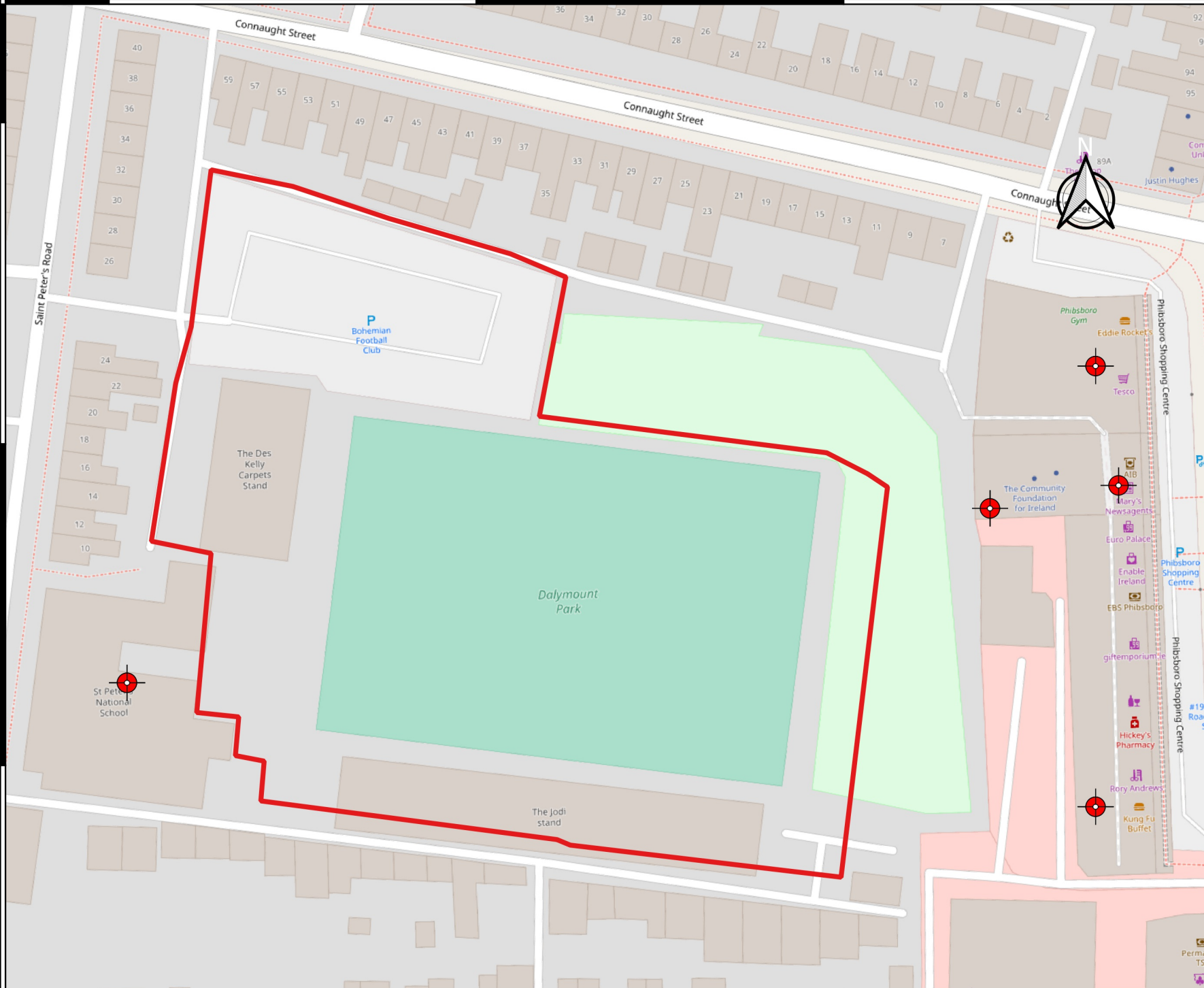
735980N



714720E

714800E

714880E

714960E



-  Site Boundary
-  Borehole Locations

Client:
 Comhairle Cathrach
 Bhaile Átha Cliath
 Dublin City Council

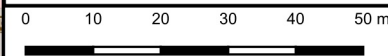
Project Code:
 11772-04-22

Project Title:
 Dalymount Stadium
 Redevelopment

Drawing Title:
 Figure 4 - Geotechnical
 Database



Ground Investigations Ireland Ltd.
 Catherinstown House,
 Hazelhatch Road,
 Newcastle, Co. Dublin
 www.gii.ie 01-6015175/5176



Drawn By: CE	Date: 15/06/2022
-----------------	---------------------

[2923 SE - 187]

Inv ID: 57867

Dalymount Park	clay & stones	0	30	¹¹⁰ 95	⁸¹ 65
For Bohemian Football Club.	Hard band gravel + clay	30	40	⁸⁰ 65	⁷⁰ 55
95 E O.D. 1938.	Boulders + gravel	40	76	⁷⁰ 55	³⁴ 19
S.V.L. 40' B.G.L.	Limestone	76	200	³⁴ 19	-105

26.2 m O.D. Main

REPORT NO 389 BOX 17

INV. ID. 57867

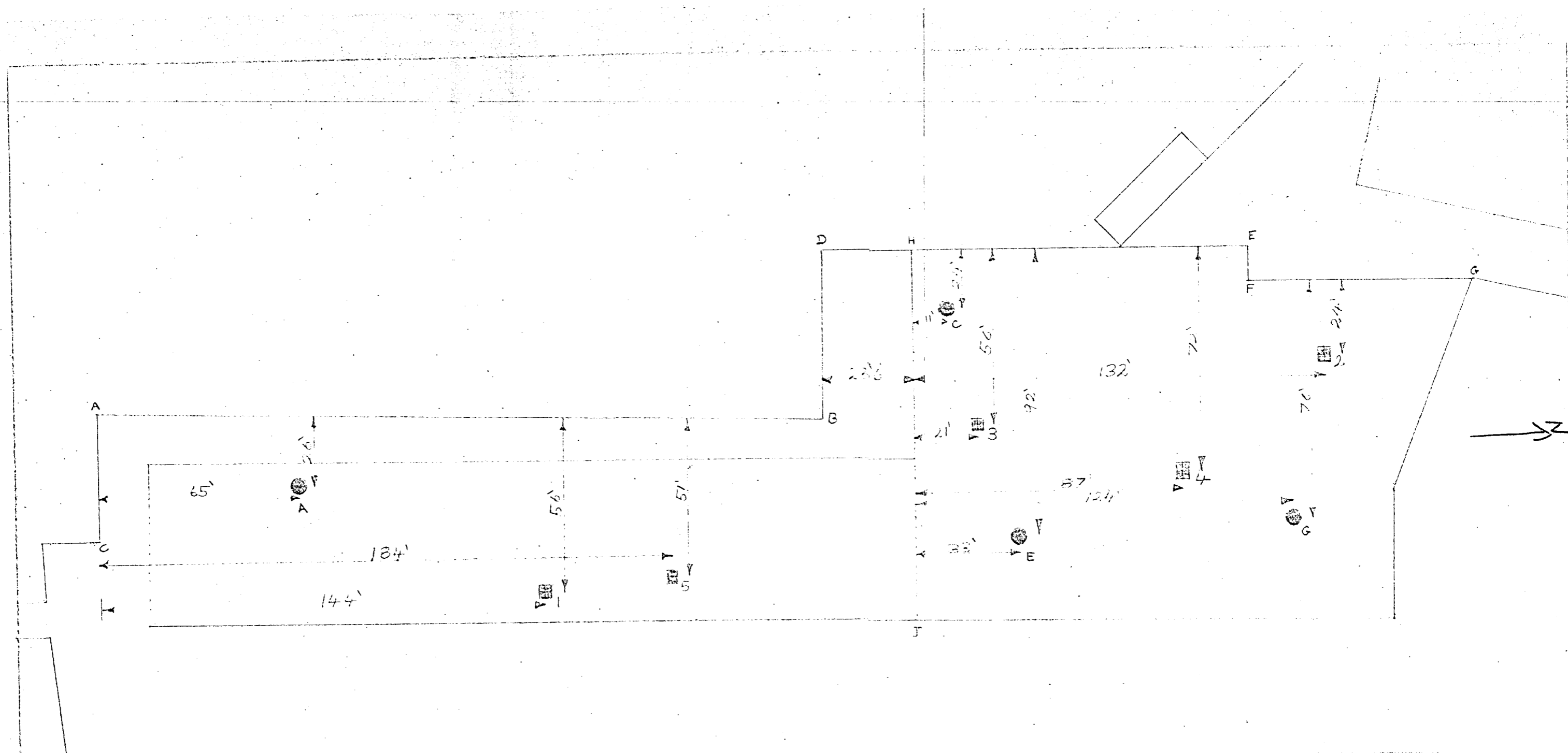
REPORT # 346
Box 15

16

SITE INVESTIGATION - PHIBSBORO' DEVELOPMENT



Messrs. J. McCullough & Associates,
Consulting Engineers,
Bridge House,
Baggot St. Bridge,
DUBLIN, 4.

The Cementation Company (I) Ltd.
9, Mount St. Crescent,
DUBLIN, 2.



PHIBSBORO ROAD

REPORT 346 BOX 15

BOREHOLES SHOWN THUS 
 TRIAL PITS SHOWN THUS 

PHIBSBORO DEVELOPMENT
 SITE PLAN
 SHOWING POSITION OF
 BOREHOLES & TRIAL PITS

SCALE 3/4"
 15/2/67
 N2647

Cementation
 9 MOUNT ST. CRESCENT DUBLIN

THE CEMENTATION CO., (IRELAND) LTD.

SOIL INVESTIGATION
BORING RECORD

CONTRACT Phibsboro Development.

BOREHOLE No. E.

Report No.

Order No.

Bored for Messrs. J. McCullough & Associates

Site Address Phibsboro Road, Dublin

Boring Commenced 1/2/67

Boring Completed 3/2/67

Type of Boring Percussive

Diameter of Borehole 15 ins.

Ground Level O.D.

Water Struck (1) - (2) (3)

G.L. ~ 100.29

Standing Water Level 18'6" on morning of 3/2/67. *8.1.77* = 27.9" *Mahr*

Remarks Water level at end of day 7' below ground level. *13.2.67*

Description of Strata	Depth		Thickness	Samples		
	From	To		Ref No.	Type	Depth
Filling of clay, brick, etc.	0	9'	9'	13893	J	4'0"
				13894	J	8'6"
Very stiff black, silty, stony clay with cobbles.	9'	30'		13895	J	9'6"
				13896	J	14'6"
				13897	J	19'6"
				13898	J	24'6"
				13899	J	29'6"
<u>Standard Penetration Tests</u>						
At 4'0"	4 blows	to 12"				
10'0"	25 "	" 12"				
15'0"	41 "	" 12"				
20'0"	38 "	" 12"				
25'0"	28 "	" 2" Refusal				
29'9"	33 "	" 2" Refusal				

Code: U—Undisturbed Sample D—Large Disturbed Sample J—Jar Sample W—Water Sample

Checked by: Date: Driller's Signature: Date:

This form to be returned to Head Office immediately the borehole is completed.

THE CEMENTATION CO., (IRELAND) LTD.

SOIL INVESTIGATION BORING RECORD

CONTRACT Phibsboro Development BOREHOLE No. A.
 Report No. Order No.
 Bored for Messrs. J. McCullough & Associates
 Site Address Phibsboro Road, Dublin
 Boring Commenced 31/1/67 Boring Completed 1/2/67
 Type of Boring Percussive Diameter of Borehole 15 ins.
 Ground Level O.D.
 Water Struck (1) 14'6" B.G. (2) (31.38) (3) C.L. - 101 88
~~Standing~~ Water Level 17'9" on morning of 1/2/67 (34.13) = 28.3^m Mahi
 Remarks Borehole dry on completion. All levels are related to ground level.

Description of Strata	Depth		Thickness	Samples			
	From	To		Ref No.	Type	Depth	
Filling of clay, brick etc.	0		4'				101 88
Stiff brown grey and yellow silty stony clay with cobbles and boulders.	4'	9'	5'	13889	J	4'6"	97 88
Very stiff black, silty, stony clay with cobbles.	9'			13890	J	9'6"	
				13891	J	14'6"	
		20'		13892	J	19'6"	81 88
Standard Penetration Tests							
At 4'6"	39 blows to	12"					
9'6"	74 " "	12"					
14'6"	53 " "	12"					
19'6"	47 " "	12"					

Code : U — Undisturbed Sample D — Large Disturbed Sample J — Jar Sample W — Water Sample
 Checked by : Date: Driller's Signature: Date:

This form to be returned to Head Office immediately the borehole is completed.

THE CEMENTATION CO., (IRELAND) LTD.

SOIL INVESTIGATION

BORING RECORD

CONTRACT Phibsboro Development

BOREHOLE No. G.

Report No.

Order No.

Bored for Messrs. J. McCullough & Associates.

Site Address Phibsboro Road, Dublin

Boring Commenced 7/2/67

Boring Completed 8/2/67

Type of Boring Percussive

Diameter of Borehole 15 ins.

Ground Level O.D.

Water Struck (1) 11'3" B.G.L. (2) 8'5" 4'8" (3)

~~Water~~ Water Level 19'6" B.G.L. on 8/2/67 8'1" 2'3"

G.L. ~ 100.73

Remarks All levels are related to ground level.

= 28.0

Description of Strata	Depth		Thickness	Samples		
	From	To		Ref No.	Type	Depth
Filling of clay, brick, etc.	0	2'6"	2'6"			
Stiff brown, grey and yellow silty stony clay with cobbles & boulders.	2'6"	9'0"	6'6"	12148	J	3'0"
				12149	J	8'0"
Very stiff black, silty stony clay with cobbles	9'	25'		12150	J	9'6"
				14205	J	14'6"
				14206	J	19'6"
				14207	J	24'6"
Standard Penetration Tests						
At 4'6"	30 blows	to 12"				
9'6"	38 "	" 12"				
14'6"	51 "	" 12"				
19'6"	37 "	" 12"				
24'6"	35 "	" 1" Refusal				

100.73
91.25
91.73
75.73

Code: U — Undisturbed Sample D — Large Disturbed Sample J — Jar Sample W — Water Sample

Checked by: Date: Driller's Signature: Date:

This form to be returned to Head Office immediately the borehole is completed.



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Site
New Metro North

Borehole Number
BH01

Machine : Beretta T47	Casing Diameter 148mm cased to 32.10m	Ground Level (mOD) 22.28	Client Transport Infrastructure Ireland	Job Number 7267-11-17
Flush : Water and polymer			Engineer ARUP	Sheet 1/4
Core Dia: 102 mm	Location (dGPS) 715088.4 E 736017.6 N	Dates 23/01/2018- 26/01/2018		
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50					B	21.88	(0.40)	Concrete			
1.00					B	21.08	0.40	MADE GROUND: Black mottled brown slightly sandy gravelly Clay with plastic, ceramic, glass and metal fragments			
1.20	86					20.78	1.20 (0.30)	Poor Recovery - Driller notes FILL. Recovery consists of Made Ground of angular to subangular cobbles and boulders of Limestone with pieces of clay pipe			
2.10					2,2/4,4,5,6 SPT(C) N=19 CS	20.18	1.50 (0.60)	Poor Recovery - Driller notes FILL. Recovery consists of probable Made Ground consisting of dark grey sandy gravelly Clay with occasional cobbles			
2.10-2.55							2.10	Stiff grey sandy gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is fine to coarse subangular to subrounded			
2.10-3.60	85						(1.50)				
3.60					5,6/6,8,12,15 SPT(C) N=41 CS	18.68	3.60	Very stiff grey sandy gravelly CLAY with occasional subangular to subrounded cobbles and boulders. Gravel is fine to coarse subangular to subrounded			
3.60-4.05							(1.50)				
3.60-5.10	73										
5.10					3,7/9,25,16 SPT(C) 50/135 CS	17.18	5.10	Driller notes gravelly CLAY - Recovery consists subangular to subrounded cobbles and boulders of Limestone			
5.10-5.39							(0.45)				
5.10-6.60	60					16.73	5.55	Very stiff grey sandy gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded. Layer of grey fine to coarse subangular to subrounded slightly clayey GRAVEL occurs between 5.60m to 5.7 BGL. Poor Recovery between 6.0 to 6.50s BGL			
6.60					5,25/50 SPT(C) 50/10 CS	15.68	6.60	Very stiff grey slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles. Gravels fine to coarse subangular to subrounded. 6.60-7.30m - Poor Recovery			
6.60-6.76							(1.05)				
6.60-8.10	60										
8.10					7,18/50 SPT(C) 50/10 CS		6.60	8.10-8.30m - Poor Recovery			
8.10-8.26											
8.10-9.60											
8.80-9.15	86				EN						
9.60					4,5/9,13,13,15 SPT(C) N=50 CS		(6.00)				
9.60-10.05											
9.60-11.10											

Remarks Inspection pit carried out to 1.20m BGL Geobore S techniques carried out from 1.20 Open hole BeTec drilling with 150mm casing due to granular deposits from ground level to 13.50m BGL 50mm slotted standpipe installed from 31.50m to 28.50m with pea gravel surround, plain pipe installed from 28.50m to ground level with bentonite seal and flush cover. CS - Core sample	Scale (approx) 1:50	Logged By S Kealy
Figure No. 7267-11-17.BH01		



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Flush : Water and polymer			Engineer ARUP	Sheet 2/4
Core Dia : 102 mm	Location (dGPS) 715088.4 E 736017.6 N	Dates 23/01/2018- 26/01/2018		
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
9.80	73				GW			9.60-10.10m - Poor Recovery			
11.10 11.10-11.55 11.10-14.10					5,9/11,11,14,14 SPT(C) N=50 CS			11.10-11.90m - Poor Recovery			
11.90-12.25	47				CS						
12.60						9.68	12.60	Very stiff brown grey slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles. Gravels fine to coarse subangular to subrounded 12.60-13.90m - Poor Recovery			
14.10 14.10-14.26 14.10-15.60					22,3/50 SPT(C) 50/10 CS			14.10-14.20m - Poor Recovery			
14.65-15.00	93				CS		(4.70)				
15.60 15.60-15.76 15.60-18.60					Water strike(1) at 15.20m. 18,7/50 SPT(C) 50/10 CS						
16.40-16.75	100				CS						
17.10 17.10-17.26 17.30	100	76	61		25/50 SPT(C) 50/10	4.98	17.30	Strong grey fine LIMESTONE interbedded with black thinly laminated fine MUDSTONE. Partially weathered with calcite veining and some clay infilling.			
18.60	100	73	67	6				17.30-20.30m - Two Fracture Sets. F1: Very close to close spaced subhorizontal to 20 degrees undulating smooth tight to open with clay infilling. F2: Close to medium spaced, 30 to 50 degrees, undulating smooth, tight to open with clay infilling 19.40-20.10m - Mudstone bands			

Remarks	Scale (approx)	Logged By
	1:50	S Kealy
	Figure No. 7267-11-17.BH01	



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Flush : Water and polymer	Location (dGPS) 715088.4 E 736017.6 N	Dates 23/01/2018- 26/01/2018	Engineer ARUP	Sheet 3/4
Core Dia : 102 mm				
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
20.10 20.30							(5.80)				
	86	76	73	2				20.30-21.60m - One Fracture Sets. F1: Close to wide spaced subhorizontal to 20 degrees, undulating smooth tight o open			
21.60								21.60-22.20m - Mudstone bands			
	100	26	26	6				21.60-23.10m - Two Fracture Sets. F1: Very close to close spaced subhorizontal to 20 degrees, undulating smooth tight to open with a clay smearing. F2: Close spaced 60 to 80 degrees, undulating smooth tight to open with a clay infill			
23.10						-0.82	23.10	Strong grey fine LIMESTONE interbedded with black thinly laminated fine MUDSTONE. Partially weathered with calcite veining. 23.30-23.60m - Mudstone bands			
	73	60	7	6				23.90-24.20m - Mudstone bands			
24.60							(4.00)	23.10-24.60m - Two Fracture Sets. F1: Very close to close spaced, subhorizontal to 20 degrees, undulating smooth, tight to open. F2: Medium spaced, 30 to 50 degrees, undulating smooth, tight to open			
	100	66	46	6				24.60-27.10m - Two fracture Sets. F1: Close to medium spaced, subhorizontal to 20 degrees, undulating smooth, tight to open. F2: Medium to wide, 60 to 80 degrees, undulating smooth, tight to open			
26.10											
	100	73	53								
27.10						-4.82	27.10	Strong dark grey fine LIMESTONE interbedded with black thinly laminated fine MUDSTONE. Partially weathered with calcite veining.			
27.60											
	100	100	100								
29.10							(5.00)	27.10-32.10m - Two Fracture Sets. F1: Close to wide spaced, subhorizontal to 20 degrees, undulating smooth, tight to open. F2: Very close to wide, 30 to 50 degrees, undulating smooth, tight to open			
	100	80	80	4							

Remarks	Scale (approx)	Logged By
	1:50	S Kealy
	Figure No. 7267-11-17.BH01	



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Flush : Water and polymer	Location (dGPS) 715088.4 E 736017.6 N	Dates 23/01/2018- 26/01/2018	Engineer ARUP	Sheet 4/4
Core Dia : 102 mm				
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
30.60								30.00-30.60m - Mudstone bands			
	100	66	53					31.20-32.10m - Mudstone bands			
32.10						-9.82	32.10	Complete at 32.10m			

Remarks	Scale (approx)	Logged By
	1:50	S Kealy
	Figure No. 7267-11-17.BH01	