

**Greater Dublin Drainage Scheme
Preliminary Ground Investigation Contract – Phase 1**

**Factual Report on Ground Investigation
(Report No. 16695)**

Client: Fingal County Council

August 2013



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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (Greater Dublin Drainage Scheme – Preliminary Ground Investigation Scheme – Phase 1) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). Currently, the Republic of Ireland does not have a National Annex and the following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- IS EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting

Recommendations made and opinions expressed in this report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for Fingal County Council and the information should not be used without prior written permission. The recommendations developed in this report specifically relate to the proposed development. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures

Unless otherwise stated, 'shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Rotary Drilling Procedures

Rotary drilling methods have been used to recover bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Open hole drilling methods (odex or symmetrix) were utilized to advance the drillholes through the superficial deposits with coring in bedrock. The key objectives of the rock sampling were to obtain high core recovery (TCR), minimize sample disturbance and facilitate accurate identification of strength, weathering and discontinuity characteristics.

In-Situ Testing

Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

* N/S – not stated. Presume a representative sample of appropriate size.

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S*
5.5.6	Particle Size Analysis	N/S*
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S*
5.5.9	Soil Dispersivity	N/S*
5.5.10	Frost Susceptibility	N/S*
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S*
5.11	Permeability	2

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible, drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

Retention of Samples

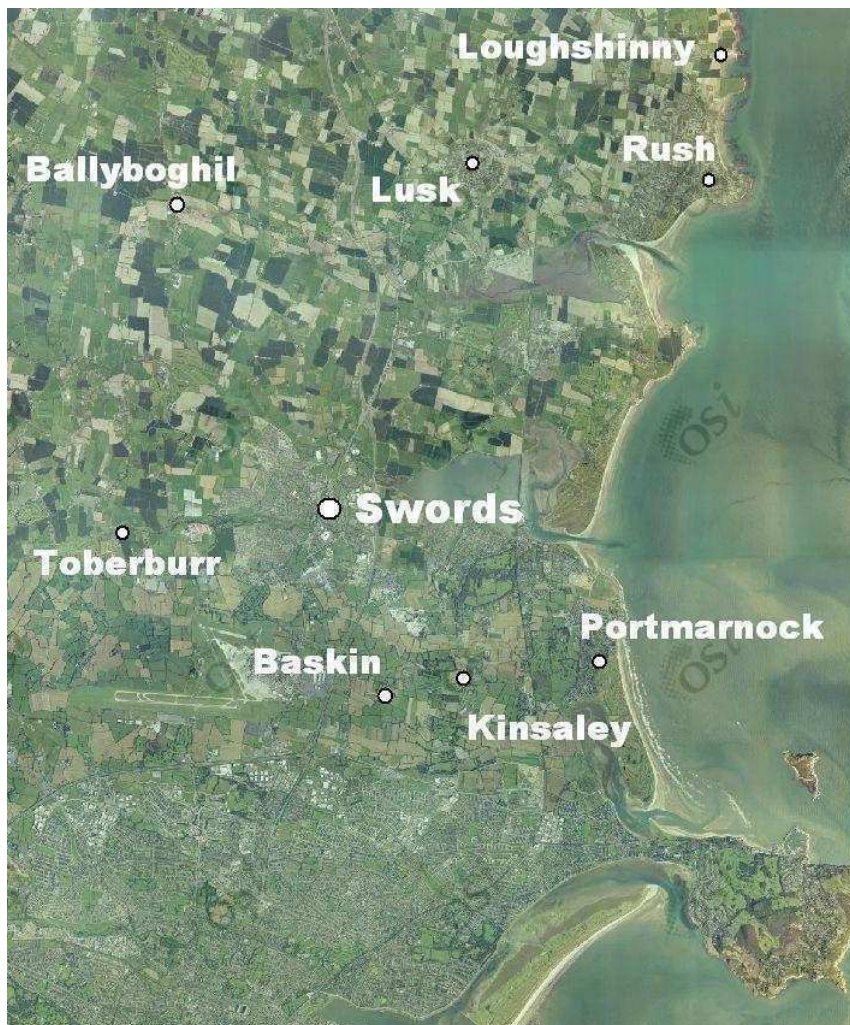
After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

1. INTRODUCTION

Fingal County Council proposes to develop a wastewater drainage network and treatment infrastructure across the north Dublin area in a plan termed the Greater Dublin Drainage Scheme. The initiative involves the provision of a new wastewater treatment works, a marine outfall, and a new drainage network in the northern part of the Greater Dublin Area.

The IGSL investigation comprised a number of boreholes and trial excavations on as yet unselected sites for both the wastewater treatment works (Clonshaugh, Annsbrook and NewtownCorduff), the pipeline infrastructure and the eventual marine outfall (north of Loughshinny & southeast of Portmarnock).

Figure 1 - Site Location, North County Dublin



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The geotechnical investigatory works combined a programme of intrusive works across the greater North Dublin area along with geophysical surveying focused on two proposed outfall areas. The works were carried out by IGSL from January to April 2013. The intrusive works comprised cable percussive boreholes, rotary core drillholes and trial pits. The fieldworks were carried out in accordance with BS 5930, Code of Practice for Site Investigations (1999+A2:2010) and Engineers Ireland Specification for Ground Investigation (2006). Geotechnical laboratory testing has been performed on selected samples recovered from the exploratory holes.

The primary objectives of this investigation were as follows:

- Outline the composition and strength or stiffness of the superficial deposits
- Establish bedrock (if present) and associated engineering geological characteristics
- Assess the geophysical properties of the soil / rock present at the northern and southern marine outfall

This report presents the factual data on the ground conditions.

2. FIELDWORK

2.1 General

The geotechnical investigations comprised the following:

- Trial pits incorporating soakaway testing (BRE Digest 365)
- Cable percussion boring
- Rotary drilling
- Groundwater Monitoring including variable head testing
- Geophysical surveying
- Surveying of as-built exploratory locations

The fieldworks were supervised by an IGSL Geotechnical Engineer.

2.2 Trial Pits

Trial pitting was performed at seventeen locations using an 8 tonne tracked excavator. The trial pits were logged and sampled by an IGSL engineering geologist in accordance with BS 5930 (1999+A2:2010). The trial pits were positioned at both outfall areas as well as within the footprint of each of the proposed treatment facilities. In a single trial pit at each proposed treatment plant, a soakaway test was performed in accordance with BRE Digest 365 Soakaway Design. The results are presented in Appendix 5.

Bulk disturbed samples (typically 30 to 40 kg) were taken as the pits progressed. The samples were placed in heavy-duty polyethylene bags and sealed before being transported to Naas for examination and laboratory testing. The pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs are presented in Appendix 1 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

2.3 Cable Percussion Boreholes

Cable percussion boring was undertaken at twenty two locations using a Dando 2000 rig. The boreholes are referenced BH01 to BH26 (not inclusive) and extended to a maximum depth of 13.70m bgl. Boring commenced after CAT scanning to verify the presence or absence of service ducts. Disturbed bulk samples (denoted B on the logs) were recovered during boring and were examined to classify the strata. Chiselling or hard strata boring was necessary to advance the boreholes through cobble / boulder obstructions.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-values reported are the number of blows for 300mm increment penetration (e.g. BH 01 at 2.0m where N=12). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH01 at 12.0m where N=50 / 285mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (E_r) reported on the engineering logs. Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the boring records in Appendix 2. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records.

2.4 Rotary Drillholes

Rotary drilling was undertaken at fifteen locations denoted RC01 to RC24 (not inclusive) using both a Casagrande top drive rotary rig and a Unimog truck-mounted Knebel rotary coring unit. Symmetrix drilling was utilized to advance the drillholes through overburden / highly fractured rock with rotary coring using the T6116 system producing 86mm diameter cores (P Size Core). Where rotary

coreholes were drilled through the overburden soils, Standard Penetration Tests (SPT's) were carried out to verify soil strengths. The coreholes were terminated at depths specified by the project engineer. The rotary drilling records are presented in Appendix 3.

2.5 Groundwater Monitoring

Groundwater levels were recorded during boring, coring and in trial pits. Details are presented on the engineering logs. Standpipes were installed in eight of the exploratory holes (BH04, RC01, RC02, RC05, RC06, RC07, RC09 & RC12) to establish equilibrium groundwater levels. All water well locations are sited within the proposed treatment areas with the exception of RC12 which is situated at the northern outfall, north of Loughshinny. The standpipes (50mm diameter) incorporated pea gravel response zones, cement-bentonite pellet seals and protective stand-up covers. Groundwater levels in the standpipes were measured using a battery-operated dipmeter and results are presented in Appendix 4.

Both rising and falling head tests were carried out in the borehole installations on completion of site works. The records from the in situ testing are detailed in Appendix 6.

2.6 Geophysical Surveying

Geophysical surveying was performed by Minerex Geophysics Limited on behalf of IGSL. The survey encompassed three distinct sites; the southern and northern outfalls at Portmarnock and Loughshinny as well as north of the R123 in the townland of Maynetown, south west of Portmarnock. A combination of techniques (i.e. seismic refraction and 2-D resistivity) were used to evaluate the stratigraphy and stiffness properties of the ground conditions. The P-wave seismic data was used to produce ground models / profiles. The resistivity values compliment the findings of the seismic survey thus permitting development of the stratigraphic model. Details of the methodologies employed, cross-sections and data interpretation are presented in the geophysical report (Appendix 7).

2.7 Surveying of Exploratory Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to national grid (Malin Head) and ground level (z) established. The co-ordinates and ground levels are incorporated on the engineering logs.

3. LABORATORY TESTING

Geotechnical laboratory testing has been carried out on selected trial pit and cable percussive borehole samples. The geotechnical soils testing was undertaken in accordance with BS 1377 (1990) and results are presented in Appendix 8. The soils testing included the following:

- Moisture content
- Particle size grading
- Atterberg Limit (Liquid & Plastic Limit)
- CBR
- Dry Density (MCR)
- Moisture Condition Value
- 5 Point MCV
- pH
- Organic Content
- Acid- & Water-soluble Sulphate content
- Sulphide content

Point Load Strength Index (PLSI) tests and Unconfined Compressive Strength (UCS) tests were performed on the rock cores in accordance with ISRM. The results of the rock testing are presented in Appendix 9.

4. GROUND CONDITIONS & GROUNDWATER

4.1 Ground Profile

The geotechnical investigatory works undertaken by IGSL have revealed the ground conditions to typically comprise the following:

- TOPSOIL
- Brown sandy gravelly CLAY with a low to medium cobble content
- Grey brown to dark grey black slightly sandy gravelly CLAY with a medium cobble content
- Rockhead consisting of varied Dublin Basin Argillaceous Limestones occasionally with subordinate Mudstone. Brecciation / weathering was noted in the northern outfall boreholes

4.2 Superficial Deposits

Trial pits and boreholes were almost exclusively carried out on farmland with the exception of those sited at Fingal County Council lands near Portmarnock Strand. Topsoil was found in the majority of exploratory holes with generally a thickness of 0.30m to 0.40m. The superficial deposits comprise fine-grained soils (sandy gravelly CLAY with cobbles) which range in consistency from soft to firm in the upper zone (i.e. c.1m), generally becoming firm / occasionally very stiff with depth.

Plate 1 – Typical clay succession observed across the site (exposed in Trial Pit TP16)



In extremities of the site, a contrasting soil profile was encountered (i.e. TP's 12 and TP14 & 15; BH14 & 14A). Medium to coarse grained beach sands were encountered in TP12 and BH14 / 14A with poor stability exhibited during pitting and boring. At the northern outfall, both trial pit excavations encountered firm to stiff brown sandy gravelly CLAY with a high coarse content of cobbles and boulders. Soils in TP14 graded to gravelly SAND from 1.10m to the end depth of 3.10m. In the same region, gravels were sampled in BH11 at 4.0m.

Plate 2a & 2b – Beach / Estuarine Sands exposed in TP12. Coarse-rich gravelly CLAY and SAND strata in TP14



Plate 2a



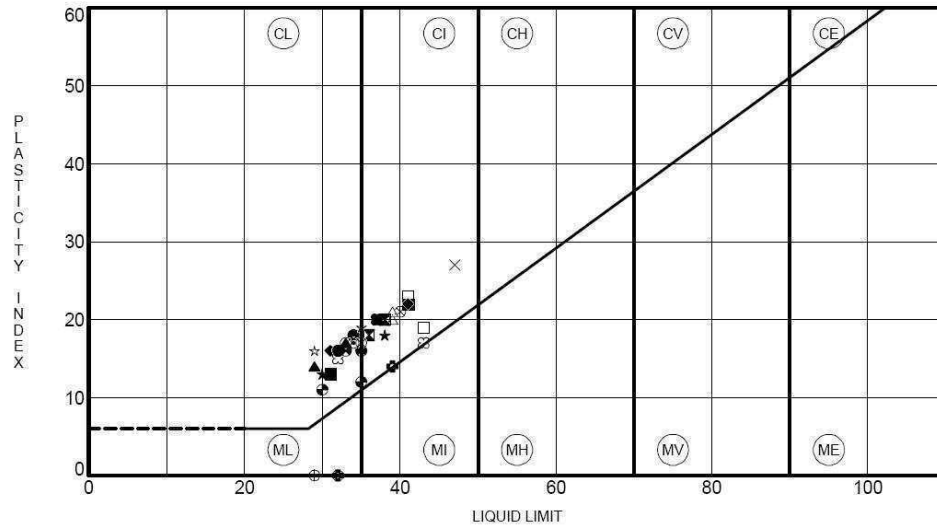
Plate 2b

Trial excavations were extended to a maximum depth of 3.85m. No pits encountered rockhead. In most cases, trial pitting was terminated on stiff to very stiff clays where slow progress was noted during excavation. Where rockhead was not located the majority of cable percussive boreholes were terminated at refusal in this stiff clay.

It is thought that the soils for the most part represent over-consolidated ablation till deposits. The glacial till matrix is predominantly clay in nature. The gravel constituents or clasts range from fine to coarse and are subangular to subrounded.

Liquid and Plastic Limit tests (Atterberg Limits or Consistency Indices) were determined on a number of samples from both trial pits and boreholes. The results obtained from trial pit samples are summarized in Figure 3. These show the fine soils are mainly intermediate to low plasticity clays (CL to CI) with the majority of the tests plotting above the A-Line on the Casagrande Chart.

Figure 2 – Atterberg Limit Plot for Trial Pit samples

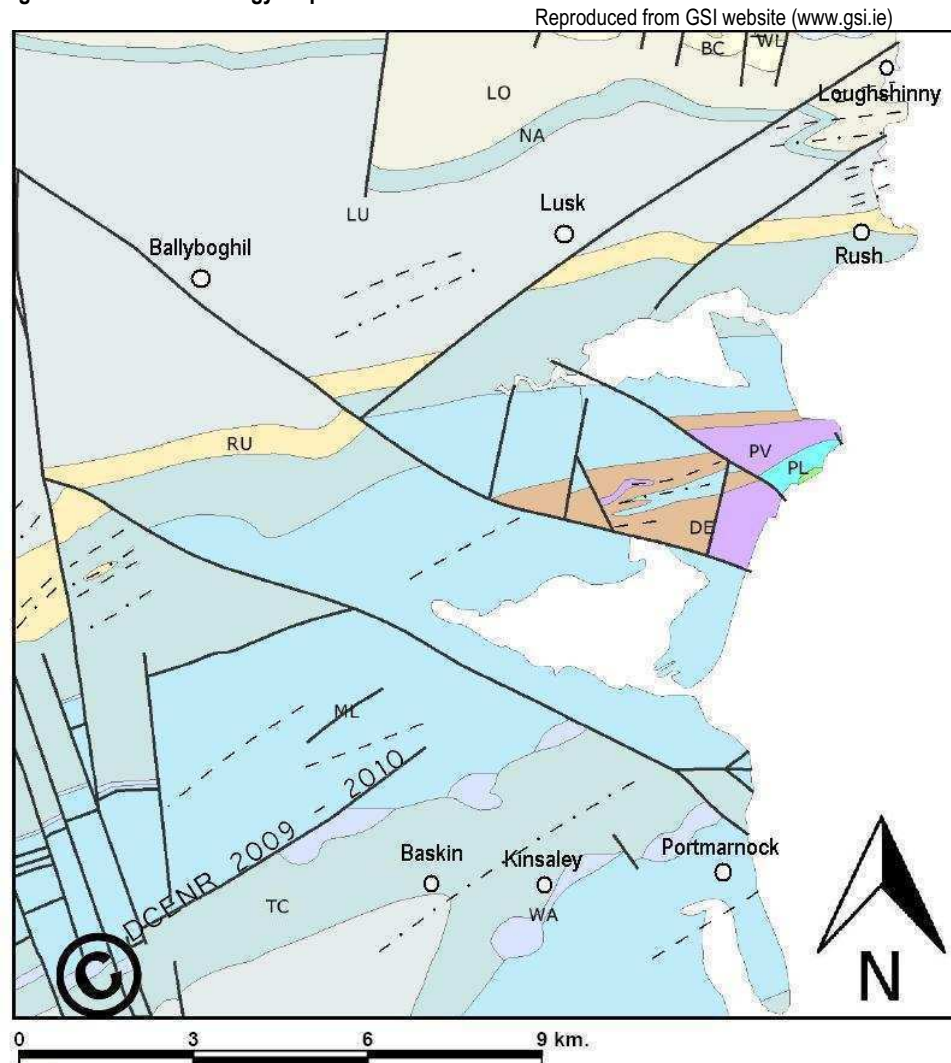


Liquid Limits predominantly range between 28 and 38% while Plastic Limits are principally in the range 16 to 20%. A small number of the samples analysed were found to be non-plastic to varying degrees and these plotted below the A-Line. In most cases, they represented samples recovered from exploratory holes at Portmarnock beach (TP12, BH14, BH14A) and trial pits at Loughshinny where sand- and gravel- prone strata were noted (e.g. TP14 at 1.10m). Plasticity Indices are mainly in the 15 to 20% envelope.

4.3 Bedrock

Reference to the GSI bedrock map for the area (1:100,000 series) shows that the site is underlain by the Lower Carboniferous deposits of the Dublin Basin. Basinal limestones and mudstones dominate the lithological record across the north Dublin area. Rock was found at its shallowest in the west of the site near Toberburr and Balheary, north west of Swords. Here rock was intercepted at 3.0m (RC17) and 5.0m (RC24). Elsewhere, rock was encountered at greater depths and in some cases not at all (RC01 and RC02 at Clonshaugh were terminated at 18.0m without encountering rock). Rock, when cored, was logged as medium strong to strong argillaceous limestone. However more weak rock, occasionally showing brecciation, was also found.

Figure 3 – Bedrock Geology Map for the Area



- Key:**
- | | | |
|----------------------------|---------------------|----------------------------|
| LU = Lucan Fm | NA = Naul Fm | DB = Donabate Fm |
| TC = ToberColleen Fm | LO = Loughshinny Fm | PV = Portrane Volcanic Fm |
| ML = Malahide Fm | WL = Walshestown Fm | PL = Portrane Limestone Fm |
| WA = Waulsortian Limestone | BC = Balrickard Fm | |
| RU = Rush Conglomerate Fm | | |

4.4 Groundwater

Groundwater was encountered as seepages during trial excavations. Soakaway testing proved the clays to be highly impermeable (Appendix 5). Borehole water strikes are recorded on the individual logs presented in Appedices 1 and 2. Ground water monitoring data is also presented in this report in Appendix 4.

References

1. BS 5930 (1999+A2:2010) Code of Practice for Site Investigation, British Standards Institution (BSI).
2. BS 1377 (1990) Methods of Testing of Soils for Civil Engineering Purposes, BSI.
3. Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.
4. Geological Survey of Ireland (1999). Geology of Meath (Bedrock Geology Sheet 13), 1:100,000 Series
5. Geological Survey of Ireland (1994). Geology of Kildare - Wicklow (Bedrock Geology Sheet 16), 1:100,000 Series

Appendix 1

Trial Pit Records



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP01	
LOGGED BY JL		SHEET Sheet 1 of 1	
CLIENT Fingal County Council ENGINEER		CO-ORDINATES 319,331.07 E 242,075.04 N	
		DATE STARTED 23/01/2013 DATE COMPLETED 23/01/2013	
		GROUND LEVEL (m) 42.79	
		EXCAVATION METHOD Kubota KX080-3a	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft to firm brown to grey brown slightly sandy CLAY. Sand is fine to medium.									
0.40	Firm grey brown slightly sandy slightly gravelly CLAY with a low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		0.40	42.39		AN4615	B	0.50-0.70		
1.40 - 1.60m	Pocket of grey subrounded medium GRAVEL with a medium cobble content				↓ (Seepage)					
1.75	Firm to stiff dark grey black slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.75	41.04		AN4616	B	1.90-2.00		
2.50	Stiff to very stiff dark grey black slightly sandy gravelly CLAY with a low cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to medium of limestone. Cobbles are subangular to subrounded of limestone.		2.50	40.29		AN4617	B	2.60-2.70		
3.20	End of Trial Pit at 3.20m		3.20	39.59						

Groundwater Conditions
Very slight seepage at 1.30m

Stability
Good

General Remarks
Pit terminated on stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP02	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,600.96 E 241,815.26 N		DATE STARTED 23/01/2013	
CLIENT ENGINEER Fingal County Council		DATE COMPLETED 23/01/2013	
GROUND LEVEL (m) 41.28		EXCAVATION METHOD Kubota KX080-3a	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft to firm grey brown sandy CLAY. Sand is fine to medium.									
0.40	Soft to firm yellow brown to brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.		0.40	40.88						
0.60	Firm brown mottled grey brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone.		0.60	40.68		AN4618	B	0.60-0.80		
1.75	Stiff dark grey black slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		1.75	39.53		AN4619	B	1.60-1.70		
1.85			1.85			AN4620	B	1.85-2.00		
2.75	Stiff to very stiff dark grey black slightly sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		2.75	38.53						
3.15	End of Trial Pit at 3.15m		3.15	38.13		AN4621	B	2.80-3.00		

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP03	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,823.90 E 241,931.69 N		DATE STARTED 23/01/2013	
GROUND LEVEL (m) 39.18		DATE COMPLETED 23/01/2013	
CLIENT ENGINEER Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of various lithologies.									
	Soft to firm yellow brown sandy gravelly SILT. Sand is fine to medium.		0.40	38.78		AN4611	B	0.50-0.65		
	Firm becoming stiff dark grey brown slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		0.90	38.28		AN4612	B	0.90-1.10		
2.0						AN4613	B	2.00-2.10		
3.0										
	Stiff to very stiff dark grey black slightly gravelly slightly silty CLAY with a medium cobble content. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		3.20	35.98		AN4614	B	3.50-3.60		
4.0	End of Trial Pit at 3.85m		3.85	35.33						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP04	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 317,484.29 E 254,376.52 N		DATE STARTED 24/01/2013	
GROUND LEVEL (m) 31.61		DATE COMPLETED 24/01/2013	
CLIENT Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	
ENGINEER			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft grey brown silty CLAY									
0.30	Soft to firm brown to yellow brown slightly sandy silty CLAY. Sand is fine to medium.		0.30	31.31						
0.50	Soft to firm grey brown occasionally mottled yellow brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.		0.50	31.11						
0.90	Firm grey brown sandy gravelly CLAY with a low cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		0.90	30.71		AN4642	B	0.60-0.80		
1.60	Stiff dark grey brown sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.60	30.01		AN4643	B	1.00-1.10		
2.30	Very stiff dark grey brown gravelly CLAY with a low to medium cobble content. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		2.30	29.31		AN4644	B	1.90-2.00		
2.50			2.50			AN4645	B	2.50-2.60		
3.20	End of Trial Pit at 3.20m		3.20	28.41						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP05	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 317,525.63 E 253,995.98 N		DATE STARTED 24/01/2013	
GROUND LEVEL (m) 29.11		DATE COMPLETED 24/01/2013	
CLIENT Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	
ENGINEER			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown slightly sandy silty CLAY. Sand is fine.									
	Soft to firm yellow brown sandy gravelly CLAY. Sand is fine to medium.		0.30	28.81		AN4626	B	0.50-0.60		
	Soft to firm grey brown occasionally mottled orange brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone.		0.90	28.21		AN4627	B	1.20-1.30		
	Firm to stiff grey brown occasionally mottled light grey sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.40	27.71		AN4628	B	1.50-1.70		
	Stiff to very stiff grey brown slightly sandy gravelly CLAY with a low to medium cobble content and a low boulder content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone. Boulders are subrounded of limestone (up to 300mm).		2.40	26.71	↓ (Seepage)	AN4629	B	2.60-2.70		
3.0	End of Trial Pit at 3.00m		3.00	26.11						

Groundwater Conditions
Very slight seepage at 2.15m

Stability
Good

General Remarks
Pit terminated on stiff to very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP06	
LOGGED BY JL		SHEET Sheet 1 of 1	
CLIENT Fingal County Council		DATE STARTED 24/01/2013	
ENGINEER		DATE COMPLETED 24/01/2013	
CO-ORDINATES 317,598.82 E 254,006.12 N		EXCAVATION METHOD Kubota KX080-3a	
GROUND LEVEL (m) 28.42			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft grey brown to brown silty CLAY									
0.40	Soft to firm yellow brown mottled light grey brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of limestone.		0.40	28.02		AN4634	B	0.50-0.60		
0.80	Firm grey brown mottled light grey slightly sandy slightly gravelly CLAY with a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		0.80	27.62		AN4635	B	0.90-1.10		
1.80	Stiff grey brown slightly sandy gravelly CLAY with a low to medium cobble content and a low boulder content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles and boulders are subangular to subrounded occasionally tabular of limestone.		1.80	26.62		AN4636	B	1.90-2.00		
2.60	Very stiff to hard grey brown slightly sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		2.60	25.82		AN4637	B	2.70-2.90		
2.90	End of Trial Pit at 2.90m		2.90	25.52						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP07	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 317,650.64 E 253,853.31 N		DATE STARTED 24/01/2013	
GROUND LEVEL (m) 25.89		DATE COMPLETED 24/01/2013	
CLIENT Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	
ENGINEER			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown silty CLAY									
0.40	Soft to firm yellow brown to brown slightly sandy silty CLAY. Sand is fine to medium.		0.40	25.49						
0.60	Soft to firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.		0.60	25.29						
1.00	Firm brown mottled orange brown slightly sandy slightly gravelly SILT with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.00	24.89		AN4630	B	0.70-0.80		
1.60	Soft to firm brown occasionally mottled reddish brown slightly sandy slightly gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		1.60	24.29	↓ (Seepage)	AN4631	B	1.10-1.20		
2.10	Very stiff dark grey brown slightly sandy gravelly silty CLAY with a low to medium cobble content. Sand is fine. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		2.10	23.79		AN4632	B	1.70-1.90		
2.30			2.30							
2.30-2.40						AN4633	B	2.30-2.40		
3.00	End of Trial Pit at 3.00m		3.00	22.89						
4.00										

Groundwater Conditions
Moist at 1.10m. Seepage at 1.80m

Stability
Poor stability

General Remarks
Pit terminated on stiff clay coupled with poor stability from ground level to 2.10m

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP08	
LOGGED BY JL		SHEET Sheet 1 of 1	
CLIENT Fingal County Council		DATE STARTED 24/01/2013	
ENGINEER		DATE COMPLETED 24/01/2013	
CO-ORDINATES 317,428.02 E 254,084.64 N		EXCAVATION METHOD Kubota KX080-3a	
GROUND LEVEL (m) 30.32			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft to firm brown slightly sandy CLAY. Sand is fine to medium.									
0.40	Soft to firm brown to yellow brown slightly sandy silty CLAY. Sand is fine to medium.		0.40	29.92						
0.55	Soft to firm grey brown sandy gravelly CLAY with rare rootlets. Sand is fine. Gravel is subangular to subrounded fine to medium of limestone.		0.55	29.77						
0.80	Firm grey mottled brown and orange brown sandy gravelly CLAY. Sand is fine to medium.		0.80	29.52		AN4622	B	0.60-0.80		
1.0	1.40m - Occasional subrounded boulder of limestone (up to 250mm)					AN4623	B	1.00-1.10		
2.0	Very stiff grey to grey brown gravelly CLAY with a medium cobble content. Gravel is subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		2.00	28.32		AN4624	B	2.10-2.20		
3.0	End of Trial Pit at 3.20m		3.20	27.12		AN4625	B	3.10-3.20		

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP09	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 317,817.37 E 254,292.17 N		DATE STARTED 24/01/2013	
CLIENT Fingal County Council		DATE COMPLETED 24/01/2013	
ENGINEER		EXCAVATION METHOD Kubota KX080-3a	
GROUND LEVEL (m) 28.70			

Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
			Sample Ref	Type	Depth		
0.0	28.60						
0.10	28.60						
0.30	28.40						
0.60	28.10		AN4638	B	0.40-0.60		
1.00			AN4639	B	1.00-1.10		
1.75	26.95	↓ (Seepage)	AN4640	B	1.80-2.00		
2.50	26.20						
3.30	25.40		AN4641	B	3.20-3.30		
3.30	25.40						

Groundwater Conditions
Seepage at 1.50m

Stability
Good

General Remarks
Pit terminated on stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP10	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,539.77 E 254,231.54 N		DATE STARTED 07/03/2013	
GROUND LEVEL (m) 22.23		DATE COMPLETED 07/03/2013	
CLIENT Fingal County Council		EXCAVATION METHOD Hitachi Zaxis 80SB	
ENGINEER			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown slightly sandy CLAY. Sand is fine to medium.									
	Soft to firm brown and yellow brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to medium of limestone.		0.45	21.78		AA0211	B	0.50-0.60		
1.0	Firm to stiff grey brown occasionally mottled yellow brown slightly sandy gravelly CLAY with a medium cobble content and a low boulder content. Gravel is angular to subrounded fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 300mm).		0.80	21.43		AA0212	LB	1.10-1.20		
2.0	Very stiff to hard dark greyish brown slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.80	20.43		AA0213	B	2.00-2.10		
	End of Trial Pit at 2.60m		2.60	19.63						
3.0										
4.0										

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP11	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,468.49 E 253,986.28 N		DATE STARTED 07/03/2013	
CLIENT Fingal County Council		DATE COMPLETED 07/03/2013	
ENGINEER		EXCAVATION METHOD Hitachi Zaxis 80SB	
GROUND LEVEL (m) 19.40			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft light brown CLAY									
	Soft light brown occasionally mottled yellow brown sandy gravelly CLAY. Sand is fine to medium.		0.50	18.90		AA0214	B	0.60-0.70		
1.0	Firm to stiff grey brown occasionally mottled yellow brown slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		0.95	18.45		AA0215	B	1.20-1.30		
2.0	Stiff dark grey to dark greyish brown sandy gravelly SILT/CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse predominantly fine to medium of limestone. Cobbles are subangular to subrounded of limestone.		1.80	17.60		AA0216	LB	2.00-2.10		
2.70	End of Trial Pit at 2.70m		2.70	16.70						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP12	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 324,569.01 E 242,303.17 N		DATE STARTED 23/01/2013	
GROUND LEVEL (m) 2.47		DATE COMPLETED 23/01/2013	
CLIENT ENGINEER Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown to grey brown sandy SILT with occasional rootlets. Sand is fine to medium.	x x x x x	0.05	2.42						
	(Moderately Compact) Grey mottled orange brown silty fine to medium SAND with rare rootlets	x x x x x	0.40	2.07		AN4605	B	0.30-0.40		
	(Moderately Compact) Brown to grey brown fine to coarse slightly silty SAND	x x x x x				AN4606	B	0.70-0.90		
1.0	(Moderately Compact) Grey slightly silty medium to coarse SAND with occasional shell fragments	x x x x x	1.00	1.47		AN4607	B	1.40-1.50		
2.0		x x x x x			↓ (Seepage)					
	End of Trial Pit at 2.30m	x x x x x	2.30	0.17						
3.0		x x x x x								
4.0		x x x x x								

Groundwater Conditions
Seepage at 2.30m

Stability
Very poor stability with sidewall collapse from 0.40m - 1.40m

General Remarks
Pit terminated due to sidewall instability

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP13	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,153.63 E 254,382.46 N		DATE STARTED 07/03/2013	
GROUND LEVEL (m) 21.72		DATE COMPLETED 07/03/2013	
CLIENT ENGINEER Fingal County Council		EXCAVATION METHOD Hitachi Zaxis 80SB	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown sandy CLAY with frequent rootlets. Sand is fine to medium.		0.05	21.67						
	Soft to firm light grey brown sandy gravelly CLAY with rare rootlet. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.					AA0206	B	0.40-0.50		
1.0	Firm grey to grey brown occasionally mottled orange sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone.		0.90	20.82		AA0207	B	1.10-1.20		
2.0	Soft to firm brown mottled orange, yellow and light grey blue sandy slightly gravelly SILT. Sand is fine to medium.		1.75	19.97		AA0208	B	1.80-2.00		
	Uncompact dark grey brown sandy gravelly SILT/CLAY with occasional lense of soft silt. Sand is fine to medium.		2.20	19.52	↓ (Seepage)	AA0209	B	2.60-2.70		
3.0	Stiff to very stiff dark greyish brown slightly sandy gravelly SILT/CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone.		2.80	18.92		AA0210	B	2.80-3.00		
	End of Trial Pit at 3.20m		3.20	18.52						

Groundwater Conditions
Slight seepage at 2.40m

Stability
Poor from 1.40m. Sidewall collapse from ground level upon completion of dig.

General Remarks
Pit terminated on stiff to very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP14	
LOGGED BY JL		SHEET Sheet 1 of 1	
CLIENT ENGINEER Fingal County Council		DATE STARTED 07/03/2013	
CO-ORDINATES 326,723.54 E 257,816.99 N		DATE COMPLETED 07/03/2013	
GROUND LEVEL (m) 43.52		EXCAVATION METHOD Hitachi Zaxis 80SB	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft grey brown slightly sandy CLAY. Sand is fine to medium.									
0.35	Firm brown to orange brown slightly sandy slightly gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		0.35	43.17		AA0221	B	0.40-0.60		
1.10	Compact orange brown silty/clayey gravelly SAND with a high cobble and medium boulder content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone. Cobbles and boulders are angular to subrounded of limestone (up to 350mm)		1.10	42.42		AA0222	LB	1.20-1.30		
3.00	Stiff brown sandy gravelly SILT/CLAY with a medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of limestone. Cobbles are angular to subrounded of limestone.		3.00	40.52		AA0223	B	3.00-3.10		
3.10	End of Trial Pit at 3.10m		3.10	40.42						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on compact coarse material

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP15	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 327,133.32 E 257,851.41 N		DATE STARTED 07/03/2013	
GROUND LEVEL (m) 16.85		DATE COMPLETED 07/03/2013	
CLIENT ENGINEER Fingal County Council		EXCAVATION METHOD Hitachi Zaxis 80SB	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft to firm brown sandy CLAY with rootlets. Sand is fine to medium.		0.25	16.60						
	Soft to firm brown sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone.					AA0224	B	0.40-0.65		
1.0						AA0225	B	1.20-1.30		
2.0	Firm brown sandy gravelly CLAY with a medium cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone. (up to 400mm)		2.10	14.75		AA0226	B	2.50-2.70		
3.0	Stiff brown sandy gravelly SILT/CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of limestone. Cobbles are subrounded of limestone.		3.00	13.85		AA0227	B	3.10-3.20		
	End of Trial Pit at 3.30m		3.30	13.55						

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated on stiff clay and coarse material

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP16	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 323,899.84 E 241,673.17 N		DATE STARTED 23/01/2013	
GROUND LEVEL (m) 6.75		DATE COMPLETED 23/01/2013	
CLIENT ENGINEER Fingal County Council		EXCAVATION METHOD Kubota KX080-3a	

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft to firm brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of limestone.		0.30	6.45	 (Seepage)	AN4608	B	0.50-0.60		
	Firm to stiff brown slightly sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.30	5.45		AN4609	B	1.50-1.60		
	Stiff to very stiff dark grey black slightly sandy gravelly SILT/CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.		2.50	4.25		AN4610	B	2.80-3.10		
	Very stiff dark grey black slightly sandy gravelly CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		3.40	3.35						
	End of Trial Pit at 3.40m									

Groundwater Conditions
 Very slight seepage at 0.40m

Stability
 Good

General Remarks
 Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13



TRIAL PIT RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		TRIAL PIT NO. TP17	
LOGGED BY JL		SHEET Sheet 1 of 1	
CO-ORDINATES 319,183.21 E 254,082.59 N		DATE STARTED 07/03/2013	
GROUND LEVEL (m) 21.24		DATE COMPLETED 07/03/2013	
CLIENT Fingal County Council		EXCAVATION METHOD Hitachi Zaxis 80SB	
ENGINEER			

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples			Vane Test (KPa)	Hand Penetrometer (KPa)
						Sample Ref	Type	Depth		
0.0	TOPSOIL: Soft brown slightly sandy CLAY with frequent rootlets. Sand is fine to medium.									
	Soft occasionally firm yellow brown and grey slightly sandy silty CLAY with frequent roots and rootlets. Sand is fine to medium.		0.30	20.94		AA0217	B	0.40-0.60		
1.0	Firm grey brown occasionally mottled yellow orange slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to medium of limestone.		0.90	20.34		AA0218	B	1.00-1.20		
2.0	Firm occasionally stiff brown sandy gravelly SILT/CLAY with a low to medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		1.55	19.69	↓ (Seepage)	AA0219	LB	1.90-2.00		
	Very stiff dark grey brown sandy gravelly SILT/CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of limestone. Cobbles are subrounded of limestone.		2.30	18.94		AA0220	B	2.35-2.40		
3.0	2.80m - Occasional subrounded boulder of limestone (up to 350mm) End of Trial Pit at 3.00m		3.00	18.24						
4.0										

Groundwater Conditions
Slight seepage from 1.90m

Stability
Good

General Remarks
Pit terminated on very stiff clay

IGSL_TP_LOG_16695.GPJ IGSL_GDT_16/8/13

TP01 - 1 of 2



TP01 - 2 of 2



TP02 - 1 of 2



TP02 - 2 of 2



TP03 - 1 of 2



TP03 - 2 of 2



TP04 - 1 of 2



TP04 - 2 of 2



TP05 - 1 of 2



TP05 - 2 of 2



TP06 - 1 of 2



TP06 - 2 of 2



TP07 - 1 of 2



TP07 - 2 of 2



TP08 - 1 of 2



TP08 - 2 of 2



TP09 - 1 of 2



TP09 - 2 of 2



TP10 - 1 of 2



TP10 - 2 of 2



TP11 - 1 of 2



TP11 - 2 of 2



TP12 - 1 of 2



TP12 - 2 of 2



TP13 - 1 of 2



TP13 - 2 of 2



TP14 - 1 of 2



TP14 - 2 of 2



TP15 - 1 of 2



TP15 - 2 of 2



TP16 - 1 of 2



TP16 - 2 of 2



TP17 - 1 of 2



TP17 - 2 of 2



Appendix 2

Cable Percussion Borehole Records



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH01	
		SHEET Sheet 1 of 2	
CO-ORDINATES 319,172.72 E 241,881.02 N	RIG TYPE Dando 2000	DATE COMMENCED 04/02/2013	DATE COMPLETED 05/02/2013
GROUND LEVEL (m AOD) 44.43	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 14.80		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Firm dark grey brown sandy gravelly SILT/CLAY									
1			42.43	2.00	AN3091	B	1.00-1.45			N = 10 (2, 2, 2, 2, 3, 3)
2	Firm brown slightly sandy slightly gravelly CLAY		41.63	2.80	AN3092	B	2.00-2.45			N = 12 (3, 3, 2, 3, 4, 3)
3	Stiff black slightly sandy slightly gravelly CLAY with a low to medium cobble and boulder content				AN3093	B	3.00-3.45			N = 21 (3, 4, 4, 5, 5, 7)
4					AN3094	B	4.00-4.45			N = 41 (6, 7, 9, 11, 11, 10)
5					AN3095	B	5.00-5.45			N = 50/220 mm (16, 9, 14, 17, 19)
6					AN3096	B	6.50-6.95			N = 32 (4, 7, 7, 9, 7, 9)
7			37.13	7.30						
8	Medium dense black to greyish black sandy GRAVEL. Sand is coarse. Gravel is subangular to subrounded fine to medium of limestone.				AN3097	B	8.00-8.45			N = 20 (3, 4, 4, 5, 5, 6)
9			35.73	8.70						
	Stiff to very stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content				AN3098	B	9.50-9.95			N = 42 (5, 8, 9, 11, 12, 10)

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.6	4.7	0.75		7.30	7.30	8.70	2.40	20	Rapid
5.1	5.4	0.75							
12.55	12.75	0.75							
14.4	14.8	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
					05-02-13	7.30	7.30	0.00	Start of Shift

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH01	
		SHEET Sheet 2 of 2	
CO-ORDINATES 319,172.72 E 241,881.02 N	RIG TYPE Dando 2000	DATE COMMENCED 04/02/2013	
GROUND LEVEL (m AOD) 44.43	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 05/02/2013	
	BOREHOLE DEPTH (m) 14.80		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff to very stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content (continued)		29.63	14.80	AN3099	B	10.50-10.95		N = 47 (9, 10, 10, 11, 12, 14)	
12				AN3100	B	12.00-12.45		N = 50/285 mm (8, 10, 12, 12, 14, 12)		
14				AN3101	B	13.50-13.95		N = 48 (14, 10, 12, 9, 13, 14)		
15	End of Borehole at 14.80 m									
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.6	4.7	0.75							
5.1	5.4	0.75							
12.55	12.75	0.75							
14.4	14.8	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH02	
CO-ORDINATES 319,443.52 E 241,960.54 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 41.55		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 12.00	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Firm dark brown mottled grey brown slightly sandy gravelly CLAY									
1					AN3082	B	1.00-1.45	N = 14 (3, 4, 4, 3, 4, 3)		
2					AN3083	B	2.00-2.45	N = 17 (2, 3, 2, 4, 5, 6)		
3	Stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content		38.55	3.00	AN3084	B	3.00-3.45	N = 24 (3, 4, 6, 6, 7, 5)		
4	Very stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content		37.55	4.00	AN3085	B	4.00-4.45	N = 41 (6, 7, 8, 10, 11, 12)		
5					AN3086	B	5.00-5.45	N = 50/245 mm (10, 9, 11, 14, 16, 9)		
6										
7					AN3087	B	6.50-6.95	N = 49 (5, 9, 11, 11, 13, 14)		
8					AN3088	B	8.00-8.45	N = 50/225 mm (14, 9, 13, 16, 19, 2)		
9	Very stiff to hard black slightly sandy gravelly CLAY with a low to medium cobble and boulder content		32.55	9.00	AN3089	B	9.50-9.95	N = 50/125 mm (18, 7, 26, 24)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.7	3.9	1							No water strike
6	6.2	0.5							
8.1	8.4	1							
9.6	9.9	0.75							
11.7	12	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH02	
		SHEET Sheet 2 of 2	
CO-ORDINATES 319,443.52 E 241,960.54 N	RIG TYPE Dando 2000	DATE COMMENCED 31/01/2013	DATE COMPLETED 04/02/2013
GROUND LEVEL (m AOD) 41.55	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 12.00		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very stiff to hard black slightly sandy gravelly CLAY with a low to medium cobble and boulder content (<i>continued</i>)		29.55	12.00	AN3090	B	11.00-11.45		N = 50/220 mm (12, 12, 16, 18, 16)	
11										
12	End of Borehole at 12.00 m									
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.7	3.9	1							No water strike
6	6.2	0.5							
8.1	8.4	1							
9.6	9.9	0.75							
11.7	12	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH03	
CO-ORDINATES 319,433.01 E 241,814.03 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 42.52		RIG TYPE Dando 2000	
		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 10.00	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	TOPSOIL: Soft dark brown sandy gravelly CLAY		42.12	0.40						
1	Firm light brown sandy gravelly SILT/CLAY				AN3836	B	1.00-1.45		N = 13 (2, 2, 3, 4, 3, 3)	
2	Firm becoming stiff black slightly sandy gravelly CLAY with a low to medium cobble and boulder content		40.92	1.60	AN3837	B	2.00-2.45		N = 9 (2, 2, 2, 2, 2, 3)	
3					AN3838	B	3.00-3.45		N = 21 (3, 4, 4, 5, 5, 7)	
4					AN3839	B	4.00-4.45		N = 20 (2, 4, 4, 5, 5, 6)	
5					AN3840	B	5.00-5.45		N = 27 (4, 5, 6, 7, 7, 7)	
6	Medium dense dark brown sandy GRAVEL. Sand is coarse. Gravel is subangular to subrounded fine to medium of limestone.		36.72	5.80						
7	Stiff becoming very stiff black slightly sandy gravelly CLAY with a low to medium cobble and low boulder content		36.42	6.10	AN3841	B	6.50-6.95		N = 29 (3, 6, 6, 7, 7, 9)	
8					AN3842	B	8.00-8.45		N = 36 (10, 12, 9, 8, 9, 10)	
9					AN3843	B	9.50-9.95		N = 42 (8, 12, 11, 12, 10, 9)	
			32.52	10.00						

HARD STRATA BORING CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.8	5.9	0.5		5.80	5.80		5.30	20	Slow
7	7.2	0.75							
7.5	7.9	1							
9.2	9.3	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Borehole terminated at required depth	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL.BH.LOG 16695.GPJ IGSL.GDT 16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH04	
CO-ORDINATES 319,915.89 E 242,118.38 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 39.44		DATE COMMENCED 07/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 07/02/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 10.00			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft light brown sandy CLAY with a low to medium cobble content		38.84	0.60						
1	Firm to stiff dark brown slightly sandy gravelly CLAY with a low to medium cobble content		AN3844	B	1.00-1.45			N = 8 (1, 2, 2, 2, 2, 2)		
2	Stiff black slightly sandy gravelly CLAY with a medium cobble content and a low to medium boulder content		AN3845	B	2.00-2.45			N = 10 (2, 3, 3, 2, 3, 2)		
3			AN3846	B	3.00-3.45			N = 20 (3, 4, 4, 5, 5, 6)		
4			AN3847	B	4.00-4.45			N = 22 (3, 4, 5, 5, 6, 6)		
5			AN3848	B	5.00-5.45			N = 30 (4, 6, 7, 7, 8, 8)		
6										
7			AN3849	B	6.50-6.95			N = 28 (5, 6, 6, 7, 7, 8)		
8			AN3850	B	8.00-8.45			N = 29 (6, 7, 7, 7, 7, 8)		
9			AN3851	B	9.50-9.95			N = 31 (7, 7, 6, 8, 8, 9)		
			29.44	10.00						

HARD STRATA BORING CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.7	4.9	0.75							No water strike
6	6.2	0.75							
7.5	7.75	1							
9	9.35	0.75							

GROUNDWATER PROGRESS					INSTALLATION DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments	Date	Tip Depth	RZ Top	RZ Base	Type
					07-02-13	8.00	2.00	8.00	50mm SP

REMARKS Borehole terminated at required depth. 50mm diameter standpipe installed.

Sample Legend
 D - Small Disturbed (tub) Sample
 B - Bulk Disturbed
 LB - Large Bulk Disturbed
 Env - Environmental Sample (Jar + Vial + Tub)
 UT - Undisturbed 100mm Diameter Sample
 P - Undisturbed Piston Sample
 W - Water Sample

IGSL_BH.LOG 16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH05	
CO-ORDINATES 317,601.67 E 253,854.56 N		SHEET Sheet 1 of 2	
GROUND LEVEL (m AOD) 25.48		DATE COMMENCED 13/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 13/02/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 13.20			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm light brown sandy gravelly CLAY									
1					AN3715	B	1.00-1.45	N = 5 (2, 1, 1, 2, 1, 1)		
2					AN3716	B	2.00-2.45	N = 3 (0, 1, 1, 0, 1, 1)		
			22.58	2.90						
3	Medium dense grey brown sandy subangular to subrounded fine to coarse GRAVEL				AN3717	B	3.00-3.45	N = 14 (1, 2, 2, 3, 4, 5)		
			21.48	4.00						
4	Stiff occasionally very stiff dark brown sandy gravelly CLAY				AN3718	B	4.00-4.45	N = 49 (3, 6, 8, 11, 14, 16)		
5					AN3719	B	5.00-5.45	N = 25 (4, 6, 6, 5, 7, 7)		
6					AN3720	B	6.50-6.95	N = 30 (6, 6, 7, 7, 8, 8)		
7					AN3721	B	8.00-8.45	N = 23 (5, 6, 7, 7, 5, 4)		
			16.88	8.60						
9	Medium dense to dense dark grey sandy GRAVEL. Gravel is subangular to subrounded fine to coarse of limestone.									
	Stiff dark brown sandy gravelly CLAY with a medium cobble content				AN3722	B	9.50-9.95	N = 35 (6, 7, 8, 8, 9, 10)		
			16.28	9.20						

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.8	8.9	0.75		2.90	2.90	4.00	1.60	20	Slow
10.6	10.8	0.75		8.60	8.60		7.10	20	Moderate
11.7	11.9	0.5							
12.9	13.2	1.25							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH05	
		SHEET Sheet 2 of 2	
CO-ORDINATES 317,601.67 E 253,854.56 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 25.48		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 13.20	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff dark brown sandy gravelly CLAY with a medium cobble content (<i>continued</i>)		14.58	10.90						
11	Stiff to very stiff light brown sandy gravelly silty CLAY with a medium cobble and boulder content				AN3723	B	11.00-11.45		N = 34 (4, 6, 7, 7, 8, 12)	
12										
13					AN3724	B	12.50-12.95		N = 50/225 mm (8, 11, 12, 10, 19, 9)	
13	End of Borehole at 13.20 m		12.28	13.20						
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.8	8.9	0.75							
10.6	10.8	0.75							
11.7	11.9	0.5							
12.9	13.2	1.25							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH06	
CO-ORDINATES 317,620.73 E 254,276.17 N		SHEET Sheet 1 of 2	
GROUND LEVEL (m AOD) 29.51		DATE COMMENCED 14/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 15/02/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 13.70			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft to firm light grey brown sandy gravelly CLAY									
1			27.81	1.70	AN3725	B	1.00-1.45	N = 9 (1, 2, 2, 2, 2, 3)		
2	Firm to stiff dark brown mottled orange brown sandy gravelly CLAY with a medium cobble content				AN3726	B	2.00-2.45	N = 11 (2, 3, 3, 2, 3, 3)		
3					AN3727	B	3.00-3.45	N = 15 (2, 3, 3, 4, 4, 4)		
4					AN3728	B	4.00-4.45	N = 24 (4, 5, 6, 6, 7, 5)		
5					AN3729	B	5.00-5.45	N = 24 (6, 6, 5, 5, 7, 7)		
6	Dense BOULDERS with some dark brown clayey sand		23.71	5.80						
7					AN3730	B	6.50-6.95	N = 30 (4, 5, 7, 7, 8, 8)		
8	Very stiff black slightly sandy gravelly CLAY with a medium cobble and low to medium boulder content		21.31	8.20	AN3731	B	8.00-8.45	N = 50/190 mm (11, 14, 16, 19, 15)		
9	Very stiff dark brown sandy gravelly CLAY with a medium boulder content		20.21	9.30	AN3732	B	9.50-9.95	N = 50/225 mm (9, 11, 14, 16, 18, 2)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.7	2.9	0.5		5.80	5.80	6.50	5.80	20	Seepage
6	6.2	1							
7.8	7.9	0.5							
10	10.25	0.75							
13.5	13.7	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH06	
		SHEET Sheet 2 of 2	
CO-ORDINATES 317,620.73 E 254,276.17 N	RIG TYPE Dando 2000	DATE COMMENCED 14/02/2013	DATE COMPLETED 15/02/2013
GROUND LEVEL (m AOD) 29.51	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 13.70		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very stiff dark brown sandy gravelly CLAY with a medium boulder content (<i>continued</i>)		15.81	13.70						
11					AN3733	B	11.00-11.45			N = 49 (6, 8, 11, 12, 12, 14)
12					AN3734	B	12.50-12.95			N = 50/225 mm (10, 11, 13, 16, 18, 3)
13										
14	End of Borehole at 13.70 m									
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.7	2.9	0.5							
6	6.2	1							
7.8	7.9	0.5							
10	10.25	0.75							
13.5	13.7	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH07	
CO-ORDINATES 319,149.60 E 254,283.62 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 21.61		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 10.60	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft to firm light brown sandy gravelly CLAY		20.31	1.30	AN8543	B	1.00-1.45		N = 10 (3, 4, 4, 2, 2, 2)	
1	Firm brown slightly sandy slightly gravelly CLAY									AN8544
3	Firm becoming stiff black slightly sandy gravelly CLAY with a low to medium cobble content		18.51	3.10	AN8545	B	3.00-3.45		N = 15 (3, 4, 4, 4, 3, 4)	
4					AN8546	B	4.00-4.45	N = 25 (5, 5, 6, 6, 6, 7)		
5					AN8547	B	5.00-5.45	N = 28 (3, 6, 6, 8, 7, 7)		
6					AN8548	B	6.50-6.95	N = 36 (4, 6, 7, 9, 9, 11)		
8					AN8549	B	8.00-8.45		N = 50/285 mm (6, 8, 11, 13, 14, 12)	
9	Stiff to very stiff dark brown slightly sandy gravelly CLAY with a medium cobble content		12.71	8.90	AN8550	B	9.50-9.95		N = 46 (7, 7, 10, 11, 10, 15)	

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.85	2.95	0.5							No water strike
7.2	7.4	0.75							
8.9	9.1	0.75							
10.4	10.6	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH07	
		SHEET Sheet 2 of 2	
CO-ORDINATES 319,149.60 E 254,283.62 N	RIG TYPE Dando 2000	DATE COMMENCED 07/03/2013	
GROUND LEVEL (m AOD) 21.61	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 10.60	DATE COMPLETED 08/03/2013	
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff to very stiff dark brown slightly sandy gravelly CLAY with a medium cobble content (<i>continued</i>)		11.01	10.60						
	End of Borehole at 10.60 m									
11										
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.85	2.95	0.5							No water strike
7.2	7.4	0.75							
8.9	9.1	0.75							
10.4	10.6	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH08	
CO-ORDINATES 319,362.60 E 254,098.24 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 19.96		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 12.60	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm dark brown sandy gravelly silty CLAY									
1					AN8525	B	1.00-1.45			N = 9 (2, 2, 2, 3, 2, 2)
2					AN8526	B	2.00-2.45			N = 14 (2, 3, 3, 3, 4, 4)
3			16.76	3.20	AN8527	B	3.00-3.45			N = 25 (4, 4, 5, 6, 7, 7)
4	Stiff black slightly sandy gravelly CLAY with a medium cobble content				AN8528	B	4.00-4.45			N = 25 (3, 5, 5, 6, 6, 8)
5					AN8529	B	5.00-5.45			N = 28 (5, 5, 7, 7, 6, 8)
6					AN8530	B	6.50-6.95			N = 27 (4, 6, 6, 7, 6, 8)
7			12.76	7.20						
8	Stiff dark brown sandy gravelly silty CLAY with a low to medium cobble content		12.16	7.80						
8	Dense BOULDERS with some grey brown clayey very sandy subangular to subrounded fine to coarse GRAVEL				AN8531	B	8.00-8.45			N = 50/190 mm (12, 13, 16, 18, 16)
9					AN8532	B	9.50-9.95			N = 36 (4, 7, 8, 8, 9, 11)

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.8	3.9	0.5		7.80	7.80	10.50	7.00	20	Slow
7.8	7.9	0.5							
8.2	8.6	1							
9.8	10	0.75							
12.4	12.6	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH08	
		SHEET Sheet 2 of 2	
CO-ORDINATES 319,362.60 E 254,098.24 N	RIG TYPE Dando 2000	DATE COMMENCED 05/03/2013	DATE COMPLETED 06/03/2013
GROUND LEVEL (m AOD) 19.96	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 12.60		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Dense subangular to subrounded fine to coarse GRAVEL (<i>continued</i>)		9.56	10.40						
11	Stiff black slightly sandy gravelly CLAY with a low to medium cobble content				AN8533	B	11.00-11.45		N = 37 (7, 9, 8, 8, 10, 11)	
12			7.46	12.50						
13	Dense subangular to subrounded fine to coarse GRAVEL		7.36	12.60	AN8534	B	12.50-12.95		N = 50/75 mm (22, 3, 46, 4)	
13	End of Borehole at 12.60 m									
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.8	3.9	0.5		12.60	12.60		11.00	20	Moderate
7.8	7.9	0.5							
8.2	8.6	1							
9.8	10	0.75							
12.4	12.6	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH09	
CO-ORDINATES 319,367.32 E 254,356.57 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 22.96		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 11.70	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft to firm light brown sandy gravelly CLAY									
1			21.66	1.30	AN8534	B	1.00-1.45	N = 10 (2, 2, 2, 2, 3, 3)		
2	Firm to stiff light and dark brown slightly sandy slightly gravelly CLAY									
2			20.26	2.70	AN8535	B	2.00-2.45	N = 20 (3, 4, 4, 5, 5, 6)		
3	Stiff black slightly sandy slightly gravelly CLAY with a low to medium cobble content									
3					AN8536	B	3.00-3.45	N = 26 (4, 6, 6, 7, 7, 6)		
4					AN8537	B	4.00-4.45	N = 22 (3, 4, 5, 5, 6, 6)		
5					AN8538	B	5.00-5.45	N = 23 (3, 4, 5, 5, 6, 7)		
6										
6			16.16	6.80	AN8539	B	6.50-6.95	N = 35 (6, 7, 7, 8, 11, 9)		
7	Stiff dark brown sandy gravelly CLAY with a low to medium cobble content									
8					AN8540	B	8.00-8.45	N = 24 (4, 5, 5, 6, 6, 7)		
9			13.96	9.00						
9	Stiff black silty sandy slightly gravelly CLAY with a low to medium cobble content									
9			13.56	9.40						
9	Medium dense silty sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to medium.				AN8541	B	9.50-9.95	N = 41 (6, 7, 8, 10, 12, 11)		
9			13.36	9.60						

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6	6.2	0.5		9.40	9.40	10.00	8.60	20	Slow
9	9.2	0.75							
9.75	9.9	0.75							
11.4	11.7	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH09	
		SHEET Sheet 2 of 2	
CO-ORDINATES 319,367.32 E 254,356.57 N	RIG TYPE Dando 2000	DATE COMMENCED 06/03/2013	
GROUND LEVEL (m AOD) 22.96	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED 07/03/2013	
	BOREHOLE DEPTH (m) 11.70		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very stiff black slightly sandy slightly gravelly CLAY with a low to medium cobble content (<i>continued</i>)		11.26	11.70	AN8542	B	11.00-11.45			
11										
12	End of Borehole at 11.70 m									
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6	6.2	0.5							
9	9.2	0.75							
9.75	9.9	0.75							
11.4	11.7	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH10	
CO-ORDINATES 325,356.52 E 257,579.62 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 41.73		DATE COMMENCED 18/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 18/02/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 7.20			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft light brown sandy gravelly CLAY with a low to medium cobble content									
1					AN3735	B	1.00-1.45		N = 7 (1, 1, 2, 2, 2, 1)	
2					AN3736	B	2.00-2.45		N = 8 (1, 2, 2, 1, 2, 3)	
	Stiff dark brown sandy gravelly CLAY		39.13	2.60						
3					AN3737	B	3.00-3.45		N = 26 (3, 4, 6, 6, 7, 7)	
	Stiff grey black sandy gravelly CLAY with a medium cobble content		38.53	3.20						
4					AN3738	B	4.00-4.45		N = 32 (5, 6, 7, 7, 8, 10)	
5					AN3739	B	5.00-5.45		N = 50/285 mm (7, 9, 11, 12, 14, 13)	
6										
	Dense BOULDERS with some grey gravel		35.43	6.30						
			35.03	6.70	AN3740	B	6.50-6.95		N = 50/105 mm (21, 4, 36, 14)	
7	Very stiff dark brown sandy gravelly CLAY with a medium boulder content									
	End of Borehole at 7.20 m		34.53	7.20						
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.75	4.85	0.5							No water strike
6.4	6.6	0.75							
7	7.2	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH11	
		SHEET Sheet 1 of 1	
CO-ORDINATES 326,914.15 E 257,853.74 N	RIG TYPE Dando 2000	DATE COMMENCED 19/02/2013	DATE COMPLETED 19/02/2013
GROUND LEVEL (m AOD) 28.92	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 4.80		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft dark brown sandy gravelly CLAY		28.02	0.90						
1	Soft to firm light brown sandy gravelly CLAY				AM2742	B	1.00-1.45		N = 7 (1, 2, 2, 2, 2, 1)	
2					AM2743	B	2.00-2.45		N = 8 (2, 2, 2, 2, 2, 2)	
3	Soft to firm light brown and grey slightly sandy slightly gravelly SILT/CLAY		26.12	2.80	AM2744	B	3.00-3.45		N = 2 (2, 1, 0, 0, 1, 1)	
4	Dense brown clayey/silty very sandy GRAVEL with a low to medium cobble content		24.92	4.00	AM2745	B	4.00-4.45		N = 50/180 mm (13, 12, 16, 19, 15)	
5	End of Borehole at 4.80 m		24.12	4.80						
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.4	4.8	1.5							No water strike

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH12	
		SHEET Sheet 1 of 1	
CO-ORDINATES 327,094.71 E 257,945.22 N	RIG TYPE Dando 2000	DATE COMMENCED 21/02/2013	DATE COMPLETED 21/02/2013
GROUND LEVEL (m AOD) 15.45	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 4.70		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm light reddish brown sandy gravelly CLAY with a medium cobble content		12.45	3.00	AN3748	B	1.00-1.45		N = 8 (1, 2, 2, 2, 2, 2)	
1				2.00-2.45	AN3749	B			N = 10 (2, 2, 2, 3, 3, 2)	
2	Firm brown slightly sandy slightly gravelly SILT/CLAY with a low to medium cobble content		10.75	4.70	AN3750	B	3.00-3.45		N = 14 (2, 3, 3, 4, 3, 4)	
3					AN3751	B	4.00-4.45		N = 50/225 mm (7, 8, 11, 14, 16, 9)	
4	End of Borehole at 4.70 m									
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.3	4.7	1.2							No water strike

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH13	
CO-ORDINATES 323,822.42 E 241,678.81 N		SHEET Sheet 1 of 2	
GROUND LEVEL (m AOD) 9.21		DATE COMMENCED 30/01/2013	
RIG TYPE Dando 2000		DATE COMPLETED 31/01/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 13.00			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft to firm dark brown slightly sandy slightly gravelly CLAY with a low to medium cobble content									
1					AN3072	B	1.00-1.45	N = 8 (1, 2, 2, 3, 1, 2)		
2			6.51	2.70	AN3073	B	2.00-2.45	N = 9 (2, 2, 2, 3, 2, 2)		
3	Firm to stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content				AN3074	B	3.00-3.45	N = 22 (3, 4, 4, 5, 6, 7)		
4	Stiff black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content		5.21	4.00	AN3075	B	4.00-4.45	N = 32 (6, 7, 7, 8, 8, 9)		
5					AN3076	B	5.00-5.45	N = 33 (4, 6, 6, 8, 10, 9)		
6			2.71	6.50	AN3077	B	6.50-6.95	N = 50/265 mm (7, 8, 11, 12, 14, 13)		
7	Very Stiff to hard black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content									
8					AN3078	B	8.00-8.45	N = 50/95 mm (25, 36, 14)		
9					AN3079	B	9.50-9.95	N = 50/225 mm (9, 11, 14, 17, 17, 2)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4	4.2	0.75							No water strike
7.9	8.3	1							
9	9.2	0.75							
12.7	13	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH13	
		SHEET Sheet 2 of 2	
CO-ORDINATES 323,822.42 E 241,678.81 N	RIG TYPE Dando 2000	DATE COMMENCED 30/01/2013	DATE COMPLETED 31/01/2013
GROUND LEVEL (m AOD) 9.21	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 13.00		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Very Stiff to hard black slightly sandy gravelly CLAY with a medium cobble and a low to medium boulder content <i>(continued)</i>				AN3080	B	11.00-11.45		N = 50/225 mm (7, 9, 11, 12, 19, 8)	
11										
12										
13	End of Borehole at 13.00 m		-3.79	13.00						
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4	4.2	0.75							No water strike
7.9	8.3	1							
9	9.2	0.75							
12.7	13	2							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH14	
CO-ORDINATES 324,657.66 E 242,268.42 N		SHEET Sheet 1 of 2	
GROUND LEVEL (m AOD) 2.77		DATE COMMENCED 23/01/2013	
RIG TYPE Dando 2000		DATE COMPLETED 24/01/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 10.50			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY CB	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Loose, dark brown SAND.	x								
1			1.57	1.20	AN3061	B	1.00-1.45	N = 7 (1, 1, 2, 2, 1, 2)		
2	Loose to medium dense light brown silty slightly gravelly SAND with shell material.	x o			AN3062	B	2.00-2.45	N = 10 (2, 2, 2, 2, 3, 3)		
3			0.27	2.50	AN3063	B	3.00-3.45	N = 15 (2, 2, 3, 3, 4, 5)		
4	Medium dense light brown slightly silty SAND with shell material.	x x			AN3064	B	4.00-4.45	N = 14 (2, 2, 3, 3, 4, 4)		
5			-2.33	5.10	AN3065	B	5.00-5.45	N = 16 (1, 3, 3, 4, 4, 5)		
6	Stiff dark grey sandy SILT with shell material.	x x x			AN3066	B	6.50-6.95	N = 15 (3, 4, 4, 3, 4, 4)		
7			-4.23	7.00						
7	Firm grey sandy SILT with shell material.	x x								
7			-4.53	7.30						
7	Medium dense grey silty sandy GRAVEL with shell material.	x o x								
7			-4.83	7.60						
8	Soft to firm dark brown to dark grey slightly sandy slightly gravelly SILT with shell material	x o x o			AN3067	B	8.00-8.45	N = 13 (2, 2, 3, 3, 4, 3)		
9					AN3068	B	9.50-9.95	N = 9 (2, 2, 2, 2, 3, 2)		
9			-7.13	9.90						

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
7.3	7.5	0.75		2.20	2.20	7.30	1.90	20	Slow
10	10.1	0.5		9.20	9.20		4.30	20	Slow
11.7	12	0.75							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Boring rig became unstable at 10.50m depth with subsidence at ground level - sand beginning to collapse. On Health & Safety grounds borehole was abandoned, and borehole re-set-up.

Sample Legend
 D - Small Disturbed (tub) Sample
 B - Bulk Disturbed
 LB - Large Bulk Disturbed
 Env - Environmental Sample (Jar + Vial + Tub)
 UT - Undisturbed 100mm Diameter Sample
 P - Undisturbed Piston Sample
 W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH14	
		SHEET Sheet 2 of 2	
CO-ORDINATES 324,657.66 E 242,268.42 N	RIG TYPE Dando 2000	DATE COMMENCED 23/01/2013	DATE COMPLETED 24/01/2013
GROUND LEVEL (m AOD) 2.77	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 10.50		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6 ENERGY RATIO (%) 55	BORED BY WC PROCESSED BY CB	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff dark grey sandy SILT (<i>continued</i>)	x . x . x . x x . x . x . x x . x . x . x	-7.73	10.50						
	Pit terminated due to unstable ground conditions. End of Borehole at 10.50 m									
11										
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
7.3	7.5	0.75							
10	10.1	0.5							
11.7	12	0.75							

INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments
Date	Tip Depth	RZ Top	RZ Base	Type	24-01-13	10.50	10.50	2.00	End of Borehole

REMARKS Boring rig became unstable at 10.50m depth with subsidence at ground level - sand beginning to collapse. On Health & Safety grounds borehole was abandoned, and borehole re-set-up.	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH14A	
		SHEET Sheet 1 of 2	
CO-ORDINATES 324,661.67 E 242,270.67 N	RIG TYPE Dando 2000	DATE COMMENCED 24/01/2013	DATE COMPLETED 24/01/2013
GROUND LEVEL (m AOD) 2.78	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 13.70		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY CB	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Loose dark brown SAND.	•••••								
1	Loose to medium dense light brown silty SAND with shell material.	x x x x x	1.58	1.20						
2	Medium dense light brown silty SAND with occasional shell material	x x x x x	0.28	2.50						
3		x x x x x								
4	4.40 - 4.60m - Rare subangular to subrounded BOULDER	x x x x x								
5	Stiff dark grey sandy SILT with shell material.	x x x x x	-2.32	5.10						
6		x x x x x								
7	Firm grey sandy SILT with shell material.	x x x x x	-4.22	7.00						
	Medium dense grey silty sandy GRAVEL with shell material.	x x x x x	-4.52	7.30						
	Soft to firm dark brown sandy SILT with shell material.	x x x x x	-4.82	7.60						
8		x x x x x								
9		x x x x x								
		x x x x x	-7.12	9.90						

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.4	4.6	1.5		2.20					
12.9	13	0.5		9.20					
13.4	13.5	0.75							
13.6	13.7	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Progressing 200mm diameter casing becoming difficult in sandy silts. Casing reduced to 150mm diameter at 9.50m. Borehole completed in 150mm casing. Obstruction encountered at 13.4m. Following chiselling, borehole terminated at 13.7m.

Sample Legend
 D - Small Disturbed (tub) Sample
 B - Bulk Disturbed
 LB - Large Bulk Disturbed
 Env - Environmental Sample (Jar + Vial + Tub)
 UT - Undisturbed 100mm Diameter Sample
 P - Undisturbed Piston Sample
 W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH14A	
		SHEET Sheet 2 of 2	
CO-ORDINATES 324,661.67 E 242,270.67 N	RIG TYPE Dando 2000	DATE COMMENCED 24/01/2013	DATE COMPLETED 24/01/2013
GROUND LEVEL (m AOD) 2.78	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 13.70		
CLIENT Fingal County Council ENGINEER	SPT HAMMER REF. NO. SPT6 ENERGY RATIO (%) 55	BORED BY WC PROCESSED BY CB	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	Stiff grey sandy SILT with shell material. <i>(continued)</i>				AN3069	B	10.50-10.95		N = 27 (5, 5, 6, 6, 7, 8)	
11										
12	Very stiff dark brown sandy gravelly CLAY		-8.92	11.70	AN3070	B	12.00-12.45		N = 39 (5, 7, 9, 10, 10, 10)	
13										
13	Dense grey silty sandy subangular fine to medium grained GRAVEL		-10.62	13.40						
14	End of Borehole at 13.70 m		-10.92	13.70	AN3071	B	13.50-13.95		N = 50/150 mm (22, 5, 37, 13)	
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING					WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
4.4	4.6	1.5								
12.9	13	0.5								
13.4	13.5	0.75								
13.6	13.7	1								

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Progressing 200mm diameter casing becoming difficult in sandy silts. Casing reduced to 150mm diameter at 9.50m. Borehole completed in 150mm casing. Obstruction encountered at 13.4m. Following chiselling, borehole terminated at 13.7m.	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub)	UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH15	
CO-ORDINATES 313,067.51 E 247,660.39 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 78.49		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 3.40	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm dark brown slightly sandy slightly gravelly CLAY with a low cobble and boulder content.		75.09	3.40						
1					AN8502	B	1.00-1.45		N = 7 (1, 2, 2, 2, 1, 2)	
2					AN8503	B	2.00-2.45		N = 14 (2, 2, 3, 3, 4, 4)	
3					AN8504	B	3.00-3.40		N = 50/150 mm (5, 7, 9, 18, 23)	
	End of Borehole at 3.40 m									
4										
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.2	3.4	1.5		3.10	3.10		2.70	20	Slow

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Borehole terminated at 3.40m. Driller reports obstruction / possible rockhead	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH17	
		SHEET Sheet 1 of 1	
CO-ORDINATES 315,274.53 E 251,201.85 N	RIG TYPE Dando 2000	DATE COMMENCED 22/02/2013	DATE COMPLETED 22/02/2013
GROUND LEVEL (m AOD) 23.43	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 3.10		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft dark brown sandy gravelly CLAY									
1	Loose becoming medium dense dark grey silty gravelly SAND		22.33	1.10	3759	B	1.00-1.45	N = 8 (1, 2, 2, 2, 2, 2)		
2	Firm to stiff black sandy gravelly silty CLAY		21.13	2.30	3759	B	2.00-2.45	N = 11 (1, 1, 2, 2, 3, 4)		
3	Medium dense dark grey sandy subangular fine to medium GRAVEL End of Borehole at 3.10 m		20.53 20.33	2.90 3.10	3759	B	3.00-3.45	N = 50/0 mm (25, 50)		
4										
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.9	3.1	1.5		1.10	1.10	2.30	0.60	20	Slow

INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments
Date	Tip Depth	RZ Top	RZ Base	Type					

REMARKS	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH19	
CO-ORDINATES 320,704.27 E 255,469.62 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 34.01		DATE COMMENCED 21/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 22/02/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 9.70			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft dark brown sandy CLAY with a low to medium cobble content									
1			32.11	1.90	AN3752	B	1.00-1.45	N = 7 (1, 2, 2, 1, 2, 2)		
2	Firm light brown sandy gravelly CLAY with a medium cobble content				AN3753	B	2.00-2.45	N = 9 (2, 2, 3, 2, 2, 2)		
3					AN3754	B	3.00-3.45	N = 18 (3, 4, 7, 4, 4, 3)		
4	Firm to stiff dark brown sandy silty CLAY with a medium cobble content and a low boulder content		30.21	3.80	AN3755	B	4.00-4.45	N = 19 (3, 4, 5, 5, 5, 4)		
5					AN3756	B	5.00-5.45	N = 31 (5, 6, 6, 7, 8, 10)		
6			27.31	6.70	AN3757	B	6.50-6.95	N = 50/200 mm (11, 13, 16, 17, 17)		
7	Very stiff black sandy gravelly silty CLAY with a medium cobble and boulder content				AN3758	B	8.00-8.45	N = 50/190 mm (12, 13, 16, 19, 15)		
8										
9			24.31	9.70	AN3759	B	9.50-9.95	N = 50/95 mm (20, 5, 32, 18)		
End of Borehole at 9.70 m										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
6.6	7	1							No water strike
7.75	7.85	0.5							
9.5	9.7	1							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH20	
CO-ORDINATES 324,487.08 E 257,266.58 N		RIG TYPE Dando 2000	
GROUND LEVEL (m AOD) 54.06		BOREHOLE DIAMETER (mm) 200	
		BOREHOLE DEPTH (m) 10.20	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft dark brown silty sandy gravelly CLAY with a low cobble content									
1			52.26	1.80	AN8509	B	1.00-1.45	N = 8 (2, 2, 2, 2, 2, 2)		
2	Soft to firm light brown slightly sandy slightly gravelly CLAY				AN8510	B	2.00-2.45	N = 9 (1, 2, 2, 3, 2, 2)		
3			51.06	3.00	AN8511	B	3.00-3.45	N = 20 (2, 3, 3, 4, 6, 7)		
4	Firm to stiff light brown slightly sandy slightly gravelly CLAY				AN8512	B	4.00-4.45	N = 19 (3, 3, 4, 4, 5, 6)		
5			50.36	3.70	AN8513	B	5.00-5.45	N = 45 (5, 6, 7, 7, 14, 17)		
6					AN8514	B	6.50-6.95	N = 31 (6, 7, 7, 8, 9, 7)		
7			46.66	7.40						
8	Dense to medium dense fine to coarse angular GRAVEL		46.36	7.70						
8	Stiff black slightly sandy slightly gravelly CLAY with a high cobble and medium boulder content				AN8515	B	8.00-8.45	N = 38 (5, 7, 8, 8, 10, 12)		
9					AN8516	B	9.50-9.95	N = 50/225 mm (7, 9, 12, 17, 19, 2)		

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.7	3.9	0.5		7.40	7.40	7.70	7.00	20	Slow
5.3	5.6	0.75							
7.6	7.7	0.5							
9.9	10.2	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH20	
		SHEET Sheet 2 of 2	
CO-ORDINATES 324,487.08 E 257,266.58 N	RIG TYPE Dando 2000	DATE COMMENCED 01/03/2013	DATE COMPLETED 01/03/2013
GROUND LEVEL (m AOD) 54.06	BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 10.20		
CLIENT Fingal County Council	SPT HAMMER REF. NO. SPT6	BORED BY WC	
ENGINEER	ENERGY RATIO (%) 55	PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
10	End of Borehole at 10.20 m		43.86	10.20						
11										
12										
13										
14										
15										
16										
17										
18										
19										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.7	3.9	0.5							
5.3	5.6	0.75							
7.6	7.7	0.5							
9.9	10.2	1.5							

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH24	
CO-ORDINATES 317,067.22 E 249,126.22 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 10.76		DATE COMMENCED 26/02/2013	
RIG TYPE Dando 2000		DATE COMPLETED 26/02/2013	
CLIENT Fingal County Council		SPT HAMMER REF. NO. SPT6	
ENGINEER		ENERGY RATIO (%) 55	
		BORED BY WC	
		PROCESSED BY JL	

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm dark brown sandy gravelly CLAY									
1			8.76	2.00	AN8505	B	1.00-1.45			
2	Loose to medium dense grey silty sandy GRAVEL Firm dark grey very sandy gravelly CLAY		8.66	2.10	AN8506	B	2.00-2.45	N = 7 (1, 2, 2, 2, 1, 2)		
3	Medium dense clayey/silty sandy subangular to subrounded fine to coarse GRAVEL. Sand is coarse.		7.96	2.80						
3	Firm black silty gravelly CLAY with a low cobble content		7.36	3.40	AN8507	B	3.00-3.45	N = 11 (2, 3, 3, 3, 2, 3)		
4	Medium dense to dense grey slightly clayey/silty sandy subangular to subrounded fine to coarse GRAVEL End of Borehole at 4.20 m		6.86	3.90						
4			6.56	4.20	AN8508	B	4.00-4.45	N = 16 (3, 4, 4, 3, 4, 5)		
5								N = 50/75 mm (21, 4, 40, 10)		
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.8	2.9	0.5		2.40	2.40	3.40	1.80	20	Slow
3.9	4.2	1.5		3.90	3.90		3.00	20	Moderate

INSTALLATION DETAILS					GROUNDWATER PROGRESS				
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Borehole terminated at 4.20m. Driller reports obstruction / possible weathered rockhead	Sample Legend D - Small Disturbed (tub) B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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IGSL_BH_LOG_16695.GPJ IGSL_GDT_16/8/13



GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH25	
CO-ORDINATES 320,983.94 E 243,516.89 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 17.69		DATE COMMENCED 08/02/2013	
CLIENT Fingal County Council		DATE COMPLETED 08/02/2013	
ENGINEER		BORED BY WC	
RIG TYPE Dando 2000		PROCESSED BY JL	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 10.00			
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm light brown slightly sandy gravelly CLAY with a low to medium cobble content		12.69	5.00						
1					AN3852	B	1.00-1.45		N = 11 (2, 2, 5, 2, 2, 2)	
2					AN3853	B	2.00-2.45		N = 12 (2, 3, 3, 2, 3, 4)	
3					AN3854	B	3.00-3.45		N = 12 (3, 3, 4, 4, 2, 2)	
4					AN3855	B	4.00-4.45		N = 17 (3, 4, 4, 5, 4, 4)	
5	Stiff light brown slightly sandy gravelly CLAY with a low to medium cobble content		10.89	6.80	AN3856	B	5.00-5.45		N = 25 (4, 6, 9, 5, 5, 6)	
6					AN3857	B	6.50-6.95		N = 47/170 mm (3, 3, 4, 12, 31)	
7	Dense light brown sandy GRAVEL. Sand is coarse. Gravel is subangular to subrounded fine to medium of limestone. Very stiff to hard dark brown slightly sandy slightly gravelly CLAY		10.39	7.30						
8					AN3858	B	8.00-8.45		N = 50/210 mm (9, 14, 16, 19, 15)	
9					AN3859	B	9.50-9.95		N = 50/190 mm (8, 12, 18, 21, 11)	
			7.69	10.00						

HARD STRATA BORING CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.75	2.85	0.5		6.80	6.80	7.30	6.20	20	Slow
4.65	4.85	0.75							
6.8	7.2	1.5							

GROUNDWATER PROGRESS				
INSTALLATION DETAILS				
Date	Hole Depth	Casing Depth	Depth to Water	Comments
Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Borehole terminated at required depth	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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GEOTECHNICAL BORING RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		BOREHOLE NO. BH26	
CO-ORDINATES 322,403.33 E 241,809.63 N		SHEET Sheet 1 of 1	
GROUND LEVEL (m AOD) 12.60		DATE COMMENCED 02/03/2013	
RIG TYPE Dando 2000		DATE COMPLETED 02/03/2013	
BOREHOLE DIAMETER (mm) 200			
BOREHOLE DEPTH (m) 10.00			
CLIENT Fingal County Council		BORED BY WC	
ENGINEER		PROCESSED BY JL	
SPT HAMMER REF. NO. SPT6			
ENERGY RATIO (%) 55			

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples				Field Test Results	Standpipe Details
					Ref. Number	Sample Type	Depth (m)	Recovery		
0	Soft becoming firm dark brown to grey brown slightly sandy slightly gravelly CLAY		9.70	2.90						
1					AN8517	B	1.00-1.45		N = 9 (2, 2, 2, 3, 2, 2)	
2					AN8518	B	2.00-2.45		N = 9 (3, 3, 2, 2, 2, 3)	
3	Firm to stiff black slightly sandy slightly gravelly CLAY with a low to medium cobble content		5.70	6.90	AN8519	B	3.00-3.45		N = 15 (3, 4, 4, 3, 4, 4)	
4					AN8520	B	4.00-4.45		N = 20 (3, 5, 5, 4, 5, 6)	
5					AN8521	B	5.00-5.45		N = 24 (4, 6, 6, 7, 5, 6)	
6					AN8522	B	6.50-6.95		N = 37 (6, 7, 8, 8, 10, 11)	
7					AN8523	B	8.00-8.45		N = 41 (8, 9, 9, 10, 11, 11)	
8	Stiff to very stiff dark brown sandy slightly gravelly CLAY with a low to medium cobble content		2.60	10.00	AN8524	B	9.50-9.95		N = 49/285 mm (7, 12, 12, 13, 13, 11)	
9										

HARD STRATA BORING CHISELLING				WATER STRIKE DETAILS					
From (m)	To (m)	Time (h)	Comments	Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
3.65	3.8	0.75							No water strike
5.7	5.9	0.5							
8	8.3	0.75							

GROUNDWATER PROGRESS				
INSTALLATION DETAILS				
Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Borehole terminated at required depth	Sample Legend D - Small Disturbed (tub) Sample B - Bulk Disturbed LB - Large Bulk Disturbed Env - Environmental Sample (Jar + Vial + Tub) UT - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample W - Water Sample
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Appendix 3

Rotary Drillhole Records



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC01
CO-ORDINATES 319,172.72 E 241,881.02 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 44.43	RIG TYPE Knebel	DATE DRILLED 26/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4												
5												
6												
7												
8												
9												

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS				
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)
					No water strike recorded				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
					Date	Hole Depth	Casing Depth	Depth to Water	Comments
26-02-13	8.80	6.80	8.80	50mm SP					

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC01
CO-ORDINATES 319,172.72 E 241,881.02 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 44.43	RIG TYPE Knebel	DATE DRILLED 26/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			Cased down Shell & Auger Hole (<i>continued</i>)	10.50	33.93		
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill				
12												
13												
14												
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy gravelly clay with occasional cobbles and boulders.	14.80	29.63		N = 75/125 mm (25, 50)
16												N = 50/125 mm (14, 11, 32, 18)
17												N = 50/230 mm (13, 12, 15, 18, 14, 3)
18								End of Borehole at 18.00 m	18.00	26.43		N = 50/115 mm (16, 9, 29, 21)
19												

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
26-02-13	8.80	6.80	8.80	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC02
CO-ORDINATES 319,443.52 E 241,960.54 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 41.55	RIG TYPE Knebel	DATE DRILLED 25/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4												
5												
6									6.50	35.05		
7								SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill				
8												
9												

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
26-02-13	18.00	13.00	18.00	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC02
CO-ORDINATES 319,443.52 E 241,960.54 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 41.55	RIG TYPE Knebel	DATE DRILLED 25/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 26/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill (continued)				
11												
12								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy very gravelly clay with occasional cobbles and boulders.	12.00	29.55		N = 50/115 mm (16, 9, 32, 18)
13												
14								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy gravelly clay with occasional cobbles and boulders.	13.60	27.95		N = 44 (7, 9, 11, 13, 10, 10)
15												
16												N = 50/295 mm (10, 12, 14, 12, 12, 12)
17												N = 44 (6, 10, 12, 9, 10, 13)
18								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey fine sand	17.40	24.15		
								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy gravelly clay with occasional cobbles and boulders.	17.80	23.75		
								End of Borehole at 18.00 m	18.00	23.55		N = 50/115 mm (17, 8, 29, 21)
19												

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					GROUNDWATER DETAILS					
INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	26-02-13	18.00	18.00	13.30	Water level recorded 10mins after end of drilling	
26-02-13	18.00	13.00	18.00	50mm SP						

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC05
		SHEET Sheet 1 of 3
CO-ORDINATES 317,601.67 E 253,854.56 N	RIG TYPE Casagrande C6 FLUSH Air/Mist	DATE DRILLED 12/03/2013
GROUND LEVEL (mOD) 25.48		DATE LOGGED 13/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 80	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
3.50								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill	3.50	21.98		
4												
5												
6												
7												
8												
9												

REMARKS Hole cased 0.00-24.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					22.00					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
13-03-13	24.00	22.50	24.00	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC05
		SHEET Sheet 2 of 3
CO-ORDINATES 317,601.67 E 253,854.56 N		DATE DRILLED 12/03/2013
GROUND LEVEL (mOD) 25.48		DATE LOGGED 13/03/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill (<i>continued</i>)				
11												
12												
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay with gravel bands.	13.20	12.28		
14												
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay	15.00	10.48		N = 50/85 mm (5, 20, 32, 18)
16												
17												N = 50/80 mm (8, 17, 35, 15)
18												N = 50/80 mm (18, 7, 44, 6)
19												N = 50/135 mm (7, 18, 32, 18)

REMARKS Hole cased 0.00-24.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					22.00					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	
13-03-13	24.00	22.50	24.00	50mm SP	12-03-13	18.00	18.00	7.00	Water level recorded at start of shift	

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC05
		SHEET Sheet 3 of 3
CO-ORDINATES 317,601.67 E 253,854.56 N		DATE DRILLED 12/03/2013
GROUND LEVEL (mOD) 25.48		DATE LOGGED 13/03/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL
RIG TYPE Casagrande C6		
FLUSH Air/Mist		
INCLINATION (deg) -90		
CORE DIAMETER (mm) 80		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay (<i>continued</i>)				
21												N = 50/30 mm (7, 25, 50)
22												N = 50/0 mm (9, 16, 50)
23												
24		0	0	0				Attempted Coring observed by driller as possible limestone boulder with some clay	24.00	1.48		N = 50/0 mm (25, 50)
25	25.00							End of Borehole at 25.00 m	25.00	0.48		
26												
27												
28												
29												

REMARKS Hole cased 0.00-24.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					22.00					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	12-03-13	25.00	24.00	16.50	Water level recorded at end of borehole	
13-03-13	24.00	22.50	24.00	50mm SP						

IGSL RC F1 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC06
		SHEET Sheet 1 of 3
CO-ORDINATES 317,620.73 E 254,276.17 N	RIG TYPE Casagrande C FLUSH Air/Mist	DATE DRILLED 14/03/2013
GROUND LEVEL (mOD) 29.51		DATE LOGGED 20/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500		[Symbol]	SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay				
1							[Symbol]					
2							[Symbol]					
3							[Symbol]					
4							[Symbol]					
5							[Symbol]					
6							[Symbol]					
7							[Symbol]					
8							[Symbol]					
9							[Symbol]					

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	14-03-13			2.50	Water level recorded in open cable tool pre-bore	
20-03-13	18.00	15.00	18.00	50mm SP						

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC06
		SHEET Sheet 2 of 3
CO-ORDINATES 317,620.73 E 254,276.17 N	RIG TYPE Casagrande C FLUSH Air/Mist	DATE DRILLED 14/03/2013
GROUND LEVEL (mOD) 29.51		DATE LOGGED 20/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay (<i>continued</i>)				
11												
12												
13												
14												
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay with bands of gravel	15.00	14.51		N = 50/15 mm (11, 14, 50)
16												
17												N = 50/35 mm (9, 16, 50)
18												
18.40	100	30	30					Medium strong thinly bedded grey fine grained agrillaceous LIMESTONE with occasional medium to widely spaced medium strong to weak very thin black MUDSTONE. Weathering: Negligible	18.00	11.51		N = 50/0 mm (25, 50)
18.85	100	56	33									
19								Discontinuities 18.0-22.15m 0-10° very closely to medium spaced smooth planar tight to partly open, clean. Occasional extremely closely spaced fractures in mudstone				
19.70	100	84	46					18.0-18.12m Fracture 90° smooth planar				
	100	64	0					18.60-18.86m Fracture 90° smooth planar				

REMARKS					WATER STRIKE DETAILS					
Hole cased 0.00-18.00m					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
					GROUNDWATER DETAILS					
INSTALLATION DETAILS					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	14-03-13	15.00	15.00	14.00	Water level recorded 10mins after end of drilling	
20-03-13	18.00	15.00	18.00	50mm SP	15-03-13	15.00	15.00	12.50	Water level recorded at start of shift	

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC06
		SHEET Sheet 3 of 3
CO-ORDINATES 317,620.73 E 254,276.17 N	RIG TYPE Casagrande C6	DATE DRILLED 14/03/2013
GROUND LEVEL (mOD) 29.51	FLUSH Air/Mist	DATE LOGGED 20/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20	20.15							19.70m Coarse sand-sized disseminated cubic pyrite Medium strong thinly bedded grey fine grained agrillaceous LIMESTONE with occasional medium to widely spaced medium strong to weak very thin black MUDSTONE. Weathering: Negligible				
	20.50	100	57	34								
	20.95	100	80	31								
21	21.50	100	73	42								
	21.80	100	90	37								
22	22.15	100	14	0				Discontinuities 18.0-22.15m 0-10° very closely to medium spaced smooth planar tight to partly open, clean. Occasional extremely closely spaced fractures in mudstone (<i>continued</i>) 21.26-21.30m Soft to firm black CLAY with some subangular gravel-sized fragments of very weak mudstone	22.15	7.36		
								SYMMETRIX DRILLING: No recovery, observed by driller as returns of LIMESTONE				
23												
24								End of Borehole at 22.15 m	24.00	5.51		
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-18.00m					WATER STRIKE DETAILS				
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)
					No water strike recorded				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
					Date	Hole Depth	Casing Depth	Depth to Water	Comments
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments
20-03-13	18.00	15.00	18.00	50mm SP	15-03-13	20.50	18.00	17.30	Water level recorded at end of shift
					19-03-13	20.50	18.00	18.70	Water level recorded at start of shift
					19-03-13	22.15	18.00	20.00	Water level recorded at end of shift

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC07
		SHEET Sheet 1 of 2
CO-ORDINATES 319,149.60 E 254,283.62 N		DATE DRILLED 03/04/2013
GROUND LEVEL (mOD) 21.61		DATE LOGGED 04/04/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL
RIG TYPE Casagrande C6		
FLUSH Air/Mist		
INCLINATION (deg) -90		
CORE DIAMETER (mm) 90		

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4												
5												
6												
7												
8								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill	7.50	14.11		
9												

REMARKS Hole cased 0.00-15.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					12.00					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
04-04-13	13.00	11.50	13.00	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC07
		SHEET Sheet 2 of 2
CO-ORDINATES 319,149.60 E 254,283.62 N	RIG TYPE Casagrande C6 FLUSH Air/Mist	DATE DRILLED 03/04/2013
GROUND LEVEL (mOD) 21.61		DATE LOGGED 04/04/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill (<i>continued</i>)	10.60	11.01		
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay				
12								SYMMETRIX DRILLING: No recovery, observed by driller as returns of SAND	12.00	9.61		
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY	12.80	8.81		
14								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly BOULDERS (Possible Weathered Rockhead)	13.50	8.11		N = 50/0 mm (25, 50)
15								Medium strong thinly to medium bedded dark grey fine to medium grained argillaceous LIMESTONE with medium to widely spaced very thin medium strong black MUDSTONE bands. Weathering: Loss of wall strength to very weak in extremely closely fractured / laminated mudstone. (16.40 - 16.48m)	15.00	6.61		N = 50/0 mm (25, 50)
16		100	86	49				Discontinuities 15.0-17.80m 0-10° extremely closely to medium predominantly closely spaced smooth planar tight, clean.				
17		100	97	16				15.45-15.48m Non intact angular to subangular gravel-sized fragments of argillaceous limestone with some black clay				
17.10		100	100	0				15.92-16.32m Fracture 80° to subvertical smooth undulating with thin (1-2mm thick) brown CLAY veneer				
17.16		94	78	45				17.34-17.43m Fracture 60° smooth planar with brown non-penetrative discolouration				
17.80								End of Borehole at 17.80 m	17.80	3.81		
18												
19												

REMARKS Hole cased 0.00-15.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					12.00					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	03-04-13	12.50	12.50	DRY	DRY at end of shift	
04-04-13	13.00	11.50	13.00	50mm SP	04-04-13	12.50	12.50	10.00	Water level recorded at start of shift	
					04-04-13	17.80	15.00	9.30	Water level recorded at end of borehole	

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme			DRILLHOLE NO RC09	
CO-ORDINATES 319,367.32 E 254,356.57 N			SHEET Sheet 1 of 2	
GROUND LEVEL (mOD) 22.96			DATE DRILLED 05/04/2013	
CLIENT Fingal County Council			DATE LOGGED 06/04/2013	
ENGINEER			DRILLED BY M. Newland	
			LOGGED BY JL	

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
<div style="display: flex; justify-content: space-between;"> <div style="width: 10%;"> <p>0</p><p>1</p><p>2</p><p>3</p><p>4</p><p>5</p><p>6</p><p>7</p><p>8</p><p>9</p> </div> <div style="width: 30%; text-align: center;"> <p>0 250 500</p> </div> <div style="width: 10%; text-align: center;"> <p>Legend</p> </div> <div style="width: 40%;"> <p>SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay</p> </div> </div>												

REMARKS						WATER STRIKE DETAILS					
Hole cased 0.00-15.0m						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						11.00					
INSTALLATION DETAILS						GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type		Date	Hole Depth	Casing Depth	Depth to Water	Comments	
06-04-13	12.00	10.00	12.00	50mm SP							

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC09
		SHEET Sheet 2 of 2
CO-ORDINATES 319,367.32 E 254,356.57 N	RIG TYPE Casagrande C6 FLUSH Air/Mist	DATE DRILLED 05/04/2013
GROUND LEVEL (mod) 22.96		DATE LOGGED 06/04/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of boulder clay (<i>continued</i>)				
11												
12												
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of black CLAY (Possible Weathered Rockhead)	13.00	9.96		N = 50/10 mm (6, 19, 50)
14												
15								Medium strong to strong medium to thickly bedded dark grey fine grained argillaceous LIMESTONE. Weathering: Negligable	15.00	7.96		N = 50/0 mm (25, 50)
16	100	73	55					Discontinuities 15.0-18.0m 0-10° closely to medium spaced smooth planar to undulating, tight, clean. Rare brown surface discolouration on fracture surfaces (16.50m & 17.80m)				
16.50												
17	100	67	57									
18.00								End of Borehole at 18.00 m	18.00	4.96		
19												

REMARKS Hole cased 0.00-15.0m					WATER STRIKE DETAILS						
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments	
					11.00						
INSTALLATION DETAILS					GROUNDWATER DETAILS						
					Date	Hole Depth	Casing Depth	Depth to Water	Comments		
Date	Tip Depth	RZ Top	RZ Base	Type	05-04-13	18.00	15.00	10.20	Water level recorded at end of shift		
06-04-13	12.00	10.00	12.00	50mm SP	06-04-13	18.00	15.00	3.30	Water level recorded at start of shift		

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC10
CO-ORDINATES 325,356.52 E 257,579.62 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 41.73	RIG TYPE Knebel	DATE DRILLED 08/05/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 09/05/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
7									7.20	34.53		
8								SYMMETRIX DRILLING: No recovery, observed by driller as returns of limestone fragments (Possible Weathered Rockhead)	8.20	33.53		
9	9.10	100	60	43								
		100	61	44				9.38-9.53m Reduction of core to black gravelly CLAY. Notably brecciated material with a network of extremely closely spaced calcite veins				

REMARKS Hole cased 0.0m-8.20m					WATER STRIKE DETAILS				
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)
					No water strike recorded				
INSTALLATION DETAILS					GROUNDWATER DETAILS				
					Date	Hole Depth	Casing Depth	Depth to Water	Comments
Date	Tip Depth	RZ Top	RZ Base	Type	09-05-13	9.10	8.20	6.50	Water level recorded at start of shift

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC10
CO-ORDINATES 325,356.52 E 257,579.62 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 41.73	RIG TYPE Knebel	DATE DRILLED 08/05/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 09/05/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								9.88-10.02m Fracture 75° rough planar with calcite veneer on fracture surface				
10.50								Medium Strong dark greyish black very thin to thinly bedded fine grained argillaceous LIMESTONE with occasional widely spaced thin (<2mm) calcite vein. Weathering: Rare pitting of calcite veinfill (10.25m). Rare orange brown / yellow non-penetrative discolouration of calcite veinfill (15.60-16.20m)				
11.00	100	40	18									
11.40	100	90	25					Discontinuities 8.20-17.60m 35-55° very closely to medium spaced predominantly closely spaced smooth planar clean, partly open to open occasionally with thin calcite veneer on fracture surfaces. (continued)				
12.40	100	54	27									
13.70	100	73	50					11.68-11.72m & 12.50-12.54m & 15.42-15.45m Bands of black gravelly CLAY. Gravel is angular fine to medium platy of extremely weak to very weak muddy limestone / mudstone.				
14.80	100	65	65					14.22-14.27m Fracture subvertical smooth planar with calcite veneer on fracture surface				
15.60	100	80	54					16.30m & 16.55m 2 No. fractures 65° smooth planar with calcite veneer on fracture surfaces				
16.20	100	45	22									
16.80	100	88	65									
17.60	100	72	51						17.60	24.13		
18								End of Borehole at 17.60 m				

REMARKS Hole cased 0.0m-8.20m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC11
CO-ORDINATES 326,914.15 E 257,853.74 N		SHEET Sheet 1 of 2
GROUND LEVEL (mOD) 28.92	RIG TYPE Knebel	DATE DRILLED 01/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 04/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill	3.80	25.12		
5								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy gravelly CLAY with occasional limestone boulders	4.80	24.12		
6	6.30	100	0	0				Strong grey calcisiltite limestone BOULDER with some stiff to very stiff yellow brown to brown sandy gravelly CLAY	5.30	23.62		
7								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy gravelly CLAY with occasional limestone boulders	6.30	22.62		
8								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy Boulder CLAY	7.80	21.12		N = 50/260 mm (9, 12, 16, 11, 16, 7)
9												N = 45 (7, 9, 10, 10, 14, 11)

REMARKS Hole cased 0.00-13.40m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					15.60					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC11
CO-ORDINATES 326,914.15 E 257,853.74 N		SHEET Sheet 2 of 2
GROUND LEVEL (mOD) 28.92	RIG TYPE Knebel	DATE DRILLED 01/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 04/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy Boulder CLAY (<i>continued</i>)				N = 50/95 mm (25, 38, 12)
11												
12								SYMMETRIX DRILLING: No recovery, observed by driller as returns of greyish brown LIMESTONE with some calcite veinfill	12.10	16.82		N = 50/190 mm (6, 11, 17, 21, 12)
13												
14	14.40	100	90	52				Strong massively bedded light grey and brown calcisiltite LIMESTONE with significant brecciation coupled with penetrative brown discoloration and honeycomb dissolution features / pitting of core walls (up to 20mm). Weathering: Slight loss of core strength in areas displaying dissolution to medium strong occasionally weak	13.40	15.52		
15	15.40	100	96	41				Discontinuities 13.40-16.10m SET 1: 0-10° closely to medium spaced rough undulating occasionally smooth partly open, occasionally with brown fine sand on fracture surfaces. SET 2: Subvertical widely spaced rough undulating, open with yellow clay smearing on fracture surfaces				
16		100	92	44					16.10	12.82		
17	17.00							Medium strong medium bedded light grey green fine grained argillaceous LIMESTONE with localised brecciation often loosely cemented. Weathering: Occasional loss of wall strength to weak at fractures. Penetrative (up to 5mm) orange brown discoloration noted on subvertical fracture surfaces				
18		100	88	31				Discontinuities 16.10-19.30m SET 1: 0-10° closely spaced rough undulating tight to partly open, clean. SET 2: 60-80° closely to medium spaced rough undulating, open often displaying orange brown discoloration, occasionally with light grey green sandy CLAY veneer on surfaces. Fracture set often associated with non intact angular to subrounded fine to medium gravel-sized fragments of light grey green limestone.				
19	18.50	100	100	95				18.35-18.50m 10mm thick subvertical to undulating calcite vein				
	19.30							End of Borehole at 19.30 m	19.30	9.62		

REMARKS					WATER STRIKE DETAILS					
Hole cased 0.00-13.40m					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					15.60					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC12
CO-ORDINATES 327,094.71 E 257,945.22 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 15.45	RIG TYPE Knebel	DATE DRILLED 04/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 08/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500		0 1 2 3 4 5 6 7 8 9	SYMMETRIX DRILLING: No recovery, observed by driller as returns of Brown TOPSOIL SYMMETRIX DRILLING: No recovery, observed by driller as returns of Brown sandy gravelly Boulder CLAY	0.20	15.25		N = 44 (9, 12, 15, 10, 8, 11) N = 50/205 mm (6, 9, 14, 18, 18) N = 50/175 mm (4, 10, 12, 29,

REMARKS Hole cased 0.00m-20.50m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					14.80					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
08-03-13	16.50	10.50	16.50	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC12
CO-ORDINATES 327,094.71 E 257,945.22 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 15.45	RIG TYPE Knebel	DATE DRILLED 04/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 08/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of greyish brown LIMESTONE, possible boulder	10.10	5.35		9)
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Brown sandy CLAY	10.90	4.55		N = 38 (6, 6, 8, 9, 9, 12)
12												N = 50/60 mm (25, 50)
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Soft dark brown sandy CLAY with some limestone fragments (Possible Weathered Rockhead)	13.20	2.25		N = 21 (2, 4, 5, 6, 5, 5)
14												N = 22 (3, 4, 4, 7, 5, 6)
15												N = 38 (6, 13, 16, 8, 7, 7)
16												N = 25 (4, 6, 6, 4, 7, 8)
17												
18												
19												

REMARKS Hole cased 0.00m-20.50m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					14.80					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
08-03-13	16.50	10.50	16.50	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC12
CO-ORDINATES 327,094.71 E 257,945.22 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 15.45	RIG TYPE Knebel	DATE DRILLED 04/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 08/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20					0 250 500				20.50	-5.05		
21	0	0	0					Medium strong dark greyish brown argillaceous LIMESTONE recovered as angular to subangular medium to coarse gravel-sized fragments. (Poor Recovery)				
22	6	0	0					Discontinuities 20.50-24.80m Difficult to discern given non-intact nature				
23	13	0	0									
24								End of Borehole at 23.20 m	24.80	-9.35		
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00m-20.50m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					14.80					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						
08-03-13	16.50	10.50	16.50	50mm SP						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC13
CO-ORDINATES 323,822.42 E 241,678.81 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 9.21	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 27/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4												
5												
6									6.50	2.71		
7								SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill				
8												
9												

REMARKS Hole cased 0.00-24.50m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					15.00					Slow
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC13
CO-ORDINATES 323,822.42 E 241,678.81 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 9.21	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 27/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill (continued)				
11												
12												
13												
14								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy very gravelly clay with occasional cobbles and boulders.	13.50	-4.29		N = 45 (9, 12, 10, 9, 12, 14)
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey/brown sandy very gravelly clay with occasional cobbles and boulders - possible highly weathered rock.	14.80	-5.59		N = 21/100 mm (25, 29, 14, 7)
16												
17												N = 50/190 mm (16, 9, 17, 19, 14)
18												N = 75/100 mm (25, 50)
19												

REMARKS Hole cased 0.00-24.50m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						15.00					Slow
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC13
CO-ORDINATES 323,822.42 E 241,678.81 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 9.21	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 27/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey/brown sandy very gravelly clay with occasional cobbles and boulders - possible highly weathered rock. (continued)				
21												
22												
23												
24								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey solid rock	23.60	-14.39		
24.50								Medium strong to very strong, medium to thinly bedded, grey/pale grey fine-grained, LIMESTONE (locally plastically sheared), fresh to slightly weathered.	24.50	-15.29		
25		100	76	21				Discontinuities are medium to closely spaced, rough, irregular. Apertures are tight to moderately open, locally clay-smearred, commonly moderately iron-oxide stained, locally calcite-veined (1-3mm thick). Dips are 45° & sub-vertical.				
26												
26.00												
27		100	92	32								
27.45								End of Borehole at 27.45 m	27.45	-18.24		
28												
29												

REMARKS Hole cased 0.00-24.50m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					15.00					Slow
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	27-02-13	27.45	24.50	12.80	Water level recorded 10mins after end of drilling	

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC14A
CO-ORDINATES 324,661.67 E 242,270.67 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 2.78	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 28/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sand				
1												
2												
3												
4												
5												
6												
7									7.30	-4.52		
8							x	SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey silty fine sand				
9							x					

REMARKS Hole cased 0.00-20.20m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						7.30					Slow
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC14A
CO-ORDINATES 324,661.67 E 242,270.67 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 2.78	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 28/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500		x	SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey silty fine sand (<i>continued</i>)				
11							x					
12							x	SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey clay	12.00	-9.22		
13							x					
14							x	SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy very gravelly clay with occasional cobbles and boulders - possible highly weathered rock.	13.50	-10.72		
15							x					
16							x	SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey highly weathered rock.	15.40	-12.62		
17							x					
18							x					
19							x					
							x		19.70	-16.92		

N = 50/115
mm
(8, 17, 29, 21)

REMARKS Hole cased 0.00-20.20m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						7.30					Slow
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC14A
CO-ORDINATES 324,661.67 E 242,270.67 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 2.78	RIG TYPE Knebel	DATE DRILLED 27/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 28/02/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20	20.20							<p>SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey solid rock (<i>continued</i>)</p> <p>Medium strong to very strong, medium to thinly bedded, grey/pale grey fine-grained, LIMESTONE (locally plastically sheared, predominately calci-siltite but grading into argillaceous limestone approx every 1.00m), fresh to moderately weathered (at 20.80-20.91m).</p> <p>Discontinuities are medium to closely spaced, rough, planar. Apertures are tight to open, locally clay-smearred, locally slightly iron-oxide stained, locally calcite-veined (1-30mm thick). Dips are 45-60°.</p>	20.20	-17.42		
21	21.20	100	70	26								
22	22.70	100	94	45				End of Borehole at 22.70 m	22.70	-19.92		
23												
24												
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-20.20m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					7.30					Slow
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	28-02-13	22.70	20.20	3.80	Water level recorded 10mins after end of drilling	

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC15
		SHEET Sheet 1 of 4
CO-ORDINATES 313,067.51 E 247,660.39 N	RIG TYPE Casagrande C6	DATE DRILLED 21/03/2013
GROUND LEVEL (mOD) 78.49	FLUSH Air/Mist	DATE LOGGED 25/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								Cased down Shell & Auger Hole				
4		100	35	15				Medium strong to strong medium to thinly bedded grey and dark grey black fine grained argillaceous LIMESTONE with occasional widely spaced medium thickness band of calcisiltite LIMESTONE (3.70-3.90m, 7.50-7.70m, 8.80-9.11m, 28.95-29.90m) and occasional medium to widely spaced very thin calcite vein (rarely showing plastic shearing at 12.80-13.0m) Weathering: Slight brown and yellow brown non-penetrative staining on fracture surfaces (3.40-4.55m). Otherwise Negligible.	3.40	75.09		
4.70		100	85	25								
5.10		100	77	39				Discontinuities 3.40-8.25m SET 1: 0-10° closely spaced smooth planar tight, clean with rare yellow brown non-penetrative discolouration. SET 2: Subvertical widely spaced smooth planar to undulating partly open with occasional very thin calcite (~1mm) veneer on exposed surfaces - possible failed calcite vein				
6.45		100	89	61								
7		100	89	61								
7.70		100	100	95				7.45-7.70m Incipient subvertical fracture with brown staining along fracture				
8		100	100	95								
8.25		100	100	95								
8.80		100	100	93				Discontinuities 8.25-29.80m SET 1: 0-10° closely to widely spaced predominantly medium spaced tight, clean. SET 2: 45-60° medium to widely spaced smooth planar occasionally undulating tight clean				
9		100	100	93								
9.65		100	100	100								
9.95		100	100	100								

REMARKS Hole cased 0.00-3.40m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					3.50					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	21-03-13	3.40	1.20	Water level recorded at start of shift		
					21-03-13	9.65	6.00	Water level recorded at end of shift		
					22-03-13	9.65	3.40	0.00	Water level recorded at start of shift	

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REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC15
		SHEET Sheet 2 of 4
CO-ORDINATES 313,067.51 E 247,660.39 N		DATE DRILLED 21/03/2013
GROUND LEVEL (mOD) 78.49		DATE LOGGED 25/03/2013
CLIENT Fingal County Council		RIG TYPE Casagrande C6
		FLUSH Air/Mist
		INCLINATION (deg) -90
ENGINEER		DRILLED BY M. Newland
		LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10		100	100	100				Medium strong to strong medium to thinly bedded grey and dark grey black fine grained argillaceous LIMESTONE with occasional widely spaced medium thickness band of calcisiltite LIMESTONE (3.70-3.90m, 7.50-7.70m, 8.80-9.11m, 28.95-29.90m) and occasional medium to widely spaced very thin calcite vein (rarely showing plastic shearing at 12.80-13.0m) Weathering: Slight brown and yellow brown non-penetrative staining on fracture surfaces (3.40-4.55m). Otherwise Negligable.				
11.05		100	100	92								
11.95		100	100	100				Discontinuities 3.40-8.25m SET 1: 0-10° closely spaced smooth planar tight, clean with rare yellow brown non-penetrative discolouration. SET 2: Subvertical widey spaced smooth planar to undulating partly open with occasional very thin calcite (~1mm) veneer on exposed surfaces - possible failed calcite vein (<i>continued</i>)				
12.30		100	100	100								
13		100	100	93				13.70-13.95m Incipient fracture 70° partly open				
13.50		100	100	88								
14		100	100	88				15.45m Cluster of cubic pyrite along incipient subvertical fracture tight 15.50-15.80m 75° fracture smooth stepped				
14.80		100	100	71								
15		100	100	71				16.35-16.70m Incipient subvertical fracture tight				
15.45		100	100	100								
16		100	100	100				19.60-19.70m 45° fracture smooth planar with non-penetrative yellow brown discolouration				
16.80		100	100	97								
17		100	100	97								
18		100	100	94								
18.30		100	100	94								
19		100	100	94								
19.70												

REMARKS Hole cased 0.00-3.40m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					3.50					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	22-03-13	14.80	3.40	3.00	Water level recorded at end of shift	
					25-03-13	14.80	3.40	1.35	Water level recorded at start of shift	

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REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC15
		SHEET Sheet 3 of 4
CO-ORDINATES 313,067.51 E 247,660.39 N	RIG TYPE Casagrande C6 FLUSH Air/Mist	DATE DRILLED 21/03/2013
GROUND LEVEL (mOD) 78.49		DATE LOGGED 25/03/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20		100	100	100								
21	21.20							21.60-22.0m 70-80° fracture smooth undulating with orange brown non-penetrative discolouration on fracture surfaces				
22	22.30	100	100	100				22.40-22.50m 50° fracture smooth undulating with orange brown non-penetrative discolouration on fracture surfaces	23.00	55.49		
23	23.00							23.40-24.80m Strong matrix-supported fossiliferous mud-rich wackestone LIMESTONE (clasts up to 45mm)				
24	24.40							24.0-25.0m Possible Limestone boulder				
25	25.90	97	93	73				25.0-25.10m Thin calcite (10mm) veinfill reduced to weak wall strength				
26	26.67							25.67-25.68 Soft grey CLAY veneer on non-intact angular medium to coarse gravel fragments				
27	27.40	100	90	69								
28	28.00	100	100	100								
28	28.65	100	92	77								
28	28.95	100	100	100								
29	29.80	100	88	88				29.70-29.80m Non-intact angular medium to coarse				

REMARKS					WATER STRIKE DETAILS					
Hole cased 0.00-3.40m					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					3.50					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
Date	Tip Depth	RZ Top	RZ Base	Type	Date	Hole Depth	Casing Depth	Depth to Water	Comments	
25-03-13	23.00					23.00	3.40	2.85	Water level recorded at end of borehole	

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REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC15
		SHEET Sheet 4 of 4
CO-ORDINATES 313,067.51 E 247,660.39 N		DATE DRILLED 21/03/2013
GROUND LEVEL (mOD) 78.49		DATE LOGGED 25/03/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL
RIG TYPE Casagrande C6		
FLUSH Air/Mist		
INCLINATION (deg) -90		
CORE DIAMETER (mm) 90		

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
30					0 250 500			gravel-sized fragments of strong argillaceous limestone End of Borehole at 23.00 m				
31												
32												
33												
34												
35												
36												
37												
38												
39												

REMARKS Hole cased 0.00-3.40m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					3.50					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

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GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC17
		SHEET Sheet 1 of 2
CO-ORDINATES 315,274.53 E 251,201.85 N	RIG TYPE Casagrande C6 FLUSH Air/Mist	DATE DRILLED 27/03/2013
GROUND LEVEL (mOD) 23.43		DATE LOGGED 02/04/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								Cased down Shell & Auger Hole				
1												
2												
3								Driller Reports Stiff black CLAY with cobbles. Cobbles are subangular to subrounded of arenaceous limestone	3.00	20.43		
4	4.00	10	0	0								
5	5.00	80	0	0				Highly Weathered Rockhead recovered as angular to subangular gravel- and cobble-sized fragments of Medium strong to very weak black and grey argillaceous LIMESTONE with subordinate black MUDSTONE. Frequent cobble-sized pockets of firm black gravelly clay (Poor Recovery). Weathering: Recovery completely non-intact. Rare orange brown surface discolouration on cobble-sized fragments of argillaceous limestone. (8.0 - 8.10m)	4.50	18.93		N = 50/0 mm (9, 16, 50)
6								Discontinuities 4.50-13.0m Core recovered non intact				N = 50/10 mm (17, 8, 50)
7												
8	7.80	100	0	0								N = 50/0 mm (18, 7, 50)
9	9.00	58	0	0								
	9.50	50	0	0								N = 50/0 mm (25, 50)

REMARKS Hole cased 0.00-12.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					1.20					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	27-03-13	3.10	1.20	1.20	Water level recorded in open cable tool pre-bore	
					27-03-13	7.50	7.50	5.50	Water level recorded at end of shift	
					28-03-13	7.50	7.50	0.20	Water level recorded at start of shift	

IGSL RC Fl 10M 16695.GPJ IGSLGDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC17
		SHEET Sheet 2 of 2
CO-ORDINATES 315,274.53 E 251,201.85 N		DATE DRILLED 27/03/2013
GROUND LEVEL (mOD) 23.43		DATE LOGGED 02/04/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	30	0	0	0				Highly Weathered Rockhead recovered as angular to subangular gravel- and cobble-sized fragments of Medium strong to very weak black and grey argillaceous LIMESTONE with subordinate black MUDSTONE. Frequent cobble-sized pockets of firm black gravelly clay (Poor Recovery). Weathering: Recovery completely non-intact. Rare orange brown surface discolouration on cobble-sized fragments of argillaceous limestone. (8.0 - 8.10m)				N = 50/0 mm (16, 9, 50)
10.50												
11.00	100	0	0									
11.50												
12.00	50	0	0									
12.50	80	0	0				Discontinuities 4.50-13.0m Core recovered non intact (continued)					
13.00	100	0	0						13.00	10.43		
13.70	100	56	47					Medium strong dark grey and black very thin to thinly bedded fine grained argillaceous LIMESTONE with closely to medium spaced very thin weak MUDSTONE bands and occasional firm black clay often associated with brecciated limestone material (13.10-13.26, 13.45-13.61m & 14.44-14.75m). Weathering: Mudstone bands display occasional loss of wall strength to very weak.				
14.50	92	59	19					Discontinuities 13.0-15.0m 0-10° very closely to closely spaced smooth planar occasionally associated with angular non intact gravel-sized fragments of argillaceous limestone and mudstone, partly open, with occasional black clay smear (<2mm)				
15.00								End of Borehole at 15.00 m	15.00	8.43		

REMARKS Hole cased 0.00-12.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					1.20					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	28-03-13	13.00	12.00	9.00	Water level recorded at end of shift	
					02-04-13	13.00	12.00	2.00	Water level recorded at start of shift	
					02-04-13	15.00	12.00	9.00	Water level recorded at end of borehole	

IGSL RC F1 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC19
CO-ORDINATES 320,704.27 E 255,469.62 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 34.01	RIG TYPE Knebel	DATE DRILLED 28/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 01/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4								SYMMETRIX DRILLING: No recovery, observed by driller as returns of madeground consisting of Shell & Auger Fill	3.80	30.21		
5												
6												
7												
8												
9									9.70	24.31		

REMARKS Hole cased 0.00-20.00m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
											No water strike recorded
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC19
CO-ORDINATES 320,704.27 E 255,469.62 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 34.01	RIG TYPE Knebel	DATE DRILLED 28/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 01/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy very gravelly clay with occasional cobbles and boulders. <i>(continued)</i>	11.80	22.21		N = 50/180 mm (10, 14, 19, 22, 9)
11								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey sandy very gravelly clay with occasional cobbles and boulders.				N = 40 (6, 8, 9, 11, 8, 12)
12								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey very sandy gravelly clay with occasional cobbles and boulders.	14.10	19.91		N = 50/115 mm (9, 13, 27, 23)
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey very sandy gravelly clay with occasional cobbles and boulders.				N = 75/110 mm (25, 50)
14								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy gravelly clay with occasional cobbles and boulders.	17.90	16.11		N = 50/145 mm (19, 6, 23, 27)
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy gravelly clay with occasional cobbles and boulders.				N = 47 (7, 10, 9, 8, 14, 16)
16								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy very gravelly clay with occasional	19.60	14.41		
17								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown sandy very gravelly clay with occasional	20.00	14.01		

REMARKS Hole cased 0.00-20.00m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						No water strike recorded					
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC FL 10M 16695.GPJ IGSLGDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC19
CO-ORDINATES 320,704.27 E 255,469.62 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 34.01	RIG TYPE Knebel	DATE DRILLED 28/02/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 01/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm)	LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20					0 250 500 ----- ----- -----			cobbles and boulders - possible highly weathered rock. End of Borehole at 20.00 m				
21												
22												
23												
24												
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-20.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
										No water strike recorded
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER
16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC20
CO-ORDINATES 324,487.08 E 257,266.58 N		SHEET Sheet 1 of 3
GROUND LEVEL (mOD) 54.06	RIG TYPE Knebel	DATE DRILLED 11/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4												
5												
6												
6.50									6.50	47.56		
7								SYMMETRIX DRILLING: No recovery, observed by driller as returns of Shell & Auger Fill				
8												
9												

REMARKS Hole cased 0.00-17.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					13.20					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC20
CO-ORDINATES 324,487.08 E 257,266.58 N		SHEET Sheet 2 of 3
GROUND LEVEL (mOD) 54.06	RIG TYPE Knebel	DATE DRILLED 11/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10					0 250 500			SYMMETRIX DRILLING: No recovery, observed by driller as returns of stiff grey gravelly boulder clay	10.20	43.86		
11												N = 50/135 mm (8, 16, 24, 26)
12									12.80	41.26		
13								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown very sandy gravelly boulder clay				N = 29 (6, 7, 7, 10, 6, 6)
14									14.00	40.06		
15								SYMMETRIX DRILLING: No recovery, observed by driller as returns of stiff grey gravelly boulder clay				N = 50/215 mm (11, 14, 15, 18, 17)
16									16.10	37.96		N = 50/125 mm (25, 29, 21)
17								SYMMETRIX DRILLING: No recovery, observed by driller as returns of black heavily fractured rock / Possible fault breccia.	17.00	37.06		
18		7	0	0				Medium strong dark grey argillaceous LIMESTONE with occasional gravel-sized pocket of firm black clay recovered as angular to subangular medium to coarse gravel-sized fragments. Weathering: Negligable.				
18.50								Discontinuities 17.0-21.20m Difficult to discern given non-intact nature				
19												
19.80		15	0	0					19.80	34.26		

REMARKS Hole cased 0.00-17.0m						WATER STRIKE DETAILS					
						Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
						13.20					
INSTALLATION DETAILS						GROUNDWATER DETAILS					
						Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type							

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC20
CO-ORDINATES 324,487.08 E 257,266.58 N		SHEET Sheet 3 of 3
GROUND LEVEL (mOD) 54.06	RIG TYPE Knebel	DATE DRILLED 11/03/2013
CLIENT Fingal County Council	FLUSH Air/Mist	DATE LOGGED 11/03/2013
ENGINEER	INCLINATION (deg) -90	DRILLED BY Petersen
	CORE DIAMETER (mm) 82	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
20		39	6	0				Medium strong dark grey brecciated argillaceous LIMESTONE with multiple very closely spaced incipient fractures and much firm black clay. Frequent very thin hair-line calcite veins associated with brecciation. <i>(continued)</i>	20.70	33.36		
20.70								No Recovery	21.20	32.86		
21	21.20	0	0	0				End of Borehole at 21.20 m				
22												
23												
24												
25												
26												
27												
28												
29												

REMARKS Hole cased 0.00-17.0m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					13.20					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type						

IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC24
		SHEET Sheet 1 of 2
CO-ORDINATES 317,067.22 E 249,126.22 N	RIG TYPE Casagrande C6	DATE DRILLED 02/04/2013
GROUND LEVEL (mOD) 10.76	FLUSH Air/Mist	DATE LOGGED 03/04/2013
CLIENT Fingal County Council	INCLINATION (deg) -90	DRILLED BY M. Newland
ENGINEER	CORE DIAMETER (mm) 90	LOGGED BY JL

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					0 250 500			Cased down Shell & Auger Hole				
1												
2												
3												
4									4.20	6.56		
5								SYMMETRIX DRILLING: No recovery				
5.40	100	100	28					Strong grey and dark grey thin to medium bedded slightly fossiliferous fine grained argillaceous LIMESTONE with occasional thin calcite veins (<1mm) and rarely plastically sheared matrix. Weathering: Negligible	5.00	5.76		
6	100	100	100					Discontinuities 5.0-10.10m 5-20° closely to widely spaced predominantly medium spaced smooth undulating, tight to moderately open, clean				
6.60												
7	100	98	85									
7.45												
8	100	100	100									
8.75												
9	100	100	100						10.00	0.76		

REMARKS Hole cased 0.00-5.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					2.80					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	02-04-13	7.45	5.00	2.00	Water level recorded at end of shift	
					03-04-13	7.45	5.00	0.60	Water level recorded at start of shift	

IGSL RC FL 10M 16695.GPJ IGSL.GDT 10/5/13



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

16695

CONTRACT Greater Dublin Drainage Scheme		DRILLHOLE NO RC24
		SHEET Sheet 2 of 2
CO-ORDINATES 317,067.22 E 249,126.22 N		DATE DRILLED 02/04/2013
GROUND LEVEL (mOD) 10.76		DATE LOGGED 03/04/2013
CLIENT Fingal County Council		DRILLED BY M. Newland
ENGINEER		LOGGED BY JL
RIG TYPE Casagrande C6		
FLUSH Air/Mist		
INCLINATION (deg) -90		
CORE DIAMETER (mm) 90		

Downhole Depth (m)	Core Run Depth (m)	T.C.R. %	S.C.R. %	R.Q.D. %	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.10				0 250 500			End of Borehole at 10.10 m				
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS Hole cased 0.00-5.00m					WATER STRIKE DETAILS					
					Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					2.80					
INSTALLATION DETAILS					GROUNDWATER DETAILS					
					Date	Hole Depth	Casing Depth	Depth to Water	Comments	
Date	Tip Depth	RZ Top	RZ Base	Type	03-04-13	10.10	5.00	1.70	Water level recorded at end of borehole	

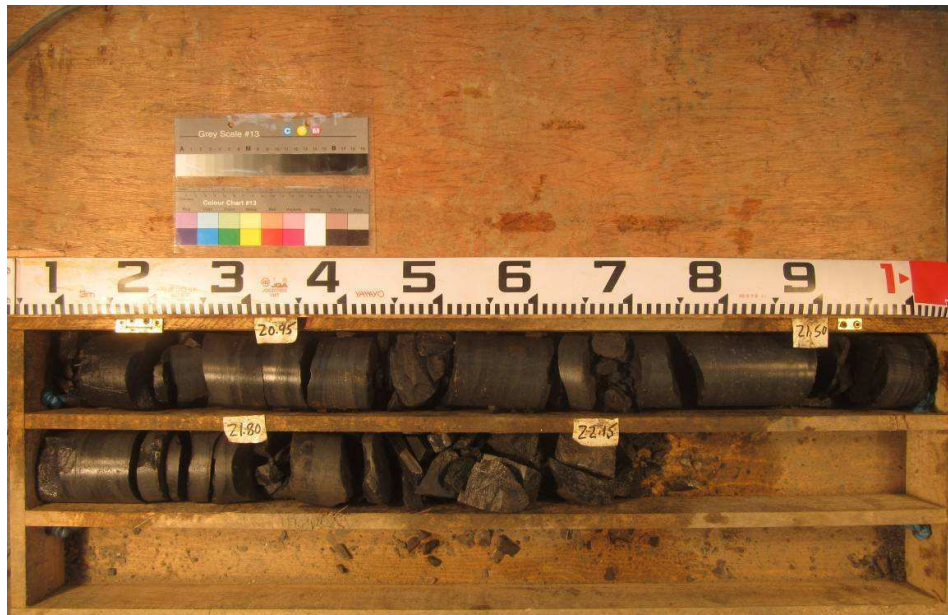
IGSL RC Fl 10M 16695.GPJ IGSL.GDT 10/5/13

16695 - Greater Dublin Drainage Scheme – Core Photography

RC06 Box 1 of 2 – 18.0-20.70m



RC06 Box 2 of 2 – 20.70-22.15m



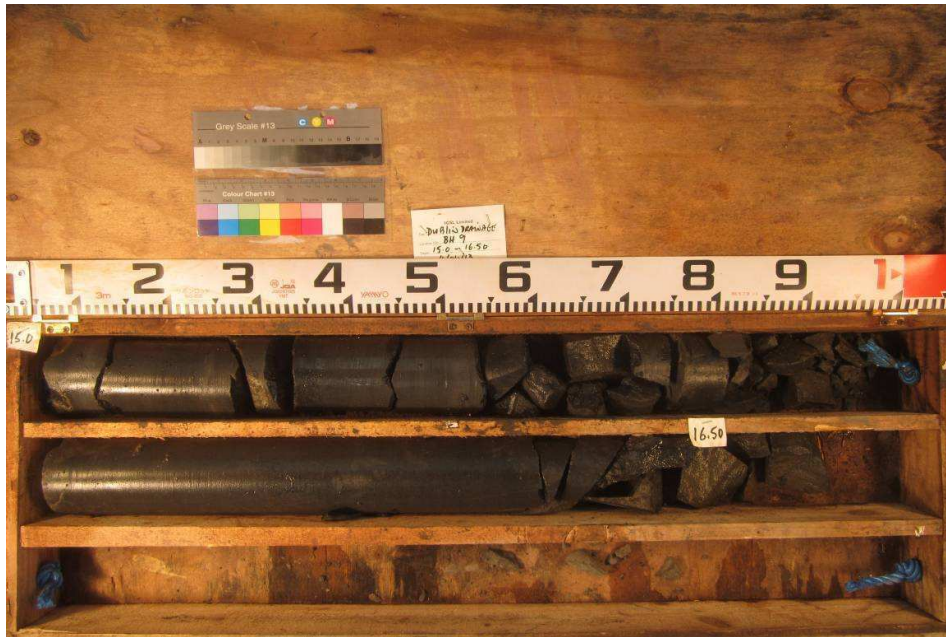
16695 - Greater Dublin Drainage Scheme – Core Photography

RC07 Box 1 of 1 – 15.0-17.80m

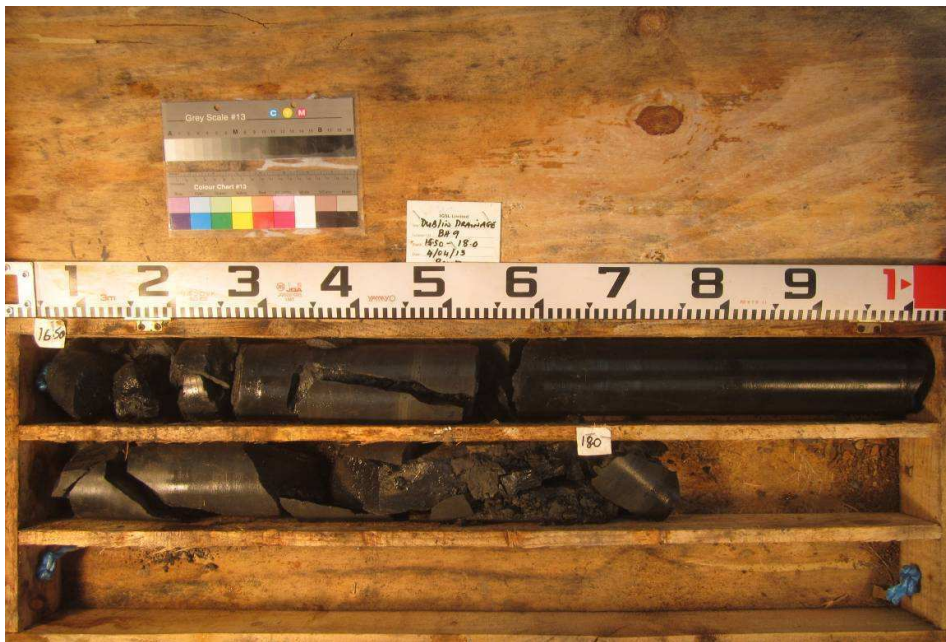


16695 - Greater Dublin Drainage Scheme – Core Photography

RC09 Box 1 of 2 – 15.0-16.50m



RC09 Box 2 of 2 – 16.50-18.0m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC10 Box 1 of 4 – 8.20-11.0m



RC10 Box 2 of 4 – 11.0-13.70m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC10 Box 3 of 4 – 13.70-16.80m



RC10 Box 4 of 4 – 16.80-17.60m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC11 Box 1 of 3 – 5.30-15.40m

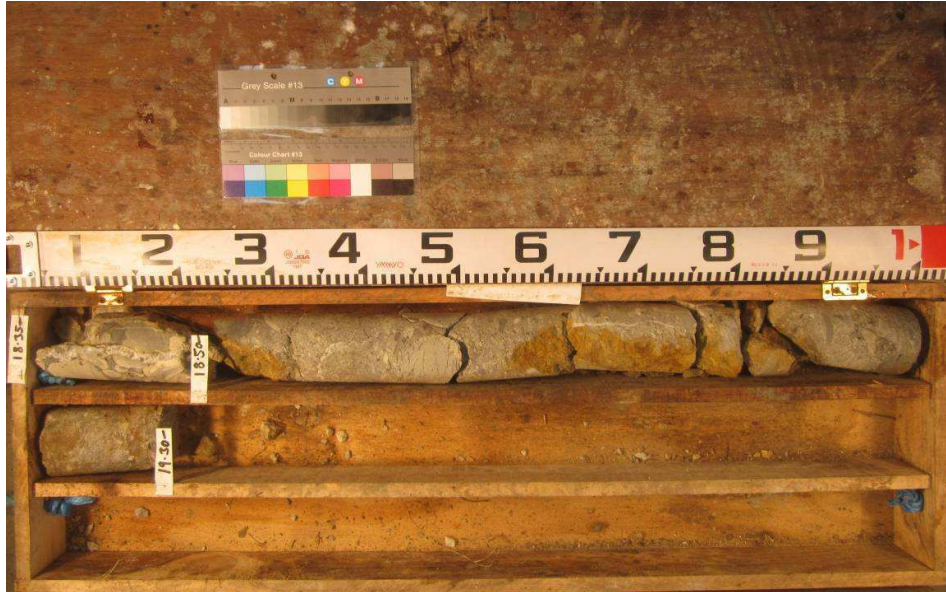


RC11 Box 2 of 3 – 15.40-18.35m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC11 Box 3 of 3 – 18.35-19.30m



RC12 Box 1 of 1



16695 - Greater Dublin Drainage Scheme – Core Photography

RC13 Box 1 of 1 – 24.50-27.45m



RC14A Box 1 of 1 – 20.20-22.70m



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RC15 Box 1 of 16 – 3.40-5.20m



RC15 Box 2 of 16 – 5.20-7.10m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 3 of 16 – 7.20-8.80m



RC15 Box 4 of 16 – 8.80-10.65m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 5 of 16 – 10.65-12.05m



RC15 Box 6 of 16 – 12.05-13.50m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 7 of 16 – 13.50-14.80m



RC15 Box 8 of 16 – 14.80-16.30m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 9 of 16 – 16.30-18.10m



RC15 Box 10 of 16 – 18.10-20.05m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 11 of 16 – 20.05-21.60m



RC15 Box 12 of 16 – 21.60-23.0m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 13 of 16 – 23.0-24.85m



RC15 Box 14 of 16 – 24.85-26.70m

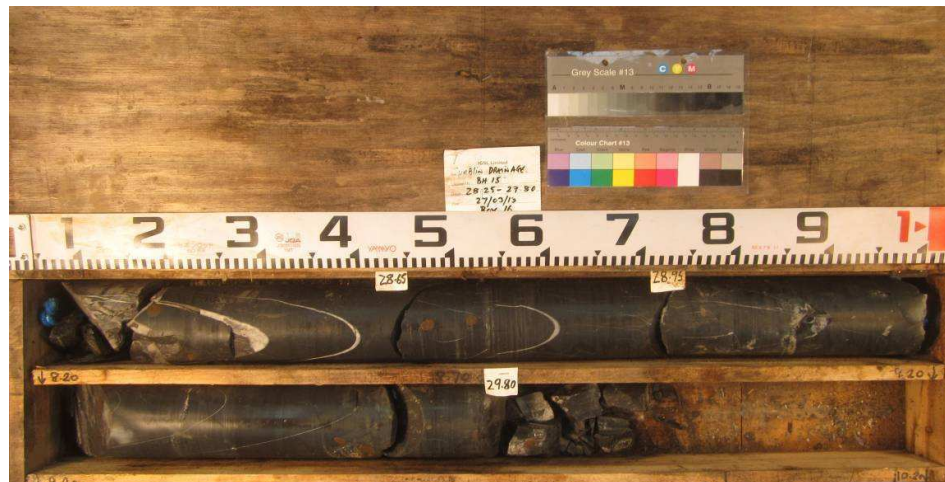


16695 - Greater Dublin Drainage Scheme – Core Photography

RC15 Box 15 of 16 – 26.70-28.25m



RC15 Box 16 of 16 – 28.25-29.80m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC17 Box 1 of 3 – 3.0-11.0m

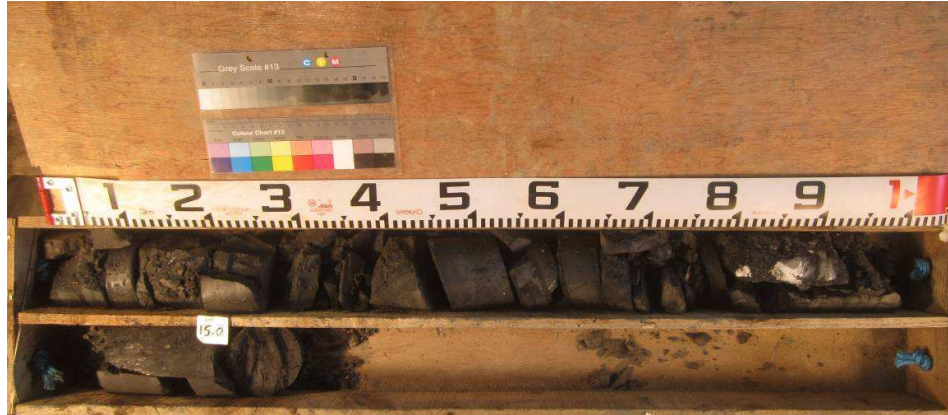


RC17 Box 2 of 3 – 11.0-13.70m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC17 Box 3 of 3 – 13.70-15.0m



RC20 Box 1 of 1 – 17.0-21.20m



16695 - Greater Dublin Drainage Scheme – Core Photography

RC24 Box 1 of 2 – 5.0-7.45m



RC24 Box 2 of 2 – 7.45-10.10m



Appendix 4

Water Monitoring Records

Water Readings



Project Name Greater Dublin Drainage Scheme

Project No. 16695

Client Fingal County Council

Date	BH04		BH01		BH02		BH05	
Elevation (m OD)	39.435		44.432		41.547		25.478	
	m bgl	m OD	m bgl	m OD	m bgl	m OD	m bgl	m OD
25/02/2013	1.32	38.12						
28/02/2013	1.24	38.20	0.78	43.65	6.00	35.55		
27/03/2013	1.03	38.41	0.30	44.13	5.78	35.77	11.88	13.60
17/04/2013								
24/04/2013	1.32	38.12	0.615	43.817	5.98	35.57	12.01	13.47
13/05/2013	1.37	38.07	0.60	43.83	6.60	34.95	12.26	13.22

Date	BH06		BH12		BH07		BH09	
Elevation (m OD)	29.511		15.452		21.613		22.957	
	m bgl	m OD	m bgl	m OD	m bgl	m OD	m bgl	m OD
25/02/2013								
28/02/2013								
27/03/2013	9.86	19.651	10.28	5.172				
17/04/2013			13.55	1.90				
24/04/2013	10.07	19.44			3.02	18.593	2.68	20.277
13/05/2013	10.04	19.47	14.23	1.22	3.5	18.113	2.71	20.247

Appendix 5

Soakaway Test Records

Soakaway Design f -value from field tests IGSL

Contract: Greater Dublin Drainage Scheme Contract No. 16695
 Test No. SA TP03
 Client Fingal County Council
 Date: 23/01/2013

Summary of ground conditions			Ground water
from	to	Description	
0.00	0.40	TOPSOIL: Soft brown slightly sandy gravelly CLAY	DRY
0.40	0.90	Soft to firm yellow brown slightly sandy silty CLAY	
0.90	2.30	Firm becoming stiff dark grey brown slightly sandy gravelly CLAY with a low to medium cobble content	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.95	0.00
0.95	0.50
0.95	1.00
0.95	1.50
0.95	2.00
0.95	2.50
0.95	3.00
0.95	3.50
0.95	4.00
0.95	4.50
0.95	5.00
0.955	8.00
0.955	12.00
0.96	25.00
0.96	35.00
0.965	45.00
0.97	55.00
0.97	60.00

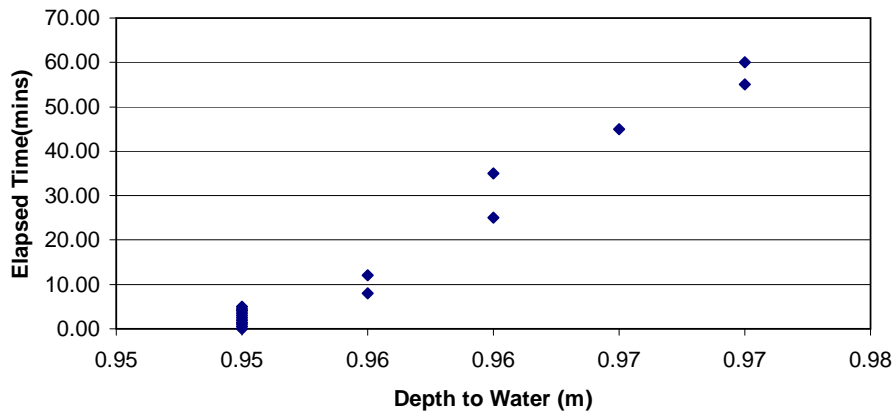
Field Test

Depth of Pit (D)	2.30	m
Width of Pit (B)	0.60	m
Length of Pit (L)	3.10	m
Initial depth to Water =	0.95	m
Final depth to water =	0.97	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.86	m ²
*Av. side area of permeable stratum over test period=	9.916	m ²
Total Exposed area =	11.776	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 5.3E-05 m/min or 8.77491E-07 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Greater Dublin Drainage Scheme Contract No. 16695
 Test No. SA TP08
 Client Fingal County Council
 Date: 24/01/2013

Summary of ground conditions			Ground water
from	to	Description	
0.00	0.40	TOPSOIL: Soft to firm brown slightly sandy CLAY	DRY
0.40	0.55	Soft to firm brown to yellow brown slightly sandy silty CLAY	
0.55	0.80	Soft to firm grey brown slightly sandy slightly gravelly silty CLAY	
0.80	2.00	Firm grey mottled brown and orange brown slightly sandy gravelly CLAY	
2.00	2.50	Very stiff grey to grey brown gravelly CLAY with a medium cobble content	

Field Data

Field Test

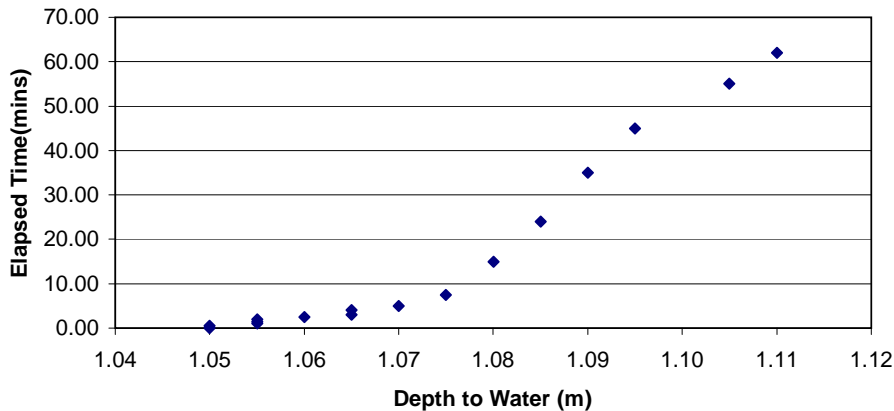
Depth to Water (m)	Elapsed Time (min)
1.05	0.00
1.05	0.50
1.055	1.00
1.055	1.50
1.055	2.00
1.06	2.50
1.065	3.00
1.065	4.00
1.07	5.00
1.075	7.50
1.08	15.00
1.085	24.00
1.09	35.00
1.095	45.00
1.105	55.00
1.11	62.00

Depth of Pit (D)	2.50	m
Width of Pit (B)	0.60	m
Length of Pit (L)	2.70	m
Initial depth to Water =	1.05	m
Final depth to water =	1.11	m
Elapsed time (mins)=	62.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.62	m ²
*Av. side area of permeable stratum over test period=	9.372	m ²
Total Exposed area =	10.992	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00014 m/min or 2.3771E-06 m/sec

Depth of water vs Elapsed Time (mins)



Soakaway Design f -value from field tests IGSL

Contract: Greater Dublin Drainage Scheme Contract No. 16695
 Test No. SA TP10
 Client Fingal County Council
 Date: 07/03/2013

Summary of ground conditions			
from	to	Description	Ground water
0.00	0.45	TOPSOIL: Soft brown slightly sandy CLAY	DRY
0.45	0.80	Soft to firm brown and yellow brown sandy gravelly CLAY	
0.80	1.80	Firm to stiff grey brown occasionally mottled yellow brown gravelly slightly silty CLAY with a medium cobble and low boulder content	
1.80	2.00	Very stiff to hard dark greyish brown slightly sandy gravelly CLAY with a low to medium cobble content	

Notes:

Field Data

Depth to Water (m)	Elapsed Time (min)
0.90	0.00
0.90	0.50
0.900	1.00
0.900	1.50
0.900	2.00
0.90	2.50
0.900	3.00
0.905	4.00
0.905	5.50
0.905	9.00
0.91	18.00
0.92	25.00
0.92	30.00
0.925	45.00
0.93	55.00
0.93	60.00

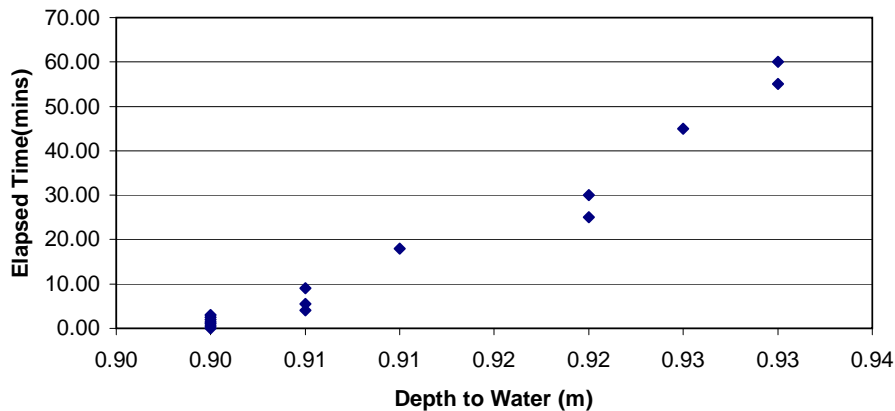
Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.60	m
Length of Pit (L)	2.65	m
Initial depth to Water =	0.90	m
Final depth to water =	0.93	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	1.59	m ²
*Av. side area of permeable stratum over test period=	7.0525	m ²
Total Exposed area =	8.6425	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 9.2E-05 m/min or 1.53312E-06 m/sec

Depth of water vs Elapsed Time (mins)



Appendix 6

Variable Head Test Records

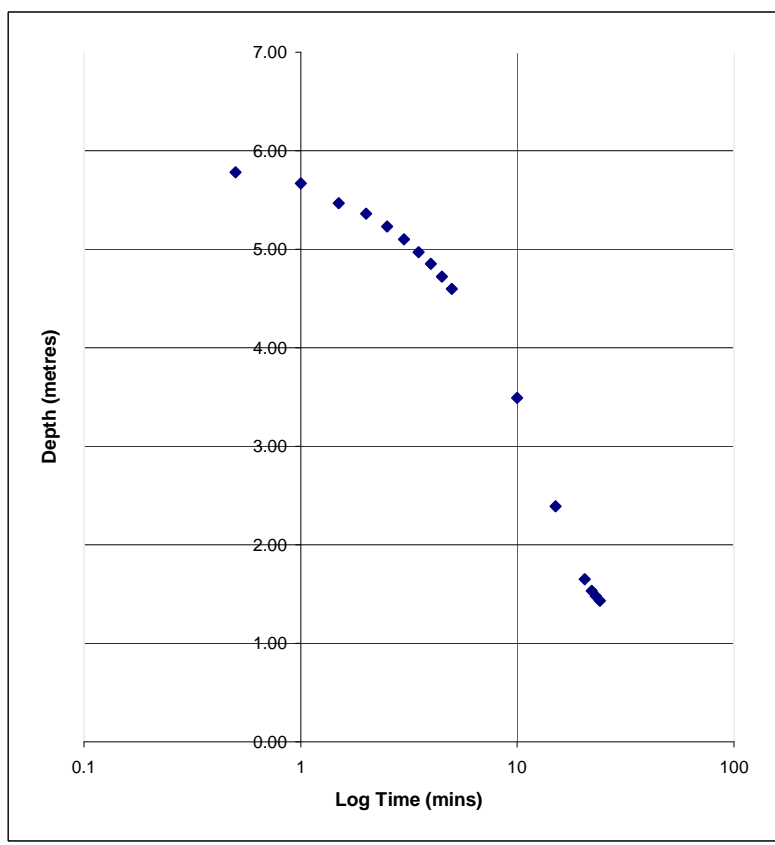
Borehole Soakaway Test Report Sheet

IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: Clonshaugh BOREHOLE No.: RC01 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 6.80 Bottom (mbgl): 8.80 Length (m): 2.00 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 0.615 Height of casing or standpipe : above ground level (m): 0.00 Falling or Rising Head Test?: RISING
---	--

Elapsed Time (mins)	Depth to Water* (m)	
---------------------	---------------------	--

0	5.85
0.5	5.78
1	5.67
1.5	5.47
2	5.36
2.5	5.23
3	5.10
3.5	4.97
4	4.85
4.5	4.72
5	4.60
10	3.49
15	2.39
20.5	1.65
22	1.53
23	1.48
24	1.43



Calculation of steady flow Rate

T1 (mins)	3.00	Response Zone
T2 (mins)	20.50	Length (m) 2.000
Period of flow	17.50	Diameter (m) 0.500
		Exposed Area 3.338
Initial depth (m)	5.10	
Final depth (m)	1.65	
Fall in level (m)	-3.45	
Volume Dispersed	-0.6775	

f-value = Volume dispersed / unit exposed area / unit time

f-value (m/min) = -0.0116

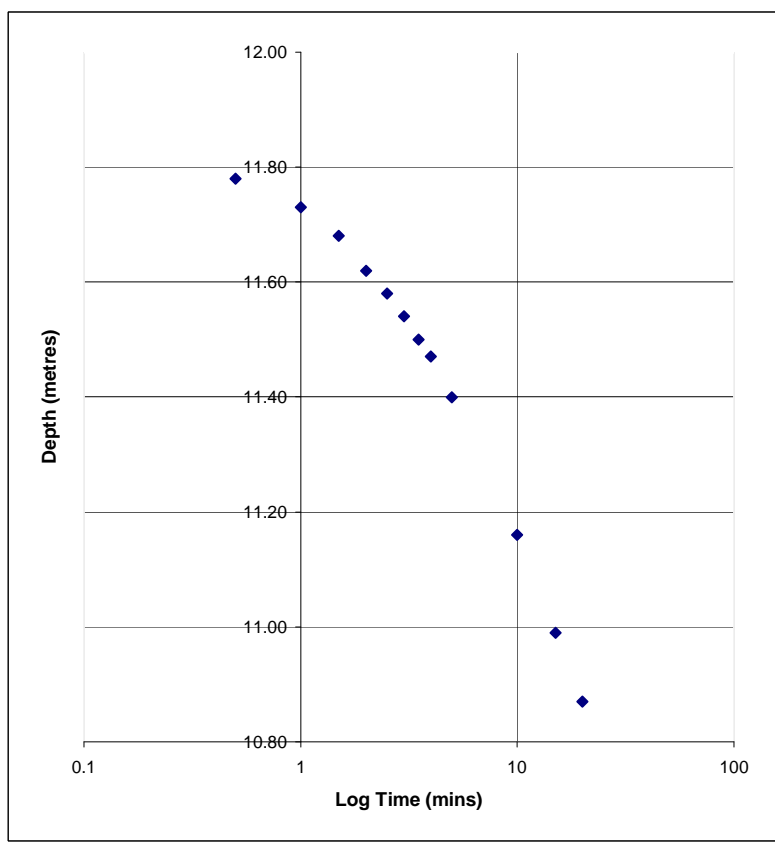
* Depth of water below top of casing

Borehole Soakaway Test Report Sheet

IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: Annsbrook BOREHOLE No.: RC06 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 15.00 Bottom (mbgl): 18.00 Length (m): 3.00 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 10.070 Height of casing or standpipe : above ground level (m): 0.00 Falling or Rising Head Test?: RISING
--	---

Elapsed Time (mins)	Depth to Water* (m)
0	11.88
0.5	11.78
1	11.73
1.5	11.68
2	11.62
2.5	11.58
3	11.54
3.5	11.50
4	11.47
5	11.40
10	11.16
15	10.99
20	10.87



Calculation of steady flow Rate

T1 (mins) 1.50	Response Zone
T2 (mins) 20.00	Length (m) 3.000
Period of flow 18.50	Diameter (m) 0.500
	Exposed Area 4.909
Initial depth (m) 11.68	
Final depth (m) 10.87	
Fall in level (m) -0.81	
Volume Dispersed -0.1591	

f-value = Volume dispersed / unit exposed area / unit time

f-value (m/min) = -0.0018

* Depth of water below top of casing

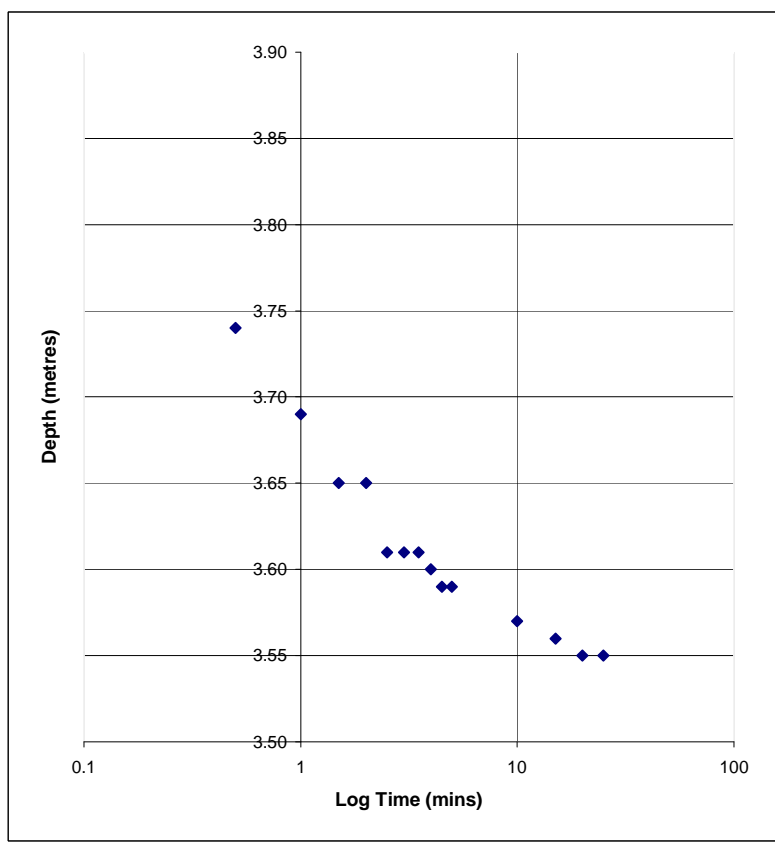
Borehole Soakaway Test Report Sheet

IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: NewtownCorduff BOREHOLE No.: RC07 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 11.50 Bottom (mbgl): 13.00 Length (m): 1.50 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 3.500 Height of casing or standpipe : above ground level (m): 0.00 Falling or Rising Head Test?: RISING
---	--

Elapsed Time (mins)	Depth to Water* (m)
---------------------	---------------------

0	3.88
0.5	3.74
1	3.69
1.5	3.65
2	3.65
2.5	3.61
3	3.61
3.5	3.61
4	3.60
4.5	3.59
5	3.59
10	3.57
15	3.56
20	3.55
25	3.55



Calculation of steady flow Rate

T1 (mins)	0.00	Response Zone
T2 (mins)	1.50	Length (m) 1.500
Period of flow	1.50	Diameter (m) 0.500
		Exposed Area 2.553

Initial depth (m)	3.88
Final depth (m)	3.65
Fall in level (m)	-0.23
Volume Dispersed	-0.0452

f-value = Volume dispersed / unit exposed area / unit time

f-value (m/min) = -0.0118

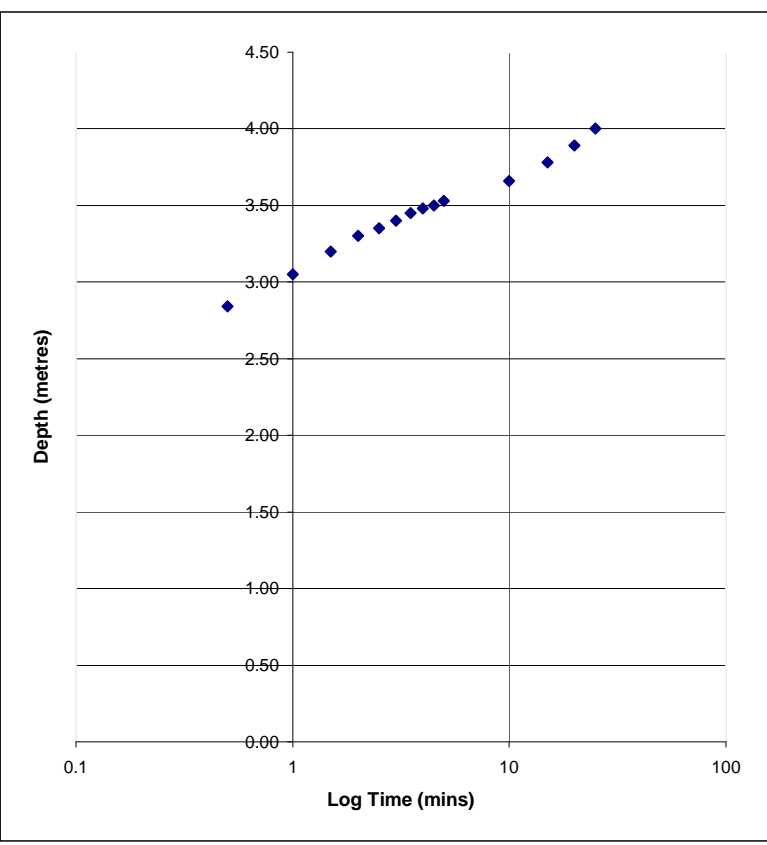
* Depth of water below top of casing

Borehole Soakaway Test Report Sheet IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: Clonshaugh BOREHOLE No.: RC02 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 13.00 Bottom (mbgl): 18.00 Length (m): 5.00 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 6.600 Height of casing or standpipe : above ground level (m): 0.00 Falling or Rising Head Test?: FALLING
---	---

Elapsed Time (mins)	Depth to Water* (m)
---------------------	---------------------

0	2.28
0.5	2.84
1	3.05
1.5	3.20
2	3.30
2.5	3.35
3	3.40
3.5	3.45
4	3.48
4.5	3.50
5	3.53
10	3.66
15	3.78
20	3.89
25	4.00



Calculation of steady flow Rate

T1 (mins)	0.50	Response Zone
T2 (mins)	25.00	Length (m) 5.000
Period of flow	24.50	Diameter (m) 0.500
		Exposed Area 8.051
Initial depth (m)	2.84	
Final depth (m)	4.00	
Fall in level (m)	1.16	
Volume Dispersed	0.2278	

f-value = Volume dispersed / unit exposed area / unit time

f-value (m/min) = 0.0012

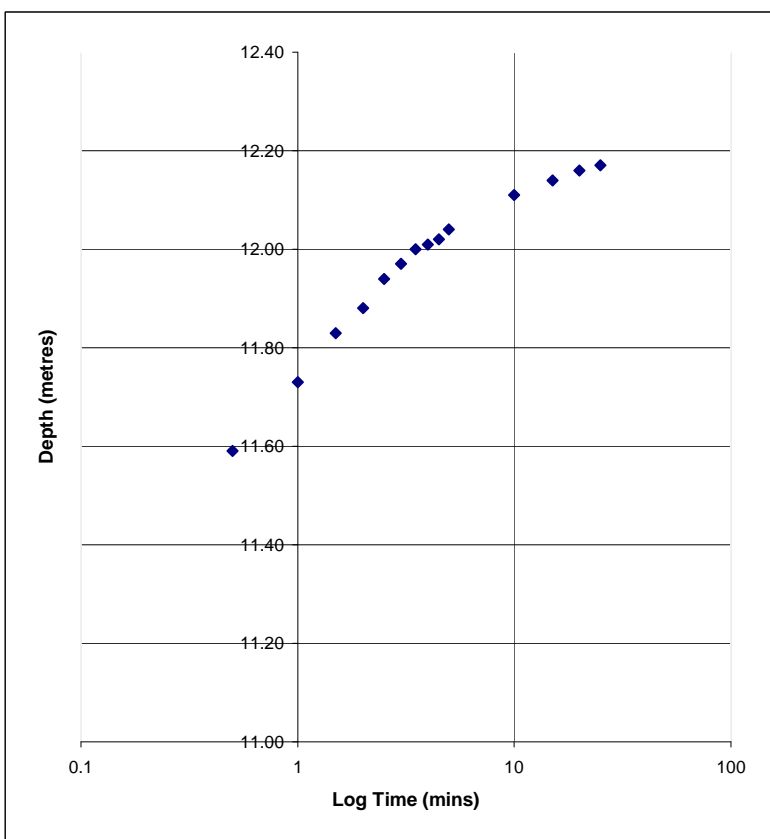
* Depth of water below top of casing

Borehole Soakaway Test Report Sheet IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: Annsbrook BOREHOLE No.: RC05 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 22.50 Bottom (mbgl): 24.00 Length (m): 1.50 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 12.260
--	---

Elapsed Time (mins)	Depth to Water* (m)		Height of casing or standpipe : above ground level (m)
			0.00
			Falling or Rising Head Test? FALLING

0	11.17
0.5	11.59
1	11.73
1.5	11.83
2	11.88
2.5	11.94
3	11.97
3.5	12.00
4	12.01
4.5	12.02
5	12.04
10	12.11
15	12.14
20	12.16
25	12.17



Calculation of steady flow Rate

T1 (mins)	0.00	Response Zone
T2 (mins)	5.00	Length (m) 1.500
Period of flow	5.00	Diameter (m) 0.500
		Exposed Area 2.553
Initial depth (m)	11.17	
Final depth (m)	12.04	
Fall in level (m)	0.87	
Volume Dispersed	0.1708	

f-value = Volume dispersed / unit exposed area / unit time

f-value (m/min) = 0.0134

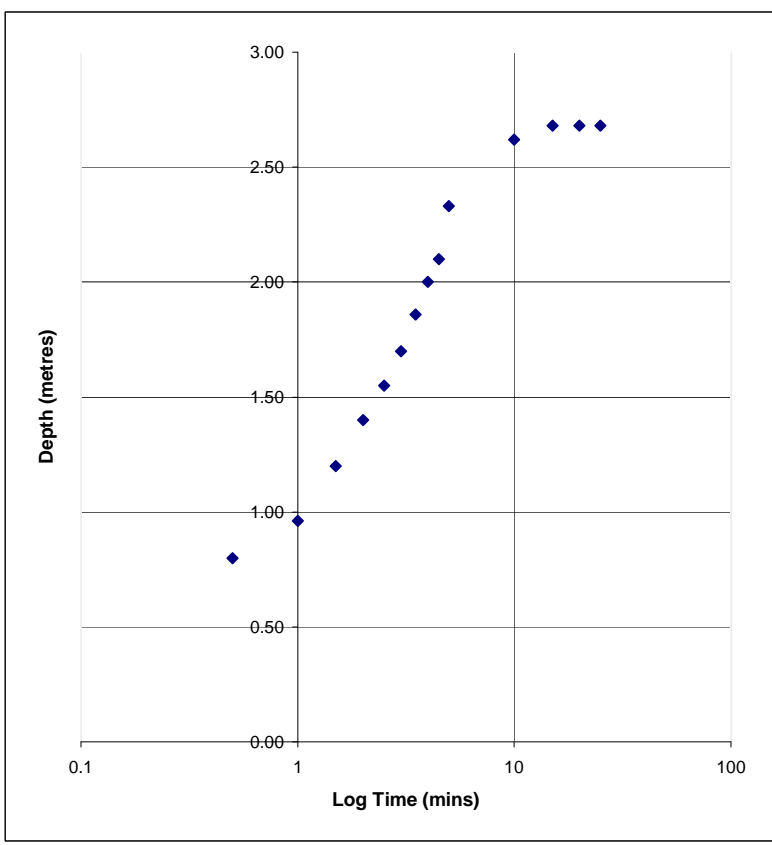
* Depth of water below top of casing

Borehole Soakaway Test Report Sheet IGSL

CONTRACT: Greater Dublin Drainage Scheme NUMBER: 16695 CLIENT: Fingal County Council LOCATION: NewtownCorduff BOREHOLE No.: RC09 TEST No.: 1	TEST RESPONSE ZONE DETAILS: Top (mbgl): 10.00 Bottom (mbgl): 12.00 Length (m): 2.00 Diameter (m): 0.500 Initial Standing Water Level (m below top of casing): 2.710 Height of casing or standpipe : above ground level (m): 0.00 Falling or Rising Head Test?: FALLING
---	---

Elapsed Time (mins)	Depth to Water* (m)	
---------------------	---------------------	--

0.5	0.80
1	0.96
1.5	1.20
2	1.40
2.5	1.55
3	1.70
3.5	1.86
4	2.00
4.5	2.10
5	2.33
10	2.62
15	2.68
20	2.68
25	2.68



Calculation of steady flow Rate

T1 (mins) 1.50 T2 (mins) 4.50 Period of flow 3.00 Initial depth (m) 1.20 Final depth (m) 2.10 Fall in level (m) 0.90 Volume Dispersed 0.1767	Response Zone Length (m) 2.000 Diameter (m) 0.500 Exposed Area 3.338
--	--

f-value = Volume dispersed / unit exposed area / unit time
 f-value (m/min) = 0.0176

* Depth of water below top of casing

Appendix 7

Geophysical Survey Report

Greater Dublin Drainage Scheme
Fingal, Dublin
Geophysical Survey

Report Status: Final

MGX Project Number:5671

MGX File Ref: 5671f-005.doc

23th April 2013

Confidential Report To:

I.G.S.L.
Unit F
M7 Business Park
Naas
Co. Kildare

**Report submitted by :
Minerex Geophysics Limited**

Unit F4, Maynooth Business Campus
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Issued by:



Hartmut Krahn (Senior Geophysicist)



Subsurface Geophysical Investigations

EXECUTIVE SUMMARY

1. Minerex Geophysics Ltd. (MGX) carried out a geophysical survey consisting of 2D-Resistivity and seismic refraction (p-wave) for the ground investigation for the Greater Dublin Drainage Scheme.
2. The main objectives of the survey were to determine ground conditions, estimate the depth to rock and overburden thickness and generate a ground model for three sites.
3. At the Southern Site at the R123 at Portmarnock a thick layer of boulder clay is present and the depth to rock is 14 m and more under the seismic profiles. The boulder clay is highly consolidated with a stiffness of very stiff to hard. The site conditions are suitable for development as the ground has a high bearing capacity but can be also excavated by digging.
4. The Southern Outfall Site on the beach near Portmarnock shows thick overburden consisting of marine sediments and boulder clay to a considerable depth of 10 m bgl. The rock head slowly dips towards the sea in the east.
5. The Northern Outfall Site has relatively shallow rock on the higher westerly part of the site. The site topography dips to the east and at the easternmost profile the overburden thickness has increased to approx. 8 m. Excavations on this site, especially at the western part, will reach strong rock after a few meters and that will require breaking and blasting for excavation.
6. The geophysical survey for this preliminary ground investigation achieved good data quality and a rapid overview of ground conditions and further surveying for the sites and routes of this scheme can be recommended.
7. It is recommended to carry out a marine seismic refraction survey in the sea east of the beach over the proposed length of the outfall pipeline to determine the sediment thickness and depth to rock.
8. Borehole information nearby the two southern survey areas indicates deep rock.
9. On the northern site boreholes and geophysics indicate the rock topography has some irregularities and that some deeper zone of rock weathering are present. Borehole logs indicate quite fractured rock cores. It is recommended to investigate this site with more boreholes and surveying with 2D-Resistivity and Seismic Refraction.
10. This report was reviewed after ground investigation information was available.

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List of Tables, Maps and Figures:

Title	Pages	Document Reference
Table 1: Summary of Interpretation Southern Site at R123	In text	In text
Table 2: Summary of Interpretation Southern Outfall Site	In text	In text
Table 3: Summary of Interpretation Northern Outfall Site	In text	In text
Map 1: Geophysical Survey Location Map	1 x A3	5671f_Maps.dwg
Figure 1a: Results at Southern Site R123 Portmarnock	1 x A3	5671f_Figs.dwg
Figure 1b: Interpretation at Southern Site R123 Portmarnock	1 x A3	5671f_Figs.dwg
Figure 2a: Results at Southern Outfall Site Portmarnock	1 x A3	5671f_Figs.dwg
Figure 2b: Interpretation at Southern Outfall Site Portmarnock	1 x A3	5671f_Figs.dwg
Figure 3a: Results at Northern Outfall Site Loughshinny	1 x A3	5671f_Figs.dwg
Figure 3b: Interpretation at Northern Outfall Site Loughshinny	1 x A3	5671f_Figs.dwg

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out a geophysical survey for the preliminary ground investigation for the Greater Dublin Drainage Scheme. The survey was carried out at three sites. The survey consisted of 2D-Resistivity and seismic refraction (p-wave) profiles. The survey was commissioned by I.G.S.L.

The survey employed two geophysical methods that complement each other and improve the interpretation.

1.2 Objectives

The main objectives of the geophysical survey were:

- To determine the ground conditions under the site
- To determine the depth to rock and overburden thickness
- To estimate the strength/stiffness/compaction of overburden materials and the quality of rock
- To determine the type of overburden and rock
- To detect lateral changes within the geological layers
- To determine the presence of possible faults and fracture zones

1.3 Site Description

The three sites are the Southern Site at the R123 in Portmarnock, the Southern Outfall Site at Portmarnock and the Northern Outfall Site at Loughshinny. The southern outfall site is on the beach and intertidal zone and was surveyed at low tide. The other two sites are located in farm land.

1.4 Geology

The bedrock geological map of Meath (GSI, 1999) indicates that the survey areas at the three sites are underlain by Carboniferous lithologies. The southern sites at Portmarnock are underlain by the Malahide Formation, described as an argillaceous bioclastic limestone and shale. The northern site at Loughshinny is underlain by the Loughshinny Formation, described as dark micritic & calcarenite and shale.

1.5 Report

This report includes the results and interpretation of the geophysical survey. Maps, figures and tables are included to illustrate the results of the survey. More detailed descriptions of geophysical methods and measurements can be found in GSEG (2002), Milsom (1989) and Reynolds (1997).

The interpretative nature and the non-invasive survey methods must be taken into account when considering the results of this survey and Minerex Geophysics Limited, while using appropriate practice to execute, interpret and present the data, give no guarantees in relation to the existing subsurface.

2. GEOPHYSICAL SURVEY

2.1 Methodology

The methodology was given in the tender documents and consisted of 2D-Resistivity and Seismic Refraction Profiles.

The survey locations are indicated on Map 1. Each of the three sites was surveyed with 3 x 155m 2D-Resistivity and 3 x 69 m seismic refraction.

All geophysical surveys are acquired, processed and reported in accordance with British Standards BS 5930:1999 +A2:2010 'Code of Practice for Site Investigations'.

2.2 2D-Resistivity

2D-Resistivity profiles with electrode spacing of 5m, 32 electrodes per set-up and a length of 155m per profile were surveyed at the locations shown on Map 1. The readings were taken with a Tigre Resistivity Meter and Imager Cables.

During 2D-Resistivity surveying data is acquired in the form of linear profiles using a suite of metal electrodes. A current is injected into the ground via a pair of electrodes while a potential difference is measured across a second pair of electrodes. This allows for the recording of the apparent resistivity in a two-dimensional arrangement below the profile. The data is inverted after the survey to obtain a model of subsurface resistivities. The generated model resistivity values and their spatial distribution can then be related to typical values for different geological materials.

2D-Resistivity has proven zones of anomalous rock/karstified rock with lateral extents of 5 m and more.

2.3 Seismic Refraction

The seismic survey consisted of p-wave seismic refraction profiling at the locations shown on Map 1. Each of the profiles consisted of 24 geophones with 3 m spacing, resulting in lengths of 69m per profile. The recording equipment consisted of a 24 Channel GEOMETRICS ES-3000 engineering seismograph with 4.5 Hz vertical geophones. The seismic energy source consisted of a hammer and plate. A zero delay trigger was used to start the recording. Seven shot points per p-wave profile were used.

In the seismic refraction survey method a p-wave is generated by a source at the surface resulting in energy travelling through surface layers directly and along boundaries between layers of differing seismic wave velocities. Processing of the seismic data allows geological layer thicknesses and boundaries to be established.

Seismic Refraction generally determines the depth to horizontal or near horizontal layers where the compaction/strength/rock quality changes with an accuracy of 10 – 20% of depth to that layer. Where low velocity layers or shadow zones are present or where layers dip with more than 20 degrees angle the accuracy becomes much less.

2.4 Site Work

The data acquisition was carried out on the 25th of January and 1st of February 2013. The weather conditions were fair throughout the acquisition period. Health and safety standards were adhered to at all times.

The locations and elevations were surveyed with a TRIMBLE RTK-GPS to accuracy < 0.02m.

3. RESULTS AND INTERPRETATION

The interpretation of geophysical data was carried out utilising the known response of geophysical measurements, typical physical parameters for subsurface features that may underlay the site, and the experience of the authors.

3.1 2D-Resistivity Profiles

The 2D-Resistivity data was positioned and inverted with the RES2DINV inversion package. Overlapping and roll-along profiles were concatenated for a joint inversion. The programme uses a smoothness constrained least-squares inversion method to produce a 2D model of the subsurface model resistivities from the recorded apparent resistivity values. Three variations of the least squares method are available and for this project the Jacobian Matrix was recalculated for the first three iterations, then a Quasi-Newton approximation was used for subsequent iterations. Each dataset was inverted using seven iterations resulting in a typical RMS error of < 4.0%. The resulting models were colour contoured with the same resistivity scale for all profiles within a site and they are displayed as cross sections (Figure 1a, 2a and 3a).

The southern outfall site is on the beach and the beach is saturated with saline sea water. This causes very low resistivities and therefore an appropriately low colour scale was selected. The other two site have a higher scale with higher resistivities which is the same for the two sites.

Resistivities ranges are typical for certain geological materials and this is reflected in the interpretation tables. Very low values under 10 Ohmm indicate saline water saturation and intrusion, and it is not possible to determine the material type as the salinity takes over (Southern Outfall).

Values between 30 and 100 Ohmm are typical for boulder clay and the thick sequence of such readings at the southern site at the R123 indicates a sequence of thick boulder clay.

High resistivity readings of over 1000 Ohmm indicate rock type with a quite clean limestone and low argillaceous or shale content.

3.2 Seismic Refraction Data

The seismic refraction data was positioned and processed with the SEISIMAGER software package to give a layered model of the subsurface. The numbers of layers has been determined by analysing the seismic traces and between 2 and 4 layers were used in the models. All seismic profiles were subject to a standardised processing sequence which consisted of a topographic correction which was based on integrated elevation data, first break picking, tomographic inversion, travel-time computation via ray-tracing and velocity modelling. Residual deviations of typically 0.4 to 1.8 msec RMS have been obtained for each profile. Following each processing stage QC procedures were adhered to. The resulting layer boundaries are shown as thick lines overlaid on the 2D-Resistivity cross sections (Figure 1a, 2a and 3a). The average seismic velocities obtained within the layers are annotated on the sections as bold black numbers.

3.3 Interpretation of Resistivity and Seismic Refraction

Tables 1 to 3 summarise the interpretation for the three sites. The strength/stiffness/compaction and the rock quality have been estimated from the seismic velocity. The estimation of the excavatability for the bedrock has been made according to the caterpillar chart published in Reynolds (1997). The geotechnical assessment for rippability will have to take factors like rock type and jointing into account and the estimation in this report is solely based on the seismic velocities.

The proposed works may not require the excavation of rock though the assessment for rippability gives a good indication about the strength of the rock.

Interpreted cross sections are shown in Figure 1b, 2b and 3b. The interpretation has been made from all available information. For overburden layers and the top of the rock the seismic refraction data has been used as seismic refraction is the best method to delineate layer boundaries. The resistivity models have been used to delineate rock and overburden type and to indicate layers where no seismic refraction data was acquired at the profile ends. Resistivity data is better suited to show rock types and features within the rock while seismic refraction velocities are indicating the change of compaction/stiffness/rock quality with depth.

Table 1: Summary of Interpretation at the Southern Site at R123

Layer	General Seismic Velocity Range (km/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation	Estimated Method	Excavation
1	0.4	< 100	Soft	Topsoil	Diggable	
2	1.0	< 100	Firm to stiff	Boulder Clay	Diggable	
3	2.3	< 100	Very stiff – hard	Boulder Clay	Diggable	
4	3.5	< 100	Strong competent rock	Rock	Breaking & Blasting	

The rock is quite deep under the site and approx. 15 – 20 thick highly consolidated boulder clay are under the site surface. The rock is so deep that the resistivity profile encounters it at the lower end and the rock type cannot be determined from resistivities. It was not intended to survey deeper and given the ground conditions a deeper survey is not required.

Rotary core hole 13 is located to the east of the site and indicates deep rock at a depth of 23.60 m below ground level. Borehole 13 indicates very stiff to hard clay in good agreement with the layer 3 of highly consolidated boulder clay.

The ground conditions appear suitable for deep excavations and high bearing pressures and no further geophysical surveying is recommended.

Table 2: Summary of Interpretation at the Southern Outfall Site

Layer	General Seismic Velocity Range (km/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation	Estimated Excavation Method
1	1.6	< 50	N/A	Marine Sediments and Boulder Clay	Diggable
4	3.5	> 50	Strong competent rock	Rock	Breaking & Blasting

The saline conditions do not allow determining if the sediments are clay or sand/gravel. The seismic velocities for layer 1 are 1.6 km/s and derive from the water saturation (the seismic velocity of water is 1.5 km/s). Therefore the compaction of layer 1 sediments cannot be determined. It can be interpreted that the layer can be excavated for creating a pipeline trench.

Rotary core hole 14 is located to the west of the site and indicates deep rock at a depth of 13.50 m below ground level. Borehole 14A indicates marine sediments, sand and silts with shell material, as the main overburden type.

It is recommended to carry out a marine seismic refraction survey along the proposed outfall pipeline from the high water mark to the proposed outfall. This will establish the depth to rock which is useful to know for future trenching operations.

Table 3: Summary of Interpretation at the Northern Outfall Site

Layer	General Seismic Velocity Range (km/sec)	General Resistivity Range (Ohmm)	Compaction/ Strength/ Rock Quality	Interpretation	Estimated Excavation Method
1	0.3	< 500	Soft	Topsoil	Diggable
2	1.0	< 500	Firm to stiff	Boulder Clay	Diggable
3	2.2	< 500	Very stiff – hard Poor rock	Boulder Clay Or weathered Rock	Diggable/Rippable
4	4.0	> 1000	Strong competent rock	Rock	Breaking & Blasting

The rock is quite shallow under profiles R9/S9 and R8/S8 with strong rock occurring within a depth of approx. 3 m bgl. On profile R7/S7 the overburden is notable thicker and strong rock appears approx. 8 m bgl.

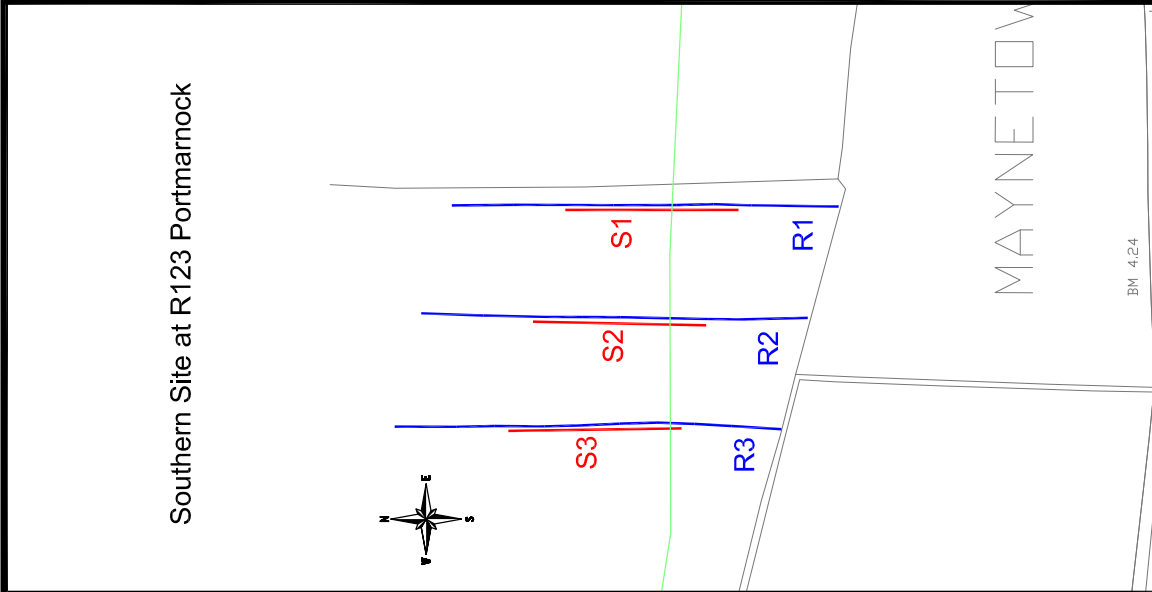
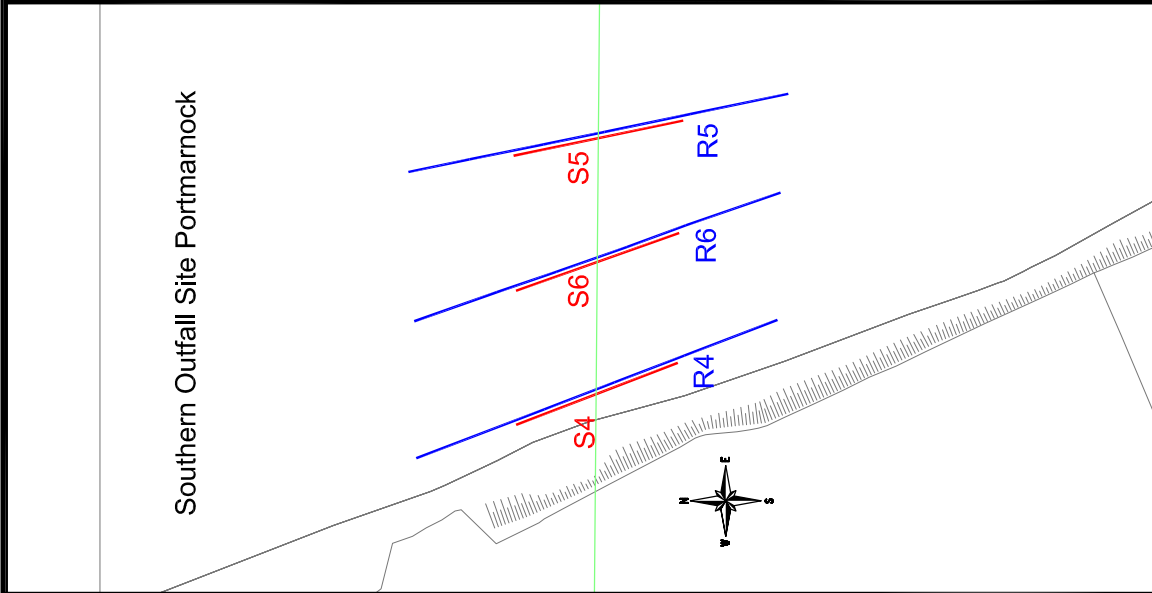
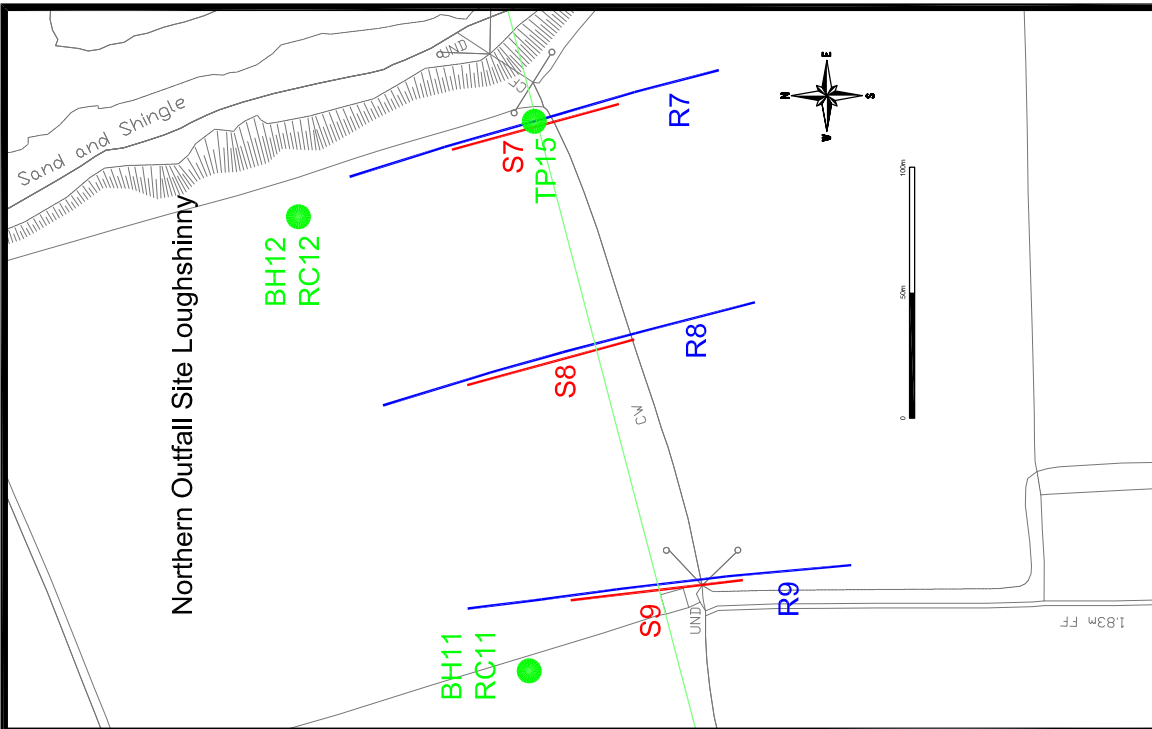
Trial pits and boreholes are located near the geophysical profiles on this site and indicate a similar ground model than the geophysics. Rotary Core Hole 12 is located past the end of R12 (Figure 3a) and shows the rock relatively deep. At the end of R12 the resistivities are low and seem to extend downwards, indicating a thickening of rock over the end of the profile.

Rotary Core Hole 13 is located near the end of R9 but 25 m beside the profile. The rock is shown much deeper than on the geophysical profile, and there may be a local deepening of rock over a weathered, fractured or paleo-karstified zone.

There are some indications for an irregular rock head on this site with possible deep weathering of rock. It is recommended to investigate the site with further rotary core holes and geophysical surveying. The survey should consist of 2D-Resistivity and Seismic Refraction, as carried out in this survey, but should encompass the entire site and cross the site at a denser grid with less spacing of adjacent profiles.

4. REFERENCES

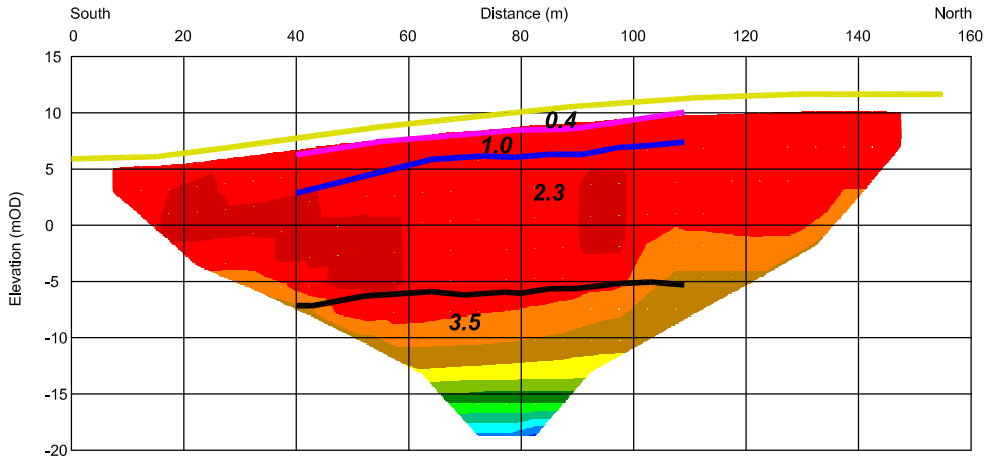
1. **GSEG 2002.** Geophysics in Engineering Investigations. Geological Society Engineering Geology Special Publication 19, London, 2002.
2. **GSI, 1995.** Geology of Meath. Geological Survey of Ireland 1999.
3. **Milsom, 1989.** Field Geophysics. John Wiley and Sons.
4. **Reynolds, 1997.** An Introduction to Applied and Environmental Geophysics. John Wiley and Son.



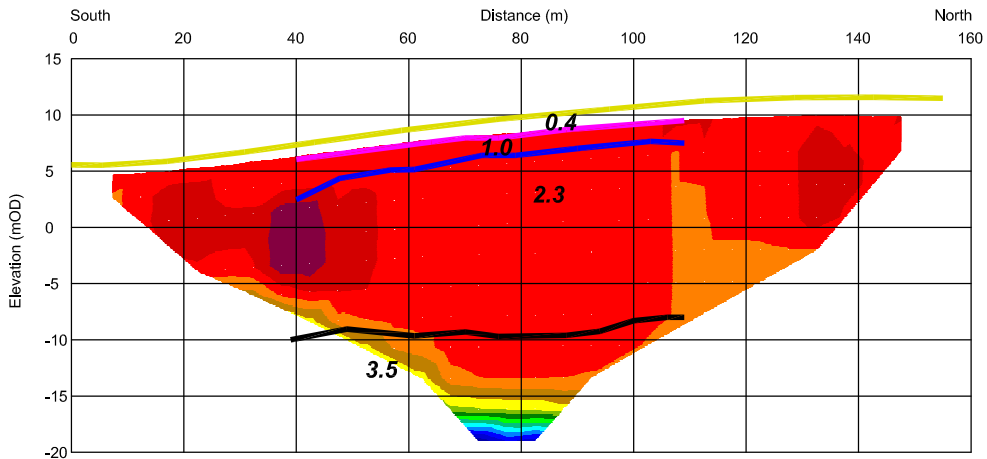
<p>Unit F4, Maynooth Business Campus Maynooth Co. Kildare Tel: (01) 6510030 Fax: (01) 6510033 Email: info@mgx.ie Web: www.mgx.ie</p>	<p>CLIENT: I.G.S.L. Final County Council</p>	<p>SCALE: 1:2000 @ A3</p> <p>PROJECT: 5671</p> <p>DRAWN: DA</p> <p>DATE: 22/04/2013</p> <p>MGX FILE: 5671_Map.dwg</p> <p>STATUS: Final</p>	<p>LEGEND:</p> <ul style="list-style-type: none"> — Seismic Refraction Profile — 2D-Resistivity Profile — Proposed Pipeline
	<p>PROJECT: Greater Dublin Drainage Scheme Geophysical Survey</p> <p>TITLE: Map 1: Geophysical Survey Location Map</p>		

Southern Site at R123 Portmarnock

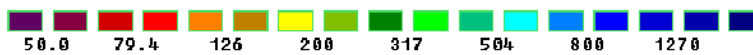
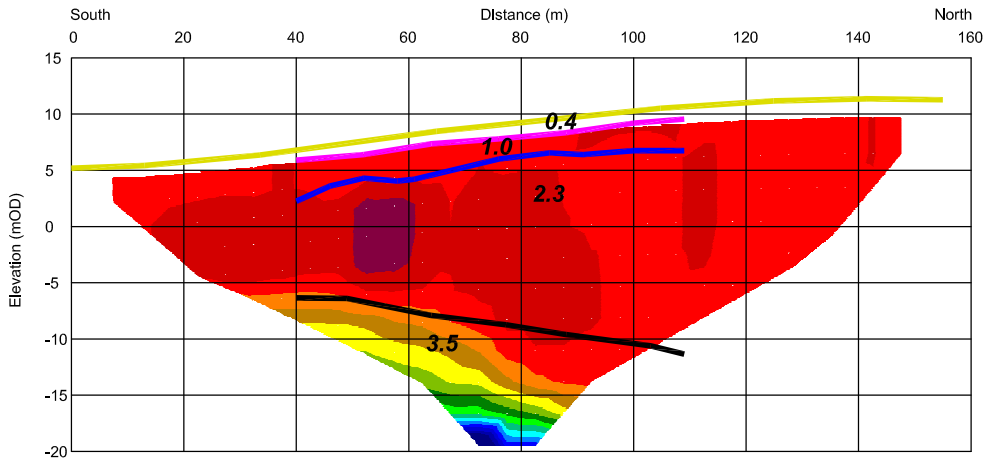
2D-Resistivity Profile R3 and Seismic Refraction Profile S3 Interpretation



2D-Resistivity Profile R2 and Seismic Refraction Profile S2 Interpretation



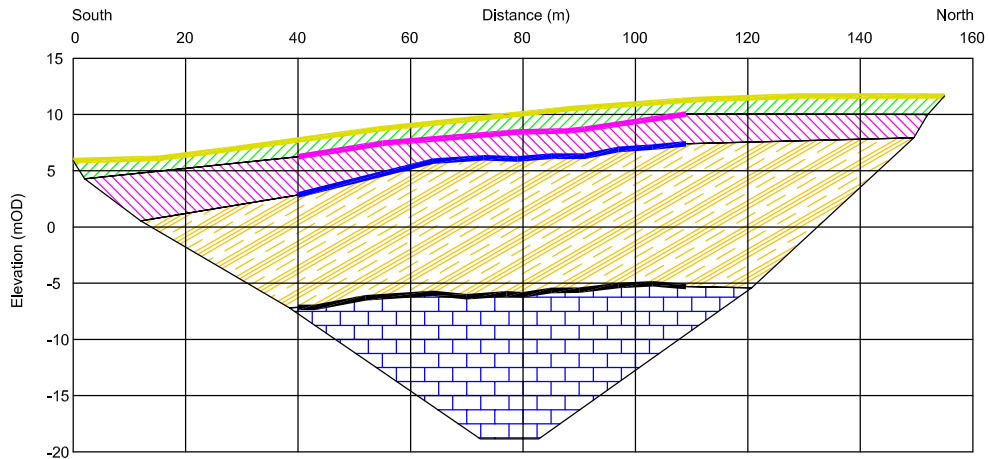
2D-Resistivity Profile R1 and Seismic Refraction Profile S1 Interpretation



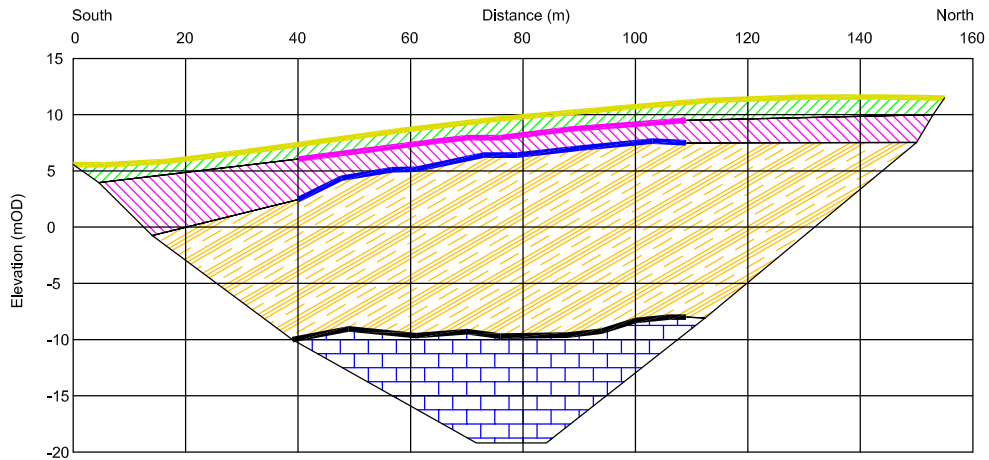
Model Resistivity in Ohmm

Southern Site at R123 Portmarnock

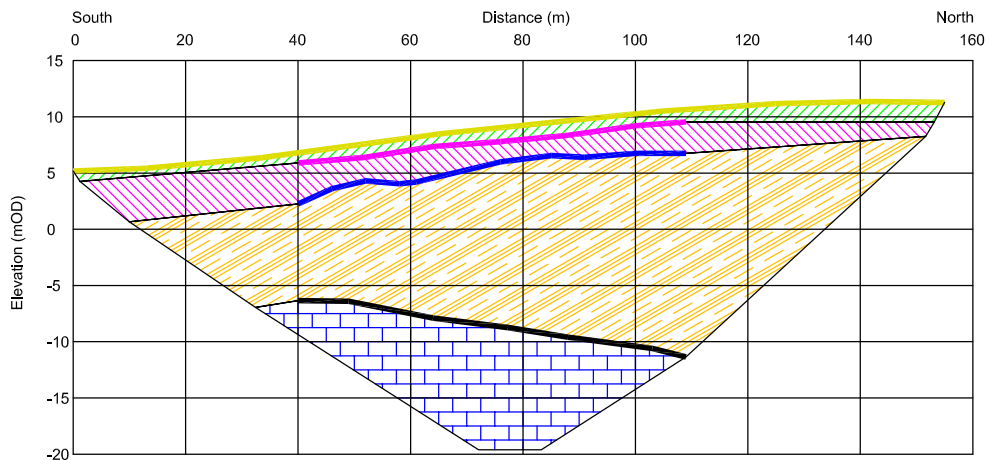
2D-Resistivity Profile R3 and Seismic Refraction Profile S3 Model



2D-Resistivity Profile R2 and Seismic Refraction Profile S2 Model

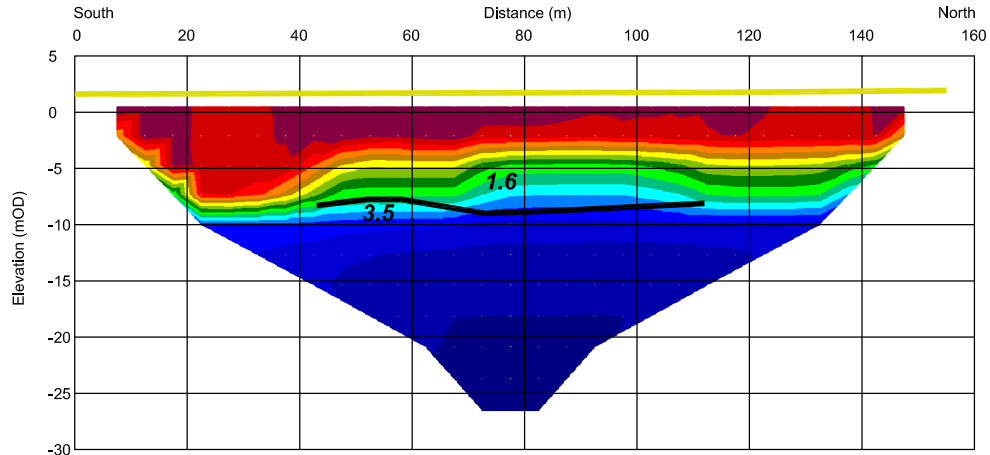


2D-Resistivity Profile R1 and Seismic Refraction Profile S1 Model

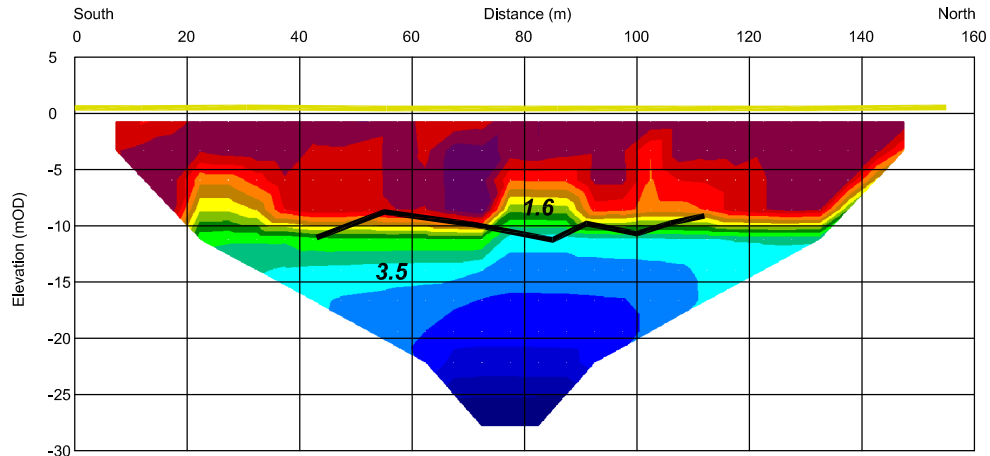


Southern Outfall Site Portmarnock

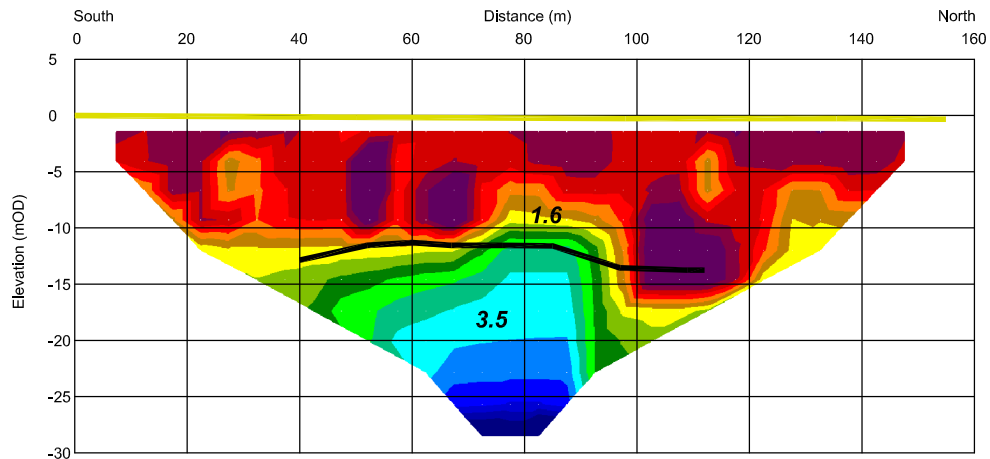
2D-Resistivity Profile R4 and Seismic Refraction Profile S4 Model



2D-Resistivity Profile R6 and Seismic Refraction Profile S6 Model



2D-Resistivity Profile R5 and Seismic Refraction Profile S5 Model



Model Resistivity in Ohm-m

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Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Tel: (01) 6510030
Fax: (01) 6510033
Email: info@mgx.ie
Web: www.mgx.ie

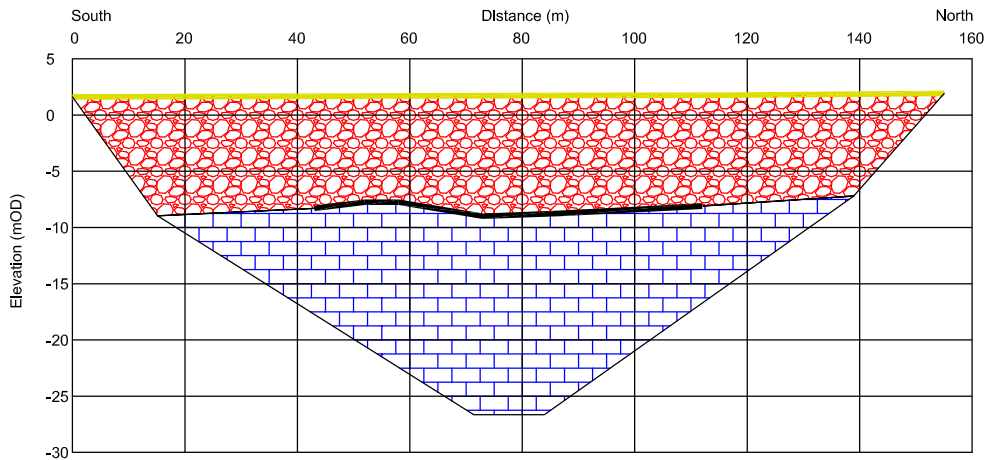
CLIENT I.G.S.L.
Fingal County Council
PROJECT Greater Dublin Drainage Scheme
Geophysical Survey
TITLE Figure 2a: Results at Southern
Outfall Site Portmarnock

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PROJECT: 5671
DRAWN: HK
DATE: 22/04/2013
MGX FILE: 5671F_Figs.dwg
STATUS: Final

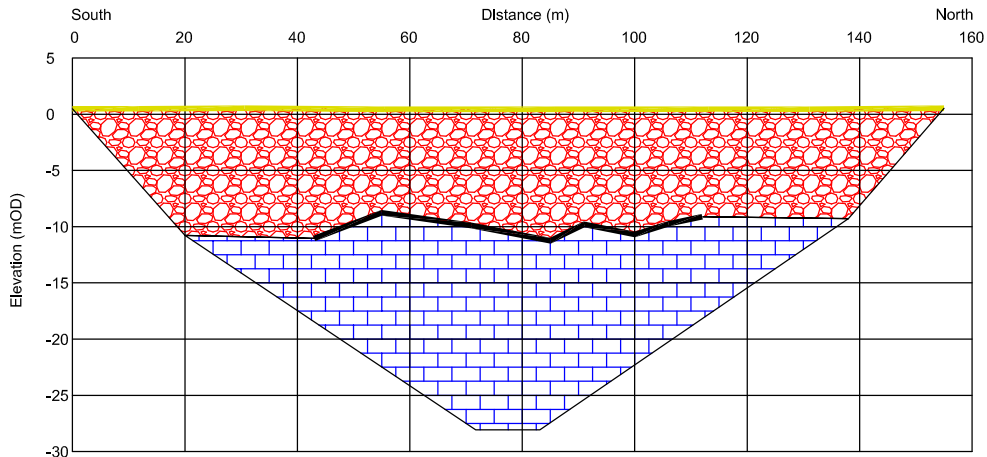
LEGEND: 1.6 Seismic Velocity km/s
Layers from Seismic Refraction Model:
Ground Surface/Top of Layer 1 (1.6 km/s)
Top of Layer 2 (3.5 km/s)

Southern Outfall Site Portmarnock

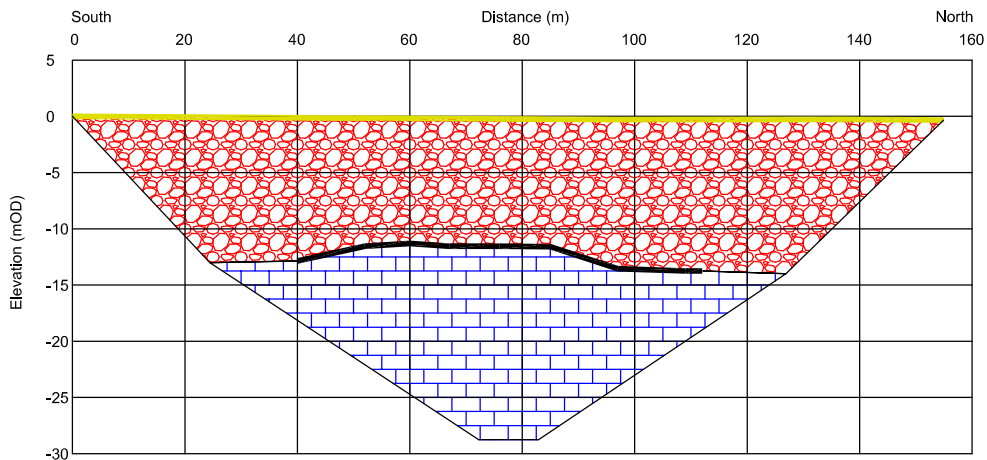
2D-Resistivity Profile R4 and Seismic Refraction Profile S4 Interpretation



2D-Resistivity Profile R6 and Seismic Refraction Profile S6 Interpretation

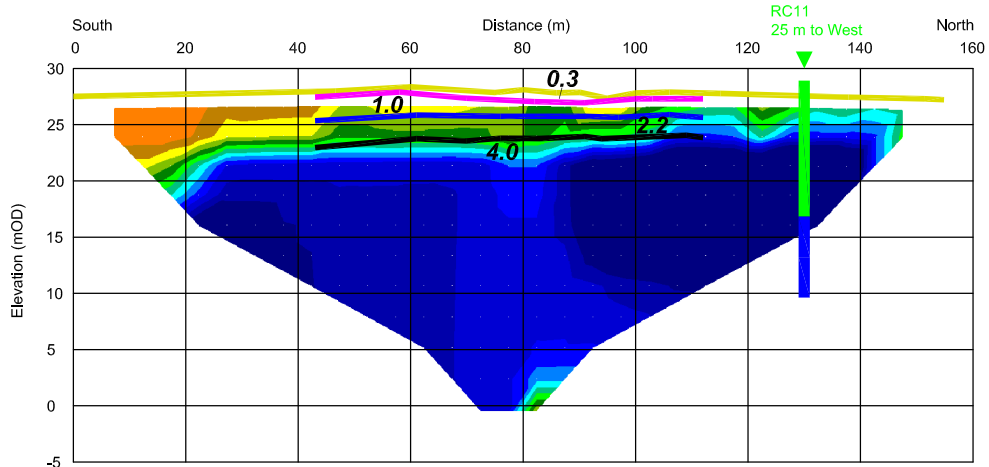


2D-Resistivity Profile R5 and Seismic Refraction Profile S5 Interpretation

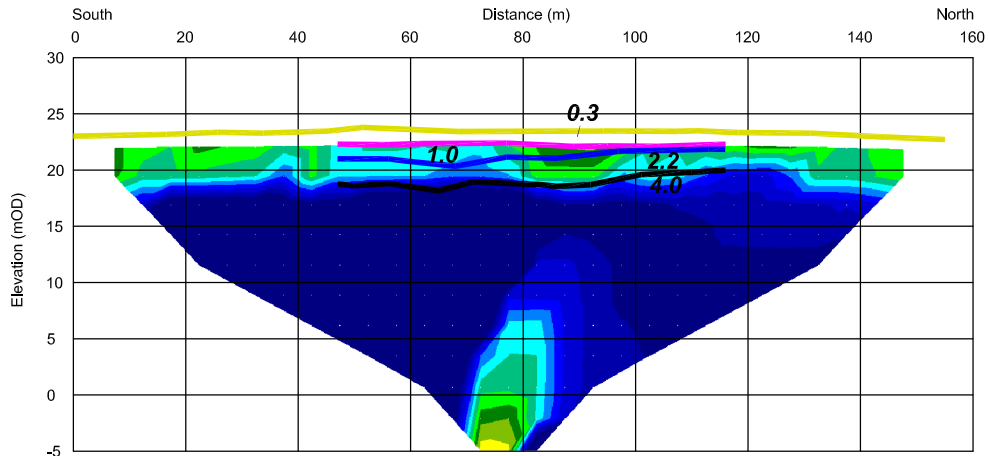


Northern Outfall Site Loughshinny

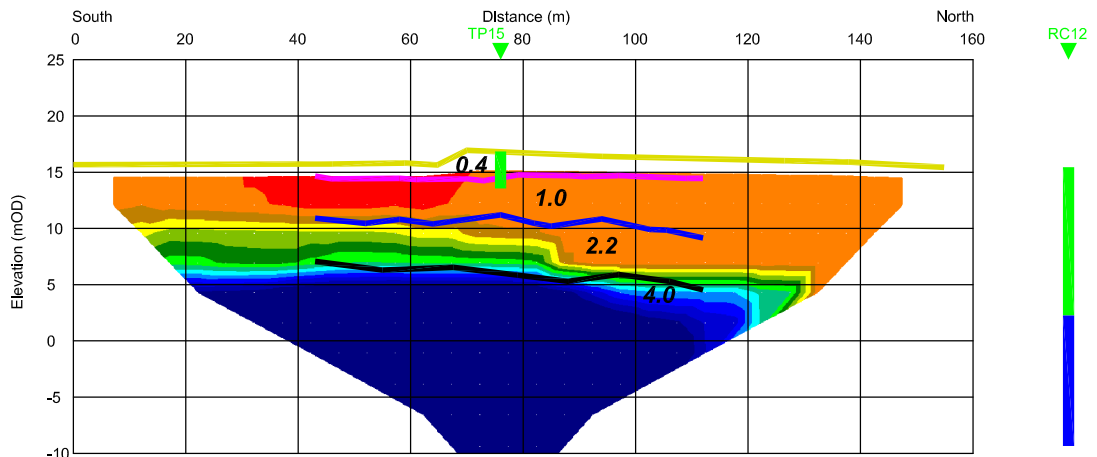
2D-Resistivity Profile R9 and Seismic Refraction Profile S9 Model



2D-Resistivity Profile R8 and Seismic Refraction Profile S8 Model



2D-Resistivity Profile R7 and Seismic Refraction Profile S7 Model



Model Resistivity in Ohm-m

Minerex
Geophysics Limited
Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Tel. (01) 6510030
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Email: info@mgx.ie
Web: www.mgx.ie

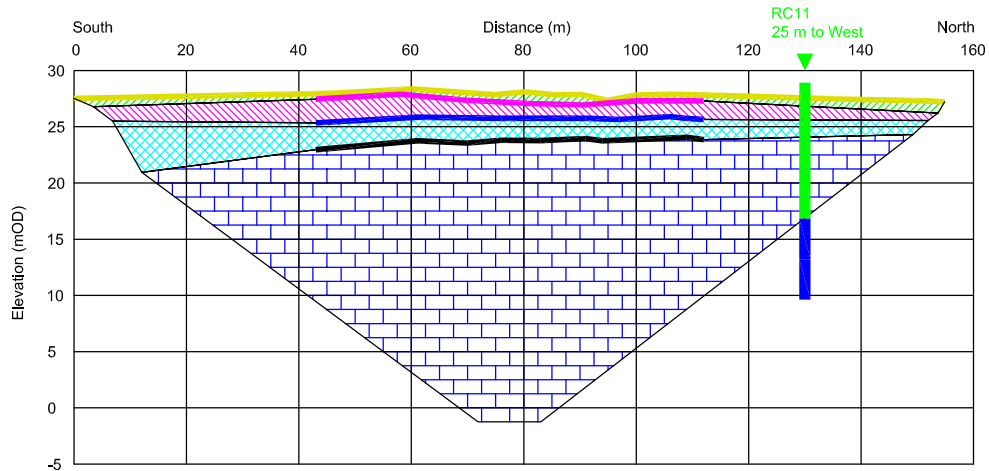
CLIENT: I.G.S.L.
Fingal County Council
PROJECT: Greater Dublin Drainage Scheme
Geophysical Survey
TITLE: Figure 3a: Results at Northern
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PROJECT: 5671
DRAWN: HK
DATE: 22/04/2013
MGX FILE: 5671F_Figs.dwg
STATUS: Draft

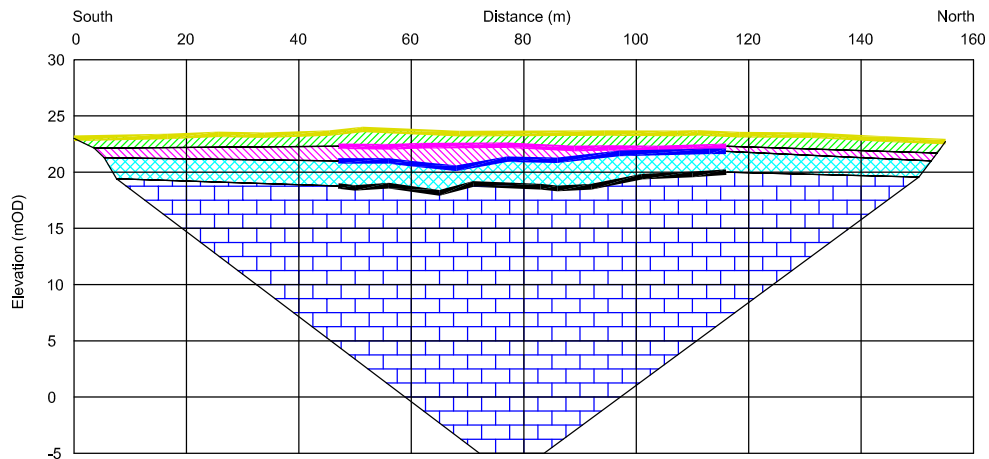
LEGEND:
1.0 Seismic Velocity km/s
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— Top of Layer 2 (1.0 km/s)
— Top of Layer 3 (2.2 km/s)
— Top of Layer 4 (4.0 km/s)
RC12 GI Point
Clay
Rock

Northern Outfall Site Loughshinny

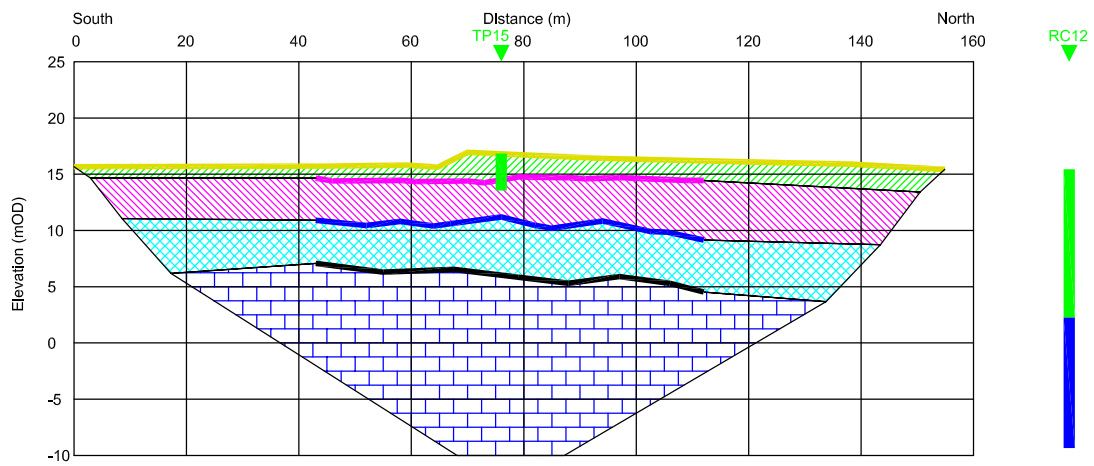
2D-Resistivity Profile R9 and Seismic Refraction Profile S9 Interpretation



2D-Resistivity Profile R8 and Seismic Refraction Profile S8 Interpretation



2D-Resistivity Profile R7 and Seismic Refraction Profile S7 Interpretation



Appendix 8

Laboratory Test Records

Schedule 1

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51363** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 26/02/13 Date Tested: 26/02/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP 01	4615	0.5	A13/0794	B	15	32	16	16	50	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CL
TP 01	4616	1.9	A13/0795	B	13	38	18	20	52	WS	4.4	C I	Brown sandy gravelly CLAY
TP 01	4617	2.6	A13/0796	B	12	33	16	17	53	WS	4.4	C L	Grey brown sandy gravelly CLAY
TP 02	4618	0.6	A13/0797	B	14	30	17	13	58	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CL
TP 02	4619	1.6	A13/0798	B	9.0	34	17	17	59	WS	4.4	C L	Grey brown slightly sandy, slightly gravelly
TP 02	4620	1.9	A13/0799	B	11	30	15	15	56	WS	4.4	C L	Grey brown sandy gravelly CLAY
TP 03	4611	0.5	A13/0800	B	24	39	25	14	86	WS	4.4	M I	Brown sandy gravelly SILT
TP 03	4613	2.0	A13/0802	B	12	33	16	17	10	WS	4.4	C L	Grey black slightly sandy, gravelly, CLAY
TP 04	4642	0.6	A13/0803	B	25	39	18	21	67	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CL
TP 04	4643	1.0	A13/0804	B	20	35	18	17	56	WS	4.4	C L	Brown sandy gravelly CLAY
TP 04	4643	1.9	A13/0805	B	8.7	38	18	20	41	WS	4.4	C I	Brown sandy gravelly CLAY
TP 05	4626	0.5	A13/0806	B	29	43	24	19	81	WS	4.4	C I	Brown sandy gravelly CLAY
TP 05	4627	1.2	A13/0807	B	22	33	17	16	74	WS	4.4	C L	Grey brown sandy gravelly CLAY
TP 05	4628	1.5	A13/0808	B	18	35	23	13	66	WS	4.4	C L	Grey brown sandy gravelly CLAY
TP 06	4635	0.9	A13/0809	B	18	35	16	19	64	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CL

Notes: Preparation: WS - Wet sieved
 AR - As received
 NP - Non plastic
 Liquid Limit 4.3 Cone Penetrometer definitive method
 Clause: 4.4 Cone Penetrometer one point method

Sample Type: B - bulk disturbed
 U - Undisturbed

Remarks:

Opinions and interpretations are outside the scope of accreditation.
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 19/03/13	Page 1 of 1

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51364** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 26/02/13 Date Tested: 26/02/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP 07	4631	1.1	A13/0811	B	22	43	26	17	73	WS	4.4	M I	Brown slightly sandy, slightly gravelly, SILT
TP 07	4632	1.7	A13/0812	B	21	31	18	13	71	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
TP 08	4622	0.6	A13/0813	B	24	41	19	22	68	WS	4.4	C I	Brown sandy gravelly CLAY
TP 08	4623	1.0	A13/0814	B	19	37	17	20	57	WS	4.4	C I	Grey brown sandy gravelly CLAY
TP 09	4638	0.4	A13/0815	B	24	47	20	27	80	WS	4.4	C I	Grey brown sandy gravelly CLAY
TP 09	4639	1.0	A13/0816	B	17	37	17	20	55	WS	4.4	C I	Grey brown slightly sandy, slightly gravelly, CLAY
TP 09	4640	1.8	A13/0817	B	16	34	16	18	45	WS	4.4	C L	Grey brown sandy gravelly CLAY
TP 12	4606	0.7	A13/0818	B	26	32	NP	NP	99	WS	4.4	C L	Brown slightly silty, SAND
TP 12	4607	1.4	A13/0819	B	28	32	NP	NP	98	WS	4.4	C L	Brown slightly silty, SAND
TP 16	4608	0.5	A13/0820	B	11	32	17	15	62	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
TP 16	4609	1.5	A13/0821	B	12	32	16	16	58	WS	4.4	C L	Grey black sandy gravelly SILT/CLAY
Bh 14	3062	2.0	A13/0822	B	23	29	NP	NP	98	WS	4.4	C L	Brown silty, slightly gravelly, SAND
Bh 14	3063	3.0	A13/0823	B	30	30	NP	NP	100	WS	4.4	C L	Brown slightly silty, SAND
Bh 14	3065	5.0	A13/0824	B	28	30	NP	NP	92	WS	4.4	C L	Brown slightly silty, slightly gravelly, SAND
Bh 14	3067	8.0	A13/0825	B	20	27	NP	NP	88	WS	4.4	C L	Grey slightly sandy, slightly gravelly, SILT

Notes: Preparation: WS - Wet sieved Sample Type: B - bulk disturbed
 AR - As received U - Undisturbed
 NP - Non plastic
 Liquid Limit 4.3 Cone Penetrometer definitive method
 Clause: 4.4 Cone Penetrometer one point method

Remarks:
 Opinions and interpretations are outside the scope of accreditation.
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 19/03/13	Page 1 of 1

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51365** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 26/02/13 Date Tested: 26/02/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 13	3072	1.0	A13/0826	B	13	32	16	16	59	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh 13	3073	2.0	A13/0827	B	14	36	18	18	68	WS	4.4	C I	Brown slightly sandy, gravelly, CLAY with many cobbles
Bh 13	3078	8.0	A13/0828	B	10	28	14	14	67	WS	4.4	C L	Grey slightly sandy, gravelly, CLAY

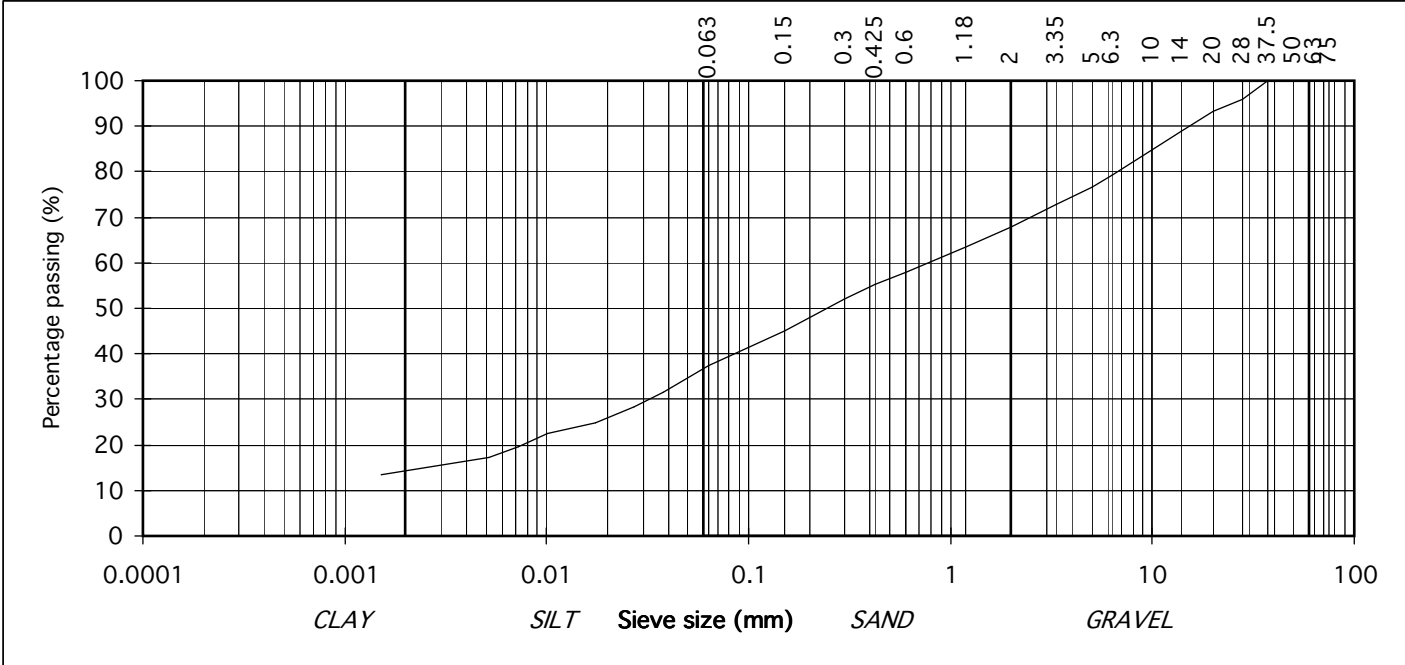
<p>Notes: Preparation: WS - Wet sieved AR - As received NP - Non plastic</p> <p> Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Sample Type: B - bulk disturbed U - Undisturbed</p>	<p>Remarks:</p> <p>Opinions and interpretations are outside the scope of accreditation. The results relate to the specimens tested. Any remaining material will be retained for one month.</p>
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IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 19/03/13	Page 1 of 1

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51380
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Depth (m): 0.50	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received: 26/02/2013	Date Testing started: 27/02/2013
37.5	100	GRAVEL	Sample No. 4615	Lab. Sample No. A13/0794
28	96		Sample Type: B	
20	93		Description: Brown slightly sandy, slightly gravelly, CLAY	
14	89		Remarks	
10	85			
6.3	79			
5	77			
3.35	73			
2	68			
1.18	63		SAND	
0.6	58			
0.425	55			
0.3	52			
0.15	45			
0.063	37	SILT/CLAY		
0.038	32			
0.027	28			
0.017	25			
0.010	23			
0.007	20			
0.005	17			
0.002	13			



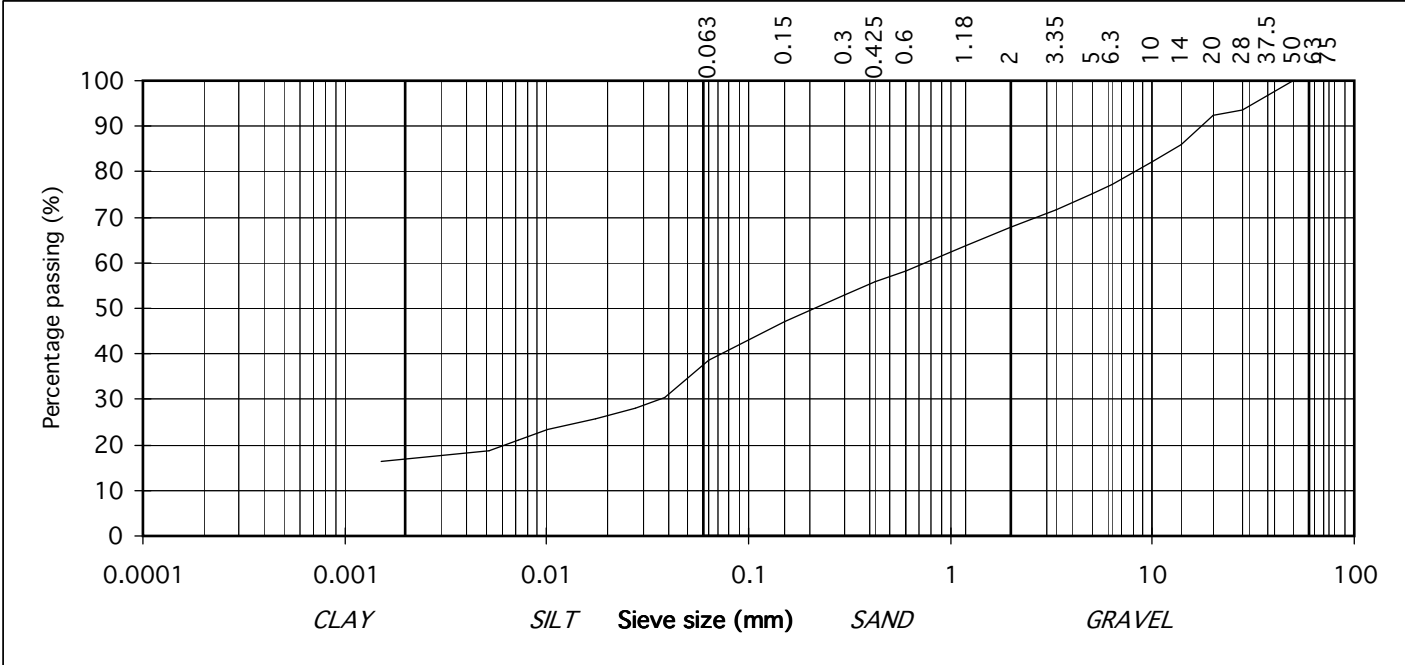
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	H Byrne	19/03/13	1 of 1

Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51381
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 0.60 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received 26/02/2013 Date Testing started 27/02/2013
37.5	97	GRAVEL	Sample No. 4618 Lab. Sample No. A13/0797
28	94		Description: Brown slightly sandy, slightly gravelly, CLAY
20	92		Remarks
14	86		
10	82		
6.3	77		
5	75		
3.35	72		
2	68		
1.18	64		SAND
0.6	58		
0.425	56		
0.3	53		
0.15	47		
0.063	39	SILT/CLAY	
0.038	30		
0.027	28		
0.017	26		
0.010	23		
0.007	21		
0.005	19		
0.002	16		



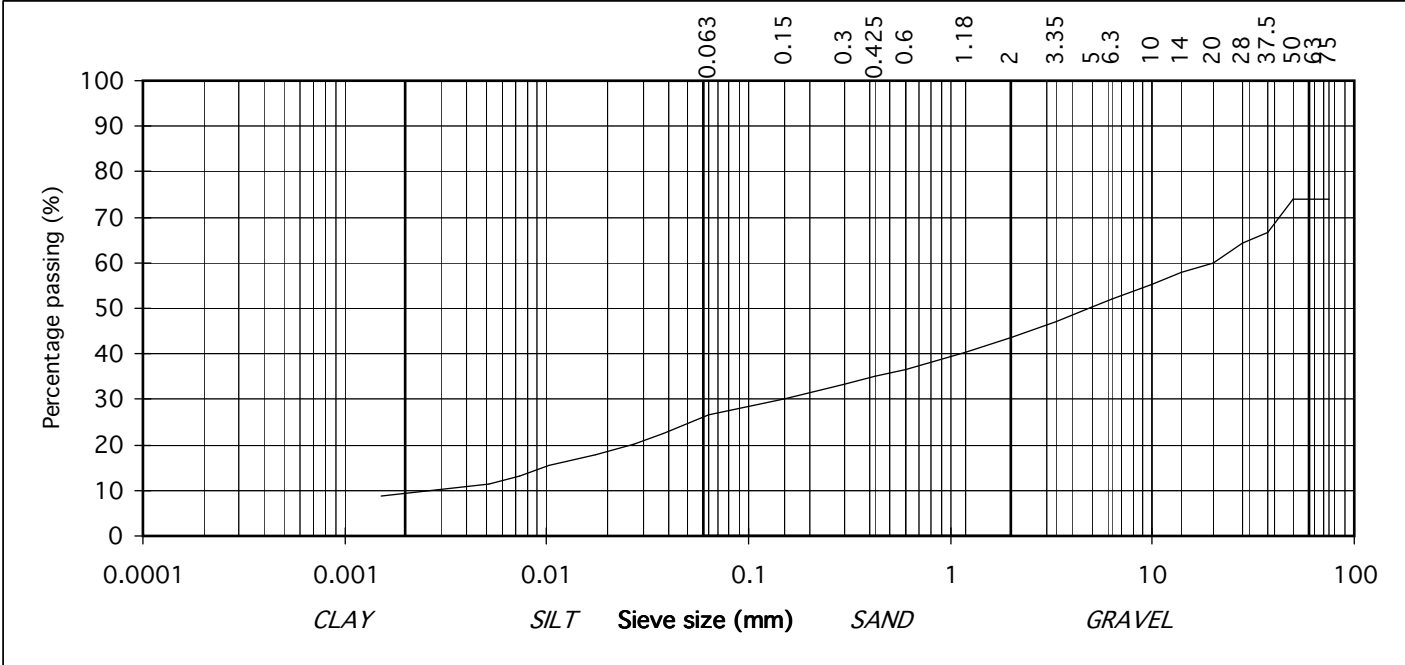
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51382
75	74	COBBLES	Contract: Greater Dublin Drainage Scheme
63	74		Depth (m): 1.60 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	74	GRAVEL	Sample No. 4619 Lab. Sample No. A13/0798
37.5	67		Sample Type: B
28	64		Date Received 26/02/2013 Date Testing started 27/02/2013
20	60		Description: Grey brown slightly sandy, slightly gravelly, CLAY with many cobbles
14	58		Remarks
10	55		
6.3	52		
5	50		
3.35	47		
2	44		
1.18	40	SAND	
0.6	37		
0.425	35		
0.3	33		
0.15	30	SILT/CLAY	
0.063	27		
0.038	22		
0.027	20		
0.017	18		
0.010	16		
0.007	13		
0.005	11		
0.002	9		



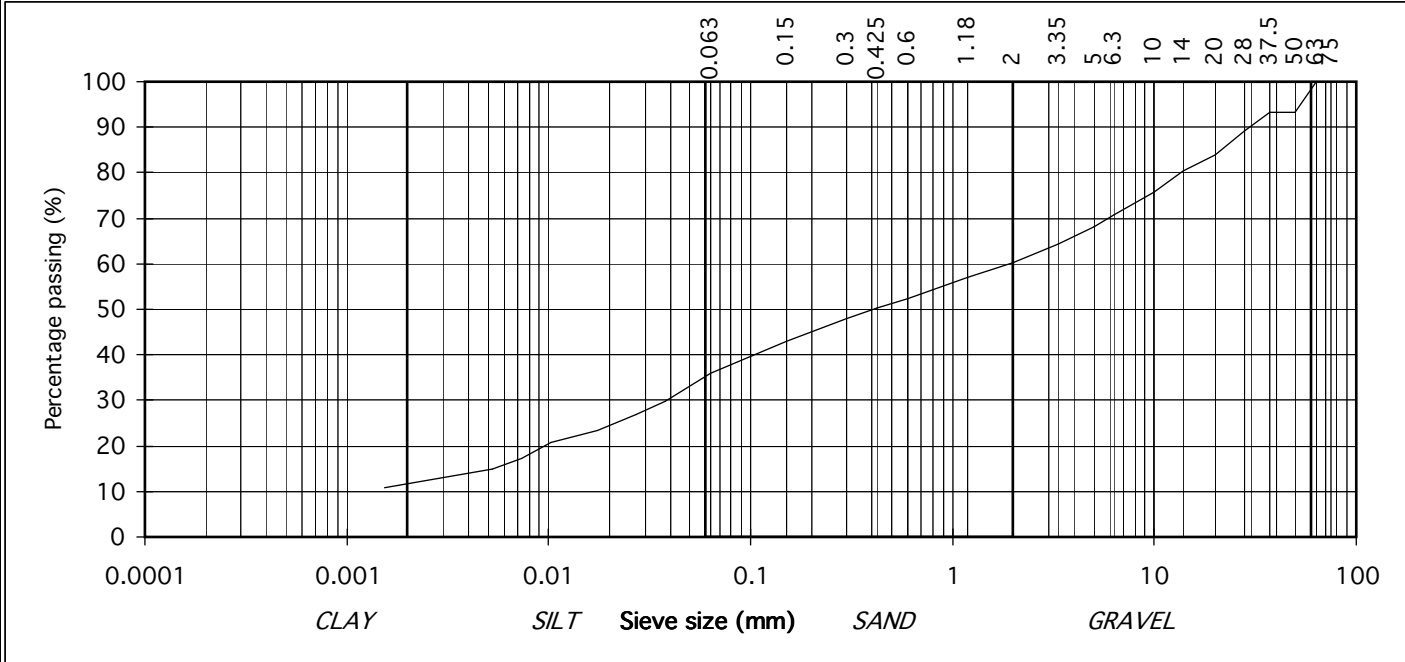
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TEST REPORT
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51383
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme		
63	100		Depth (m):	2.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du
50	93		Remarks			
37.5	93	GRAVEL	Sample No.	4613	Lab. Sample No.	A13/0802
28	89		Date Received	26/02/2013	Date Testing started	27/02/2013
20	84		Description:	Grey black slightly sandy, gravelly, CLAY		
14	80					
10	76					
6.3	71					
5	68					
3.35	64					
2	60					
1.18	57		SAND			
0.6	52					
0.425	50					
0.3	48					
0.15	43					
0.063	36	SILT/CLAY				
0.038	30					
0.027	27					
0.017	23					
0.010	21					
0.007	17					
0.005	15					
0.002	11					



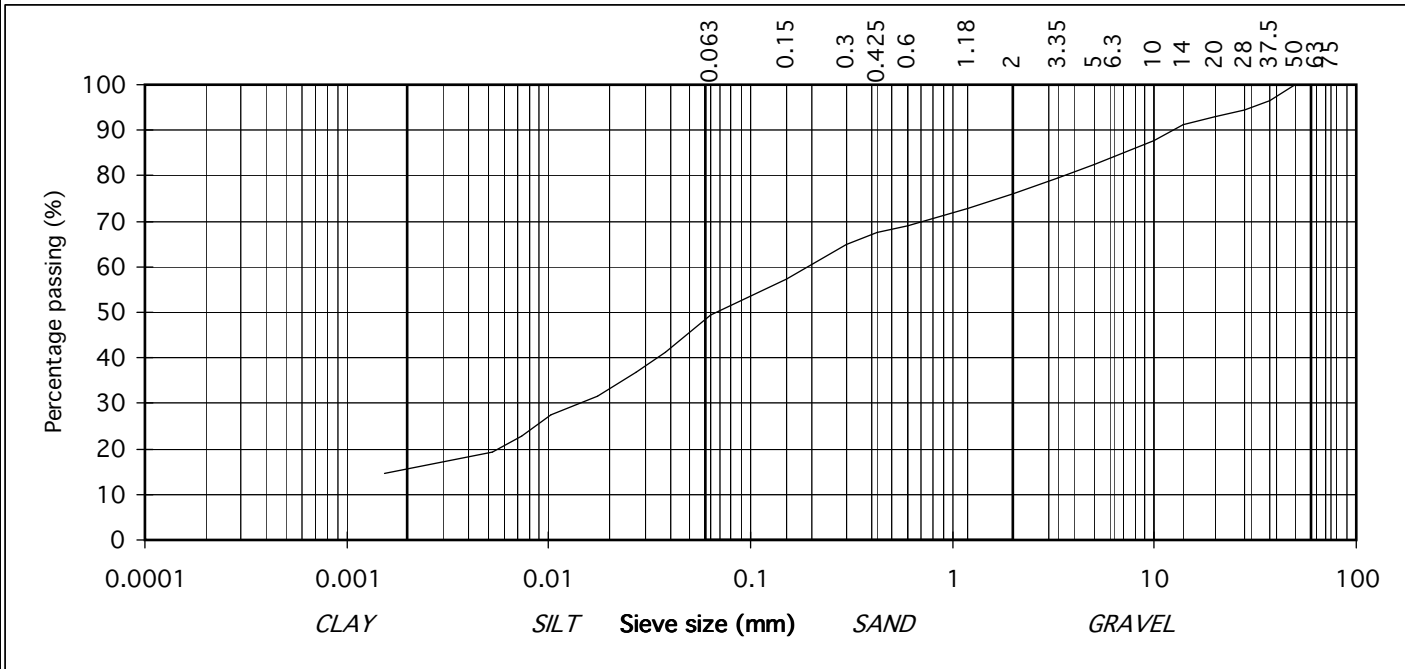
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51384
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Depth (m): 0.60	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received: 26/02/2013	Date Testing started: 27/02/2013
37.5	97	GRAVEL	Sample No. 4642	Lab. Sample No. A13/0803
28	94		Sample Type: B	
20	93		Description: Brown slightly sandy, slightly gravelly, CLAY	
14	91		Remarks	
10	88			
6.3	84			
5	82			
3.35	79			
2	76			
1.18	73		SAND	
0.6	69			
0.425	67			
0.3	65			
0.15	57			
0.063	49	SILT/CLAY		
0.038	41			
0.027	37			
0.017	32			
0.010	27			
0.007	23			
0.005	19			
0.002	14			



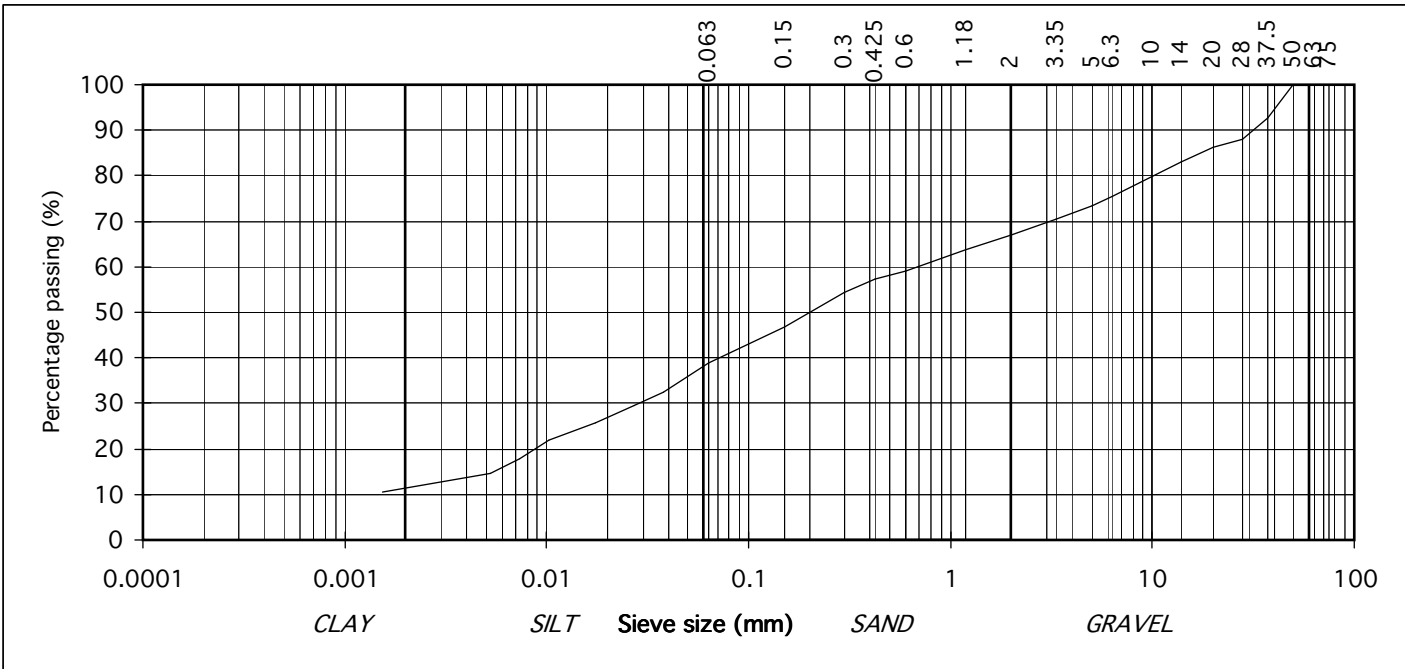
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TEST REPORT
Determination of Particle Size Distribution
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particle size	% passing		Contract No: 16695 Report No. R51385
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 0.90 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received 26/02/2013 Date Testing started 27/02/2013
37.5	93	GRAVEL	Description: Brown slightly sandy, slightly gravelly, CLAY
28	88		Remarks
20	86		
14	83		
10	80		
6.3	76		
5	73		
3.35	70		
2	67		
1.18	64		SAND
0.6	59		
0.425	57		
0.3	54		
0.15	47		
0.063	39	SILT/CLAY	
0.038	33		
0.027	29		
0.017	26		
0.010	22		
0.007	18		
0.005	15		
0.002	11		



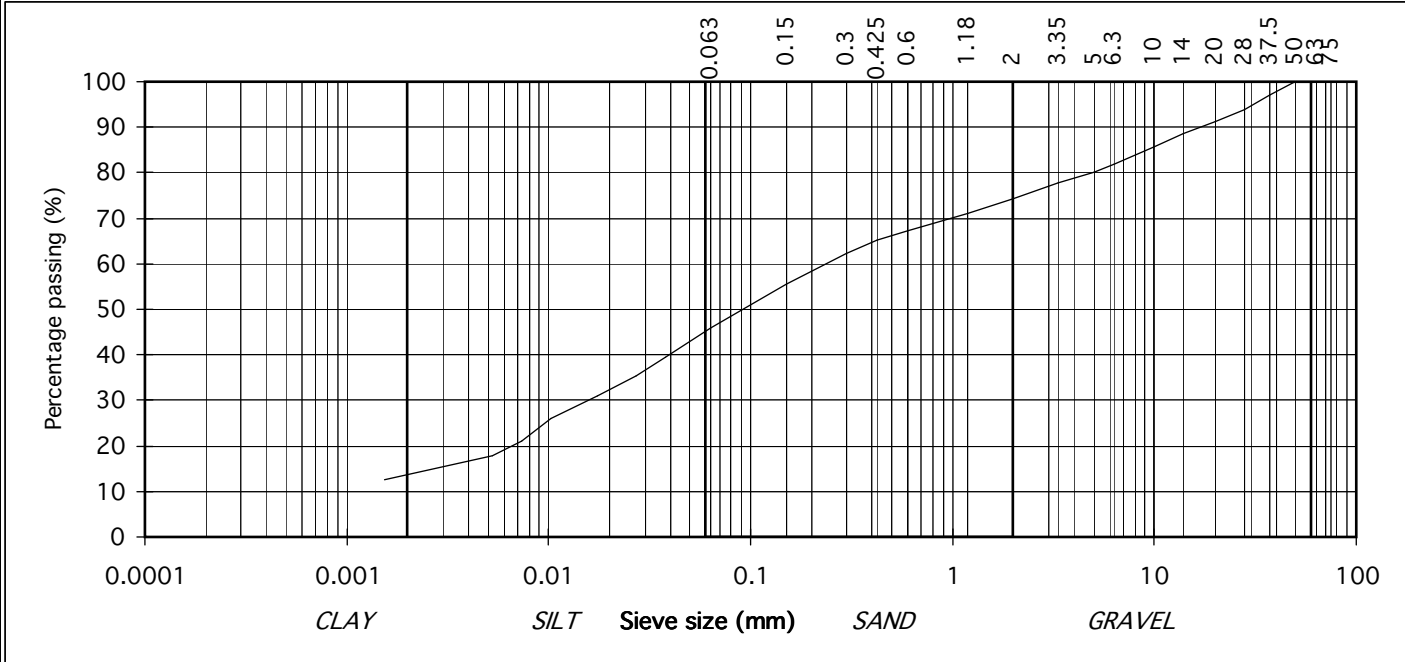
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51386
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 1.10 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received 26/02/2013 Date Testing started 27/02/2013
37.5	97	GRAVEL	Description: Brown slightly sandy, slightly gravelly, SILT
28	94		Remarks
20	91		
14	89		
10	86		
6.3	82		
5	80		
3.35	78		
2	74		
1.18	71		SAND
0.6	67		
0.425	65		
0.3	62		
0.15	55		
0.063	46	SILT/CLAY	
0.038	39		
0.027	35		
0.017	31		
0.010	26		
0.007	21		
0.005	18		
0.002	13		



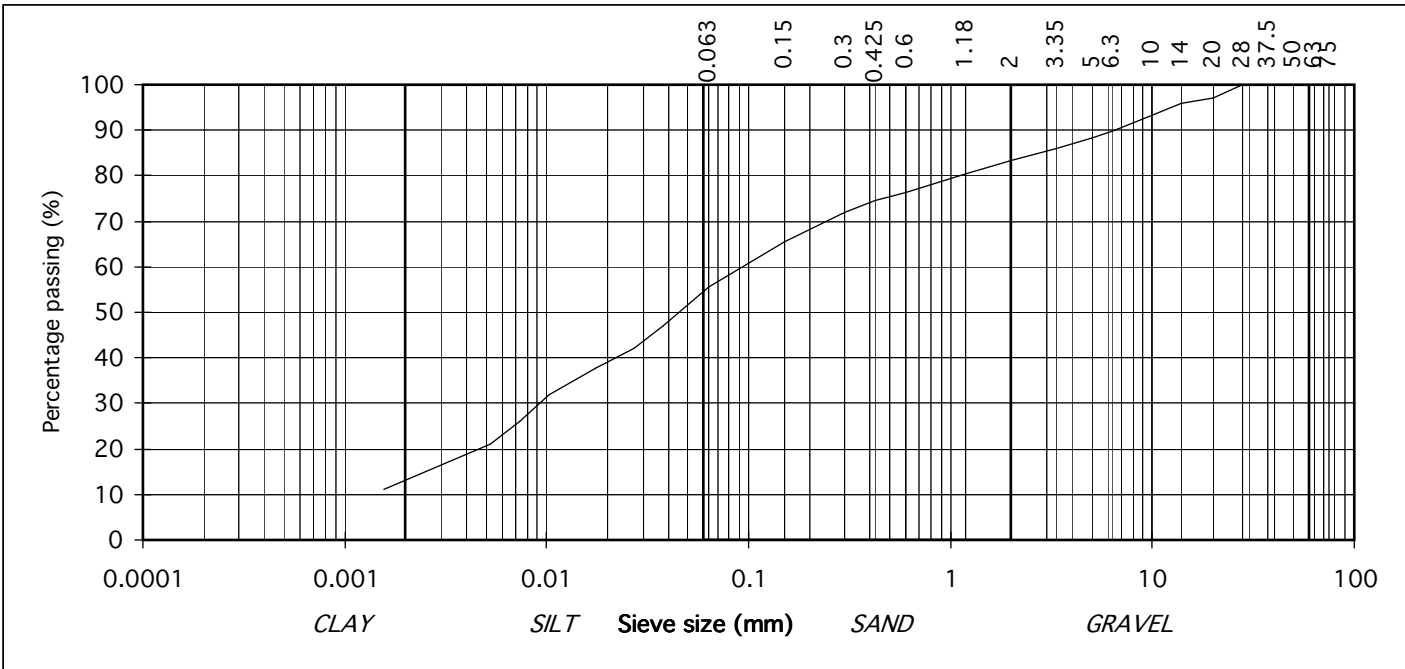
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TEST REPORT
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51387
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 1.70 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received 26/02/2013 Date Testing started 27/02/2013
37.5	100	GRAVEL	Description: Brown slightly sandy, slightly gravelly, CLAY
28	100		Remarks
20	97		
14	96		
10	93		
6.3	90		
5	88		
3.35	86		
2	83		
1.18	80		SAND
0.6	76		
0.425	75		
0.3	72		
0.15	65		
0.063	55	SILT/CLAY	
0.038	47		
0.027	42		
0.017	38		
0.010	32		
0.007	26		
0.005	21		
0.002	11		



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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51388	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Depth (m):	1.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
50	100		Date Received	26/02/2013	Date Testing started	27/02/2013	
37.5	95	GRAVEL	Sample No.	4639	Lab. Sample No.	A13/0816	
28	93		Sample Type:	B			
20	89		Description:	Grey brown slightly sandy, slightly gravelly, CLAY			
14	86		Remarks				
10	81						
6.3	78						
5	76						
3.35	73						
2	69						
1.18	65						
0.6	60						
0.425	58						
0.3	56						
0.15	50						
0.063	43	SAND					
0.037	37						
0.027	34						
0.017	30		SILT/CLAY				
0.010	26						
0.007	22						
0.005	18						
0.002	13						

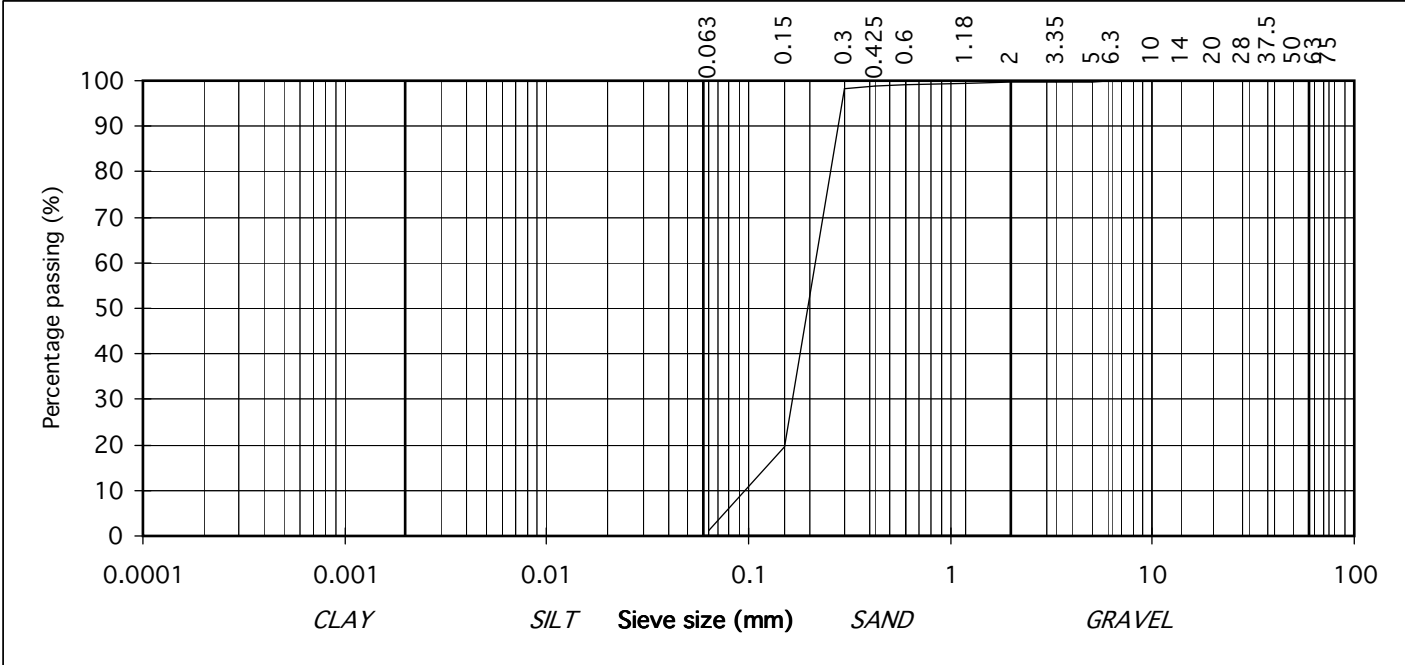
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51389
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Depth (m): 0.70	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received: 26/02/2013	Date Testing started: 27/02/2013
37.5	100	GRAVEL	Sample No. 4606	Lab. Sample No. A13/0818
28	100		Sample Type: B	
20	100		Description: Brown slightly silty, SAND	
14	100		Remarks	
10	100			
6.3	100			
5	100			
3.35	100	SAND		
2	100			
1.18	99			
0.6	99			
0.425	99	SILT/CLAY		
0.3	98			
0.15	19			
0.063	1			



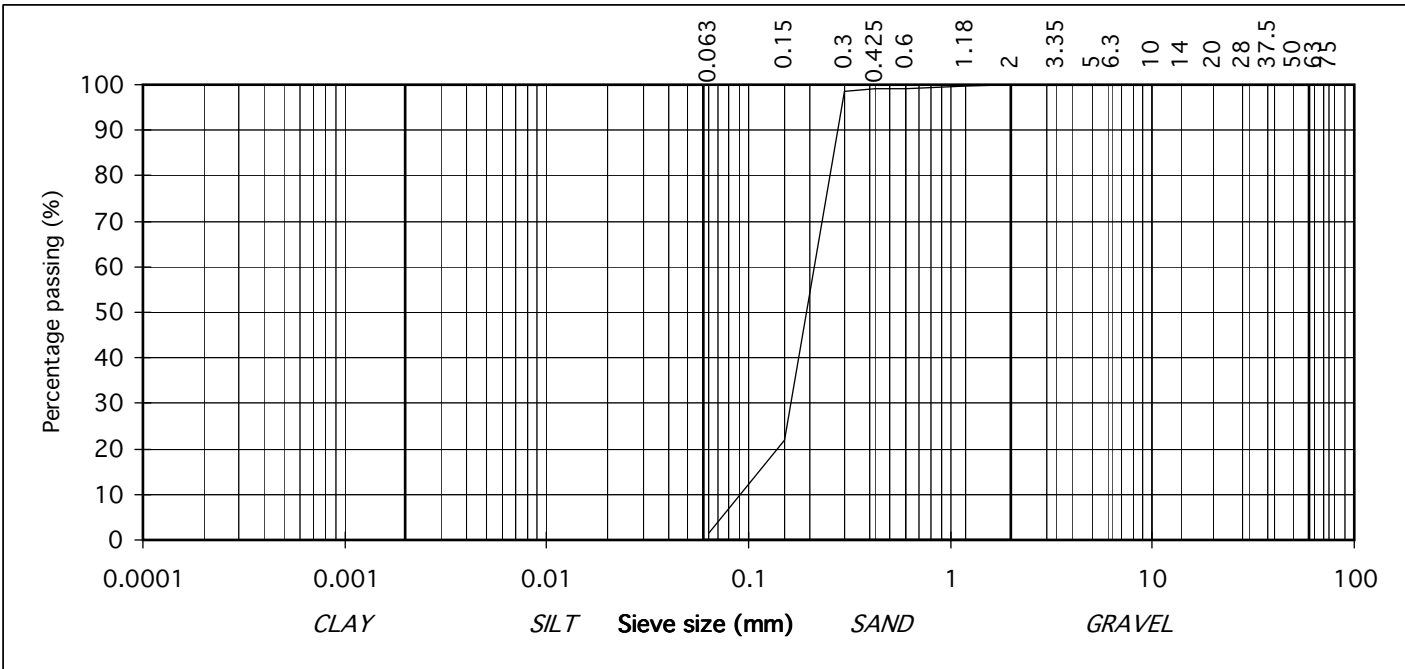
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51390	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Depth (m):	1.40			
50	100		Description:	Brown slightly silty, SAND			
37.5	100	GRAVEL	Sample No.	4607	Lab. Sample No.	A13/0819	
28	100		Sample Type:	B			
20	100		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	100		Remarks	Shell Fragments present			
10	100						
6.3	100						
5	100						
3.35	100	SAND					
2	100						
1.18	100						
0.6	99						
0.425	99						
0.3	99	SILT/CLAY					
0.15	22						
0.063	1						



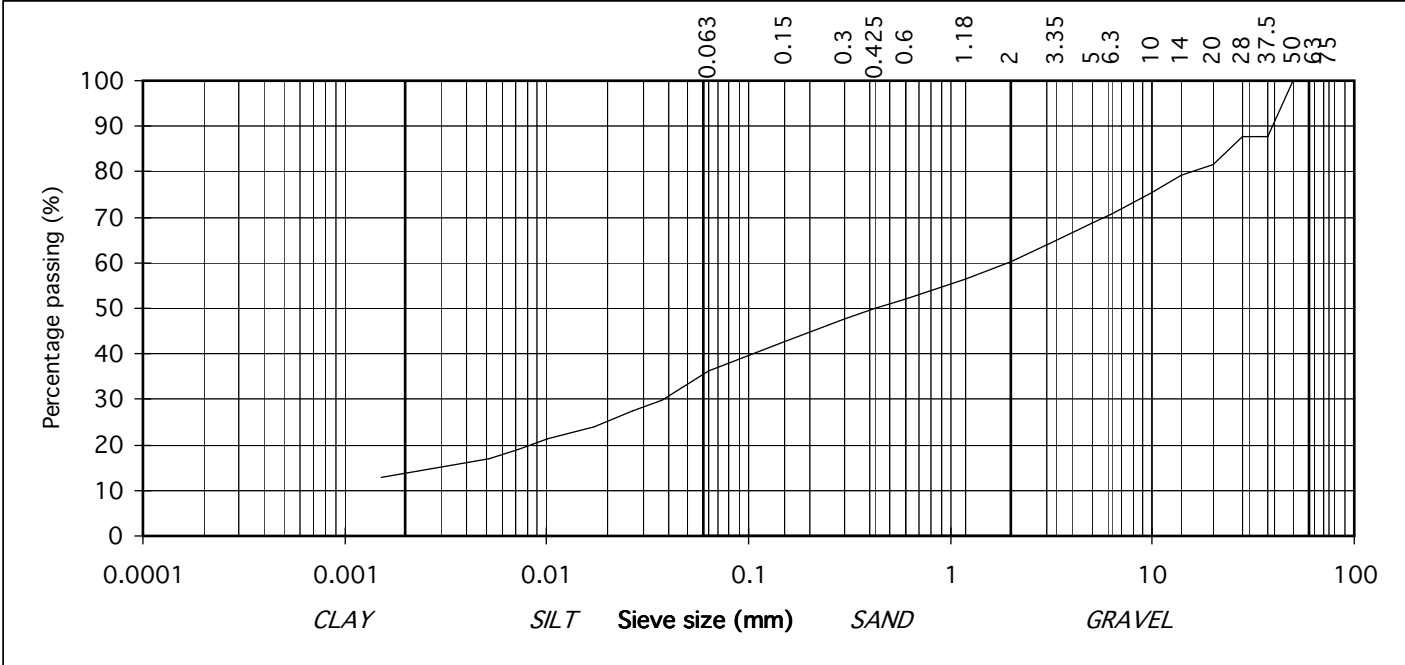
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51391
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme		
63	100		Depth (m):	0.50	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du
50	100		Date Received	26/02/2013	Date Testing started	27/02/2013
37.5	88	GRAVEL	Sample No.	4608	Lab. Sample No.	A13/0820
28	88		Sample Type:	B		
20	82		Description:	Brown slightly sandy, gravelly, CLAY		
14	79		Remarks			
10	76					
6.3	71					
5	69					
3.35	65	SAND				
2	60					
1.18	57					
0.6	52	SILT/CLAY				
0.425	50					
0.3	48					
0.15	43					
0.063	36					
0.037	30					
0.027	27					
0.017	24					
0.010	21					
0.007	19					
0.005	17					
0.002	13					



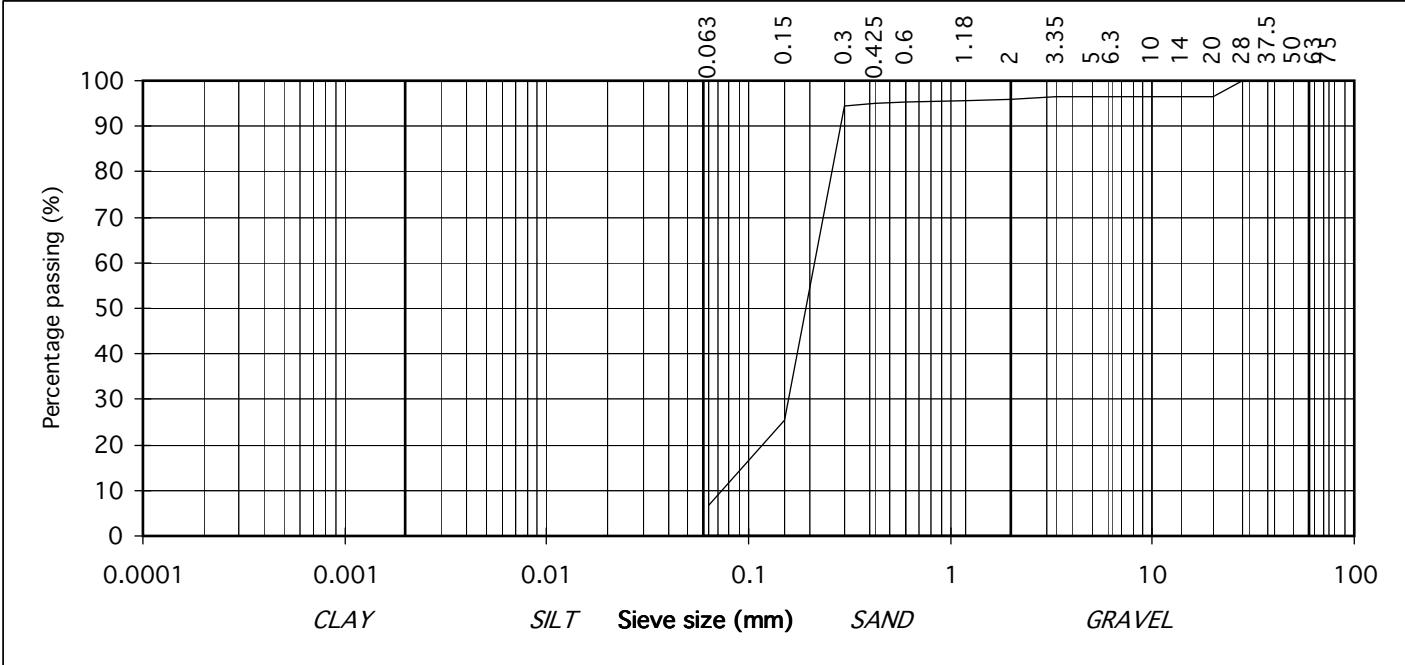
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51392
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 14	
50	100		Sample No. 3062	Lab. Sample No. A13/0822
37.5	100	GRAVEL	Sample Type: B	
28	100		Depth (m): 2.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	97		Date Received 26/02/2013	Date Testing started 27/02/2013
14	97		Description: Brown silty, slightly gravelly, SAND	
10	97		Remarks	
6.3	96			
5	96			
3.35	96			
2	96			
1.18	96		SAND	
0.6	95			
0.425	95			
0.3	94			
0.15	25			
0.063	7	SILT/CLAY		



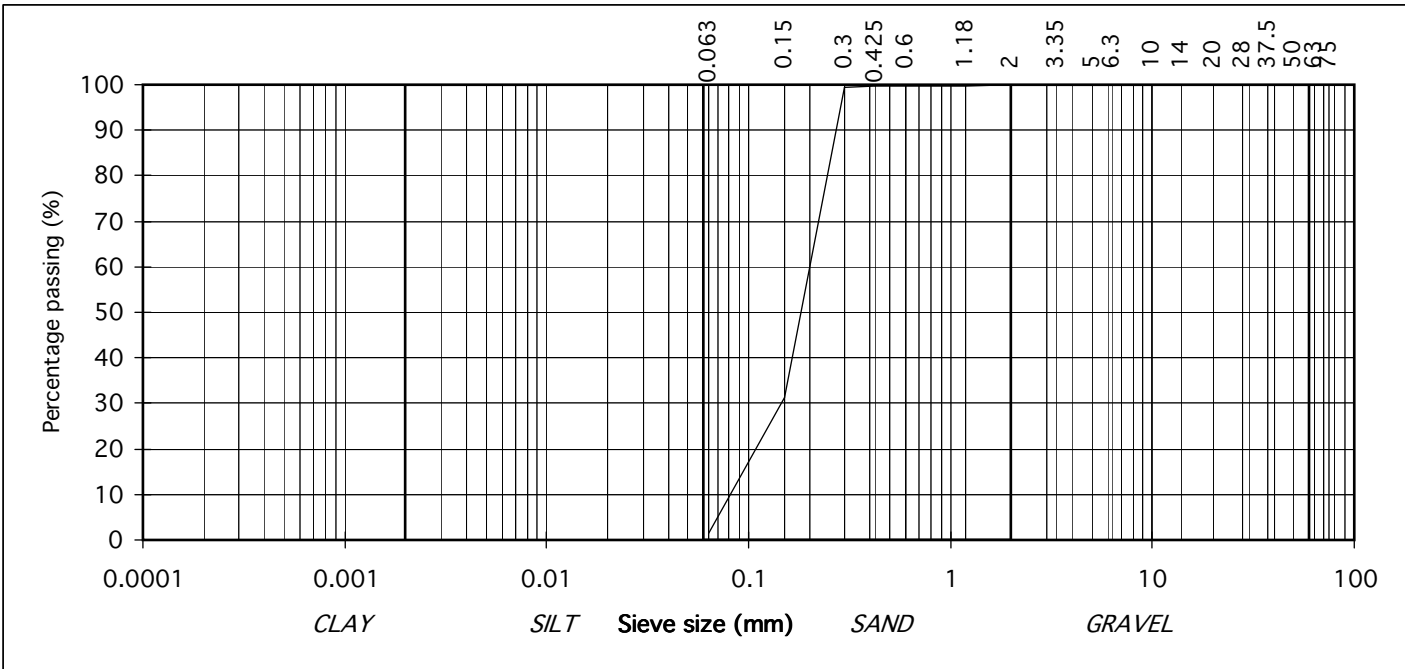
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51393
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 14
50	100		Sample No. 3063 Lab. Sample No. A13/0823
37.5	100	GRAVEL	Sample Type: B
28	100		Depth (m): 3.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	100		Date Received 26/02/2013 Date Testing started 27/02/2013
14	100		Description: Brown slightly silty, SAND
10	100		Remarks
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	SAND	
0.425	100		
0.3	100		
0.15	31	SILT/CLAY	
0.063	2		



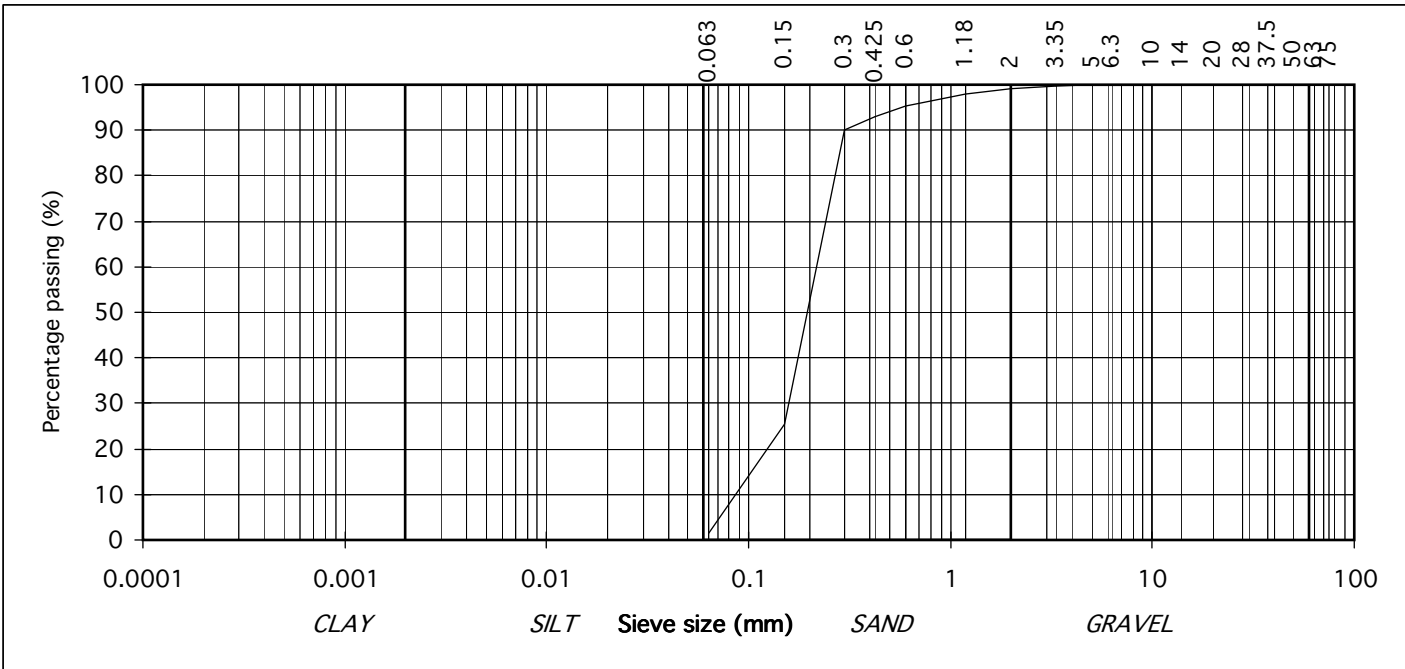
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TEST REPORT
Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51394 Contract: Greater Dublin Drainage Scheme Bh: 14 Sample No. 3065 Lab. Sample No. A13/0824 Sample Type: B Depth (m): 5.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Du Date Received 26/02/2013 Date Testing started 27/02/2013 Description: Brown slightly silty, slightly gravelly, SAND Remarks
75	100	COBBLES	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100	GRAVEL	
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	98	SAND	
0.6	95		
0.425	93		
0.3	90		
0.15	25		
0.063	1		
		SILT/CLAY	

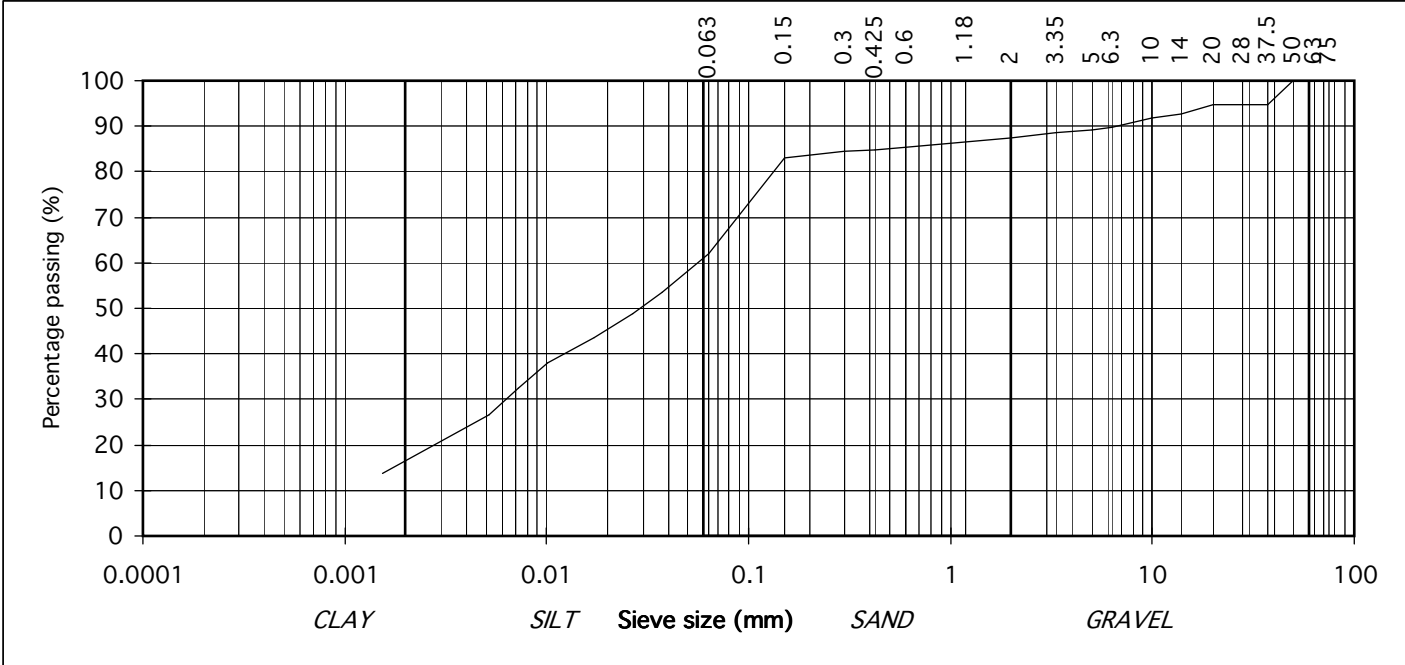


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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51395
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 14	
50	100		Sample No. 3067	Lab. Sample No. A13/0825
37.5	95	GRAVEL	Sample Type: B	
28	95		Depth (m): 8.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	95		Date Received 26/02/2013	Date Testing started 27/02/2013
14	93		Description: Grey slightly sandy, slightly gravelly, SILT	
10	92		Remarks	
6.3	90			
5	89			
3.35	88			
2	87			
1.18	87		SAND	
0.6	85			
0.425	85			
0.3	84			
0.15	83			
0.063	62	SILT/CLAY		
0.037	54			
0.027	49			
0.017	43			
0.010	38			
0.007	32			
0.005	27			
0.002	14			



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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51396	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 13	
50	100		Sample No. 3072 Lab. Sample No. A13/0826	
37.5	100	GRAVEL	Sample Type: B	
28	97		Depth (m): 1.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Du	
20	95		Date Received 26/02/2013 Date Testing started 27/02/2013	
14	90		Description: Brown slightly sandy, slightly gravelly, CLAY	
10	86		Remarks	
6.3	82		SAND	
5	79			
3.35	76			
2	72			
1.18	68			
0.6	63			
0.425	61			
0.3	58			
0.15	52			
0.063	44			
0.038	39	SILT/CLAY		
0.027	35			
0.017	32			
0.010	29			
0.007	25			
0.005	24			
0.002	18			

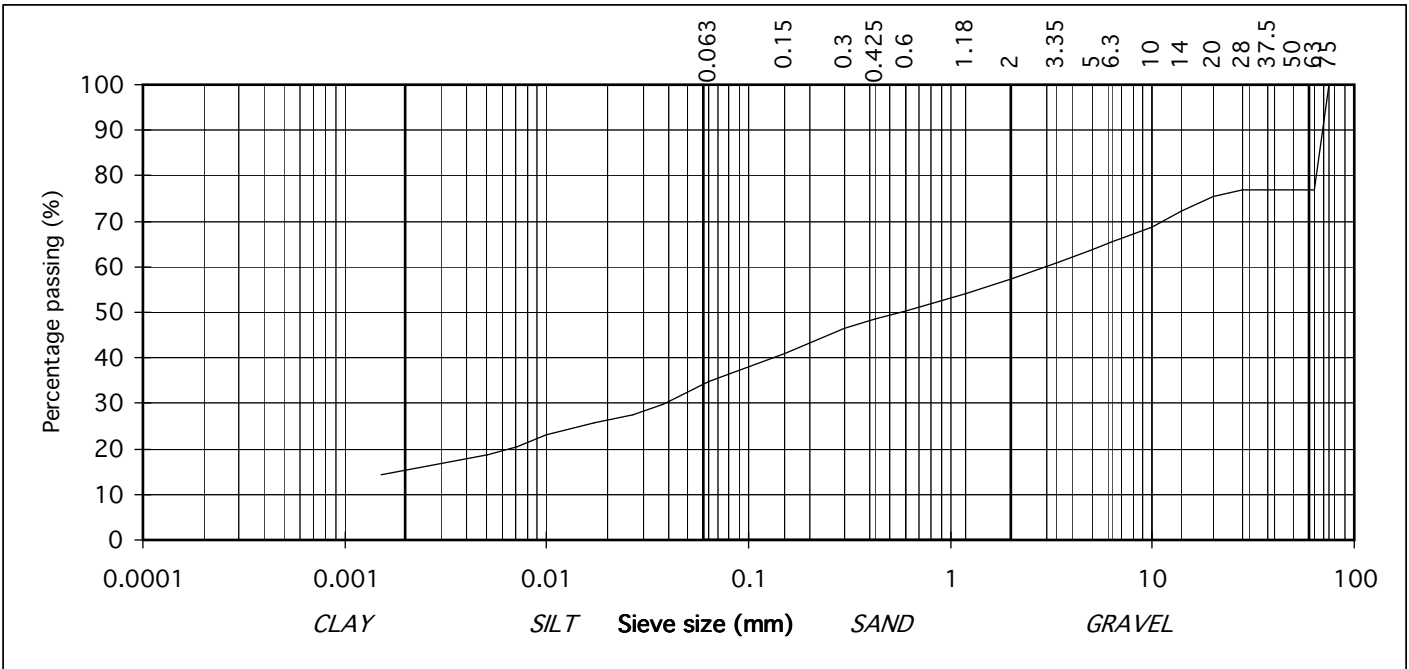
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51397
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	77		Bh: 13
50	77		Sample No. 3073 Lab. Sample No. A13/0827
37.5	77	GRAVEL	Sample Type: B
28	77		Depth (m): 2.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	75		Date Received 26/02/2013 Date Testing started 27/02/2013
14	72		Description: Brown slightly sandy, gravelly, CLAY with many cobbles
10	69		Remarks
6.3	65		
5	64		
3.35	61		
2	57		
1.18	54		SAND
0.6	50		
0.425	49		
0.3	46	SILT/CLAY	
0.15	41		
0.063	35		
0.038	30		
0.027	27		
0.017	26		
0.010	23		
0.007	21		
0.005	19		
0.002	14		



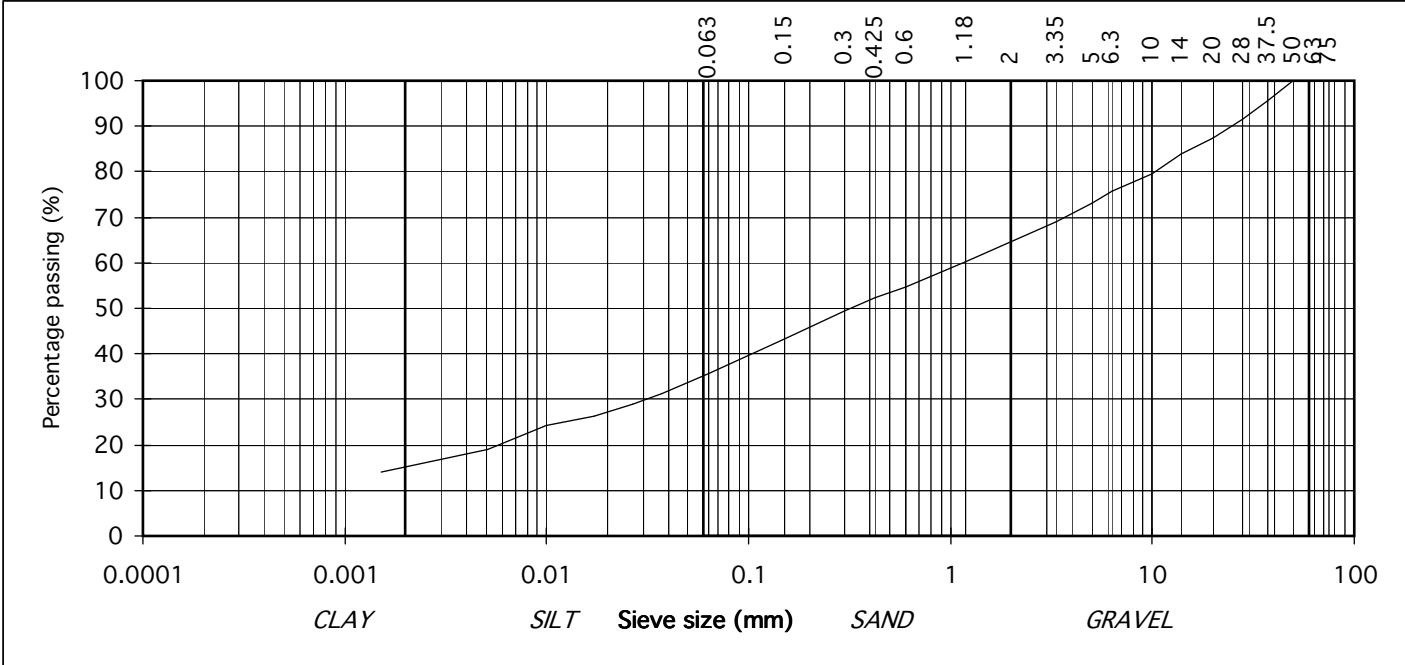
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)





particle size	% passing		Contract No: 16695	Report No. R51398
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 13	
50	100		Sample No. 3078	Lab. Sample No. A13/0828
37.5	96	GRAVEL	Sample Type: B	
28	92		Depth (m): 8.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	88		Date Received 26/02/2013	Date Testing started 27/02/2013
14	84		Description: Grey slightly sandy, gravelly, CLAY	
10	79		Remarks	
6.3	76			
5	73			
3.35	69			
2	65			
1.18	60			
0.6	55	SAND		
0.425	52			
0.3	50			
0.15	43	SILT/CLAY		
0.063	36			
0.037	31			
0.027	29			
0.017	26			
0.010	24			
0.007	22			
0.005	19			
0.002	14			




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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report				
	Determination of Moisture Condition Value at Natural Moisture Content				
	Tested in accordance with BS1377:Part 4:1990, clause 5.4				
Report No.		R51399			
Contract No.		16695			
Contract Name:		Greater Dublin Drainage Scheme			
Customer:		Fingal County Council, Grove Road, Blanchardstown, Dublin 15.			
BH/TP		Tp 4			
Sample No.		4612			
Depth (m)		0.60			
Sample Type:		B			
Lab Sample No.		A13/0804			
Source (if applicable)		N/A			
Material Type (if applicable):		soil			
Sample Received:		26/02/13			
Date Tested:		28/02/13			
Sample Cert:		Not Provided			
Moisture Content (%):		22			
% Particles > 20mm (By dry mass):		5			
MCV:		4.8			
Interpretation of Plot:		Steepest Straight Line			
Description of Soil:		Brown slightly sandy, slightly gravelly, CLAY			
<p>The result relates to the specimen tested. Any remaining material will be retained for one month. Sampling and opinions and interpretations are outside the scope of accreditation.</p>			<p>Persons authorised to approve reports</p> <p>J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)</p>		
IGSL Ltd Materials Laboratory		Approved by		Date	Page
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report				
	Determination of Moisture Condition Value at Natural Moisture Content				
	Tested in accordance with BS1377:Part 4:1990, clause 5.4				
Report No.		R51400			
Contract No.		16695			
Contract Name:		Greater Dublin Drainage Scheme			
Customer:		Fingal County Council, Grove Road, Blanchardstown, Dublin 15.			
BH/TP		Tp 5			
Sample No.		4627			
Depth (m)		1.20			
Sample Type:		B			
Lab Sample No.		A13/0807			
Source (if applicable)		N/A			
Material Type (if applicable):		soil			
Sample Received:		26/02/13			
Date Tested:		28/02/13			
Sample Cert:		Not Provided			
Moisture Content (%):		21			
% Particles > 20mm (By dry mass):		8			
MCV:		3.3			
Interpretation of Plot:		Steepest Straight Line			
Description of Soil:		Grey brown sandy gravelly CLAY			
<p>The result relates to the specimen tested. Any remaining material will be retained for one month. Sampling and opinions and interpretations are outside the scope of accreditation.</p>			<p>Persons authorised to approve reports</p> <p>J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)</p>		
IGSL Ltd Materials Laboratory		Approved by		Date	Page
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report				
	Determination of Moisture Condition Value at Natural Moisture Content				
	Tested in accordance with BS1377:Part 4:1990, clause 5.4				
Report No.		R51401			
Contract No.		16695			
Contract Name:		Greater Dublin Drainage Scheme			
Customer:		Fingal County Council, Grove Road, Blanchardstown, Dublin 15.			
BH/TP		Tp 7			
Sample No.		4631			
Depth (m)		1.10			
Sample Type:		B			
Lab Sample No.		A13/0811			
Source (if applicable)		N/A			
Material Type (if applicable):		soil			
Sample Received:		26/02/13			
Date Tested:		28/02/13			
Sample Cert:		Not Provided			
Moisture Content (%):		22			
% Particles > 20mm (By dry mass):		8			
MCV:		< 1			
Interpretation of Plot:		Steepest Straight Line			
Description of Soil:		Brown slightly sandy, slightly gravelly, CLAY			
<p>The result relates to the specimen tested. Any remaining material will be retained for one month. Sampling and opinions and interpretations are outside the scope of accreditation.</p>			<p>Persons authorised to approve reports</p> <p>J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)</p>		
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IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

TEST REPORT
Determination of MCV / moisture content
Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R51403 Contract Greater Dublin Drainage Scheme

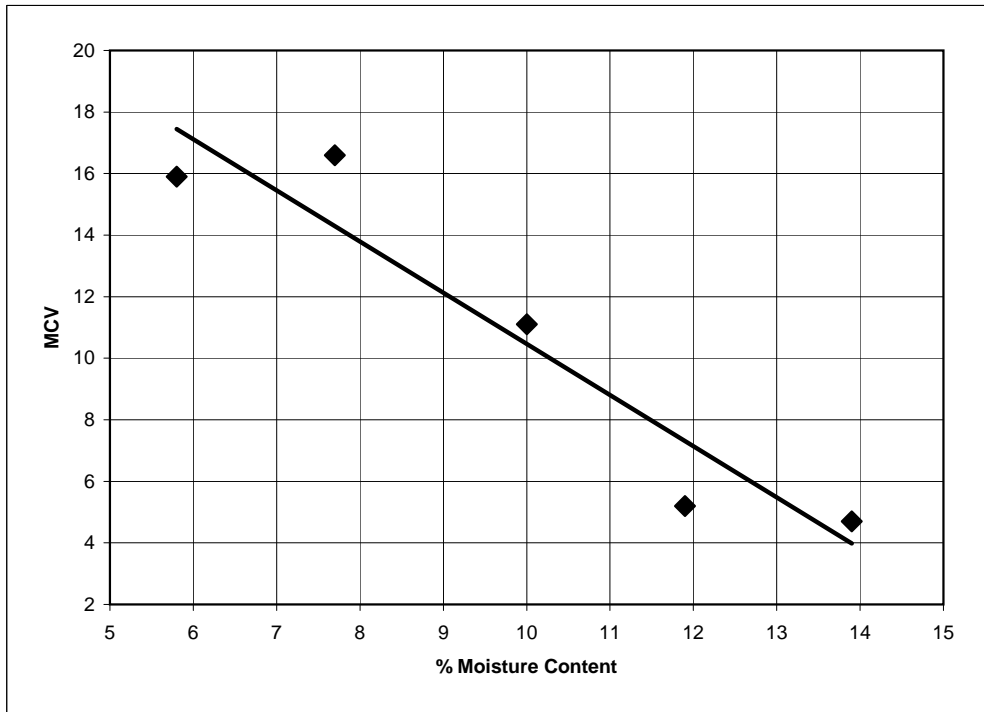
Contract No. 16695 Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Date received 26/02/13 Date Tested 28/02/13

BH/TP No. Tp 2 Sample No. 4619 Type: B

Depth (m) 1.60 Lab sample No. A13/0798

MC%	14	12	10	7.7	5.8
MCV	4.7	5.2	11.1	16.6	15.9



% material >20mm 15

Persons authorized to approve reports

J Barrett (Deputy Quality Manager)
 H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

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IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

TEST REPORT
Determination of MCV / moisture content
Relation of a soil

Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R51404 Contract Greater Dublin Drainage Scheme

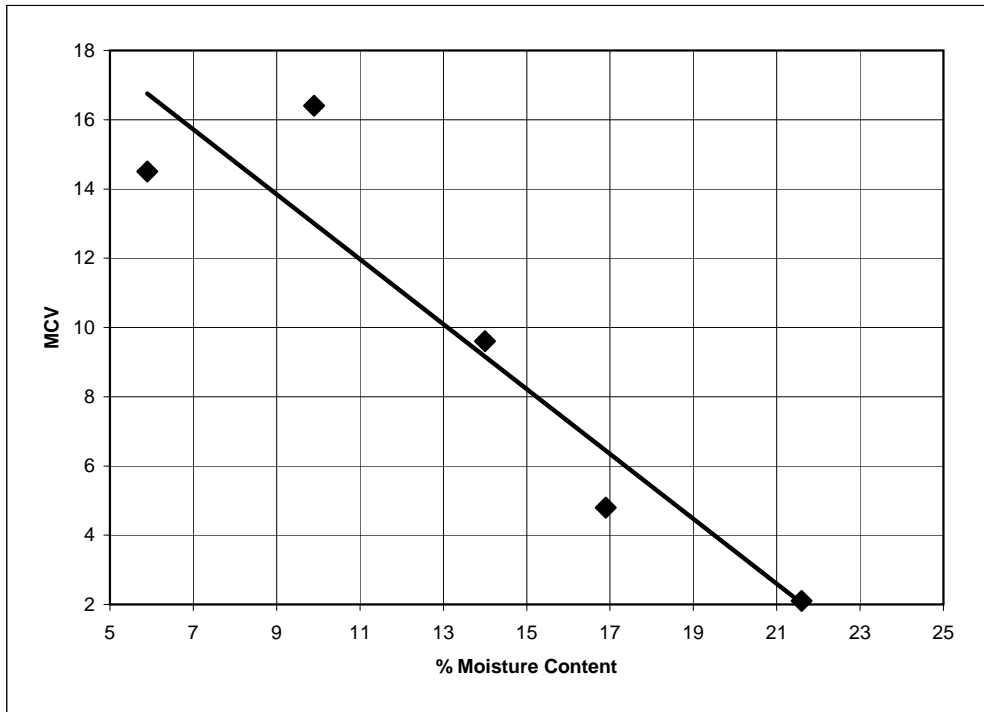
Contract No. 16695 Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Date received 26/02/13 Date Tested 28/02/13

BH/TP No. Tp 6 Sample No. 4635 Type: B

Depth (m) 0.90 Lab sample No. A13/0809

MCV	22	17	14	9.9	5.9
MCV	2.1	4.8	9.6	16.4	14.5



% material >20mm 19

Persons authorized to approve reports

J Barrett (Deputy Quality Manager)
 H Byrne (Quality Manager)

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IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

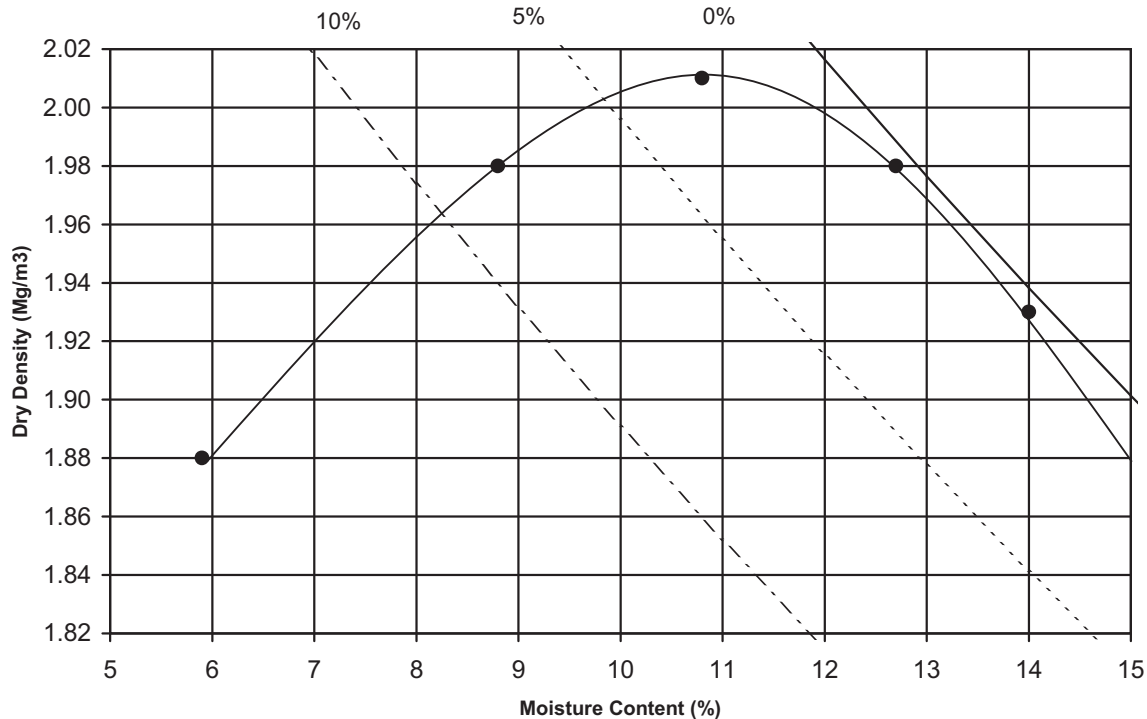
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R51402 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: TP 3
 Sample No. 4612 Depth (m) 0.9 Material Type B
 Lab sample no. A13/0801 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 26/02/2013 Test Method: 2.5 KG Rammer
 Date Tested: 28/02/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.93	2.01	1.98	1.98	1.88		
Moisture Content (%)	14	11	13	8.8	5.9		



Maximum Dry Density (Mg/m³): 2.01 Optimum Moisture Content (%): 11

Description: Grey brown sandy gravelly SILT/CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.66 Particle Density: Assumed

% retained on 20/37.5mm sieve: 14

Natural Moisture Content (%): 14

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

20/03/13

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Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



Attention : John Clancy
Date : 8th March, 2013
Your reference : 16695
Our reference : Test Report 13/2282 Batch 1
Location : GREATER DUBLIN
Date samples received : 27th February, 2013
Status : Final report
Issue : 1

Nineteen samples were received for analysis on 27th February, 2013. 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward B.Sc
Principal Chemist

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 13/2282

SOILS

Please note we are only MCERTS accredited 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. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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. 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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final 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.

Please include all sections of this report if it is reproduced

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
NFD	No Fibres Detected

Appendix 8

Laboratory Test Records

Schedule 2

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51361** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme
 Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Samples Received: 26/02/13 Date Tested: 26/02/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 01	3091	1.0	A13/0722	B	16								Grey brown sandy gravelly SILT/CLAY
Bh 01	3092	2.0	A13/0723	B	12	39	19	20	53	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CLAY
Bh 01	3094	4.0	A13/0724	B	8.7	28	14	14	58	WS	4.4		Brown slightly sandy, slightly gravelly, CLAY
Bh 01	3096	6.5	A13/0725	B	10	34	17	17	56	WS	4.4	C L	Grey black slightly sandy, gravelly, CLAY with some cobbles
Bh 01	3099	10.5	A13/0727	B	11	30	15	15	63	WS	4.4	C L	Grey black slightly sandy, gravelly, CLAY
Bh 02	3082	1.0	A13/0728	B	13	38	19	19	63	WS	4.4	C I	Grey black slightly sandy, slightly gravelly, CLAY
Bh 02	3083	2.0	A13/0729	B	11								Grey black sandy gravelly SILT/CLAY
Bh 02	3084	3.0	A13/0730	B	9.4	30	14	16	58	WS	4.4	C L	Grey black slightly sandy, slightly gravelly, CLAY
Bh 02	3089	9.5	A13/0731	B	8.2	32	15	17	65	WS	4.4	C L	Grey black slightly sandy, gravelly, CLAY
Bh 03	3836	1.0	A13/0732	B	16								Brown sandy gravelly SILT/CLAY
Bh 03	3838	3.0	A13/0733	B	9.6	31	14	17	55	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
Bh 03	3840	5.0	A13/0734	B	13	35	17	18	57	WS	4.4	C L	Grey slightly sandy, slightly gravelly, CLAY
Bh 04	3844	1.0	A13/0735	B	10	36	16	20	58	WS	4.4	C I	Brown slightly sandy, gravelly, CLAY
Bh 04	3846	3.0	A13/0736	B	9.0	32	15	17	53	WS	4.4	C L	Black slightly sandy, slightly gravelly, CLAY
Bh 25	3853	2.0	A13/0737	B	9.5	28	14	14	54	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY with some cobbles

Notes: Preparation: WS - Wet sieved
 AR - As received
 NP - Non plastic
 Liquid Limit 4.3 Cone Penetrometer definitive method
 Clause: 4.4 Cone Penetrometer one point method
 Sample Type: B - bulk disturbed
 U - Undisturbed

Remarks:
 Opinions and interpretations are outside the scope of accreditation.
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by	Date	Page
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IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51362** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 26/02/13 Date Tested: 26/02/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 25	3859	8.0	A13/0739	B	14	35	16	19	65	WS	4.4	C L	Grey slightly sandy, slightly gravelly, CLAY

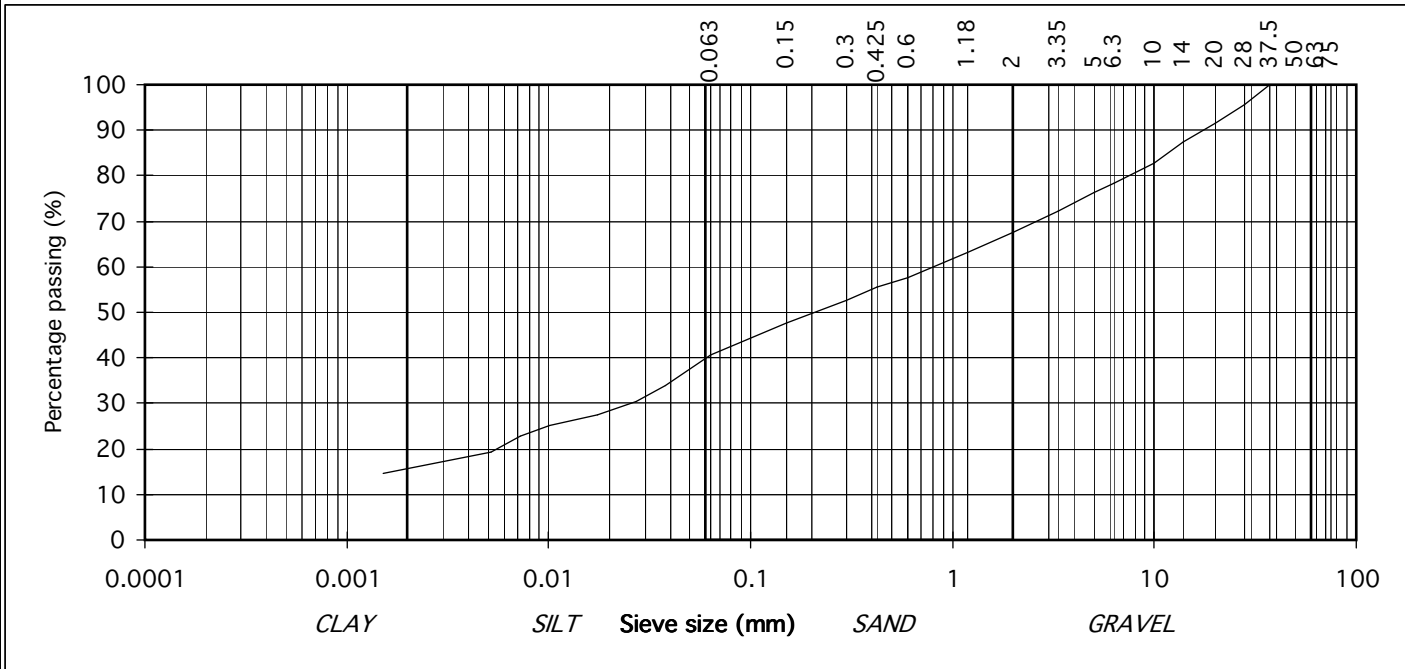
Notes: Preparation: WS - Wet sieved AR - As received NP - Non plastic Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method	Sample Type: B - bulk disturbed U - Undisturbed	Remarks: Opinions and interpretations are outside the scope of accreditation. The results relate to the specimens tested. Any remaining material will be retained for one month.
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IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 19/03/13	Page 1 of 1

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51366
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 1	
50	100		Sample No. 3092	Lab. Sample No. A13/0723
37.5	100	GRAVEL	Sample Type: B	
28	96		Depth (m): 2.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	92		Date Received 26/02/2013	Date Testing started 26/02/2013
14	87		Description: Brown slightly sandy, slightly gravelly, CLAY	
10	83		Remarks	
6.3	78			
5	76			
3.35	72			
2	68			
1.18	63		SAND	
0.6	58			
0.425	55			
0.3	53			
0.15	48			
0.063	41	SILT/CLAY		
0.038	34			
0.027	30			
0.017	28			
0.010	25			
0.007	23			
0.005	19			
0.002	15			



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51367	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	1			
50	100		Sample No.	3094	Lab. Sample No.	A13/0724	
37.5	96	GRAVEL	Sample Type:	B			
28	96		Depth (m):	4.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	89		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	84		Description:	Brown slightly sandy, slightly gravelly, CLAY			
10	81		Remarks				
6.3	76		SAND				
5	74						
3.35	71						
2	66						
1.18	62						
0.6	56						
0.425	54						
0.3	51	SILT/CLAY					
0.15	46						
0.063	40						
0.038	33						
0.027	30						
0.018	26						
0.010	22						
0.007	18						
0.005	15						
0.002	11						

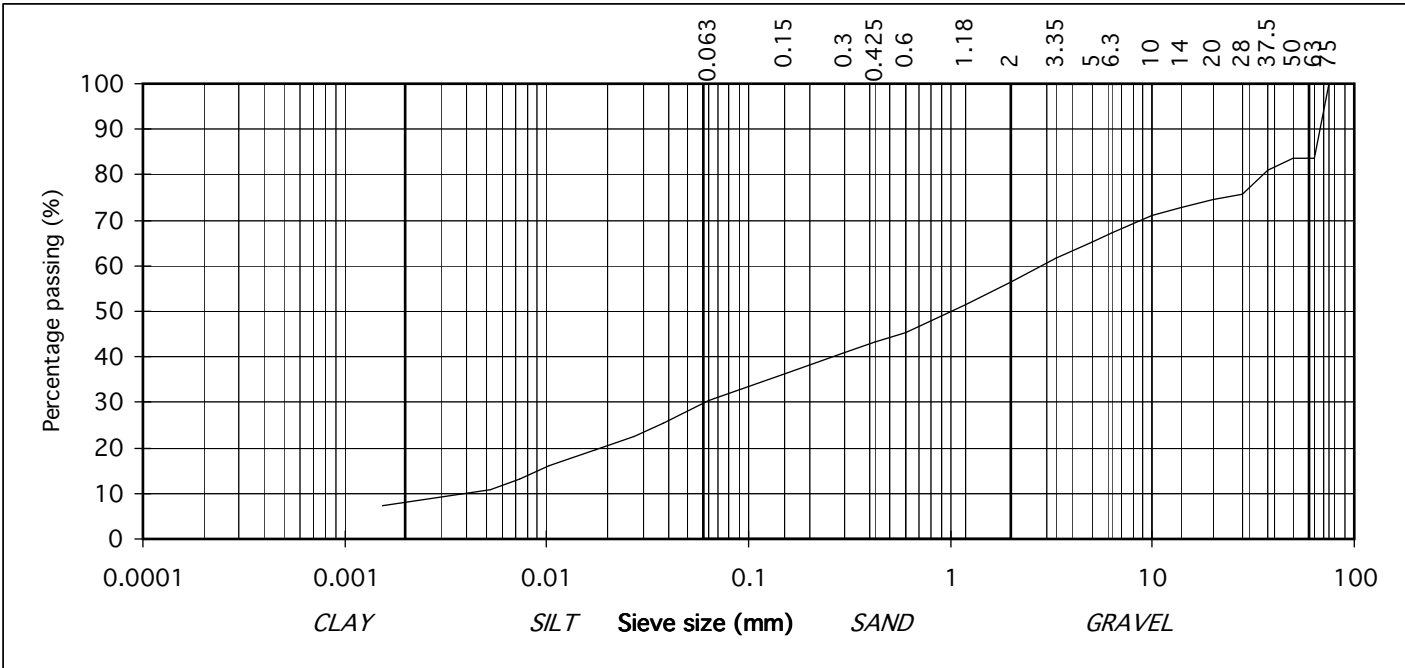
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51368
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	84		Bh: 1
50	84		Sample No. 3096 Lab. Sample No. A13/0725
37.5	81	GRAVEL	Sample Type: B
28	76		Depth (m): 6.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	75		Date Received 26/02/2013 Date Testing started 27/02/2013
14	73		Description: Grey black slightly sandy, gravelly, CLAY with some cobbles
10	71		Remarks
6.3	67		
5	65		
3.35	62		
2	56		
1.18	51		SAND
0.6	45		
0.425	43		
0.3	41	SILT/CLAY	
0.15	36		
0.063	31		
0.038	25		
0.027	23		
0.017	20		
0.010	16		
0.007	13		
0.005	11		
0.002	7		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51369	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	1			
50	100		Sample No.	3097	Lab. Sample No.	A13/0726	
37.5	100	GRAVEL	Sample Type:	B			
28	100		Depth (m):	8.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	99		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	96		Description:	Black grey slightly clayey/silty, very sandy, GRAVEL			
10	91		Remarks				
6.3	80		SAND				
5	72						
3.35	55						
2	35						
1.18	22						
0.6	14						
0.425	12						
0.3	10	SILT/CLAY					
0.15	7						
0.063	5						

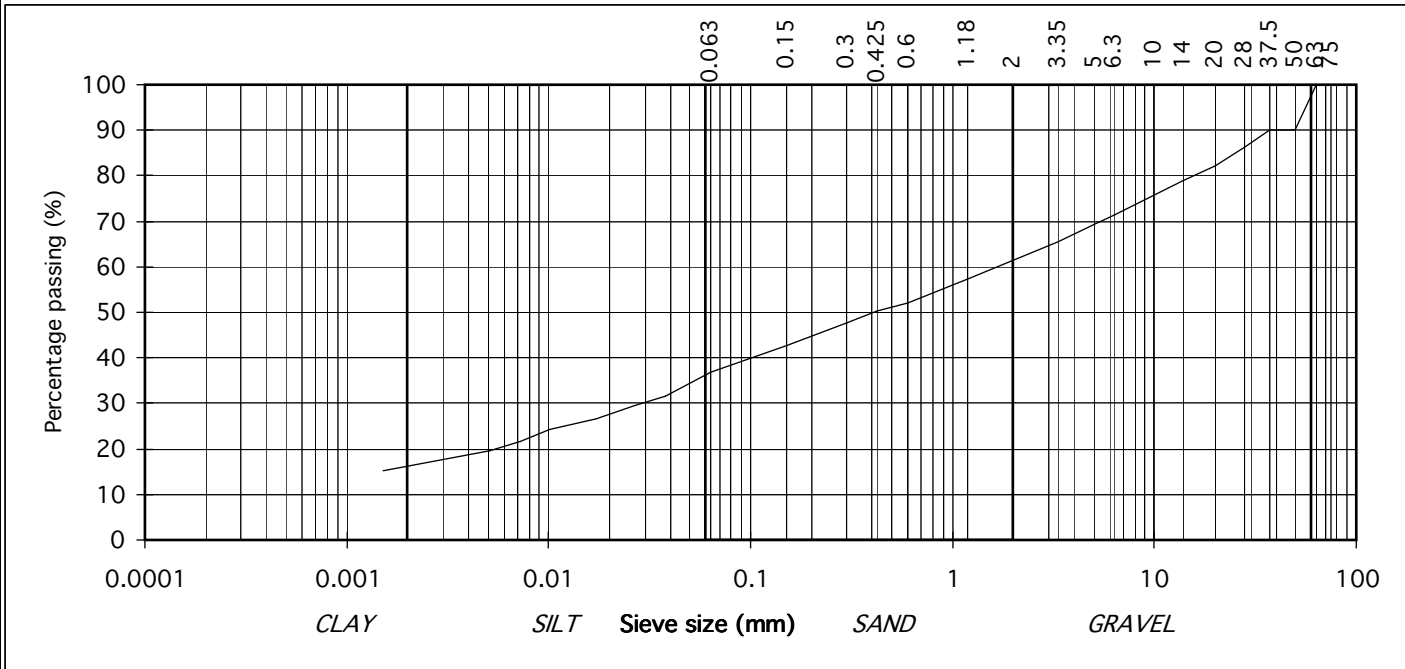
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51370
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 1
50	90		Sample No. 3099 Lab. Sample No. A13/0727
37.5	90	GRAVEL	Sample Type: B
28	86		Depth (m): 10.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	82		Date Received 26/02/2013 Date Testing started 27/02/2013
14	79		Description: Grey black slightly sandy, gravelly, CLAY
10	76		Remarks
6.3	71		
5	69		
3.35	65		
2	61		
1.18	57		
0.6	52	SAND	
0.425	50		
0.3	48		
0.15	43	SILT/CLAY	
0.063	37		
0.038	32		
0.027	30		
0.017	27		
0.010	24		
0.007	22		
0.005	20		
0.002	15		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51371	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	2			
50	86	GRAVEL	Sample No.	3082	Lab. Sample No.	A13/0728	
37.5	86		Sample Type:	B			
28	86		Depth (m):	1.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	84		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	82		Description:	Grey black slightly sandy, slightly gravelly, CLAY			
10	79		Remarks				
6.3	75		SAND				
5	73						
3.35	70						
2	66						
1.18	63						
0.6	58						
0.425	56						
0.3	54						
0.15	48						
0.063	42						
0.036	38	SILT/CLAY					
0.026	36						
0.017	34						
0.010	31						
0.007	28						
0.005	26						
0.001	23						

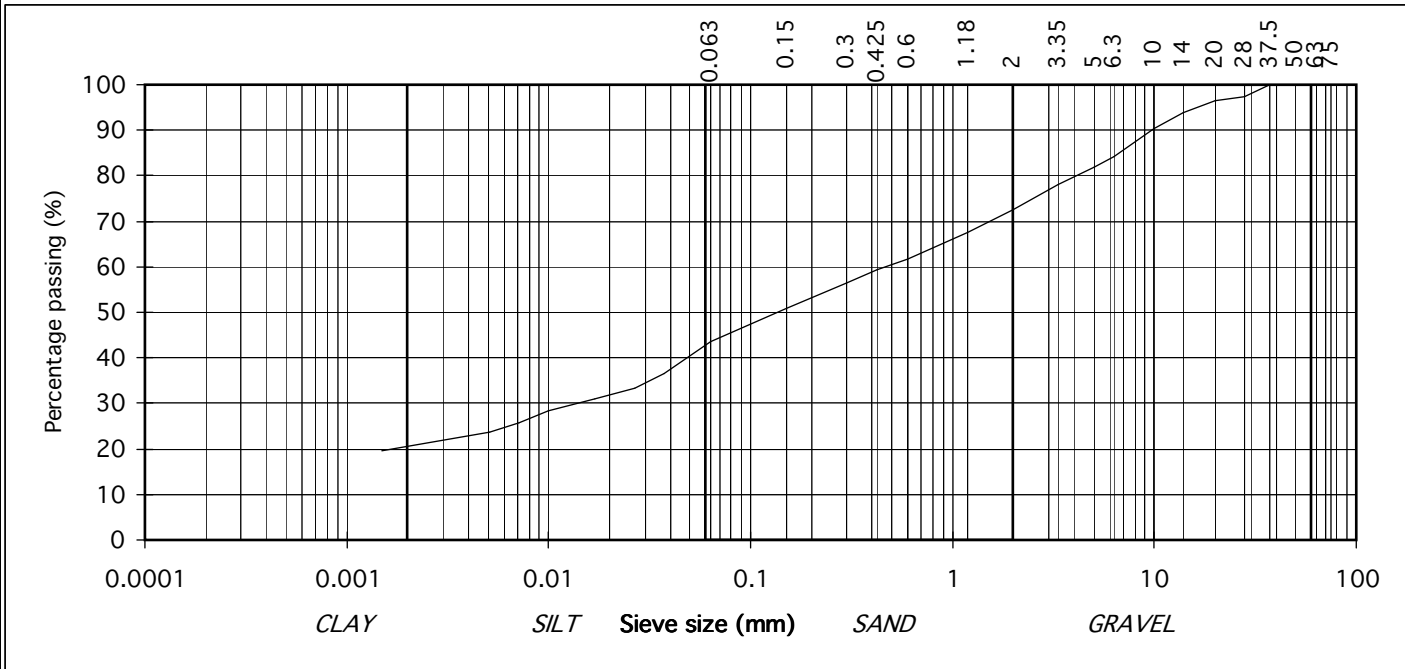
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	H Byrne	19/03/13	1 of 1

Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51372
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 2	
50	100		Sample No. 3084	Lab. Sample No. A13/0730
37.5	100	GRAVEL	Sample Type: B	
28	98		Depth (m): 3.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	96		Date Received 26/02/2013	Date Testing started 27/02/2013
14	94		Description: Grey black slightly sandy, slightly gravelly, CLAY	
10	90		Remarks	
6.3	84			
5	82			
3.35	78			
2	72			
1.18	68		SAND	
0.6	62			
0.425	60			
0.3	57			
0.15	51			
0.063	44	SILT/CLAY		
0.037	36			
0.027	33			
0.017	31			
0.010	28			
0.007	26			
0.005	24			
0.001	19			



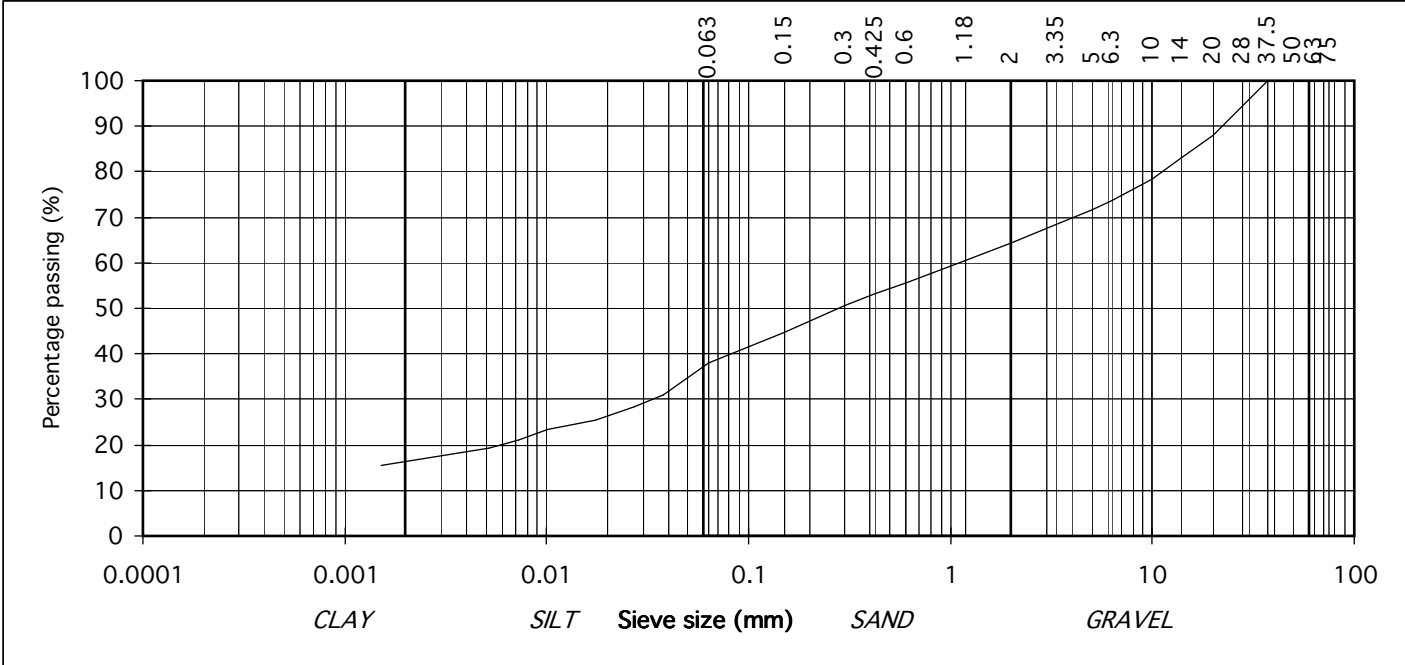
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	H Byrne	19/03/13	1 of 1

Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51373
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 2
50	100		Sample No. 3089 Lab. Sample No. A13/0731
37.5	100	GRAVEL	Sample Type: B
28	94		Depth (m): 9.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	88		Date Received 26/02/2013 Date Testing started 27/02/2013
14	83		Description: Grey black slightly sandy, gravelly, CLAY
10	78		Remarks
6.3	74		
5	72		
3.35	69		
2	64		
1.18	61		SAND
0.6	56		
0.425	53		
0.3	50		
0.15	45		
0.063	38	SILT/CLAY	
0.038	31		
0.027	28		
0.017	25		
0.010	23		
0.007	21		
0.005	19		
0.002	16		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51374	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	3			
50	100		Sample No.	3838	Lab. Sample No.	A13/0733	
37.5	100	GRAVEL	Sample Type:	B			
28	95		Depth (m):	3.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	90		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	87		Description:	Black slightly sandy, slightly gravelly, CLAY			
10	83		Remarks				
6.3	77		SAND				
5	75						
3.35	71						
2	67						
1.18	62						
0.6	57						
0.425	55						
0.3	52						
0.15	46						
0.063	40						
0.038	33	SILT/CLAY					
0.027	30						
0.017	28						
0.010	25						
0.007	22						
0.005	20						
0.002	15						

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51375
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 3	
50	100		Sample No. 3840	Lab. Sample No. A13/0734
37.5	100	GRAVEL	Sample Type: B	
28	100		Depth (m): 5.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	98		Date Received 26/02/2013	Date Testing started 27/02/2013
14	95		Description: Grey slightly sandy, slightly gravelly, CLAY	
10	91		Remarks	
6.3	85		<div style="text-align: center;"> </div>	
5	82			
3.35	78			
2	73			
1.18	68			
0.6	62			
0.425	59			
0.3	56			
0.15	49			
0.063	39			
0.038	32	SAND		
0.027	29			
0.017	27			
0.010	23			
0.007	21			
0.005	18			
0.002	12			
		SILT/CLAY		

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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51376	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	4			
50	87		Sample No.	3844	Lab. Sample No.	A13/0735	
37.5	78	GRAVEL	Sample Type:	B			
28	72		Depth (m):	1.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	69		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	67		Description:	Brown slightly sandy, gravelly, CLAY			
10	64		Remarks				
6.3	61		SAND				
5	60						
3.35	57						
2	54						
1.18	50						
0.6	46						
0.425	45						
0.3	42						
0.15	38						
0.063	32						
0.038	27	SILT/CLAY					
0.027	24						
0.017	22						
0.010	19						
0.007	17						
0.005	15						
0.002	9						

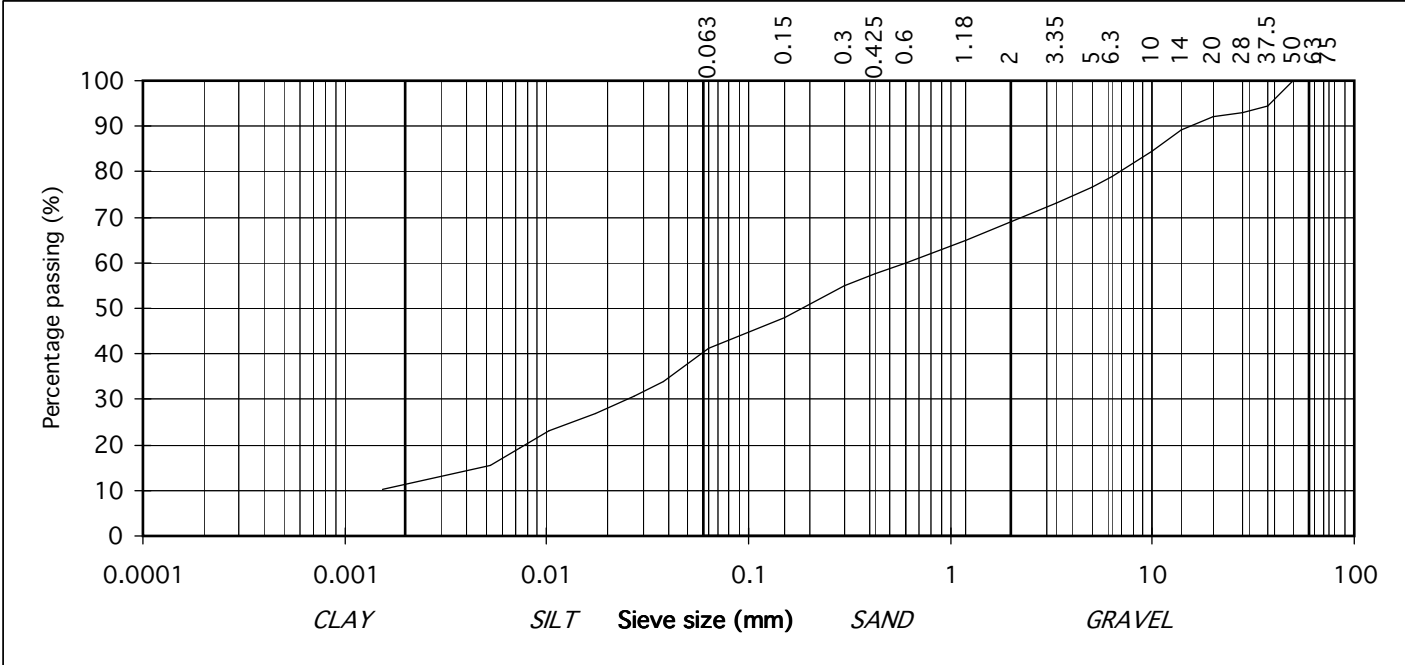
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51377
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 4	
50	100		Sample No. 3846	Lab. Sample No. A13/0736
37.5	95	GRAVEL	Sample Type: B	
28	93		Depth (m): 3.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	92		Date Received 26/02/2013	Date Testing started 27/02/2013
14	89		Description: Black slightly sandy, slightly gravelly, CLAY	
10	84		Remarks	
6.3	79			
5	77			
3.35	73			
2	69			
1.18	65		SAND	
0.6	60			
0.425	58			
0.3	55			
0.15	48	SILT/CLAY		
0.063	41			
0.038	34			
0.027	31			
0.017	27			
0.010	23			
0.007	19			
0.005	16			
0.002	10			



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51378	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	88		Bh:	25			
50	83		Sample No.	3853	Lab. Sample No.	A13/0737	
37.5	77	GRAVEL	Sample Type:	B			
28	74		Depth (m):	2.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Du	
20	71		Date Received	26/02/2013	Date Testing started	27/02/2013	
14	69		Description:	Brown slightly sandy, gravelly, CLAY with some cobbles			
10	66		Remarks				
6.3	62		SAND				
5	61						
3.35	57						
2	54						
1.18	51						
0.6	47						
0.425	45						
0.3	42						
0.15	36						
0.063	29						
0.038	24	SILT/CLAY					
0.027	21						
0.017	19						
0.010	17						
0.007	16						
0.005	14						
0.002	11						

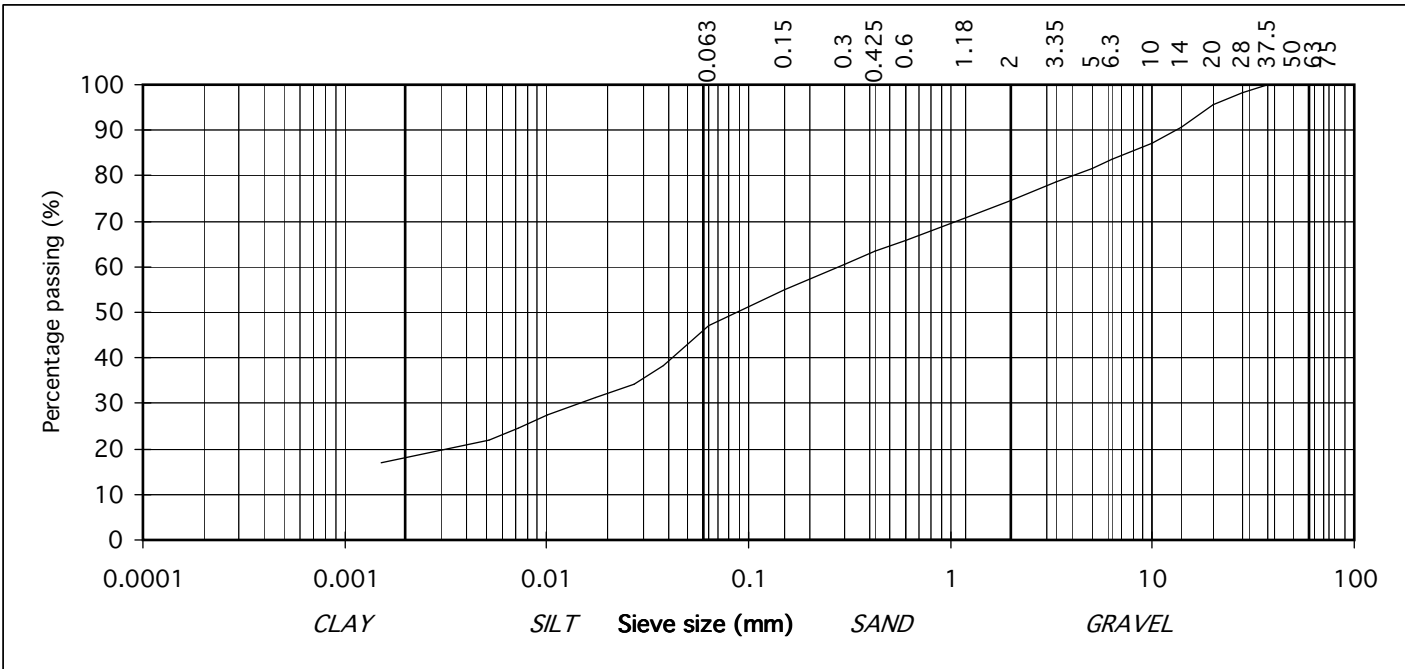
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51379
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 25	
50	100		Sample No. 3858	Lab. Sample No. A13/0739
37.5	100	GRAVEL	Sample Type: B	
28	98		Depth (m): 8.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Du
20	96		Date Received 26/02/2013	Date Testing started 27/02/2013
14	91		Description: Grey slightly sandy, slightly gravelly, CLAY	
10	87		Remarks	
6.3	84			
5	82			
3.35	79			
2	75			
1.18	71		SAND	
0.6	66			
0.425	63			
0.3	61			
0.15	55	SILT/CLAY		
0.063	47			
0.038	38			
0.027	34			
0.017	31			
0.010	28			
0.007	25			
0.005	22			
0.002	17			

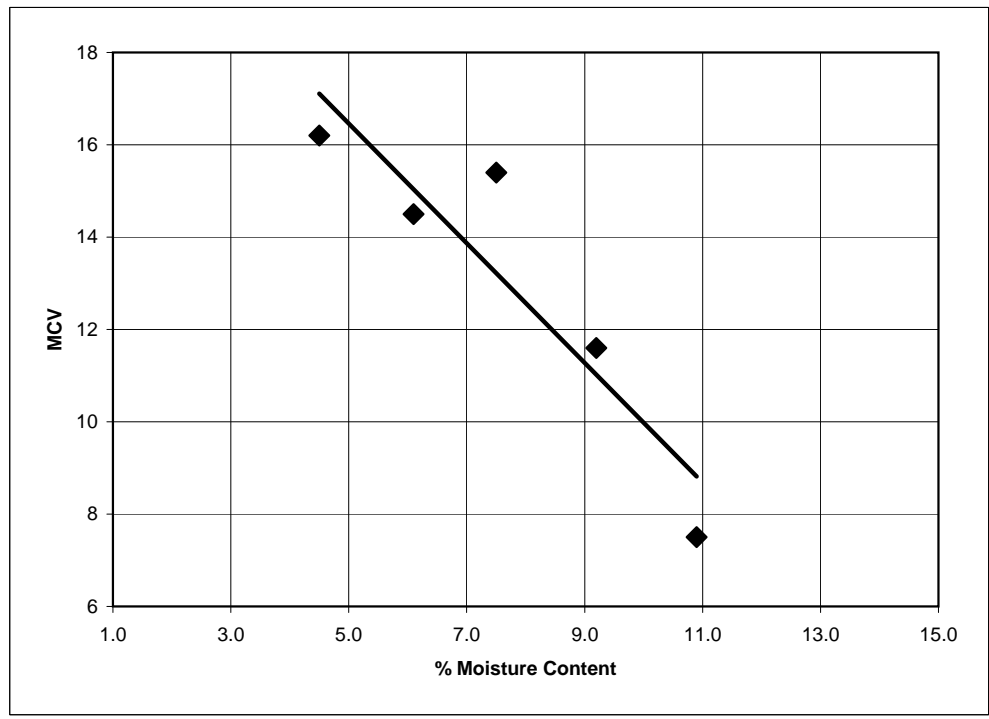


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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Report No.	R51405	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	26/02/13	Date Tested	01/03/13
BH/TP No.	Bh 4	Sample No.	3846 Type: B
Depth (m)	3.00	Lab sample No.	A13/0736

MC%	9.2	7.5	6.1	4.5	11
MCV	11.6	15.4	14.5	16.2	7.5




% material >20mm 4

Persons authorized to approve reports J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)
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Appendix 8

Laboratory Test Records

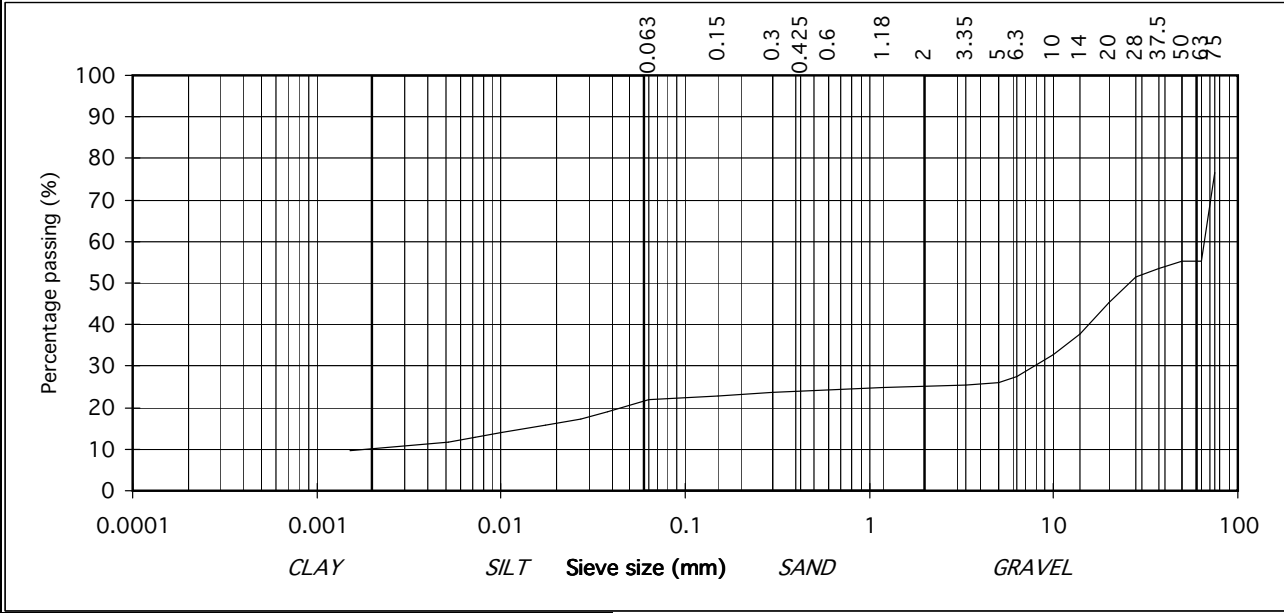
Schedule 3

IGSL Ltd Materials Laboratory Unit J5, M7 Business Park Newhall, Naas Co. Kildare 045 846176		Test Report											
		Determination of Moisture Content, Liquid & Plastic Limits Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3											
Report No. R51742		Contract No. 16695		Contract Name: Greater Dublin Drainage Scheme									
Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.													
Samples Received: 06/03/13		Date Tested: 06/03/13											
BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 05	AN3716	2.0	A13/1017	B	13	29	15	14	67	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 06	AN3725	1.0	A13/1022	B	21	42	20	22	78	WS	4.4	C I	Grey brown sandy gravelly CLAY
Bh 06	AN3728	4.0	A13/1024	B	13	32	19	13	61	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 06	AN3733	11.0	A13/1028	B	12	32	14	18	66	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 10	AN3736	2.0	A13/1030	B	17	30	16	14	60	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 10	AN3738	4.0	A13/1031	B	12	32	14	18	59	WS	4.4	C L	Grey black sandy gravelly CLAY
Bh 11	AM2743	2.0	A13/1035	B	14	30	15	15	64	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 11	AM2744	3.0	A13/1036	B	15								Brown slightly sandy, slightly gravelly, SILT/CLAY
Bh 11	AM2745	4.0	A13/1037	B	11								Brown clayey/silty, very sandy, GRAVEL
Bh 12	AN3749	2.0	A13/1038	B	13	31	16	15	57	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 12	AN3750	3.0	A13/1039	B	13								Brown slightly sandy, slightly gravelly, SILT/CLAY
Bh 19	AN3753	2.0	A13/1041	B	14	26	13	13	61	WS	4.4	C L	Brown sandy gravelly CLAY
Bh 19	AN3758	8.0	A13/1046	B	17	36	18	18	47	WS	4.4	C I	Grey black sandy gravelly CLAY
Notes: Preparation: WS - Wet sieved AR - As received NP - Non plastic				Sample Type: B - bulk disturbed U - Undisturbed				Remarks:					
Liquid Limit 4.3 Cone Penetrometer definitive method				Opinions and interpretations are outside the scope of accreditation.				The results relate to the specimens tested. Any remaining material will be retained for one month.					
Clause: 4.4 Cone Penetrometer one point method				Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)				Approved by H Byrne		Date 16/04/13	Page 1 of 1		

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51558	
75	77	COBBLES	Contract: Greater Dublin Drainage Scheme		
63	55		Bh: 5		
50	55	GRAVEL	Sample No. AN3717	Lab. Sample No. A13/1018	
37.5	53		Sample Type: B		
28	52		Depth (m): 3.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	45		Date Received 06/03/2013	Date Testing started 06/03/2013	
14	38		Description: Brown slightly sandy, gravelly, SILT/CLAY with many cobbles		
10	33		Remarks		
6.3	28		SAND		
5	26				
3.35	26				
2	25				
1.18	25				
0.6	24				
0.425	24				
0.3	24				
0.15	23				
0.063	22	SILT/CLAY			
0.038	19				
0.027	17				
0.017	16				
0.010	14				
0.007	13				
0.005	12				
0.002	10				



TEST REPORT

Determination of Particle Size Distribution
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 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51559	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 5	
50	100	GRAVEL	Sample No. AN3718 Lab. Sample No. A13/1019	
37.5	100		Sample Type: B	
28	97		Depth (m): 4.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	94		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	91		Description: Grey brown slightly sandy, slightly gravelly, SILT/CLAY	
10	86		Remarks	
6.3	83		SAND	
5	80			
3.35	77			
2	74			
1.18	70			
0.6	64			
0.425	62			
0.3	58			
0.15	49			
0.063	43			
0.038	37	SILT/CLAY		
0.027	33			
0.017	31			
0.010	28			
0.007	26			
0.005	23			
0.002	18			

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TEST REPORT

Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51560	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 5	
50	100	GRAVEL	Sample No. AN3723 Lab. Sample No. A13/1021	
37.5	100		Sample Type: B	
28	97		Depth (m): 11.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	93		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	89		Description: Brown grey slightly sandy, slightly gravelly, SILT/CLAY	
10	87		Remarks	
6.3	83		SAND	
5	82			
3.35	80			
2	78			
1.18	75			
0.6	72			
0.425	69			
0.3	66			
0.15	55			
0.063	46			
0.038	38	SILT/CLAY		
0.027	35			
0.017	32			
0.010	29			
0.007	25			
0.005	21			
0.002	15			

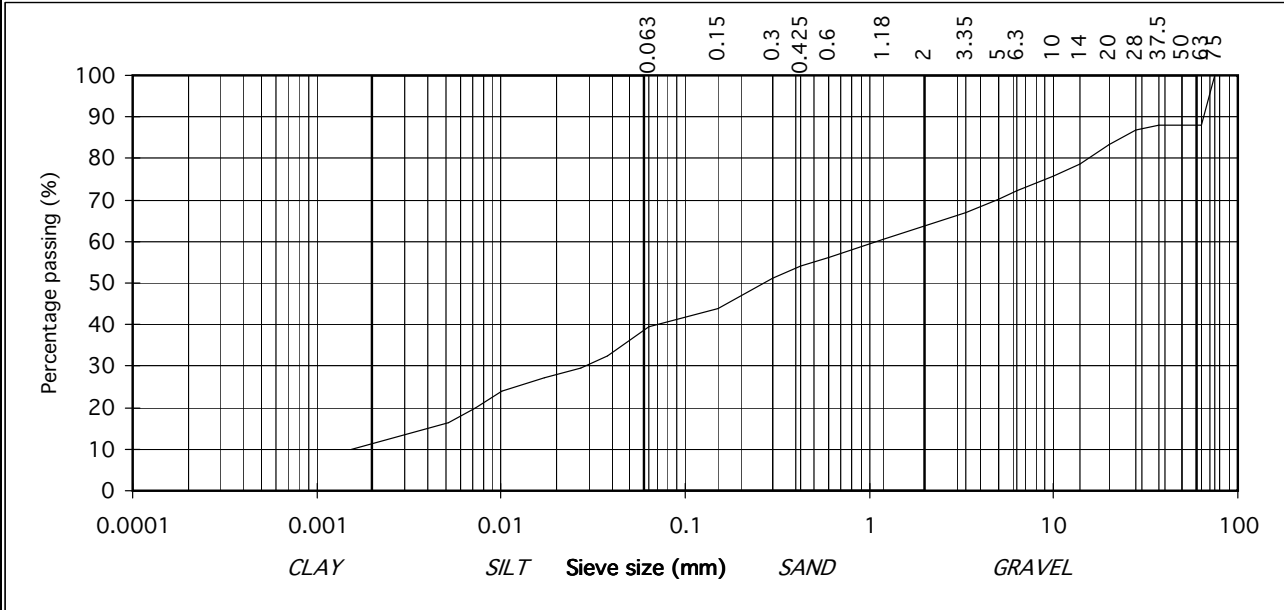
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51561	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme		
63	88		Bh: 6		
50	88	GRAVEL	Sample No. AN3726	Lab. Sample No. A13/1023	
37.5	88		Sample Type: B		
28	87		Depth (m): 2.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	83		Date Received 06/03/2013	Date Testing started 06/03/2013	
14	79		Description: Brown slightly sandy, gravelly, SILT/CLAY with some cobbles		
10	76		Remarks		
6.3	72		SAND		
5	70				
3.35	67				
2	64				
1.18	61				
0.6	56				
0.425	54				
0.3	51				
0.15	44				
0.063	39	SILT/CLAY			
0.038	32				
0.027	30				
0.017	27				
0.010	24				
0.007	20				
0.005	16				
0.002	10				



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51562	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 6	
50	100	GRAVEL	Sample No. AN3730 Lab. Sample No. A13/1026	
37.5	100		Sample Type: B	
28	100		Depth (m): 6.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	97		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	95		Description: Grey sandy, slightly gravelly, SILT/CLAY	
10	92		Remarks	
6.3	87		SAND	
5	85			
3.35	83			
2	80			
1.18	76			
0.6	70			
0.425	67			
0.3	62			
0.15	46			
0.063	36			
0.038	29	SILT/CLAY		
0.027	27			
0.017	24			
0.010	20			
0.007	18			
0.005	16			
0.002	10			

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5

(note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51563	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 6	
50	100	GRAVEL	Sample No. AN3732 Lab. Sample No. A13/1026	
37.5	100		Sample Type: B	
28	92		Depth (m): 9.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	90		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	86		Description: Brown slightly sandy, slightly gravelly, SILT/CLAY	
10	84		Remarks	
6.3	80		SAND	
5	78			
3.35	76			
2	73			
1.18	70			
0.6	66			
0.425	64			
0.3	61			
0.15	53			
0.063	47			
0.038	39	SILT/CLAY		
0.027	35			
0.017	32			
0.010	28			
0.007	24			
0.005	22			
0.002	14			

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51564	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	10			
50	100	GRAVEL	Sample No.	AN3735	Lab. Sample No.	A13/1029	
37.5	95		Sample Type:	B			
28	93		Depth (m):	1.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	92		Date Received	06/03/2013	Date Testing started	06/03/2013	
14	89		Description:	Brown slightly sandy, slightly gravelly, SILT/CLAY			
10	86		Remarks				
6.3	81		SAND				
5	79						
3.35	75						
2	71						
1.18	68						
0.6	64						
0.425	62						
0.3	58						
0.15	47						
0.063	38						
0.038	30	SILT/CLAY					
0.027	28						
0.017	24						
0.010	21						
0.007	18						
0.005	15						
0.002	10						

IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51565	
75	71	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	61		Bh: 10	
50	61	GRAVEL	Sample No. AN3739 Lab. Sample No. A13/1032	
37.5	56		Sample Type: B	
28	56		Depth (m): 5.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	53		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	51		Description: Grey black slightly sandy, slightly gravelly, SILT/CLAY with many cobbles	
10	49		Remarks	
6.3	47		SAND	
5	45			
3.35	43			
2	40			
1.18	38			
0.6	36			
0.425	34			
0.3	32			
0.15	27			
0.063	22			
0.038	18	SILT/CLAY		
0.028	16			
0.018	14			
0.010	11			
0.007	10			
0.005	9			
0.002	6			

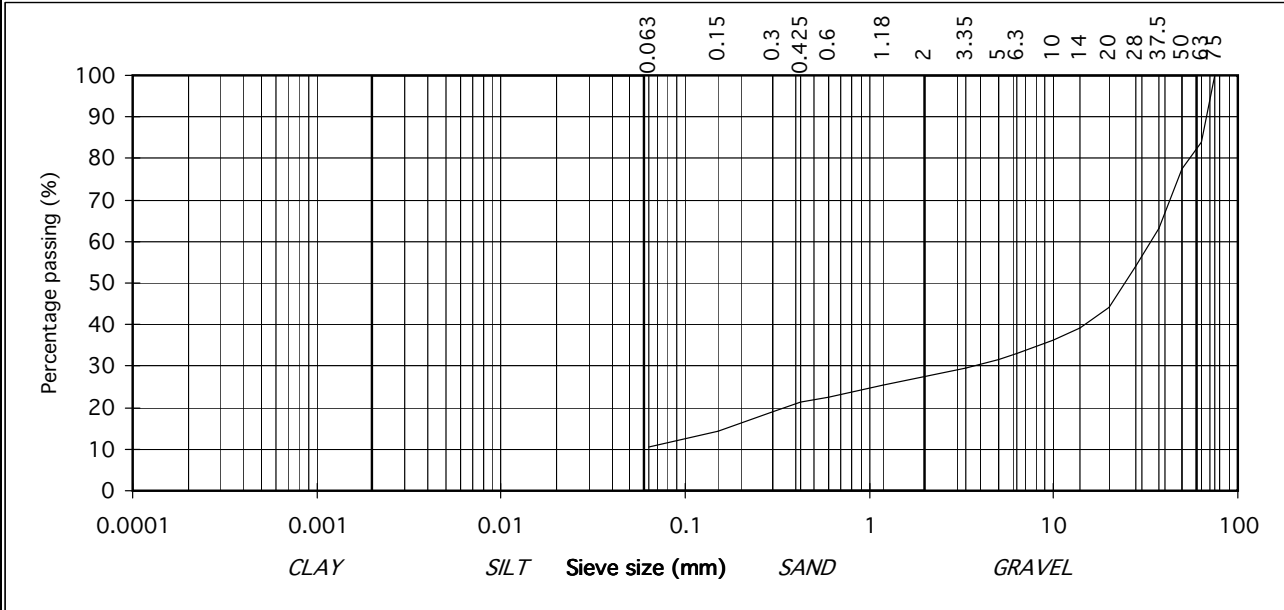
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51566
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	84		Bh: 10	
50	78	GRAVEL	Sample No. AN3740	Lab. Sample No. A13/1033
37.5	63		Sample Type: B	
28	54		depth (m) 6.50	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	44		Date Received 06/03/2013	Date Testing started 06/03/2013
14	39		Description: Black clayey/silty, sandy, GRAVEL with some cobbles	
10	36		Remarks	
6.3	33			
5	32			
3.35	30			
2	28			
1.18	26	SAND		
0.6	23			
0.425	21			
0.3	19			
0.15	14	SILT/CLAY		
0.063	10			



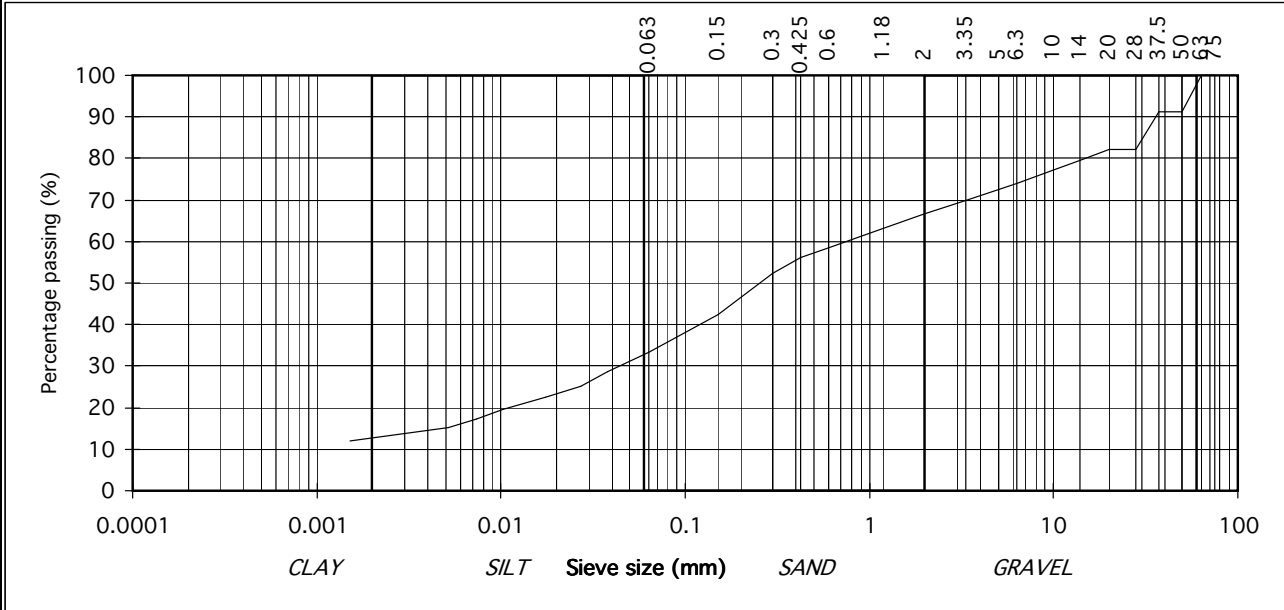
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51567	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme		
63	100		Bh: 11		
50	91	GRAVEL	Sample No. AM2744	Lab. Sample No. A13/1033	
37.5	91		Sample Type: B		
28	82		depth (m) 3.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	82		Date Received 06/03/2013	Date Testing started 06/03/2013	
14	80		Description: Brown slightly sandy, slightly gravelly, SILT/CLAY		
10	77		Remarks		
6.3	74		SAND		
5	73				
3.35	70				
2	67				
1.18	63				
0.6	59				
0.425	56				
0.3	52				
0.15	42				
0.063	33				
0.038	29	SILT/CLAY			
0.027	25				
0.017	23				
0.010	20				
0.007	17				
0.005	15				
0.002	12				



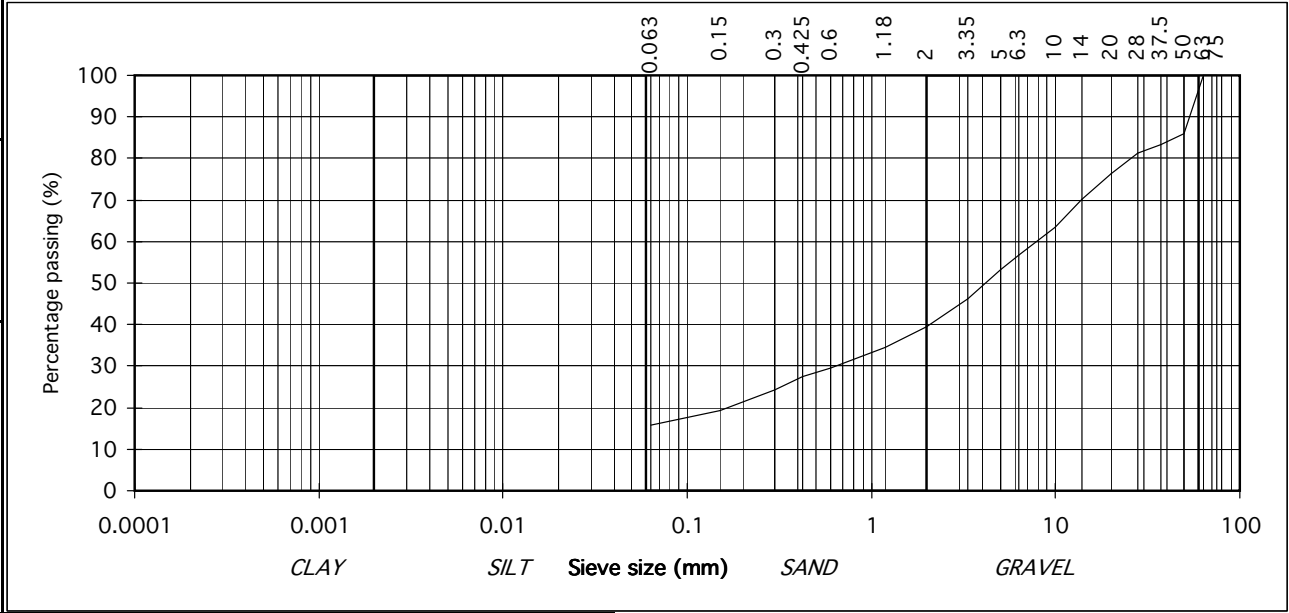
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51568	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme		
63	100		Bh: 11		
50	86	GRAVEL	Sample No. AM2745	Lab. Sample No. A13/1037	
37.5	83		Sample Type: B		
28	81		depth (m) 4.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	76		Date Received 06/03/2013	Date Testing started 06/03/2013	
14	70		Description: Brown clayey/silty, very sandy, GRAVEL		
10	64		Remarks		
6.3	57		SAND		
5	53				
3.35	46				
2	40				
1.18	35				
0.6	30				
0.425	27				
0.3	24				
0.15	19	SILT/CLAY			
0.063	16				



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990, clause 9.2 & 9.5

(note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51569	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 12	
50	100	GRAVEL	Sample No. 3858 Lab. Sample No. A13/1039	
37.5	100		Sample Type: B	
28	95		Depth (m) 3.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	93		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	91		Description: Brown slightly sandy, slightly gravelly, SILT/CLAY	
10	88		Remarks	
6.3	84		SAND	
5	83			
3.35	79			
2	75			
1.18	71			
0.6	67			
0.425	65			
0.3	62			
0.15	54			
0.063	45			
0.038	39	SILT/CLAY		
0.027	35			
0.017	33			
0.010	30			
0.007	26			
0.005	23			
0.002	18			

IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51570		
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme				
63	100		Bh:	17				
50	100		Sample No.	3759	Lab. Sample No.	A13/1040		
37.5	100		Sample Type:	B				
28	100		depth (m)	1.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.		
20	99		Date Received	06/03/2013	Date Testing started	06/03/2013		
14	99		GRAVEL	Description:	Grey very sandy, slightly gravelly, SILT/CLAY			
10	98			Remarks				
6.3	97			SAND				
5	96							
3.35	95							
2	93							
1.18	90							
0.6	84							
0.425	81							
0.3	77							
0.15	52							
0.063	25							
0.038	18	SILT/CLAY	<p align="center">CLAY SILT SAND GRAVEL</p>					
0.027	17							
0.017	15							
0.010	13							
0.007	11							
0.005	10							
0.002	9							

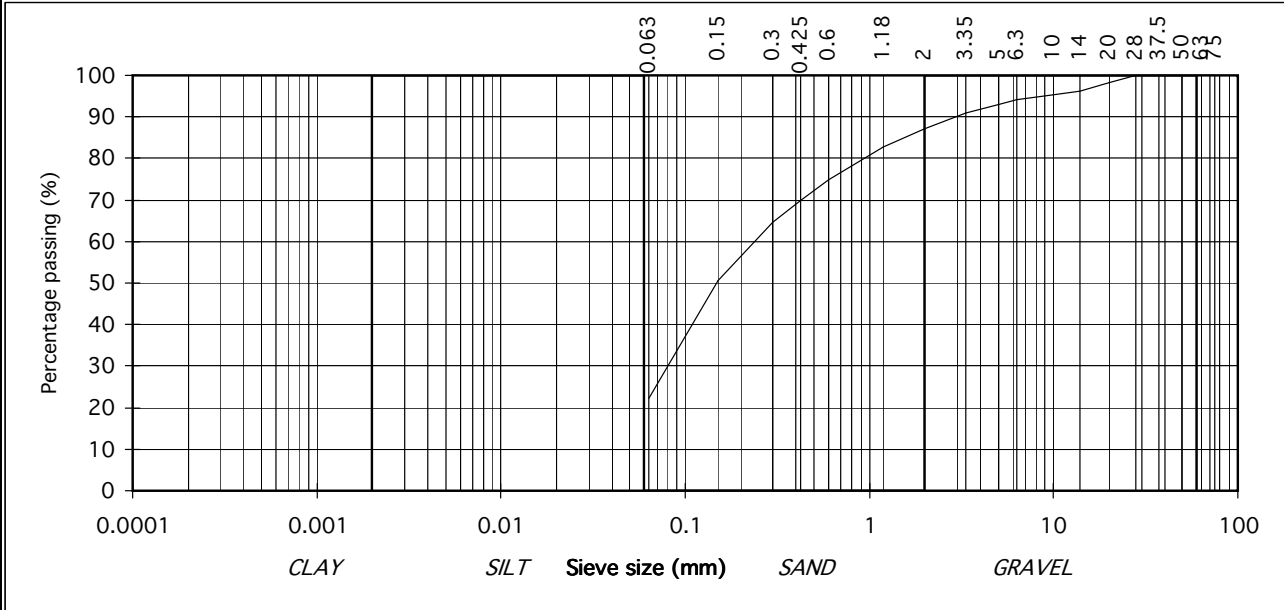
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51571	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme		
63	100		Bh: 19		
50	100	GRAVEL	Sample No. AN3754	Lab. Sample No. A13/1041	
37.5	100		Sample Type: B		
28	100		depth (m) 1.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	98		Date Received 06/03/2013	Date Testing started 06/03/2013	
14	96		Description: Grey black sandy, slightly gravelly, SILT/CLAY		
10	95		Remarks		
6.3	94		SAND		
5	93				
3.35	91				
2	87				
1.18	83				
0.6	75				
0.425	70				
0.3	65				
0.15	50	SILT/CLAY			
0.063	22				



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51572	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 19	
50	100	GRAVEL	Sample No. AN3754 Lab. Sample No. A13/1043	
37.5	95		Sample Type: B	
28	95		depth (m) 3.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	89		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	85		Description: Brown slightly sandy, slightly gravelly, SILT/CLAY	
10	83		Remarks	
6.3	81		SAND	
5	79			
3.35	78			
2	75			
1.18	73			
0.6	70			
0.425	69			
0.3	66			
0.15	57			
0.063	46			
0.038	40	SILT/CLAY		
0.027	37			
0.017	34			
0.010	31			
0.007	27			
0.005	24			
0.002	17			

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT

Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51573	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 19	
50	100	GRAVEL	Sample No. AN3755 Lab. Sample No. A13/1044	
37.5	89		Sample Type: B	
28	89		depth (m) 4.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	88		Date Received 06/03/2013 Date Testing started 06/03/2013	
14	85		Description: Brown slightly sandy, slightly gravelly, SILT/CLAY	
10	83		Remarks	
6.3	80		SAND	
5	78			
3.35	76			
2	74			
1.18	72			
0.6	71			
0.425	70			
0.3	69			
0.15	64			
0.063	58			
0.038	50	SILT/CLAY		
0.027	47			
0.017	43			
0.010	38			
0.007	33			
0.005	29			
0.002	22			

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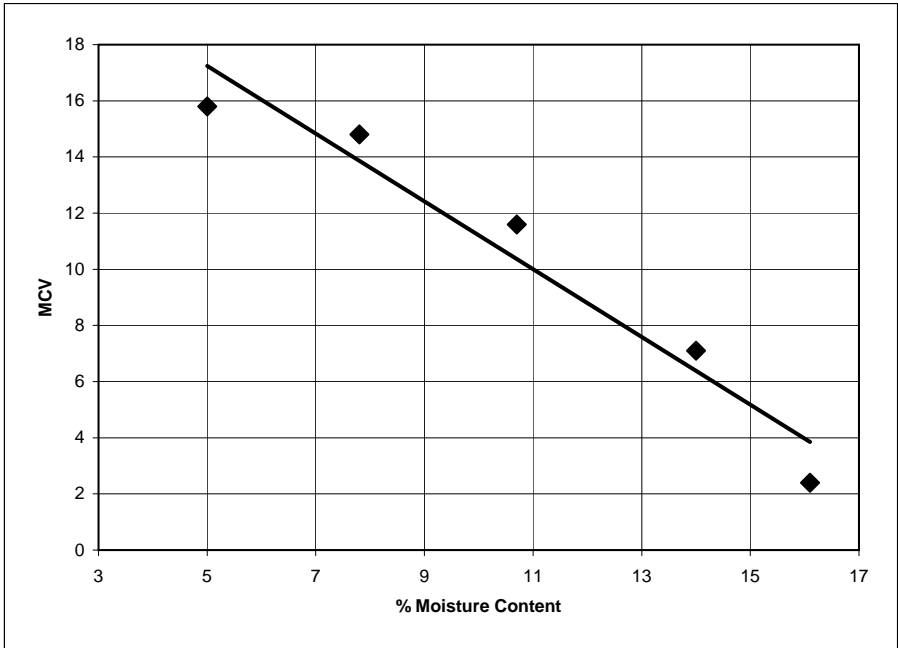
Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

IGSL Ltd
 Materials Laboratory
 M7 Business Park
 Naas Co.Kildare
 045 846176

TEST REPORT
 Determination of MCV / moisture content
 Relation of a soil
 Tested in accordance with BS1377-4:1990, clause 5.5

Report No. R51743 Contract Greater Dublin Drainage Scheme
 Contract No. 16695 Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date received 06/03/13 Date Tested 22/03/13
 BH/TP No. Bh 6 Sample No. AN3728 Type: B
 Depth (m) 4.00 Lab sample No. A13/1025

MC%	14	16	11	7.8	5.0
MCV	7.1	2.4	11.6	14.8	15.8




% material >20mm 13

Persons authorized to approve reports
 J Barrett (Deputy Quality Manager)
 H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	16/04/13	1 of 1

IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report			
	Determination of Moisture Condition Value at Natural Moisture Content			
	Tested in accordance with BS1377:Part 4:1990, clause 5.4			
Report No.		R51744		
Contract No.		16695		
Contract Name:		Greater Dublin Drainage Scheme		
Customer:		Fingal County Council, Grove Road, Blanchardstown, Dublin 15.		
BH/TP		Bh 19		
Sample No.		AN3756		
Depth (m)		5.00		
Sample Type:		B		
Lab Sample No.		A13/1045		
Source (if applicable)		N/A		
Material Type (if applicable):		soil		
Sample Received:		06/03/13		
Date Tested:		22/03/13		
Sample Cert:		Not Provided		
Moisture Content (%):		16		
% Particles > 20mm (By dry mass):		36		
MCV:		6		
Interpretation of Plot:		Steepest Straight Line		
Description of Soil:		Brown sandy, gravelly, SILT/CLAY		
<p>The result relates to the specimen tested. Any remaining material will be retained for one month. Sampling and opinions and interpretations are outside the scope of accreditation.</p>				<p>Persons authorised to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)</p>
IGSL Ltd Materials Laboratory		Approved by		Date
		H Byrne		16/04/13
				Page 1 of 1

IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

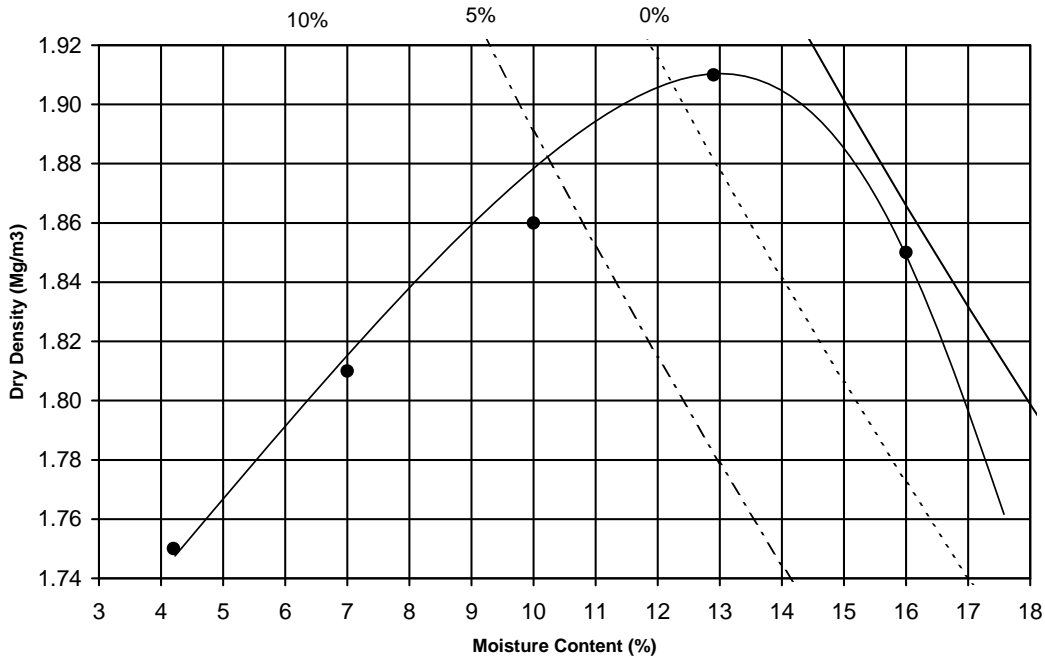
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R51745 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Bh 5
 Sample No. AN3721 Depth (m) 8 Material Type B
 Lab sample no. A13/1020 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 06/03/2013 Test Method: 2.5 KG Rammer
 Date Tested: 22/03/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.85	1.75	1.81	1.86	1.91		
Moisture Content (%)	16	4.2	7.0	10	13		



Maximum Dry Density (Mg/m³): 1.91 Optimum Moisture Content (%): 13

Description: Grey brown sandy gravelly SILT/CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m³): 2.66 Particle Density: Assumed

% retained on 20/37.5mm sieve: 17

Natural Moisture Content (%): 16

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

16/04/13

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Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



Attention : John Clancy
Date : 15th March, 2013
Your reference : 16695
Our reference : Test Report 13/2566 Batch 1
Location : GREATER DUBLIN
Date samples received : 7th March, 2013
Status : Final report
Issue : 1

Four samples were received for analysis on 7th March, 2013. 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward B.Sc
Principal Chemist

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 13/2566

SOILS

Please note we are only MCERTS accredited 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. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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. 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.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final 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.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
NFD	No Fibres Detected

Appendix 8

Laboratory Test Records

Schedule 4

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51829** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 27/03/13 Date Tested: 27/03/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP 13	AA0206	0.4	A13/1118	B	22	39	19	20	84	WS	4.4	C I	Brown sandy gravelly CLAY with root hairs
TP 13	AA0207	1.1	A13/1119	B	26	40	19	21	75	WS	4.4	C I	Brown sandy gravelly CLAY
TP 13	AA0208	1.8	A13/1120	B	26	29	NP	NP	93	WS	4.4	C L	Grey sandy, slightly gravelly, SILT
TP 13	AA0209	2.6	A13/1121	B	12								Grey black sandy gravelly SILT/CLAY
TP 13	AA0210	2.8	A13/1122	B	14								Grey sandy gravelly SILT/CLAY
TP 10	AA0211	0.5	A13/1123	B	23	36	18	18	78	WS	4.4	C I	Brown sandy gravelly CLAY
TP 10	AA0212	1.1	A13/1124	B	13	29	15	14	63	WS	4.4	C L	Grey brown slightly sandy, gravelly, CLAY
TP 10	AA0213	2.0	A13/1125	B	11								Brown sandy gravelly CLAY
TP 11	AA0214	0.6	A13/1126	B	28	38	20	18	90	WS	4.4	C I	Brown sandy gravelly CLAY
TP 11	AA0215	1.2	A13/1127	B	16	33	17	16	60	WS	4.4	C L	Grey brown slightly sandy, gravelly, CLAY
TP 11	AA0216	2.0	A13/1128	B	12								Grey sandy gravelly SILT/CLAY
TP 17	AA0217	0.4	A13/1129	B	23	41	19	22	85	WS	4.4	C I	Grey brown slightly sandy, gravelly, CLAY
TP 17	AA0218	1.0	A13/1130	B	21	31	15	16	63	WS	4.4	C L	Grey brown slightly sandy, slightly gravelly, CLAY
TP 17	AA0219	1.9	A13/1131	B	13								Grey brown sandy gravelly SILT/CLAY
TP 17	AA0220	2.4	A13/1132	B	12								Grey brown sandy gravelly SILT/CLAY

Notes: Preparation: WS - Wet sieved
 AR - As received
 NP - Non plastic
 Liquid Limit 4.3 Cone Penetrometer definitive method
 Clause: 4.4 Cone Penetrometer one point method

Sample Type: B - bulk disturbed
 U - Undisturbed

Remarks:

Opinions and interpretations are outside the scope of accreditation.
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by	Date	Page
		H Byrne	24/04/13	1 of 1

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51830** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 27/03/13 Date Tested: 27/03/13

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP 14	AA0221	0.4	A13/1133	B	19	41	18	23	75	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CLAY
TP 14	AA0222	1.2	A13/1134	B	9.9								Brown silty/clayey gravelly SAND
TP 14	AA0223	3.0	A13/1135	B	12								Brown sandy gravelly SILT/CLAY
TP 15	AA0224	0.4	A13/1136	B	17	35	19	16	79	WS	4.4	C L	Brown sandy gravelly CLAY
TP 15	AA0225	1.2	A13/1137	B	15								Brown sandy gravelly SILT/CLAY
TP 15	AA0226	2.5	A13/1138	B	14	30	19	11	67	WS	4.4	C L	Brown sandy gravelly CLAY
TP 15	AA0227	3.1	A13/1139	B	13	29	13	16	69	WS	4.4	C L	Brown sandy gravelly SILT/CLAY

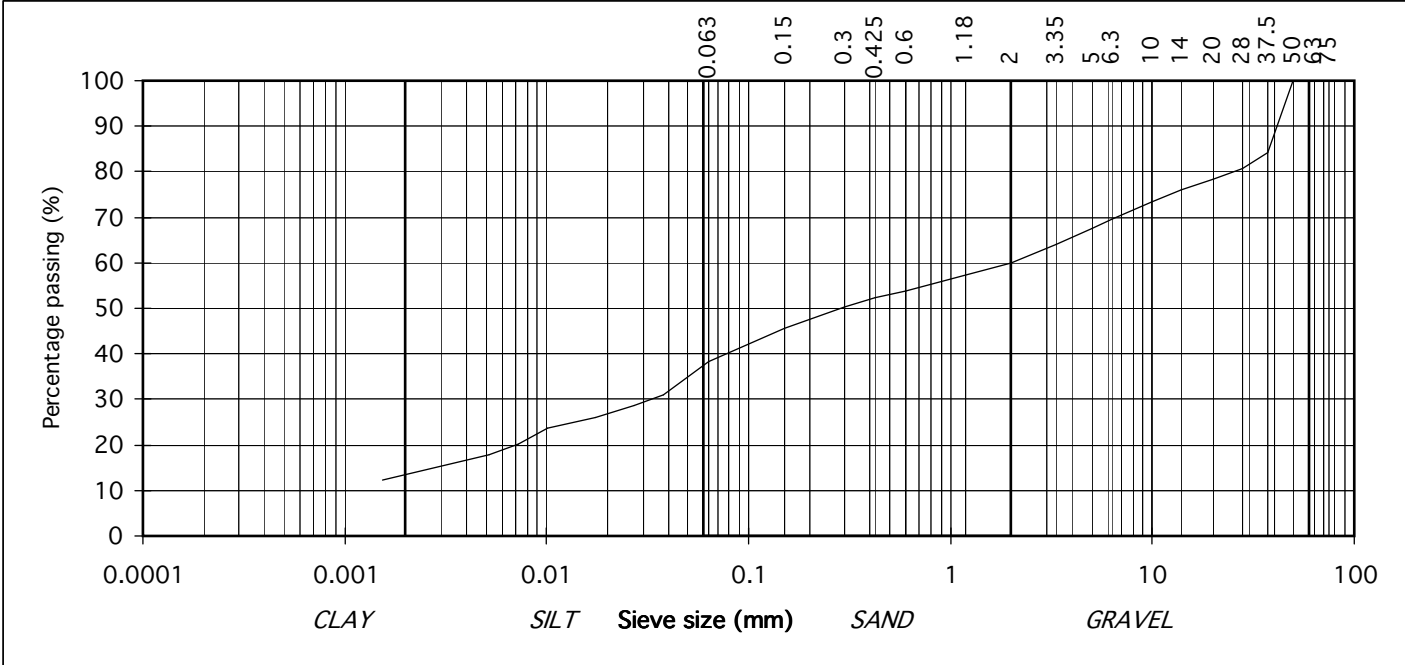
<p>Notes: Preparation: WS - Wet sieved AR - As received NP - Non plastic</p> <p>Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Sample Type: B - bulk disturbed U - Undisturbed</p>	<p>Remarks:</p> <p>Opinions and interpretations are outside the scope of accreditation. The results relate to the specimens tested. Any remaining material will be retained for one month.</p>
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IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 24/04/13	Page 1 of 1

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51831
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 1.10 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	84	GRAVEL	Sample No. AA0212 Lab. Sample No. A13/1124
28	81		Sample Type: B
20	78		Description: Grey brown slightly sandy, gravelly, CLAY
14	76		Remarks
10	73		
6.3	70		
5	68		
3.35	64		
2	60		
1.18	57		SAND
0.6	54		
0.425	52		
0.3	50		
0.15	46		
0.063	38	SILT/CLAY	
0.038	31		
0.027	29		
0.017	26		
0.010	24		
0.007	20		
0.005	18		
0.002	12		



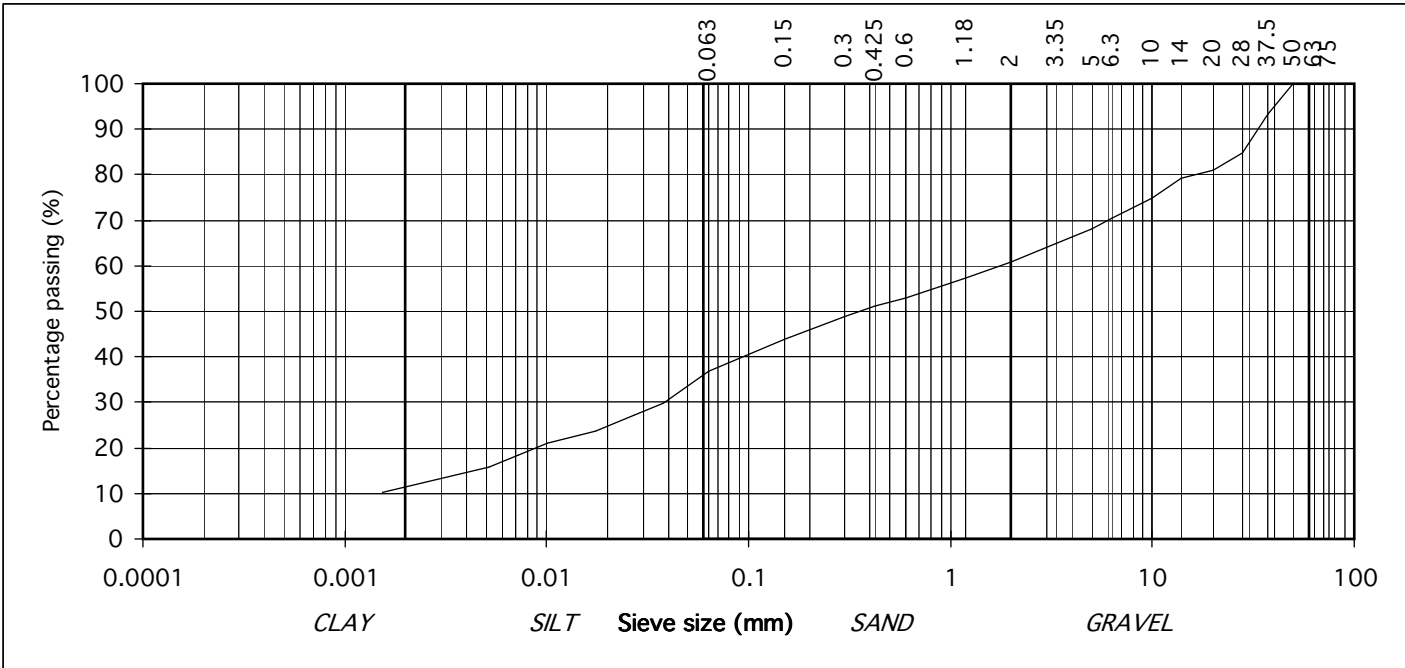
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51832	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Depth (m): 1.20 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013	
37.5	93	GRAVEL	Sample No. AA0215 Lab. Sample No. A13/1127	
28	85		Sample Type: B	
20	81		Description: Grey brown slightly sandy, gravelly, CLAY	
14	79		Remarks	
10	75			
6.3	70			
5	68			
3.35	65			
2	61			
1.18	57		SAND	
0.6	53			
0.425	51			
0.3	49			
0.15	44			
0.063	37			
0.038	30	SILT/CLAY		
0.027	27			
0.017	24			
0.010	21			
0.007	19			
0.005	16			
0.002	10			



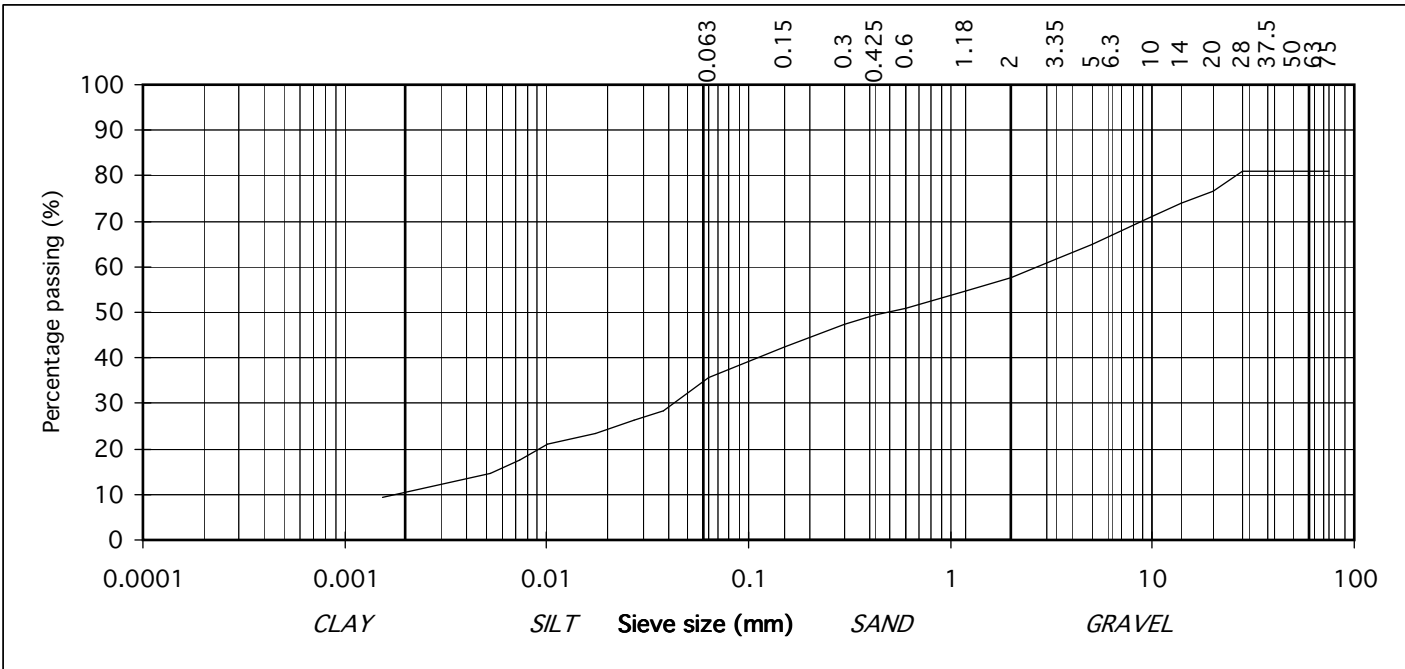
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51833
75	81	COBBLES	Contract: Greater Dublin Drainage Scheme
63	81		Depth (m): 2.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	81		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	81	GRAVEL	Description: Black slightly sandy, slightly gravelly, SILT/CLAY with some cobbles
28	81		Remarks
20	77		
14	74		
10	71		
6.3	67		
5	65		
3.35	62		
2	58		
1.18	55		SAND
0.6	51		
0.425	49		
0.3	47		
0.15	43		
0.063	36	SILT/CLAY	
0.038	28		
0.027	26		
0.017	23		
0.010	21		
0.007	18		
0.005	15		
0.002	9		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

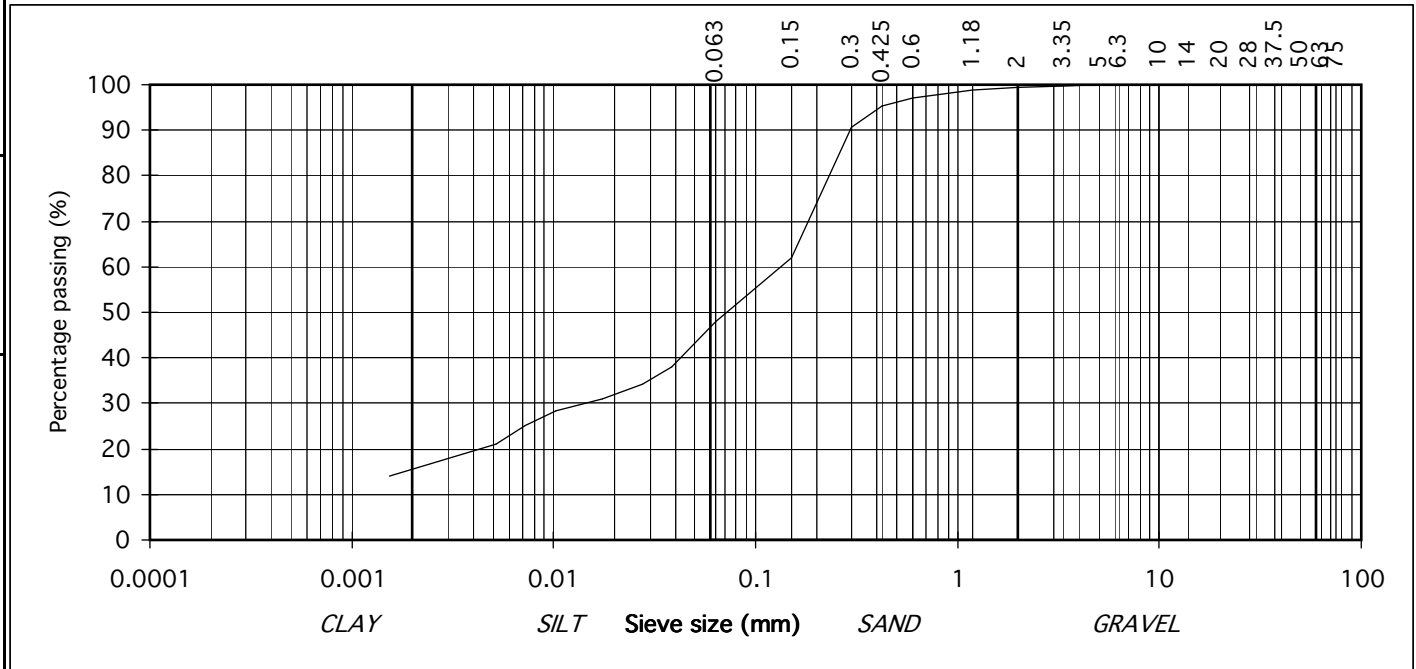
TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	100	
37.5	100	
28	100	GRAVEL
20	100	
14	100	
10	100	
6.3	100	
5	100	
3.35	100	
2	99	SAND
1.18	99	
0.6	97	
0.425	95	
0.3	91	SILT/CLAY
0.15	62	
0.063	48	
0.038	38	
0.027	34	
0.018	31	
0.010	28	
0.007	25	
0.005	21	
0.002	14	

Contract No: 16695 Report No. R51834
 Contract: Greater Dublin Drainage Scheme
 Tp: 13
 Sample No. AA0208 Lab. Sample No. A13/1120
 Sample Type: B
 Depth (m): 1.80 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received 27/03/2013 Date Testing started 27/03/2013
 Description: Grey sandy, slightly gravelly, SILT

Remarks



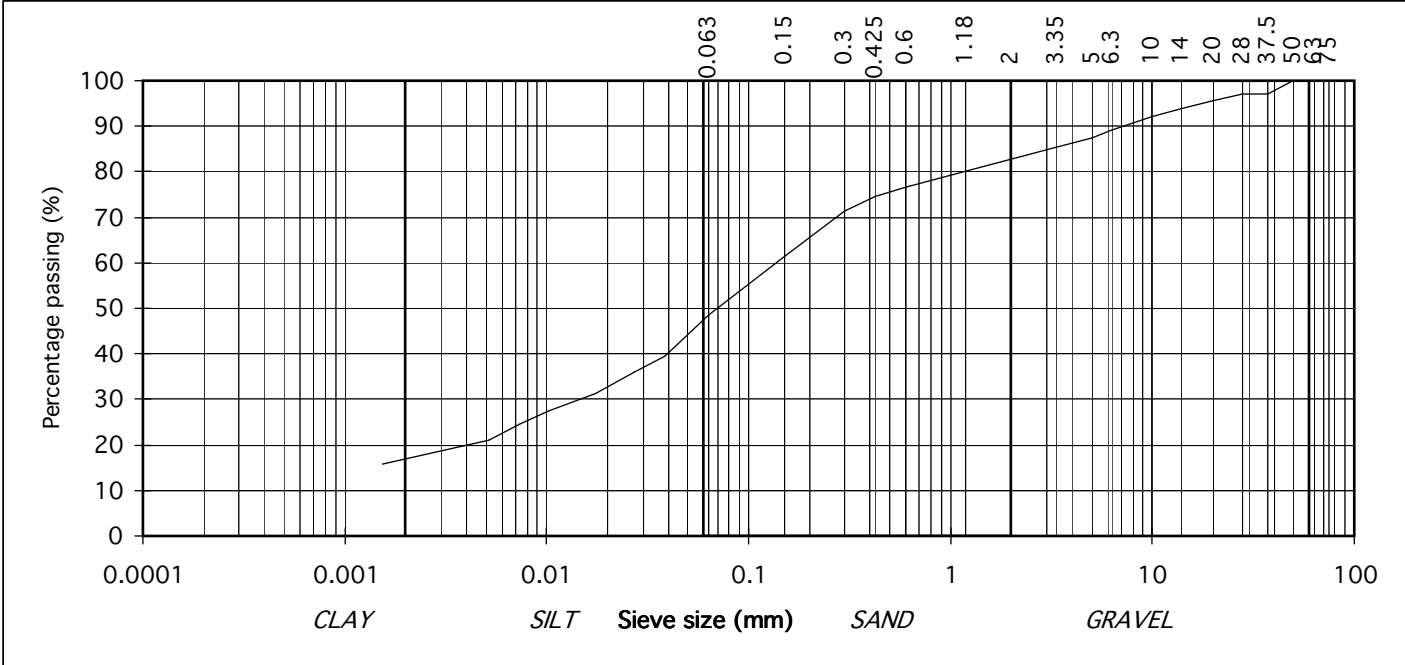
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51835
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 0.40 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	97	GRAVEL	Sample No. AA0221 Lab. Sample No. A13/1133
28	97		Description: Brown slightly sandy, slightly gravelly, CLAY
20	96		Remarks
14	94		
10	92		
6.3	89		
5	87		
3.35	86		
2	83		
1.18	80		SAND
0.6	77		
0.425	74		
0.3	71		
0.15	61		
0.063	49	SILT/CLAY	
0.038	39		
0.027	36		
0.018	31		
0.010	28		
0.007	24		
0.005	21		
0.002	16		



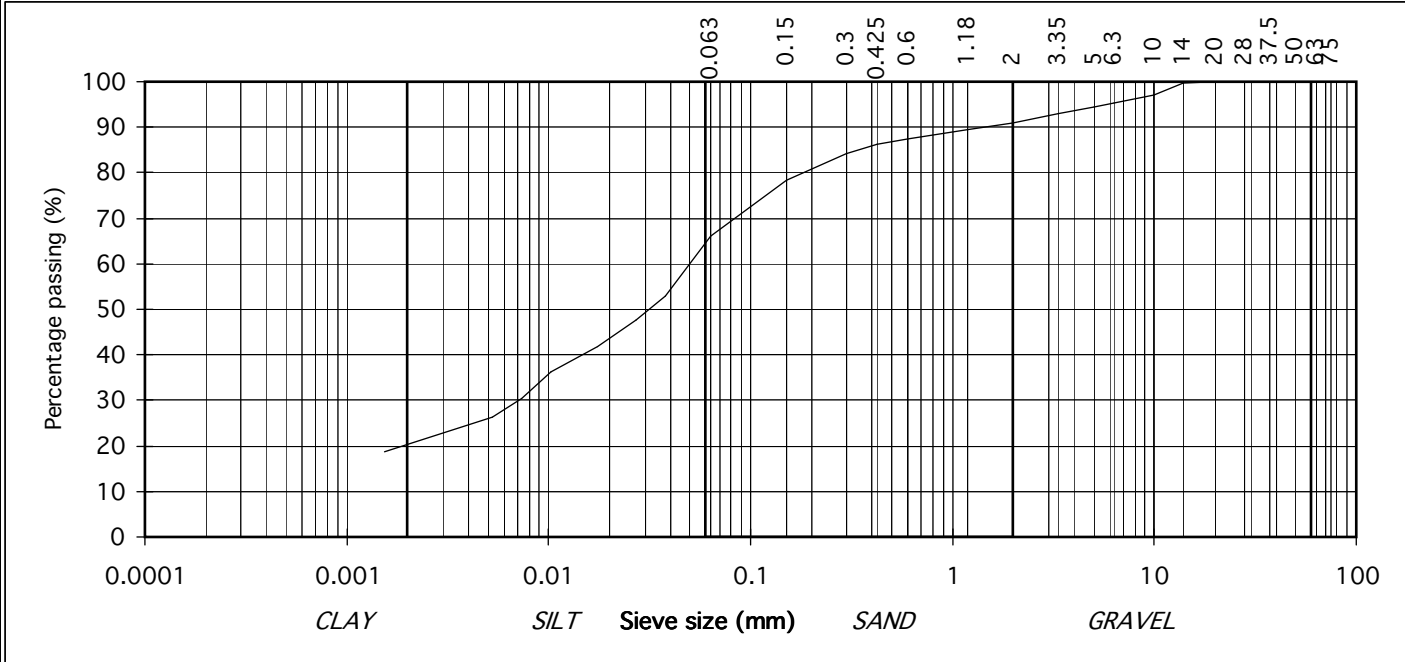
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51836
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 0.40 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	100	GRAVEL	Description: Grey brown slightly sandy, slightly gravelly, CLAY
28	100		Remarks
20	100		
14	100		
10	97		
6.3	95		
5	94		
3.35	93		
2	91		
1.18	89		SAND
0.6	87		
0.425	86		
0.3	84		
0.15	78		
0.063	66	SILT/CLAY	
0.038	53		
0.027	48		
0.018	42		
0.010	36		
0.007	30		
0.005	26		
0.002	19		



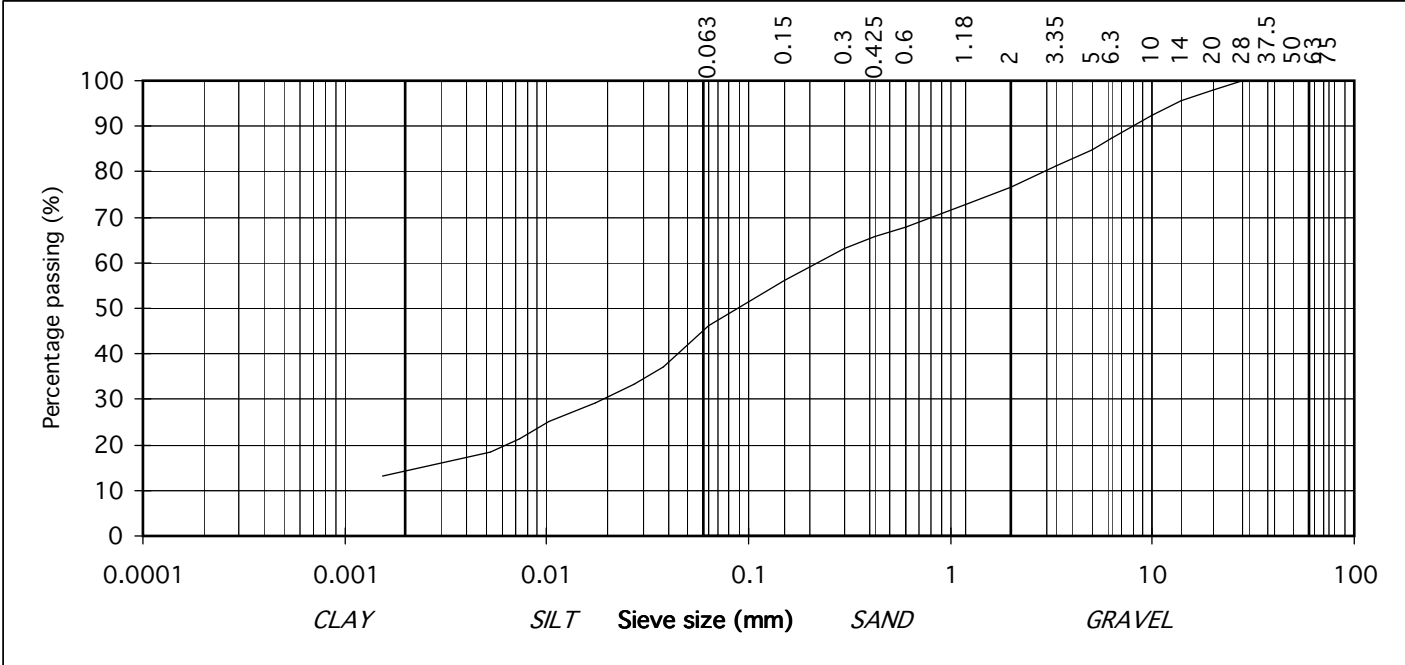
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51837
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 1.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	100	GRAVEL	Description: Grey brown slightly sandy, slightly gravelly, CLAY
28	100		Remarks
20	98		
14	96		
10	92		
6.3	87		
5	85		
3.35	81		
2	77		
1.18	73		SAND
0.6	68		
0.425	66		
0.3	63		
0.15	56		
0.063	46	SILT/CLAY	
0.038	37		
0.027	33		
0.018	29		
0.010	25		
0.007	21		
0.005	18		
0.002	13		



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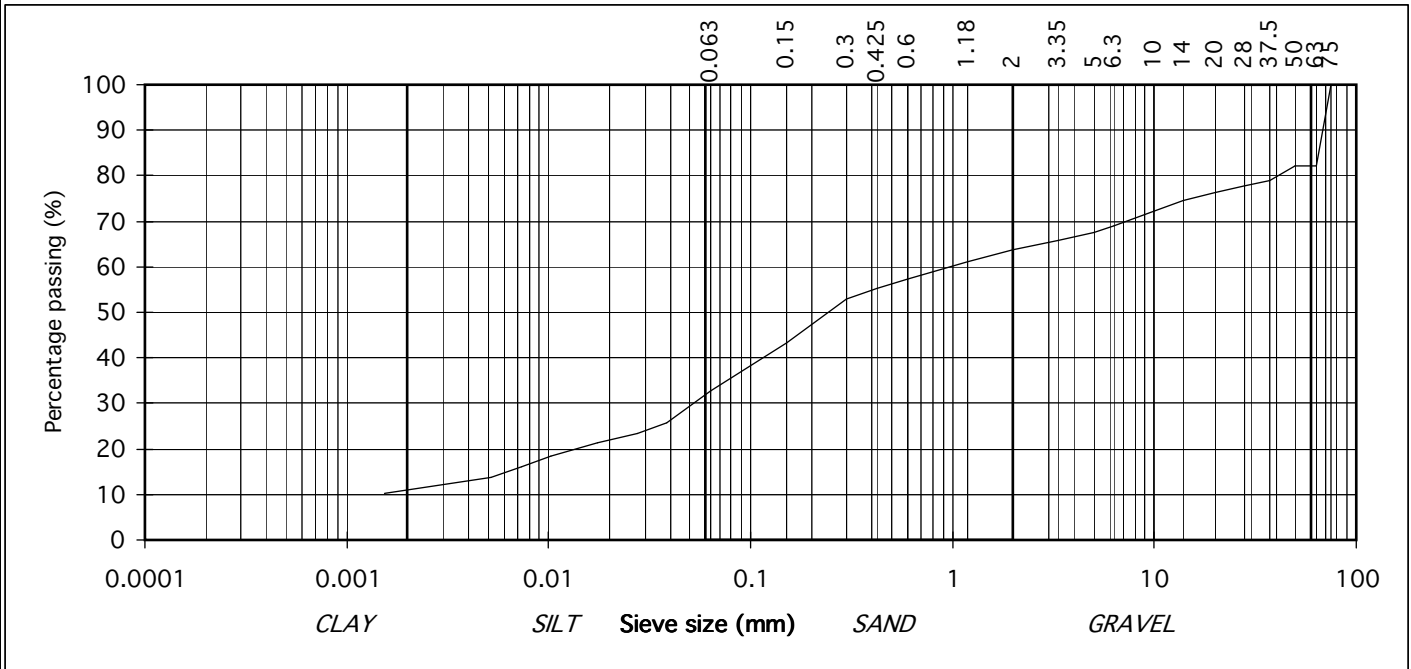
TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	82	
50	82	
37.5	79	GRAVEL
28	78	
20	76	
14	75	
10	72	
6.3	69	
5	68	
3.35	66	SAND
2	64	
1.18	61	
0.6	57	
0.425	55	
0.3	53	SILT/CLAY
0.15	43	
0.063	33	
0.038	26	
0.027	23	
0.017	21	
0.010	18	
0.007	16	
0.005	14	
0.002	10	

Contract No: 16695 Report No. R52066
 Contract: Greater Dublin Drainage Scheme
 Tp: 13
 Sample No. AA0209 Lab. Sample No. A13/1121
 Sample Type: B
 Depth (m): 2.6-2.7 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received 27/03/2013 Date Testing started 27/03/2013
 Description: Grey slightly sandy, gravelly, SILT/CLAY with some cobbles

Remarks



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

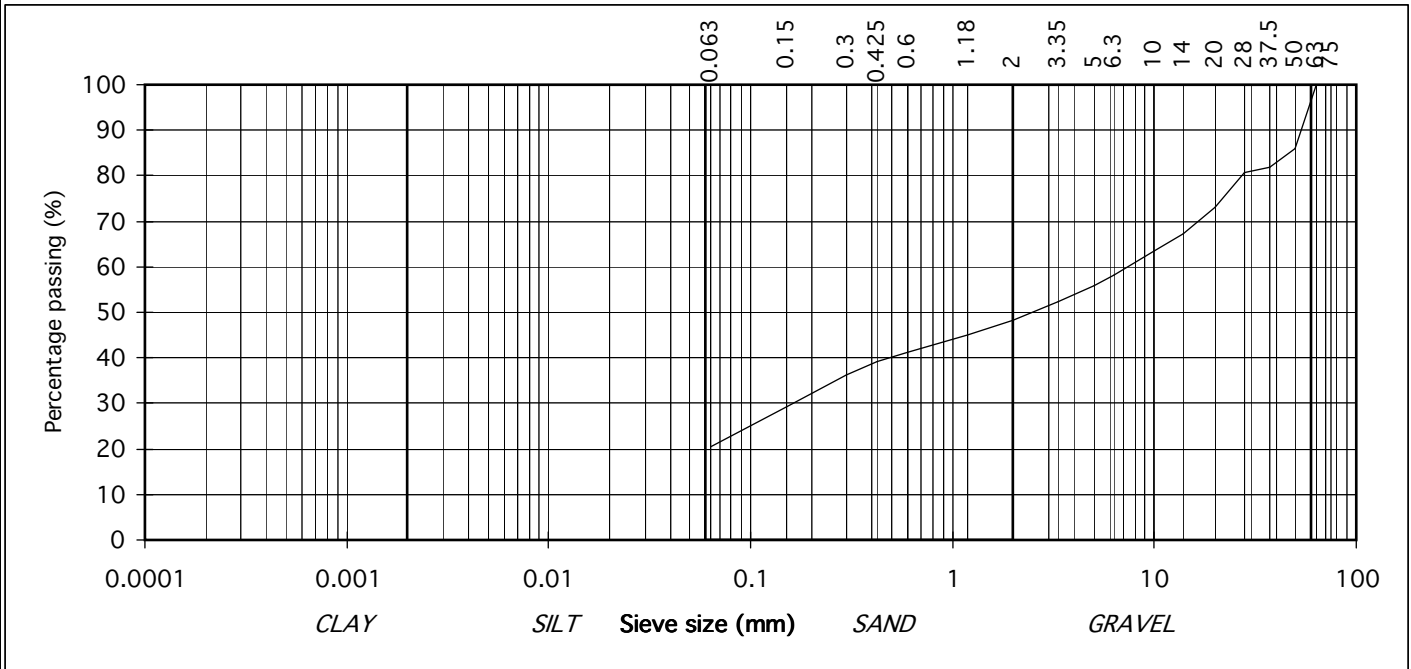
TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing	
75	100	COBBLES
63	100	
50	86	
37.5	82	GRAVEL
28	81	
20	73	
14	67	
10	64	
6.3	58	
5	56	
3.35	52	SAND
2	48	
1.18	45	
0.6	41	
0.425	39	SILT/CLAY
0.3	36	
0.15	29	
0.063	20	

Contract No: 16695 Report No. R52067
 Contract: Greater Dublin Drainage Scheme
 Tp: 14
 Sample No. AA0222 Lab. Sample No. A13/1134
 Sample Type: B
 Depth (m): 1.2-13 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received 27/03/2013 Date Testing started 27/03/2013
 Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks



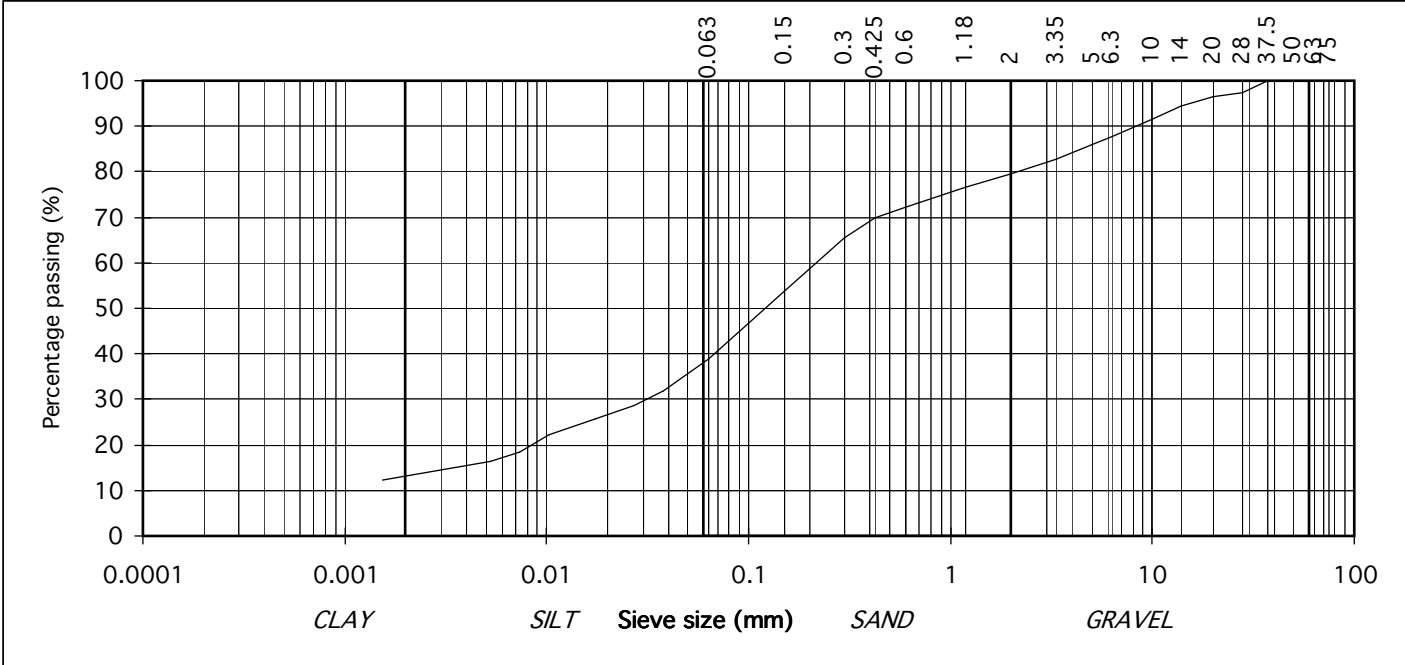
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R52068
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Depth (m): 1.2-13 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
50	100		Date Received: 27/03/2013 Date Testing started: 27/03/2013
37.5	100	GRAVEL	Description: Brown sandy, slightly gravelly, SILT/CLAY
28	97		Remarks
20	97		
14	94		
10	92		
6.3	88		
5	86		
3.35	83		
2	80		
1.18	77		SAND
0.6	72		
0.425	70		
0.3	65		
0.15	54		
0.063	39	SILT/CLAY	
0.038	32		
0.027	29		
0.017	26		
0.010	22		
0.007	18		
0.005	16		
0.002	12		



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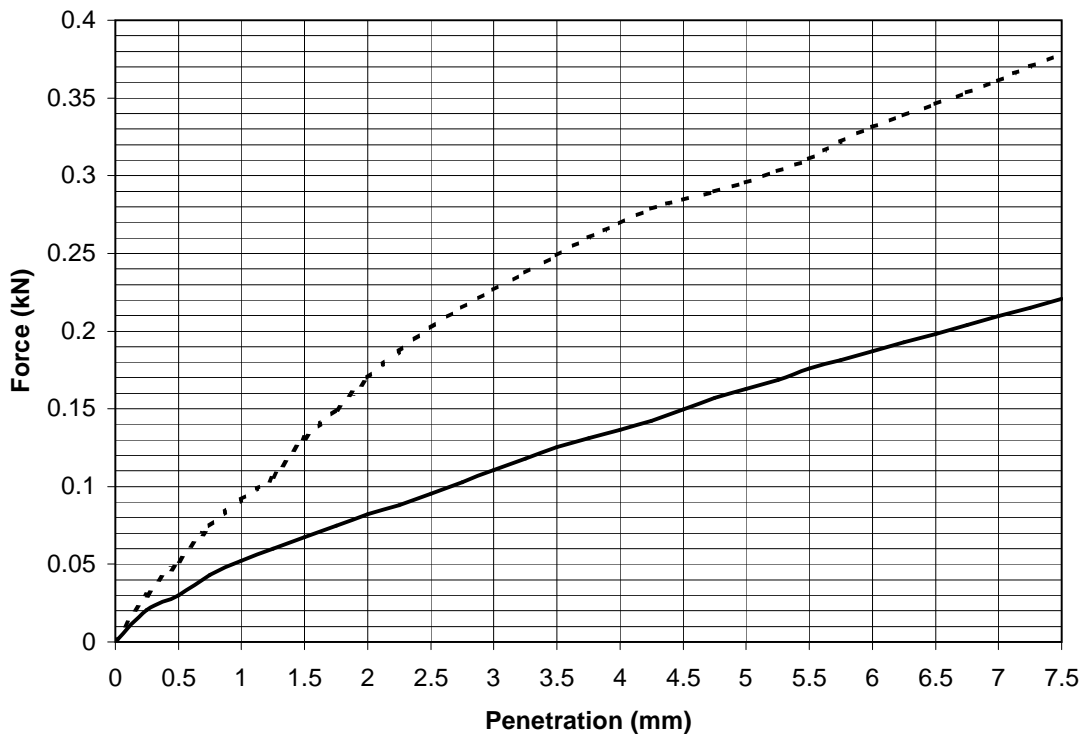
Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of California Bearing Ratio (CBR)



Tested in accordance with BS1377:Part 4:1990, clause 7

Report No.	R51838	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	27/03/13	Date Tested	05/04/13
BH/TP No.	Tp 13	Sample No.	AA0207 Type: B
Depth (m)	1.10	Lab sample No.	A13/1119



Key: ————— Top - - - - - Base

Description: Brown sandy gravelly CLAY			
Initial Condition:		Unsoaked	
Moisture Content (%):	24	Bulk Density (Mg/m ³):	2.01
Surcharge (kg):	4	Dry Density (Mg/m ³):	1.62
% Material >20mm:	3		
Method of compaction:		Static compaction	

Test Result	Top	Base
CBR %	0.8	1.5
Moisture Content %	25	24

Persons authorized to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory

Approved by	Date	Page No.
H Byrne	24/04/13	1 of 1

IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

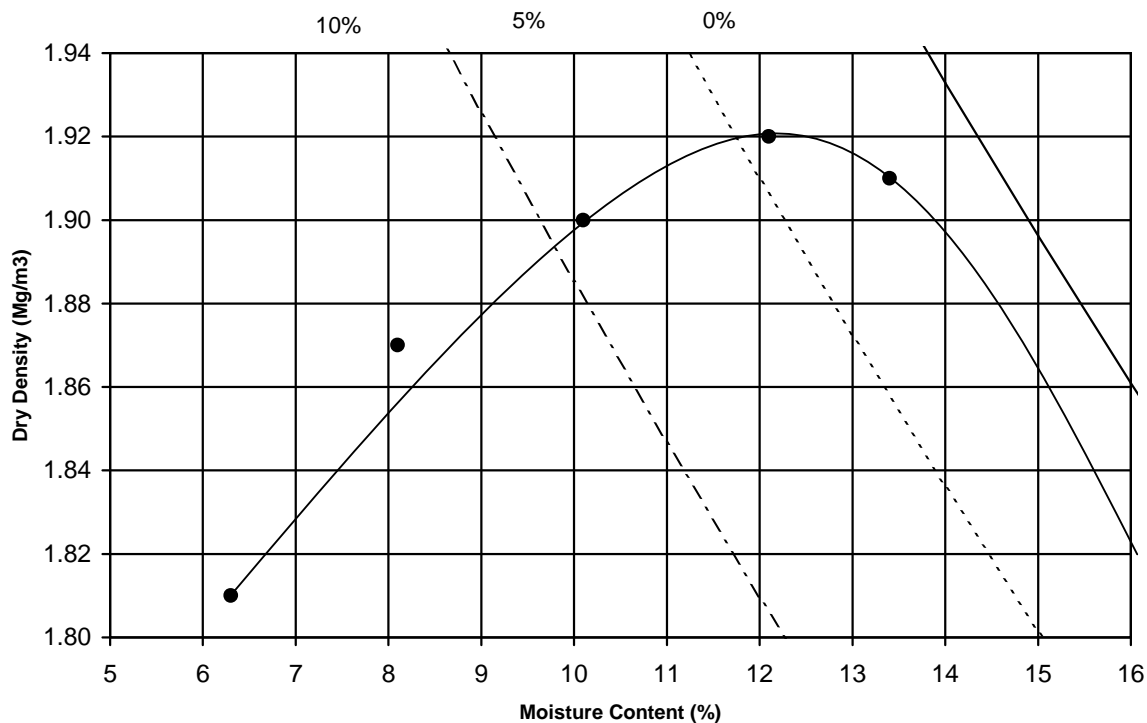
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R51840 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Tp 17
 Sample No. AA0219 Depth (m) 1.9 Material Type B
 Lab sample no. A13/1131 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 27/03/2013 Test Method: 2.5 KG Rammer
 Date Tested: 05/04/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.91	1.81	1.87	1.90	1.92		
Moisture Content (%)	13	6.3	8.1	10	12		



Maximum Dry Density (Mg/m³): 2.08 Optimum Moisture Content (%): 13

Description: Brown sandy gravelly SILT/CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 7.8

Natural Moisture Content (%): 13.4

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

24/04/13

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Test Report

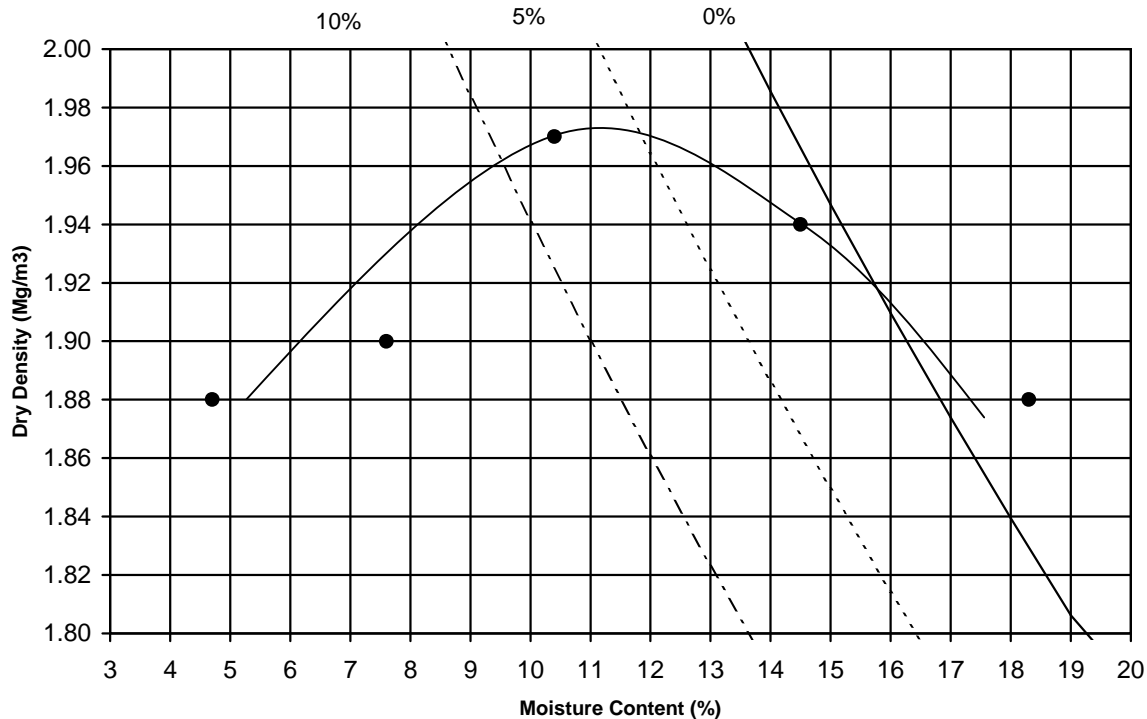
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R52077 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Tp 10
 Sample No. AA0212 Depth (m) 1.10-1.20 Material Type B
 Lab sample no. A13/1124 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 27/03/2013 Test Method: 2.5 KG Rammer
 Date Tested: 12/04/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.94	1.97	1.90	1.88	1.88		
Moisture Content (%)	15	10	7.6	4.7	18		



Maximum Dry Density (Mg/m³): 1.97 Optimum Moisture Content (%): 10

Description: Grey brown slightly sandy, gravelly, CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.75 Particle Density: Assumed

% retained on 20/37.5mm sieve: 11

Natural Moisture Content (%): 15

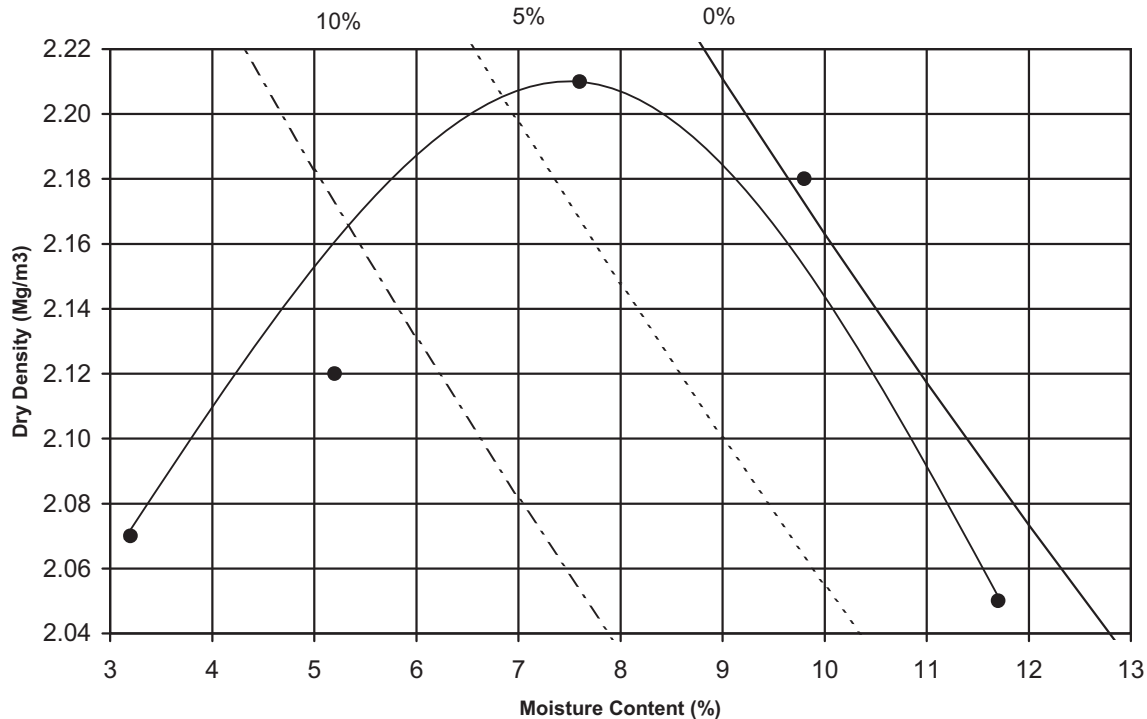
The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)



Report No. R51839 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Tp 14
 Sample No. AA0222 Depth (m) 1.2 Material Type B
 Lab sample no. A13/1134 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 27/03/2013 Test Method: 2.5 KG Rammer
 Date Tested: 04/04/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	2.18	2.07	2.12	2.21	2.05		
Moisture Content (%)	9.8	3.2	5.2	7.6	12		



Maximum Dry Density (Mg/m³): 2.21 Optimum Moisture Content (%): 8

Description: Grey brown sandy gravelly SILT/CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.76 Particle Density: Assumed

% retained on 20/37.5mm sieve: 25

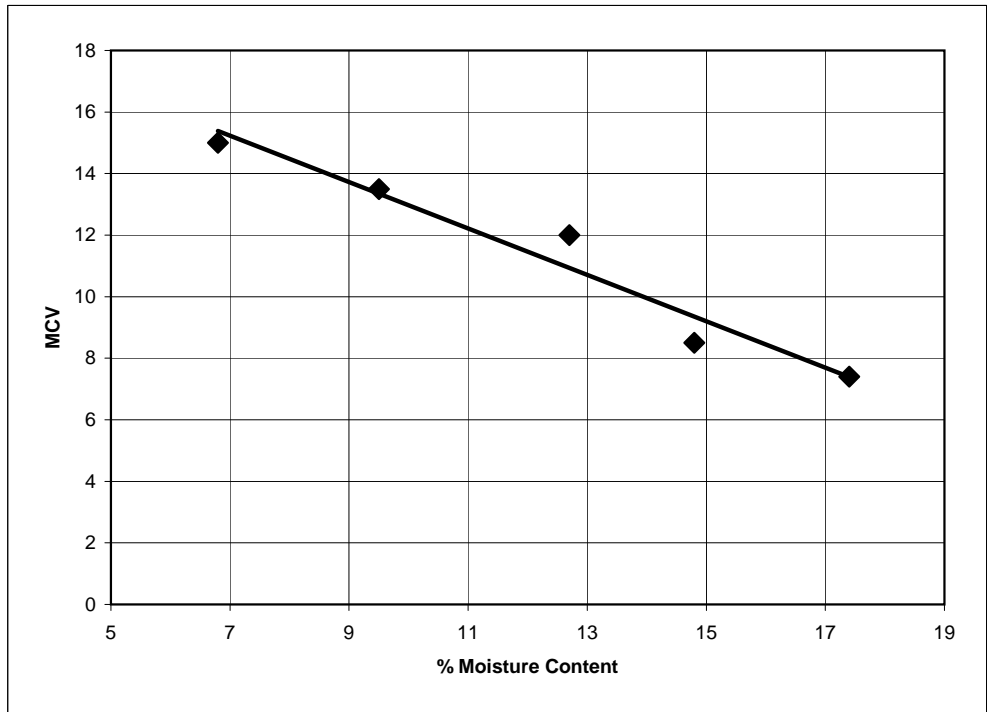
Natural Moisture Content (%): 9.8

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

Report No.	R52078	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	27/03/13	Date Tested	05/04/13
BH/TP No.	TP 15	Sample No.	AA0224 Type: B
Depth (m)	0.40	Lab sample No.	A13/1136

MC%	17	10	15	12.7	6.8
MCV	7.4	13.5	8.5	12	15

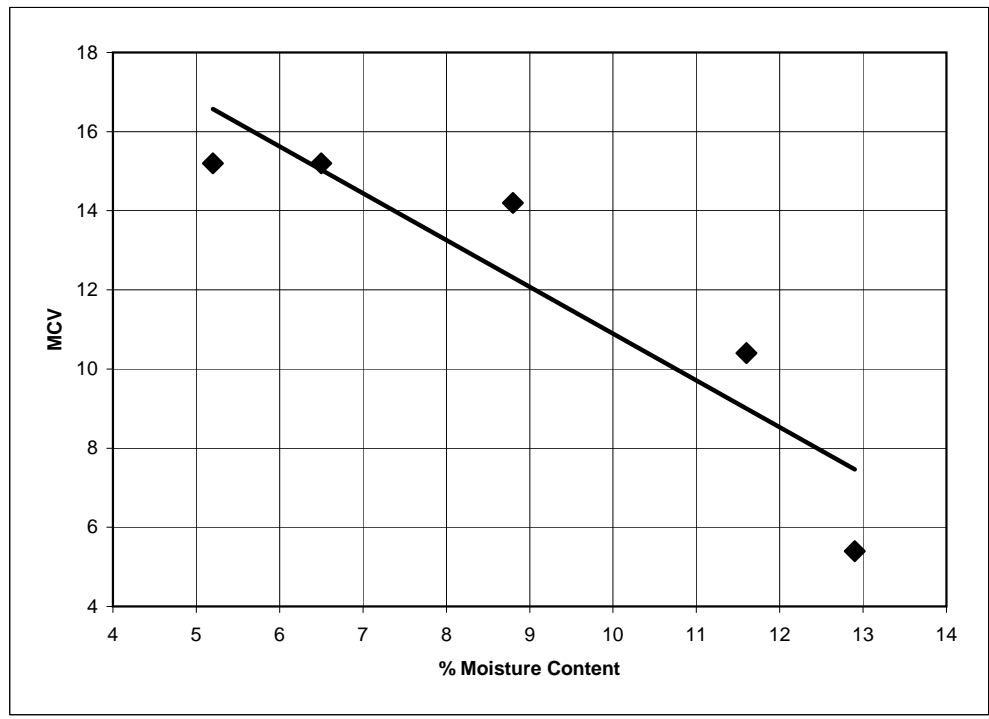


% material >20mm 6

Persons authorized to approve reports J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)
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Report No.	R52079	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	27/03/13	Date Tested	05/04/13
BH/TP No.	TP 11	Sample No.	AA0216 Type: B
Depth (m)	2.00	Lab sample No.	A13/1128

MCV	12	13	8.8	6.5	5.2
MCV	10.4	5.4	14.2	15.2	15.2



% material >20mm 14

Persons authorized to approve reports J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)
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Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



No.4225

Attention : John Clancy
Date : 9th April, 2013
Your reference : 16695
Our reference : Test Report 13/3112 Batch 1
Location : GREATER DUBLIN DRAINAGE SCHEME
Date samples received : 25th March, 2013
Status : Final report
Issue : 1

Four samples were received for analysis on 25th March, 2013. 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward B.Sc
Principal Chemist

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 13/3112

SOILS

Please note we are only MCERTS accredited 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. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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. 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.

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

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final 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.

Please include all sections of this report if it is reproduced

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
OC	Outside Calibration Range
NFD	No Fibres Detected

Appendix 8

Laboratory Test Records

Schedule 5

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51844** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 08/04/13 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 7	N/A	2.0	A13/1287	B	13	35	17	18	62	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh 7	N/A	4.0	A13/1288	B	13	32	15	17	60	WS	4.4	C L	Grey slightly sandy, gravelly, CLAY
Bh 7	N/A	6.5	A13/1289	B	7	33	16	17	63	WS	4.4	C L	Grey slightly sandy, gravelly, CLAY with some cobbles
Bh 7	N/A	9.5	A13/1290	B	12	34	18	16	63	WS	4.4	C L	Grey slightly sandy, gravelly, CLAY
Bh 8	N/A	2.0	A13/1291	B	12.5	33	16	17	65	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh 8	N/A	5.0	A13/1293	B	11.5	35	17	18	61	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
Bh 8	N/A	8.0	A13/1295	B	15	38	20	18	24	WS	4.4	C I	Brown clayey, very sandy, GRAVEL
Bh 8	N/A	11.0	A13/1296	B	16.9	42	22	20	35	WS	4.4	C I	Brown slightly sandy, gravelly, CLAY
Bh 9	N/A	2.0	A13/1297	B	21	38	19	19	70	WS	4.4	C I	Grey brown slightly sandy, slightly gravelly, CLAY
Bh 9	N/A	5.0	A13/1302	B	10	34	20	14	70	WS	4.4	C L	Grey black slightly sandy, slightly gravelly, CLAY
Bh 9	N/A	11.0	A13/1303	B	16.3	30	16	14	60	WS	4.4	C L	Grey slightly sandy, slightly gravelly, CLAY
Bh 15	N/A	2.0	A13/1304	B	14	33	16	17	55	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh 20	N/A	3.0	A13/1305	B	14	32	14	18	66	WS	4.4	C L	Brown slightly sandy, slightly gravelly, CLAY
Bh 20	N/A	8.0	A13/1307	B	12	32	17	15	52	WS	4.4	C L	Grey slightly sandy, slightly gravelly, CLAY with many cobbles
Bh 24	N/A	2.0	A13/1307	B	16	51	NP	NP	27	WS	4.4		Grey silty, sandy, GRAVEL

Notes: Preparation: WS - Wet sieved Sample Type: B - bulk disturbed
 AR - As received U - Undisturbed
 NP - Non plastic
 Liquid Limit 4.3 Cone Penetrometer definitive method
 Clause: 4.4 Cone Penetrometer one point method

Remarks:
 Opinions and interpretations are outside the scope of accreditation.
 The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 24/04/13	Page 1 of 1

IGSL Ltd
 Materials Laboratory
 Unit J5, M7 Business Park
 Newhall, Naas
 Co. Kildare
 045 846176

Test Report



Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3

Report No. **R51845** Contract No. 16695 Contract Name: Greater Dublin Drainage Scheme

Customer Fingal County Council, Grove Road, Blanchardstown, Dublin 15.

Samples Received: 08/04/13 Date Tested: Various

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
Bh 24	N/A	3.0	A13/0794	B	7.3					WS	4.4		Grey clayey/silty, sandy, GRAVEL with so
Bh 24	N/A	4.0	A13/0795	B	3.2					WS	4.4		Grey slightly clayey/silty, sandy, GRAVEL
Bh 26	N/A	2.0	A13/1311	B	13	32	16	16	60	WS	4.4	C L	Grey brown slightly sandy, slightly gravelly
Bh 26	N/A	3.0	A13/1312	B	10	32	15	17	54	WS	4.4	C L	Grey black slightly sandy, slightly gravelly
Bh 26	N/A	8.0	A13/0798	B	13	28	12	16	76	WS	4.4	C L	Brown sandy, slightly gravelly, CLAY

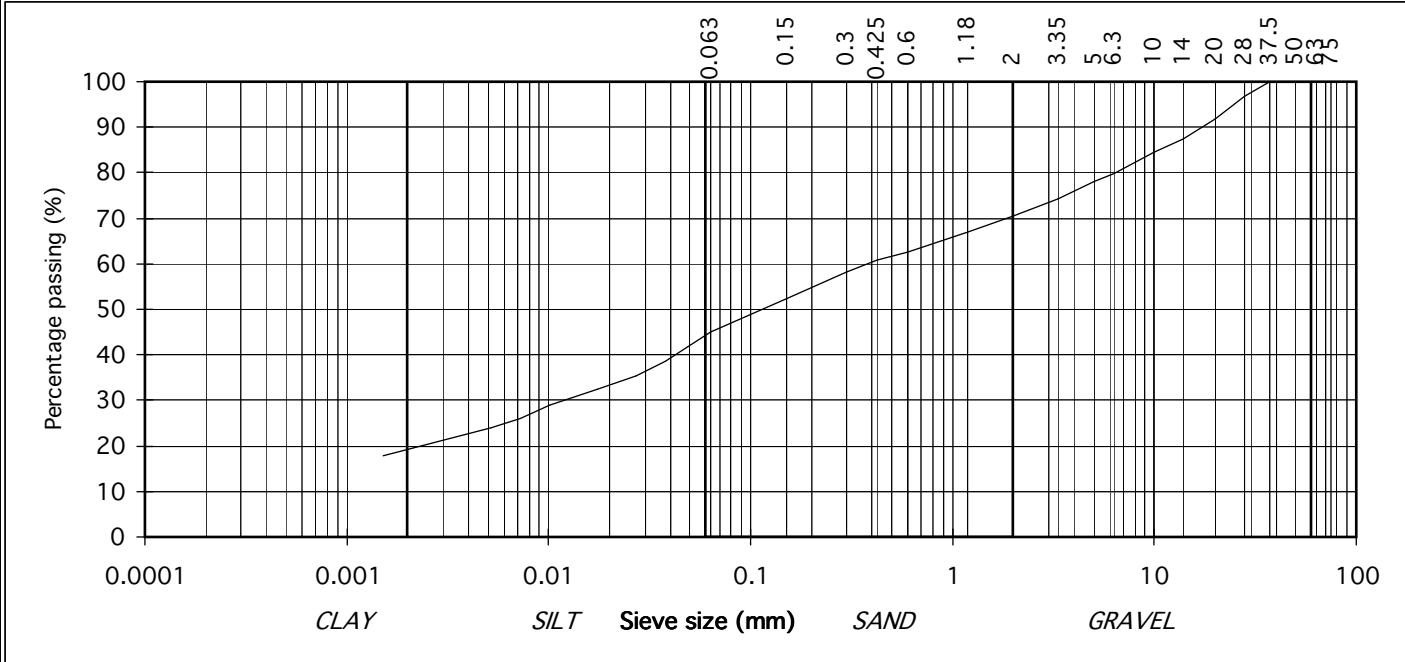
<p>Notes: Preparation: WS - Wet sieved AR - As received NP - Non plastic</p> <p>Liquid Limit 4.3 Cone Penetrometer definitive method Clause: 4.4 Cone Penetrometer one point method</p>	<p>Sample Type: B - bulk disturbed U - Undisturbed</p>	<p>Remarks:</p> <p>Opinions and interpretations are outside the scope of accreditation. The results relate to the specimens tested. Any remaining material will be retained for one month.</p>
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IGSL Ltd Materials Laboratory	Persons authorized to approve reports J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)	Approved by H Byrne	Date 24/04/13	Page 1 of 1

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51846
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 7
50	100		Sample No. N/A Lab. Sample No. A13/1287
37.5	100	GRAVEL	Sample Type: B
28	97		depth (m) 2.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	92		Date Received 08/04/2013 Date Testing started 11/04/2013
14	87		Description: Brown slightly sandy, slightly gravelly, CLAY
10	85		Remarks
6.3	80		
5	78		
3.35	74		
2	70		
1.18	67		SAND
0.6	63		
0.425	61		
0.3	58		
0.15	52		
0.063	45	SILT/CLAY	
0.038	38		
0.027	35		
0.017	32		
0.010	29		
0.007	26		
0.005	24		
0.002	18		



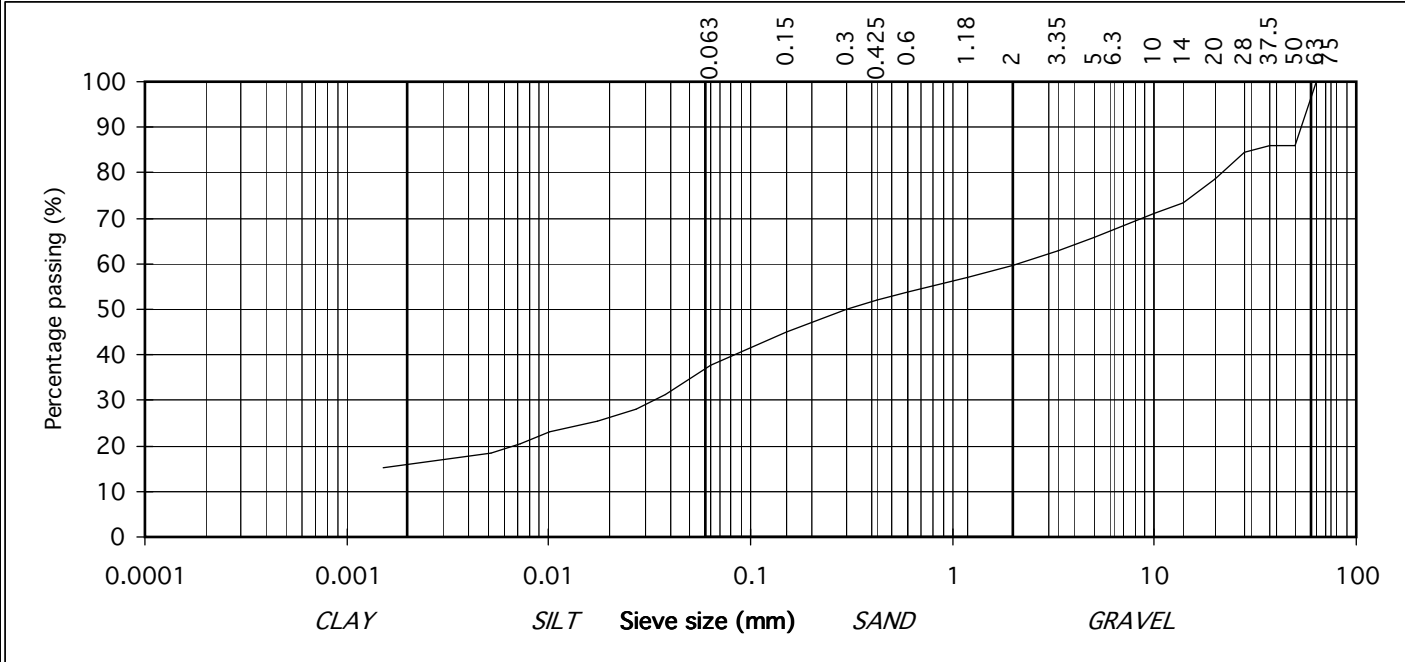
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51847
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 7	
50	86		Sample No. N/A	Lab. Sample No. A13/1288
37.5	86	GRAVEL	Sample Type: B	
28	84		depth (m) 4.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	79		Date Received 08/04/2013	Date Testing started 09/04/2013
14	73		Description: Grey slightly sandy, gravelly, CLAY	
10	71		Remarks	
6.3	68			
5	66			
3.35	63			
2	60			
1.18	57		SAND	
0.6	54			
0.425	52			
0.3	50			
0.15	45			
0.063	38	SILT/CLAY		
0.038	31			
0.027	28			
0.017	25			
0.010	23			
0.007	21			
0.005	18			
0.002	15			



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51848	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	84		Bh:	7			
50	72		Sample No.	N/A	Lab. Sample No.	A13/1289	
37.5	61	GRAVEL	Sample Type:	B			
28	57		depth (m)	6.50	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	55		Date Received	08/04/2013	Date Testing started	09/04/2013	
14	51		Description:	Grey slightly sandy, gravelly, CLAY with some cobbles			
10	50		Remarks	Sample size did not meet the Requirements of BS1377			
6.3	46		SAND				
5	45						
3.35	43						
2	40						
1.18	38						
0.6	36	SILT/CLAY					
0.425	35						
0.3	33						
0.15	30						
0.063	25						
0.038	21						
0.027	20						
0.017	18						
0.010	16						
0.007	15						
0.005	14						
0.002	11						

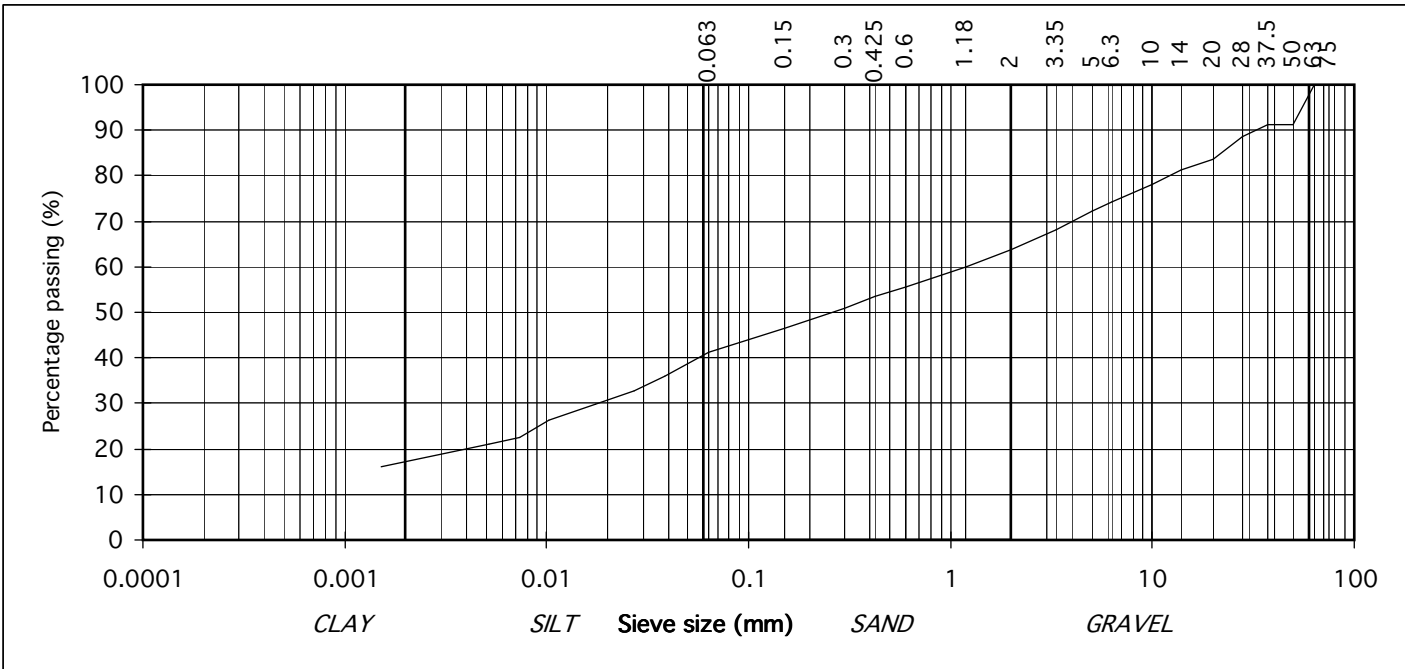
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51849
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 7
50	91		Sample No. N/A Lab. Sample No. A13/1290
37.5	91	GRAVEL	Sample Type: B
28	88		depth (m) 9.50 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	84		Date Received 08/04/2013 Date Testing started 09/04/2013
14	81		Description: Grey slightly sandy, gravelly, CLAY
10	78		Remarks
6.3	74		
5	72		
3.35	68		
2	64		
1.18	60		SAND
0.6	55		
0.425	53		
0.3	51		
0.15	47		
0.063	41	SILT/CLAY	
0.038	36		
0.027	33		
0.017	30		
0.010	26		
0.007	23		
0.005	21		
0.002	16		



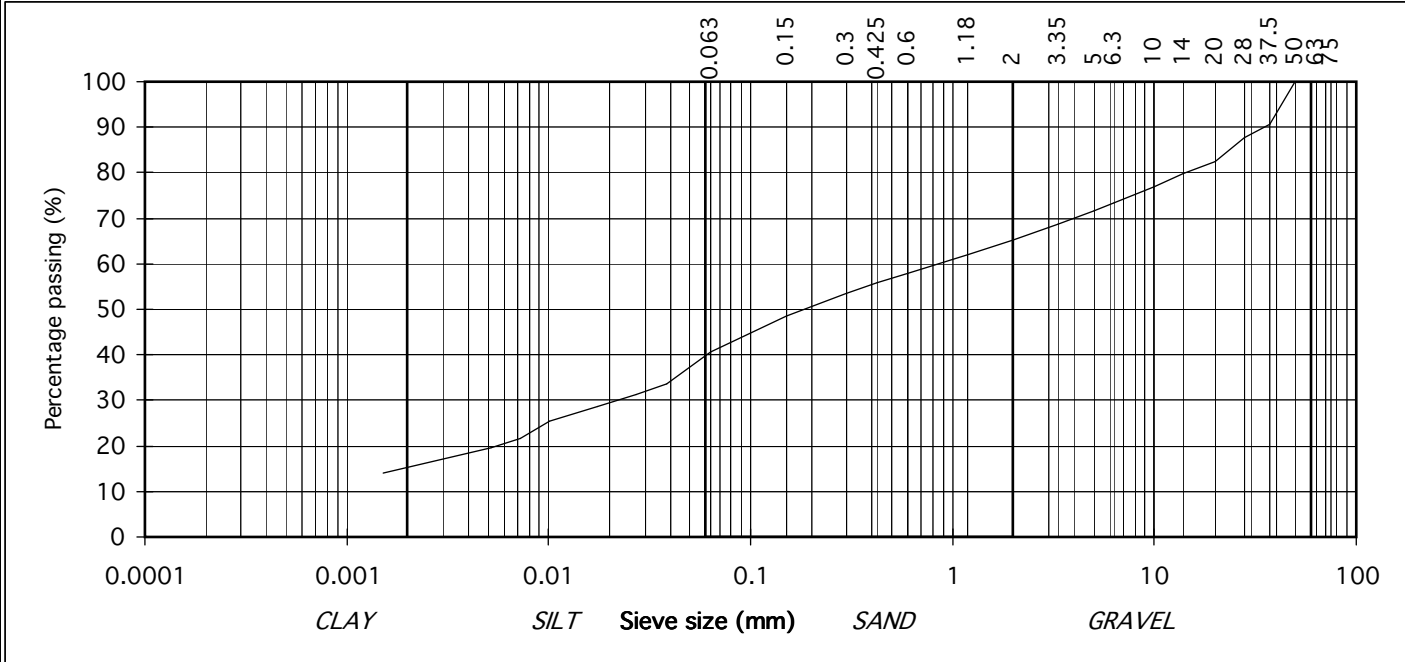
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51850
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme
63	100		Bh: 8
50	100		Sample No. N/A Lab. Sample No. A13/1291
37.5	91	GRAVEL	Sample Type: B
28	88		depth (m) 2.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	82		Date Received 08/04/2013 Date Testing started 08/04/2013
14	80		Description: Brown slightly sandy, slightly gravelly, CLAY
10	77		Remarks
6.3	73		
5	72		
3.35	69		
2	65		
1.18	62		
0.6	58	SAND	
0.425	56		
0.3	54		
0.15	48	SILT/CLAY	
0.063	41		
0.038	34		
0.027	31		
0.017	29		
0.010	25		
0.007	22		
0.005	20		
0.002	14		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51851	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	8			
50	83		Sample No.	N/A	Lab. Sample No.	A13/1291	
37.5	83	GRAVEL	Sample Type:	B			
28	83		depth (m)	5.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	80		Date Received	08/04/2013	Date Testing started	08/04/2013	
14	77		Description:	Brown slightly sandy, gravelly, CLAY			
10	75		Remarks	Sample size did not meet the Requirements of BS1377			
6.3	72		SAND				
5	70						
3.35	66						
2	62						
1.18	58						
0.6	54						
0.425	53						
0.3	51	SILT/CLAY					
0.15	46						
0.063	41						
0.038	34						
0.027	31						
0.017	28						
0.010	25						
0.007	23						
0.005	20						
0.002	15						

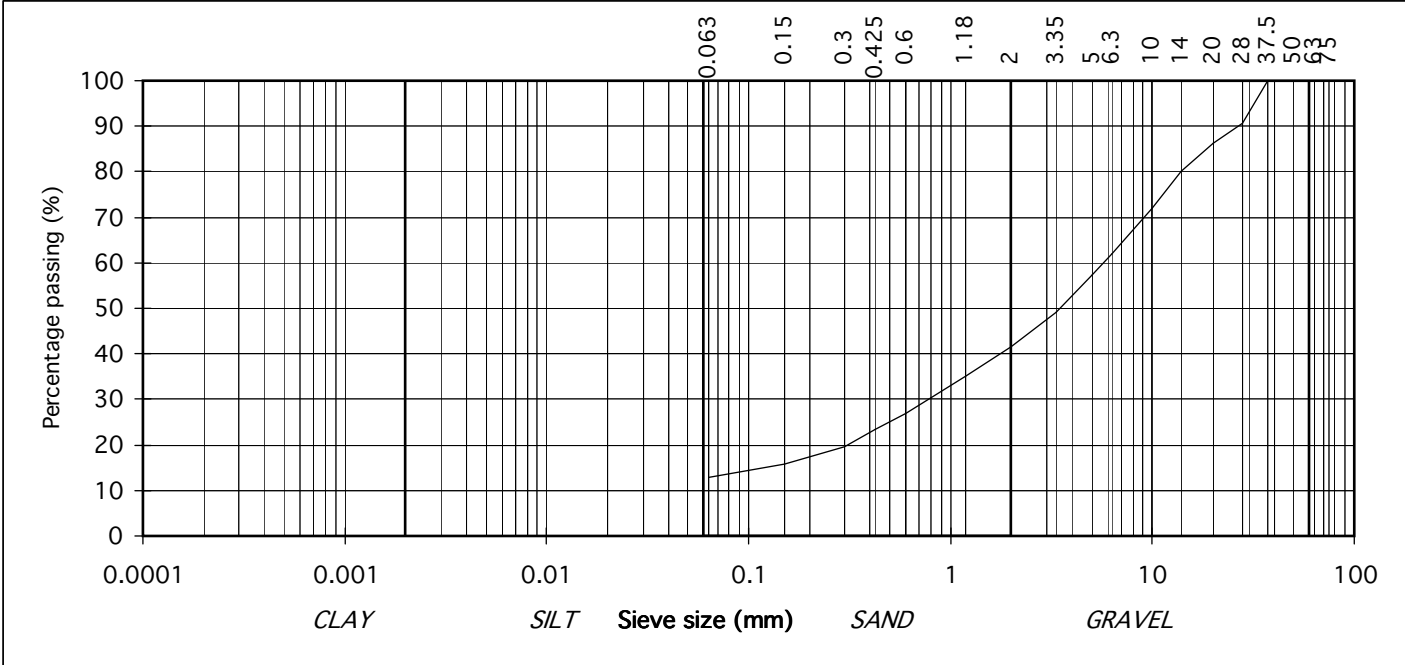
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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51852
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 8	
50	100		Sample No. N/A	Lab. Sample No. A13/1295
37.5	100	GRAVEL	Sample Type: B	
28	91		depth (m) 8.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	86		Date Received 08/04/2013	Date Testing started 08/04/2013
14	80		Description: Brown clayey, very sandy, GRAVEL	
10	72		Remarks	
6.3	62			
5	57			
3.35	49			
2	42			
1.18	35		SAND	
0.6	27			
0.425	23			
0.3	20			
0.15	16			
0.063	13	SILT/CLAY		



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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51853	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	8			
50	95		Sample No.	N/A	Lab. Sample No.	A13/1296	
37.5	95	GRAVEL	Sample Type:	B			
28	92		depth (m)	11.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	90		Date Received	08/04/2013	Date Testing started	08/04/2013	
14	85		Description:	Brown slightly sandy, gravelly, CLAY			
10	81		Remarks				
6.3	74		SAND				
5	70						
3.35	65						
2	57						
1.18	51						
0.6	44						
0.425	41						
0.3	37						
0.15	32						
0.063	26						
0.038	22	SILT/CLAY					
0.027	21						
0.017	19						
0.010	17						
0.007	15						
0.005	13						
0.002	10						

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TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51854	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	9			
50	100		Sample No.	N/A	Lab. Sample No.	A13/1297	
37.5	100		Sample Type:	B			
28	100		depth (m)	2.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	99	GRAVEL	Date Received	08/04/2013	Date Testing started	08/04/2013	
14	98		Description:	Grey brown slightly sandy, slightly gravelly, CLAY			
10	94		Remarks				
6.3	88						
5	85						
3.35	80						
2	75						
1.18	71						
0.6	67						
0.425	65						
0.3	62						
0.15	55						
0.063	46						
0.038	39	SAND					
0.027	36						
0.017	33						
0.010	29						
0.007	26						
0.005	23						
0.002	16						
		SILT/CLAY					

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51855	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	9			
50	100		Sample No.	N/A	Lab. Sample No.	A13/1302	
37.5	100		Sample Type:	B			
28	100		depth (m)	5.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	98	GRAVEL	Date Received	08/04/2013	Date Testing started	08/04/2013	
14	94		Description:	Grey black slightly sandy, slightly gravelly, CLAY			
10	91		Remarks				
6.3	88						
5	86						
3.35	82						
2	78						
1.18	74						
0.6	69						
0.425	67						
0.3	64						
0.15	58						
0.063	50						
0.038	43	SAND					
0.027	39						
0.017	35						
0.010	30						
0.007	26						
0.005	22						
0.002	14	SILT/CLAY					

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51856
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 9	
50	100		Sample No. N/A	Lab. Sample No. A13/1303
37.5	97	GRAVEL	Sample Type: B	
28	95		depth (m) 11.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	93		Date Received 08/04/2013	Date Testing started 08/04/2013
14	90		Description: Grey slightly sandy, slightly gravelly, CLAY	
10	86		Remarks	
6.3	81			
5	78			
3.35	74			
2	69			
1.18	65			
0.6	60			
0.425	57			
0.3	55			
0.15	49			
0.063	41			
0.038	36	SAND		
0.027	33			
0.017	29			
0.010	26			
0.007	22			
0.005	19			
0.002	12			
		SILT/CLAY		

IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	H Byrne	24/04/13	1 of 1

Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51857	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 15	
50	100		Sample No. N/A Lab. Sample No. A13/1304	
37.5	100		Sample Type: B	
28	100		depth (m) 2.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	97	GRAVEL	Date Received 08/04/2013 Date Testing started 09/04/2013	
14	92		Description: Brown slightly sandy, slightly gravelly, CLAY	
10	88		Remarks	
6.3	83		SAND	
5	81			
3.35	77			
2	73			
1.18	69			
0.6	64			
0.425	61			
0.3	58			
0.15	51			
0.063	41	SILT/CLAY		
0.038	36			
0.027	32			
0.017	29			
0.010	26			
0.007	22			
0.005	18			
0.002	12			

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51858	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 20	
50	91		Sample No. N/A Lab. Sample No. A13/1305	
37.5	91	GRAVEL	Sample Type: B	
28	91		depth (m) 3.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	91		Date Received 08/04/2013 Date Testing started 09/04/2013	
14	88		Description: Brown slightly sandy, slightly gravelly, CLAY	
10	86		Remarks	
6.3	81		SAND	
5	79			
3.35	76			
2	72			
1.18	69			
0.6	65			
0.425	63			
0.3	59			
0.15	51			
0.063	40			
0.038	35	SILT/CLAY		
0.027	32			
0.017	29			
0.010	26			
0.007	22			
0.005	20			
0.002	14			

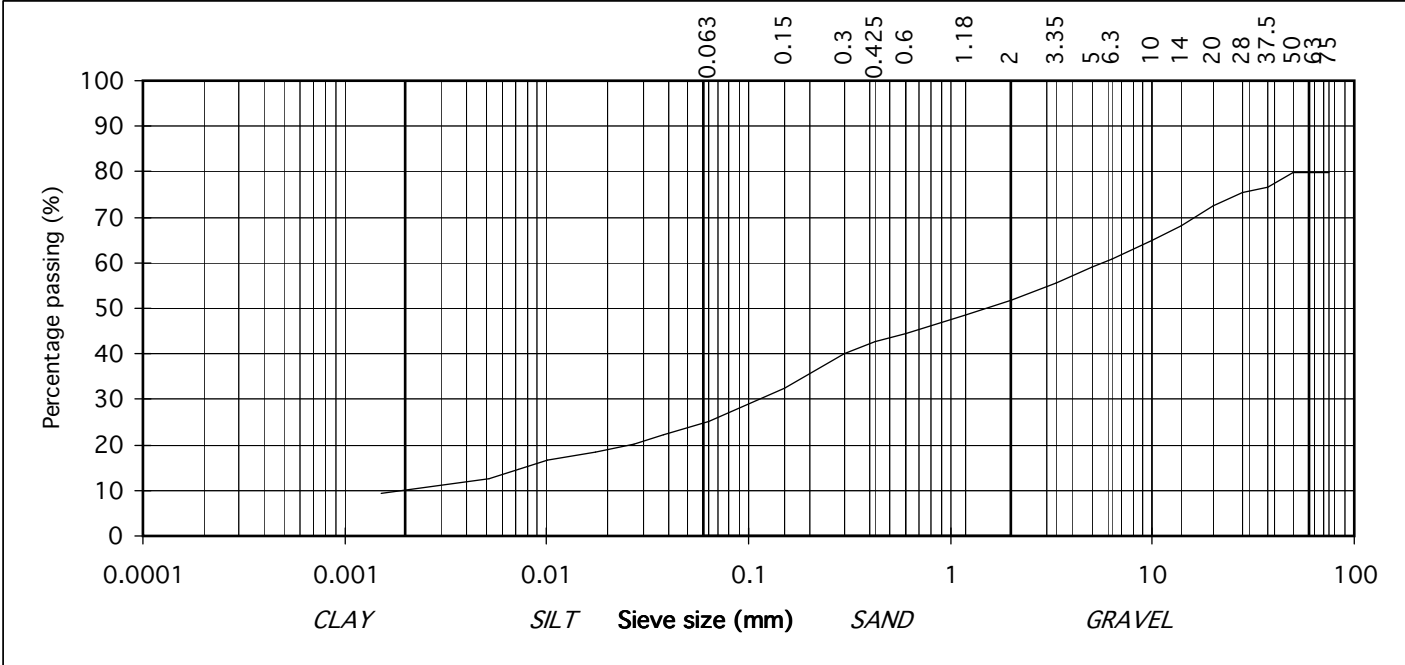
IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
	H Byrne	24/04/13	1 of 1

Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51859
75	80	COBBLES	Contract: Greater Dublin Drainage Scheme
63	80		Bh: 20
50	80		Sample No. N/A Lab. Sample No. A13/1307
37.5	77	GRAVEL	Sample Type: B
28	75		depth (m) 8.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	73		Date Received 08/04/2013 Date Testing started 08/04/2013
14	68		Description: Grey slightly sandy, slightly gravelly, CLAY with many cobbles
10	65		Remarks
6.3	61		Sample size did not meet the Requirements of BS1377
5	59		
3.35	56	SAND	
2	52		
1.18	49		
0.6	45		
0.425	43	SILT/CLAY	
0.3	40		
0.15	33		
0.063	25		
0.038	22		
0.027	20		
0.017	19		
0.010	17		
0.007	15		
0.005	13		
0.002	9		



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51860	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	24			
50	86	GRAVEL	Sample No.	N/A	Lab. Sample No.	A13/1308	
37.5	84		Sample Type:	B			
28	76		depth (m)	2.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	62		Date Received	08/04/2013	Date Testing started	08/04/2013	
14	52		Description:	Grey silty, sandy, GRAVEL			
10	44		Remarks	Sample size did not meet the Requirements of BS1377			
6.3	38		SAND				
5	36						
3.35	32						
2	28						
1.18	24						
0.6	20						
0.425	18						
0.3	17						
0.15	14	SILT/CLAY					
0.063	12						

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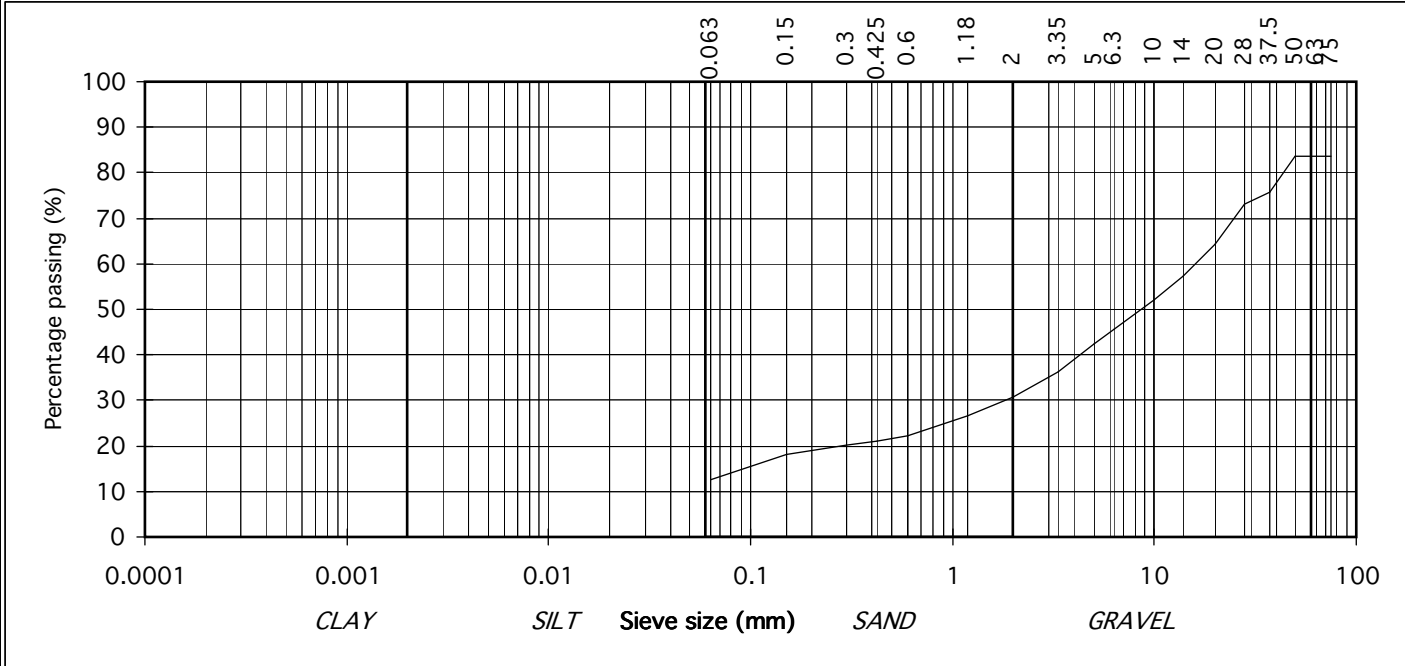
Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing	
75	84	COBBLES
63	84	
50	84	
37.5	76	GRAVEL
28	73	
20	64	
14	57	
10	52	
6.3	46	
5	42	
3.35	36	SAND
2	31	
1.18	26	
0.6	22	
0.425	21	SILT/CLAY
0.3	20	
0.15	18	
0.063	13	

Contract No: 16695 Report No. R51861
 Contract: Greater Dublin Drainage Scheme
 Bh: 24
 Sample No. N/A Lab. Sample No. A13/1309
 Sample Type: B
 depth (m) 3.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received 08/04/2013 Date Testing started 08/04/2013
 Description: Grey clayey/silty, sandy, GRAVEL with some cobbles
 Remarks: Sample size did not meet the Requirements of BS1377



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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51862	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	24			
50	93	GRAVEL	Sample No.	N/A	Lab. Sample No.	A13/1310	
37.5	81		Sample Type:	B			
28	65		depth (m)	4.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	52		Date Received	08/04/2013	Date Testing started	08/04/2013	
14	45		Description:	Grey slightly clayey/silty, sandy, GRAVEL			
10	40		Remarks	Sample size did not meet the Requirements of BS1377			
6.3	33		SAND				
5	30						
3.35	24						
2	17						
1.18	11						
0.6	6						
0.425	5						
0.3	4						
0.15	3	SILT/CLAY					
0.063	3						

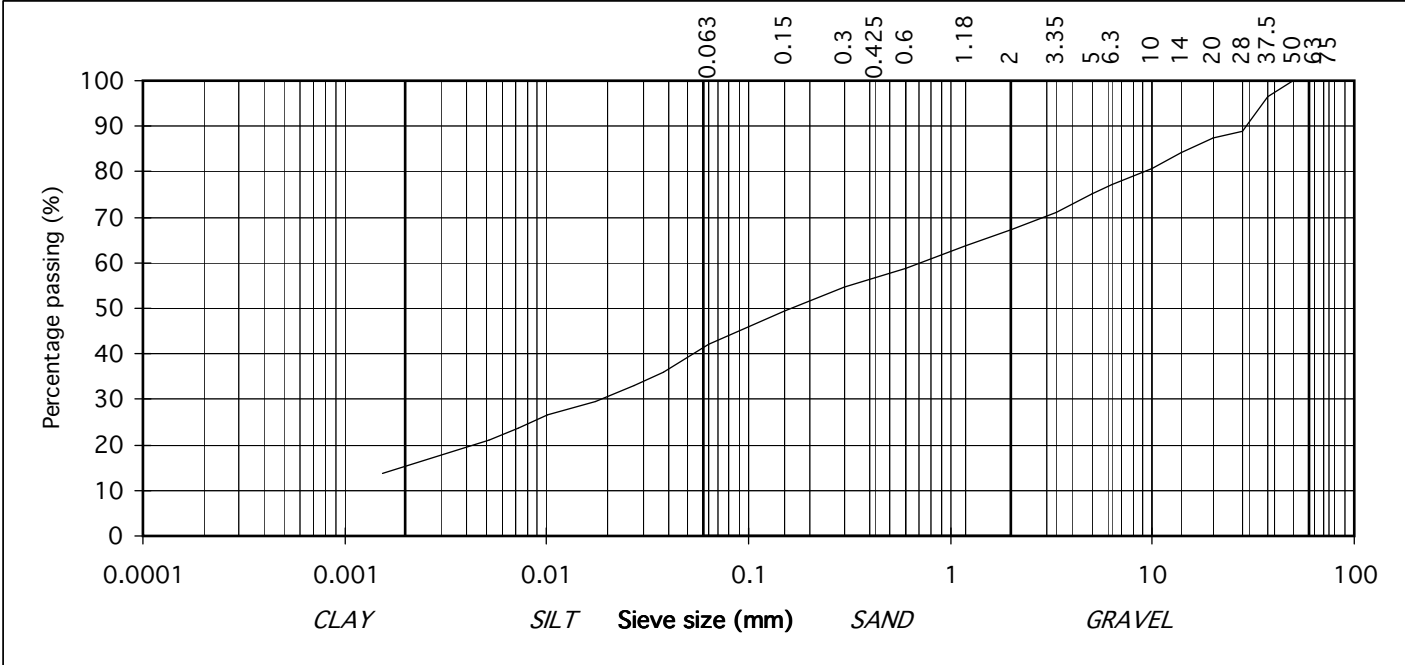
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695	Report No. R51863
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 26	
50	100		Sample No. N/A	Lab. Sample No. A13/1311
37.5	97	GRAVEL	Sample Type: B	
28	89		depth (m) 2.00	Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
20	87		Date Received 08/04/2013	Date Testing started 08/04/2013
14	84		Description: Grey brown slightly sandy, slightly gravelly, CLAY	
10	81		Remarks	Sample size did not meet the Requirements of BS1377
6.3	77			
5	75			
3.35	71	SAND		
2	67			
1.18	64			
0.6	59			
0.425	57	SILT/CLAY		
0.3	55			
0.15	49			
0.063	42			
0.038	36			
0.027	33			
0.017	29			
0.010	27			
0.007	24			
0.005	21			
0.002	14			



IGSL Ltd Materials Laboratory	Approved by:	Date:	Page no:
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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)			

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No:	16695	Report No.	R51864	
75	100	COBBLES	Contract:	Greater Dublin Drainage Scheme			
63	100		Bh:	26			
50	100		Sample No.	N/A	Lab. Sample No.	A13/1312	
37.5	100		Sample Type:	B			
28	100		depth (m)	3.00	Customer:	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	97	GRAVEL	Date Received	08/04/2013	Date Testing started	09/04/2013	
14	90		Description:	Grey black slightly sandy, slightly gravelly, CLAY			
10	86		Remarks				
6.3	81						
5	78						
3.35	74						
2	69						
1.18	65						
0.6	60						
0.425	58						
0.3	55						
0.15	50						
0.063	43						
0.038	36	SAND					
0.027	34						
0.017	31						
0.010	28						
0.007	25						
0.005	21	SILT/CLAY					
0.002	14						

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

TEST REPORT
Determination of Particle Size Distribution
 Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
 (note: Sedimentation stage not accredited)



particle size	% passing		Contract No: 16695 Report No. R51865	
75	100	COBBLES	Contract: Greater Dublin Drainage Scheme	
63	100		Bh: 26	
50	100		Sample No. N/A Lab. Sample No. A13/1314	
37.5	100	GRAVEL	Sample Type: B	
28	96		depth (m) 8.00 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.	
20	94		Date Received 08/04/2013 Date Testing started 08/04/2013	
14	93		Description: Brown sandy, slightly gravelly, CLAY	
10	92		Remarks	
6.3	89		SAND	
5	88			
3.35	86			
2	84			
1.18	81			
0.6	78			
0.425	76			
0.3	73			
0.15	63			
0.063	46			
0.038	40	SILT/CLAY		
0.027	36			
0.017	33			
0.010	30			
0.007	27			
0.005	23			
0.002	16			

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Persons authorized to approve reports: J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)

Test Report

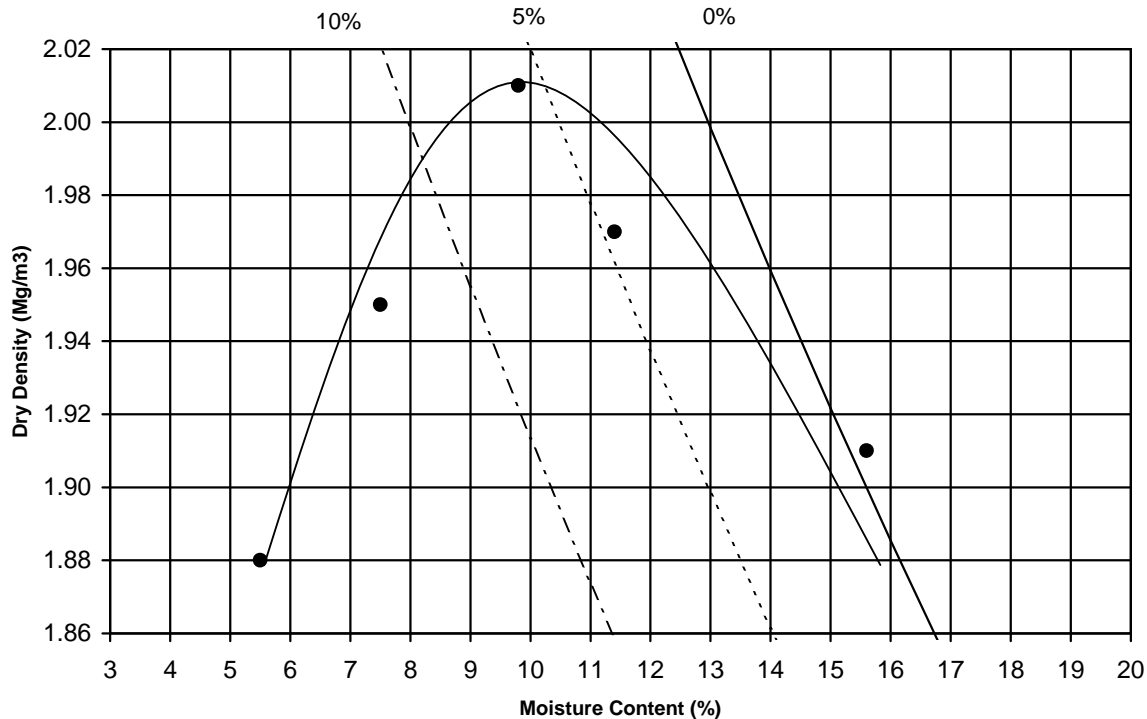
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R52080 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Bh 7
 Sample No. N/A Depth (m) 3 Material Type B
 Lab sample no. A13/1288 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 08/04/2013 Test Method: 2.5 KG Rammer
 Date Tested: 19/04/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.91	1.97	2.01	1.88	1.95		
Moisture Content (%)	16	11	9.8	5.5	7.5		



Maximum Dry Density (Mg/m³): 2.01 Optimum Moisture Content (%): 8

Description: Grey slightly sandy, gravelly, CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.7 Particle Density: Assumed

% retained on 20/37.5mm sieve: 16

Natural Moisture Content (%): 16

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

Test Report

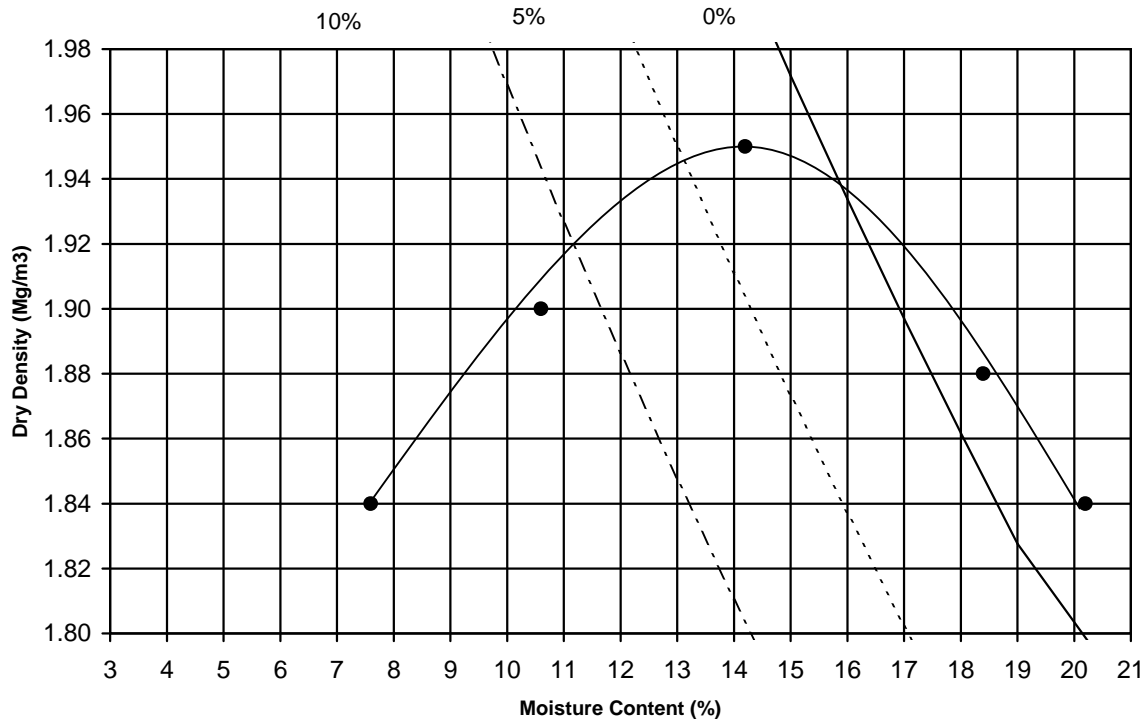
Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990



Report No. R52081 Contract No. 16695
 Contract Name: Greater Dublin Drainage Scheme
 Lab Contract No. 16695 Location: Bh 20
 Sample No. N/A Depth (m) 4 Material Type B
 Lab sample no. A13/1306 Customer: Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
 Date Received: 08/04/2013 Test Method: 2.5 KG Rammer
 Date Tested: 19/04/2013 BS1377:Part 4:1990 3.3

Dry Density (Mg/m ³)	1.95	1.90	1.84	1.84	1.88		
Moisture Content (%)	14	11	7.6	20	18		



Maximum Dry Density (Mg/m³): 1.95 Optimum Moisture Content (%): 14

Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Sample Preparation: Material passing 20mm Single / Separate samples used

Particle Density (Mg/m³): 2.75 Particle Density: Assumed

% retained on 20/37.5mm sieve: 9

Natural Moisture Content (%): 14

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

Persons authorised to approve reports
J Barrett (Dep. Quality Manager)
H Byrne (Quality Manager)

IGSL Materials Laboratory

Approved by

H Byrne

Date

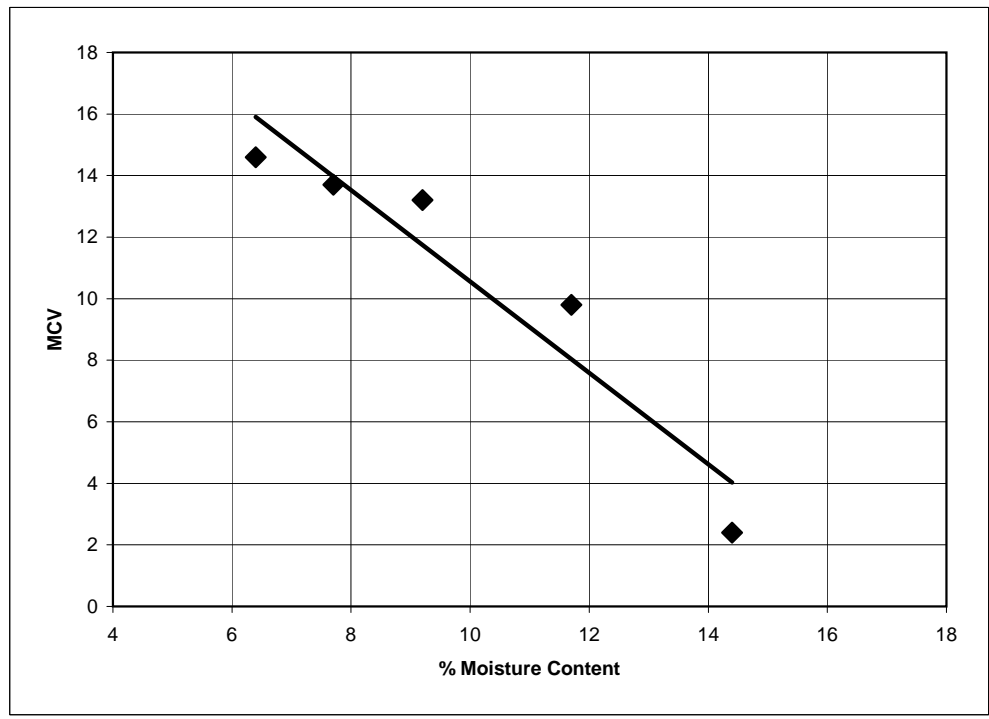
14/05/13

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Report No.	R52082	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	08/04/13	Date Tested	01/05/13
BH/TP No.	Bh 8	Sample No.	N/A Type: B
Depth (m)	5.00	Lab sample No.	A13/1292-94

MC%	12	9.2	7.7	6.4	14
MCV	9.8	13.2	13.7	14.6	2.4



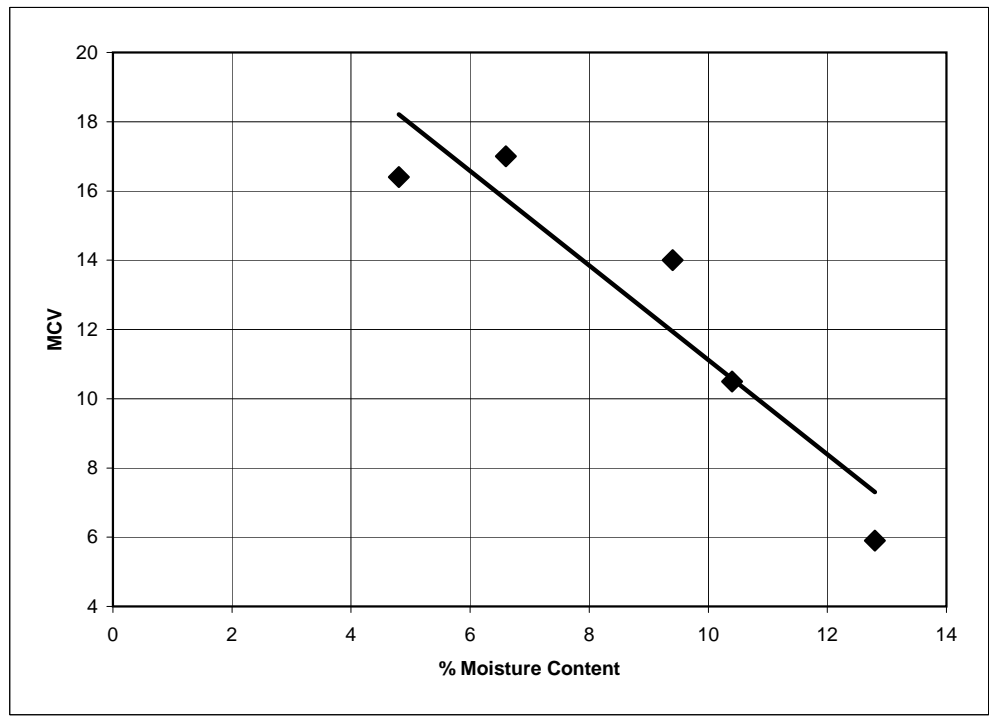
% material >20mm 10

Persons authorized to approve reports J Barrett (Deputy Quality Manager) H Byrne (Quality Manager)
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co.Kildare 045 846176	TEST REPORT Determination of MCV / moisture content Relation of a soil Tested in accordance with BS1377-4:1990, clause 5.5	
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Report No.	R52110	Contract	Greater Dublin Drainage Scheme
Contract No.	16695	Customer	Fingal County Council, Grove Road, Blanchardstown, Dublin 15.
Date received	08/04/13	Date Tested	01/05/13
BH/TP No.	Bh 26	Sample No.	N/A
		Type:	B
Depth (m)	3.00	Lab sample No.	A13/1312-13


MC%	10	13	9.4	6.6	4.8
MCV	10.5	5.9	14	17	16.4



% material >20mm 12

Persons authorized to approve reports
 J Barrett (Deputy Quality Manager)
 H Byrne (Quality Manager)

IGSL Ltd Materials Laboratory	Approved by	Date	Page No.
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report				
	Determination of Moisture Condition Value at Natural Moisture Content				
	Tested in accordance with BS1377:Part 4:1990, clause 5.4				
Report No.		R52111			
Contract No.		16695			
Contract Name:		Greater Dublin Drainage Scheme			
Customer:		Fingal County Council, Grove Road, Blanchardstown, Dublin 15.			
BH/TP		Bh 9			
Sample No.		N/A			
Depth (m)		5.00			
Sample Type:		B			
Lab Sample No.		A13/1302			
Source (if applicable)		N/A			
Material Type (if applicable):		soil			
Sample Received:		08/04/13			
Date Tested:		01/05/13			
Sample Cert:		Not Provided			
Moisture Content (%):		22			
% Particles > 20mm (By dry mass):		10			
MCV:		8.3			
Interpretation of Plot:		Steepest Straight Line			
Description of Soil:		Grey black slightly sandy, slightly gravelly, CLAY			
<p>The result relates to the specimen tested. Any remaining material will be retained for one month. Sampling and opinions and interpretations are outside the scope of accreditation.</p>			<p>Persons authorised to approve reports</p> <p>J Barrett (Dep. Quality Manager) H Byrne (Quality Manager)</p>		
IGSL Ltd Materials Laboratory		Approved by		Date	Page
		H Byrne		15/05/13	1 of 1



Jones Environmental Laboratory

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

IGSL
Unit F
M7 Business Park
Naas
Co Kildare
Ireland

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



No.4225

Attention : John Clancy
Date : 12th April, 2013
Your reference : 16695
Our reference : Test Report 13/3384 Batch 1
Location : GREATER DUBLIN DRAINAGE SCHEME
Date samples received : 5th April, 2013
Status : Final report
Issue : 1

Five samples were received for analysis on 5th April, 2013. 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward B.Sc
Principal Chemist

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 13/3384

SOILS

Please note we are only MCERTS accredited 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. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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. 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.

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

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and 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.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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.

NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in an interim report but will remove the accreditation, in this instance results should be considered indicative only. Where possible samples will be re-extracted and a final 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.

Please include all sections of this report if it is reproduced

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
OC	Outside Calibration Range
NFD	No Fibres Detected

Appendix 9

Rock Core Test Records

POINT LOAD TEST RESULTS									
Contract: Greater Dublin Drainage Scheme Contract no. 16695 Date of test: 15/5/13			Sample Type: Core						
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orientation
RC06	19	82	20.0	1.249	2.97	3.72	74	PL	90°
	19.6	82	29.0	1.249	4.31	5.39	108	PL	90°
	21.4	82	34.0	1.249	5.06	6.32	126	PL	90°
	21.6	82	22.0	1.249	3.27	4.09	82	PL	90°
RC07	15.6	82	23.0	1.249	3.42	4.27	85	PL	90°
	15.80	82	28.0	1.249	4.16	5.20	104	PL	90°
RC09	15.10	86	19.0	1.276	2.57	3.28	66	PL	90°
	15.90	86	30.0	1.276	4.06	5.18	104	PL	90°
	16.30	86	29.0	1.276	3.92	5.00	100	PL	90°
RC11	14.50	78	20.0	1.222	3.29	4.02	80	PL	90°
	14.60	78	17.0	1.222	2.79	3.41	68	PL	90°
	18.30	78	2.0	1.222	0.33	0.40	8	PL	90°
RC13	18.40	78	3.0	1.222	0.49	0.60	12	PL	90°
	25.40	78	8.0	1.222	1.31	1.61	32	PL	90°
	25.90	78	12.0	1.222	1.97	2.41	48	PL	90°
	26.10	78	18.0	1.222	2.96	3.61	72	PL	90°
RC14	27.10	78	21.0	1.222	3.45	4.22	84	PL	90°
	21.30	78	26.0	1.222	4.27	5.22	104	PL	90°
	21.70	78	15.0	1.222	2.47	3.01	60	PL	90°
	22.30	78	22.0	1.222	3.62	4.42	88	PL	90°
	22.40	78	10.0	1.222	1.64	2.01	40	PL	90°
Statistical Summary Data			Is(50)	UCS*	*UCS Normal Distribution Curve			Abbreviations	
Number of Samples Tested			21	21				i	irregular
Minimum			0.40	8				a	axial
Average			3.68	74				b	block
Maximum			6.32	126				d	diametral
Standard Dev.			1.58	32				approx. orientation to planes of <u>weakness/bedding</u>	
Upper 95% Confidence Limit			6.77	135.45				U	unknown
Lower 95% Confidence Limit			0.60	11.94	P	perpendicular			
<u>Comments:</u>					//	parallel			
*UCS taken as k x Point Load Is(50):			k=	20					

POINT LOAD TEST RESULTS									
Contract: Greater Dublin Drainage Scheme Contract no. 16695 Date of test: 15/5/13			Sample Type: Core						
RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orientation
RC15	6.55	82	4.0	1.249	0.59	0.74	15	PL	90°
	7.65	82	2.0	1.249	0.30	0.37	7	PL	90°
	7.95	82	7.0	1.249	1.04	1.30	26	PL	90°
	14	82	9.0	1.249	1.34	1.67	33	PL	90°
	14.35	82	8.0	1.249	1.19	1.49	30	PL	90°
	22.90	82	18.0	1.249	2.68	3.34	67	PL	90°
	23.45	86	12.0	1.276	1.62	2.07	41	PL	90°
	23.90	86	2.0	1.276	0.27	0.35	7	PL	90°
	27.65	86	16.0	1.276	2.16	2.76	55	PL	90°
28.10	78	10.0	1.222	1.64	2.01	40	PL	90°	
RC17	13.60	82	11.0	1.249	1.64	2.04	41	PL	90°
RC24	14.20	82	14.0	1.249	2.08	2.60	52	PL	90°
	5.50	82	21.0	1.249	3.12	3.90	78	PL	90°
	6.35	82	15.0	1.249	2.23	2.79	56	PL	90°
	6.70	82	20.0	1.249	2.97	3.72	74	PL	90°
	8.85	82	22.0	1.249	3.27	4.09	82	PL	90°
	9.65	82	18.0	1.249	2.68	3.34	67	PL	90°
	10.00	82	16.0	1.249	2.38	2.97	59	PL	90°
Statistical Summary Data			Is(50)	UCS*	*UCS Normal Distribution Curve			Abbreviations	
Number of Samples Tested			18	18				i	irregular
Minimum			0.35	7				a	axial
Average			2.31	46				b	block
Maximum			4.09	82				d	diametral
Standard Dev.			1.17	23				approx. orientation to planes of <u>weakness/bedding</u>	
Upper 95% Confidence Limit			4.60	91.93				U	unknown
Lower 95% Confidence Limit			0.02	0.42	P	perpendicular			
<u>Comments:</u>					//	parallel			
*UCS taken as k x Point Load Is(50):			k=	20					

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC9
Depth (m): 16.0-16.4m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

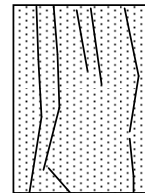
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
- II. Slightly weathered: Slight discolouration, slight weakening
- III. Moderately weathered: Considerable weakening, penetrative discolouration
- IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 190 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 354 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{354000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 58.20 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.64 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC14
Depth (m): 21.3-21.5m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

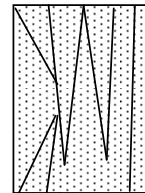
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration
IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 160 mm
Diameter (Ø): 76 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 259 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{259000}{4534.16} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 57.09 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.66 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC15
Depth (m): 7.7-7.9m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

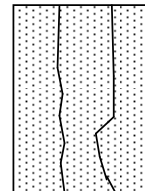
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
- II. Slightly weathered: Slight discolouration, slight weakening
- III. Moderately weathered: Considerable weakening, penetrative discolouration
- IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 201 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 386 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{386000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 63.46 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.69 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC15
Depth (m): 14.1-14.30m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

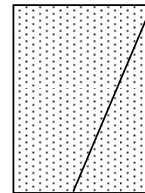
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
- II. Slightly weathered: Slight discolouration, slight weakening
- III. Moderately weathered: Considerable weakening, penetrative discolouration
- IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 201 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 87 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{87000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 14.30 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.69 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC15
Depth (m): 23.0-23.4m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

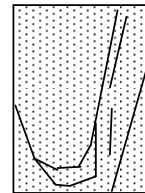
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration
IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 198 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 282 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{282000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 46.37 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.72 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC15
Depth (m): 27.8-28.0m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

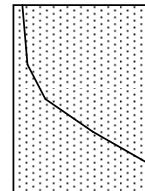
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
- II. Slightly weathered: Slight discolouration, slight weakening
- III. Moderately weathered: Considerable weakening, penetrative discolouration
- IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 181 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 162 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{162000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 26.64 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.69 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC24
Depth (m): 6.3-6.6m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

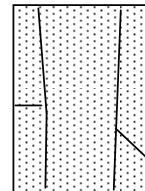
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration
IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 182 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 212 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{212000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 34.86 \text{ (Mpa)} \\ \text{Bulk Density} &= 2.67 \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name: Greater Dublin Drainage Scheme
Job Number: 16695
Hole No: RC24
Depth (m): 9.75-9.95m

Sample Description

Colour: Grey
Grain size: Fine-grained
Weathering Grade: Fresh
Rock Type: LIMESTONE

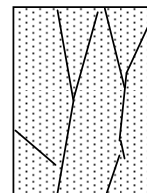
Weathering Grade Criteria

- I. Fresh: Unchanged from original state
II. Slightly weathered: Slight discolouration, slight weakening
III. Moderately weathered: Considerable weakening, penetrative discolouration
IV. Highly weathered: Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length: 160 mm
Diameter (Ø): 88 mm

Sketch of Failure Surfaces



Testing

Load Rate: 3.3 kN/min
Load at Failure (P): 573 kN

Strength Calculations

$$\begin{aligned} \text{Uniaxial Compressive Strength} &= \frac{573000}{6079.04} \\ &= \frac{1000 \times P}{\pi \times (\text{Ø}/2)^2} \\ &= 94.21 \text{ (Mpa)} \\ \text{Bulk Density} &= \text{ } \text{ (Mg/m}^3\text{)} \end{aligned}$$

Notes: